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ABOUT THE SOCIETY

MOBILIZATION Society was established in 2003 as a non-profit professional society aimed at sensitizing and mobilizing development partners and community for sustainable development. The Society, during these ensuing years has successfully mobilized researchers, academicians, planners, grass root mobilizers and student and created conducive intellectual atmosphere for introspective deliberations and conducted National seminars/ workshop to address the emerging problems experienced by the agrarian mass. Presently the Society has more than 1200 Life Members. The recognition of the Society in the efforts for strengthening the forum for scientific communication is growing among the related professionals and concerned agricultural stakeholders rapidly. The Society works on following objectives-

1. To document the on-farm and adaptive research experiences in multi- disciplinary agri-bio sciences and extension education.
2. To offer a platform for sharing the empirical experiences of development professionals, community mobilizers, academicians, multi-sectoral researchers, students etc. for the benefit of ultimate users.
3. To facilitate close and reciprocal linkage among the institutions for sustainable rural development.
4. Promoting potential and practicing entrepreneurs.
5. To disseminate the documented knowledge to the global partners through approach abstracting and indexing.

ABOUT THE JOURNAL

Journal of Community Mobilization and Sustainable Development (print ISSN 2230 – 9047; online ISSN 2231 – 6736) is published by Society for Community Mobilization for Sustainable Development twice a year. The Journal of Community Mobilization and Sustainable Development has NAAS rating 5.67 and Journal ID J158. The Journal of Community Mobilization and Sustainable Development, is also available on our website www.mobilization.co.in and it has been registered with www.indianjournal.com for national and global abstracting and indexing. MOBILIZATION envisages reorienting the young professionals and researches for imbibing the values of community participation in research, training and extension efforts.

The aim and scope of the journal are:

1. Sharing the relevant experiences and issues related to agriculture and allied fields at the grass root level and global forum to create the necessary academic and development climate.
2. Sensitizing the different stakeholders about the knowledge and innovation management system in pluralistic agri-rural environment.
3. Developing network among the related partners for convergence of their efforts for sustainable academic development of extension education discipline.

Editorial

Agricultural extension has been recognized as the lead player in rural development and community-oriented activities starting from its origin as a discipline. But in recent decades, the extension system's failure has been blamed as a reason for the gap in meeting the targeted growth in some of the development initiatives. Tracing the trajectory of vibrant extension approaches from the pre-independent era to till date may give more light in this regard. Though the need-based and situation-specific approaches could meet then identified goals to a large extent, gradual negligence in scientific theory-building has been observed while following technology-led or technocratic approaches in the subject. Along with the emphasis given on technology-led analytical skills, the extension discipline should give more effort to develop various scientific techniques and tools to quantify the unprecedented and behavioral changes. It also needs to create and validate extension models to make the deliberate behavioural changes in the complex interknitted Econo-socio-psychologic system considering the human or social system as a central point. The efforts done in creating nationally accepted models like Innovative Farmer-led Extension Delivery (IFLED) Model, Farmer Income Led Extension (FILE) Model, Value chain based - Extension beyond production etc., by various social scientists with the amalgamation of extension theories and technocratic approaches, can be considered as some of the initial steps in this regard.

With immense pleasure, I am sharing that our journal attained a prestigious position in the social science discipline with a score of **5.67 in NAAS rating for the academic journals – 2021.** Indeed, I thank all the contributors, members, and readers of MOBILIZATION journal for their valuable scientific contributions, consistent support, and productive critics, which resulted in our journal's quality improvement. I welcome all beloved readers to our journal's January- April 2021 issue with immense pleasure. We tried to follow a balanced article inclusion pattern, considering theory building and technology-led research outputs aspects. The concepts like commodity village approach, food security assessment, situational analysis of adolescents' guidance needs, ICT integration in agriculture education, multivariate analysis, content analysis, development and standardization of perception scales, value chain dynamics, semantic differential technique, and force field analysis *etc.* presented in various research papers added to the theoretical approaches and model building. At the same time, the research paper addressed constraint analysis in the adoption of button mushroom cultivation, assessment of cluster frontline demonstrations of pulses (CFLD-P), entomological aspects to reduce the post-harvest losses in pulses, evaluation of value addition in arecanut, comparative analysis of direct-seeded rice and transplanted rice, determinants of mortality of buffalo calves, performance evaluation of french bean and black gram *etc.* enriched the technocratic dimension. The journal sustains society members' interests as it recognizes the multidisciplinary nature of its scope and focuses on disseminating novel information.

The editorial team members Drs. Souvik Ghosh, S.K. Dubey, R. Roy Burman, Nishi Sharma, S.R.K. Singh, Reshma Gills, Sudipta Paul and Sujit Sarkar deserve my sincere thanks and appreciation. Their constant and committed works and efficacious editorial process helped in the journal's timely publication without compromising its quality, norms, and publication standards. My sincere thanks go to Dr. Subhashree Sahu and Dr. Hema Baliwada for their direct supervision and support in shaping this issue of the journal as online editors. Most importantly, I thank our valuable readers for their constant academic support, which helps our journal bag a respectable and appreciable position among the other scientific publications.

I wish a healthy, safe, and happy year ahead for all of our sincere readers, contributors and members.

J.P. Sharma
Chief Editor

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Unanticipated Dividends of Technology Dissemination: Experiences of Cluster Frontline Demonstrations of Pulses (CFLD-P) in India

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ABSTRACT

The present study is the analysis of large scale data (31949 ha area and 79873 farmers) generated through the CFLD on pulses across the major pulses growing states under the ICAR-ATARIs of Kanpur (Uttar Pradesh), Jodhpur (Rajasthan), Pune (Maharashtra), Jabalpur (Madhya Pradesh), Kolkota (West Bengal), Guwahati (Assam), Hyderabad (Andhra Pradesh), Bangalurue (Karnataka) and Patna (Bihar) for the period of 2016-18. The pulse crops included for the present analysis represented the crops of all three growing seasons namely *kharif* (pigeon pea-5556 ha, black gram-6067 ha and green gram-2689 ha), *rabi* (chickpea-8376 ha, lentil-3747 ha and field pea-1890 ha) and summer (green gram-3624 ha). The average performance data of CFLD were obtained for the above states for the above crops representing all three growing seasons during the cropping seasons of 2016-17 and 2017-18. Thus, CFLD data were analyzed from across minimum of 13 states (green gram) and maximum of 19 states (black gram). The CFLD-P, though intended for ensuring productivity of profitability advantages at farmers' level, the unintended dividends emanated through these CFLDs were analyzed using the research variables viz., likely diffusion of the produce as the quality seed (upto second generation), the nutritional advantages accrued due to the surplus availability of various pulses for protein, minerals, carbohydrates and energy; soil nutrient especially N_2 enrichment and economic impact in terms of growth rate of export, import, production and per capita availability during the pulses development period (2012-13 to 2017-18) as compared to the base year of 2005-06 to 2009-10 for all the pulses. The analysis showed that more than 12 percent area may be anticipated to bring under improved pulses varieties in a couple of years as result of seed diffusion due to CFLD-P. Likewise, there was enormous magnitude of nutritional security to be ensured for the Indian population in terms of major nutrients supplemented by the different pulses generated through CFLD-P programme. Not only the human nutrition, the soil nutrient especially N_2 has been worked out to be immensely added to soil through the natural process of N_2 fixation by the pulse crops which has very significant economic value. And finally, on economic front, the actual data from Government record showed that pulses import has declined and export has been marginally increased (1.07%) and this has become possible mainly because of the large scale demonstration and development programme for the pulses as rolled out by the Government of India

Keywords: Seed replacement rate, Human nutrition, Soil health, Economic benefits and CFLD-P

INTRODUCTION

The virtue of high protein content, which is almost double than that of cereals, makes the pulses to occupy unique position on the global agriculture. India grows the largest varieties of pulses in the world sharing about 38 per cent of the area and 33 per cent of the production followed by other countries like Canada, China, Myanmar and Brazil. In India, it is also considered as "A poor man's meat" as pulses is the cheapest and concentrated source of dietary amino acids & protein and thus, the demand of vegetarian population is fulfilled through pulses for large populace. Pulse crops are considered as the wonderful gift of nature as they have an ability to fix the atmospheric nitrogen (N_2), thereby helping in N cycling within the ecosystem.

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The major pulses producing states in India are Madhya Pradesh, Maharashtra, Uttar Pradesh, Rajasthan, Andhra Pradesh, Karnataka, Gujarat, Chhattisgarh and Bihar which produce chickpea, pigeon pea, green gram, black gram, lentil and field pea. Though pulses are cultivated in India over a very large area and have been a traditional crop, there has been a fluctuating tendency in area, production and productivity of pulses from time to time. There are several factors responsible for extremely low pulses productivity and high yield gap. They are mostly related to inputs and their efficient management (Ali *et al.,* 2012; Reddy, 2009). Besides, Poor soil and agro-climatic conditions not only compel late sowing of legumes, leads to reduced length of growing period but also necessitate to sustain cold injuries at early vegetative phase which freeze all biological activities for prolonged period. The implementation of the NFSM scheme is continued during XII Plan. Further, to accelerate the pulses production, a centrally sponsored Accelerated Pulses Production Programme (A3P) (2010-11 to 2013-14)-was initiated with cluster demonstration approach from. From 2014-15, the Pulses development scheme under NFSM is under implementation in 24 states viz. Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Gujarat, Haryana, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Odisha, Punjab, Rajasthan, Sikkim, Tamil Nadu, Telangana, Tripura, Uttar Pradesh and West Bengal with additional production target of 4 Million tonnes by the end of XII Plan (2016-17). Accordingly, the ICAR–Division of Agricultural Extension planned to organize Cluster FLDs on Pulses during *rabi* 2016-17 through Krishi Vigyan Kendra in the country. Besides, the main effect of these large scale CFLD-P in terms of yield advantages, economic advantages and yield gap reduction, other implicit benefits are likely to happen. In this context the research questions like to what extent the quality produce obtained through CFLD-P may be anticipated to spread so as to enhance the seed replacement rate in the country, what is the magnitude of human nutrition and soil nutrition benefits that could be derived from the yield advantages of CFLD-P and finally what economic advantages could be impacted during the pulses development period as against the baseline period which demands systemic empirical probe. This paper, therefore, aims at analyzing the large scale data emanated from CFLD pulses across various states of India covering the pulse crops of all three seasons for deriving the policy centered implications.

MATERIALS AND METHODS

The present study is basically the analysis of large scale data (31949 ha area and 79873 farmers) generated through the CFLD on pulses across various major pulses growing states covered by the ICAR-ATARIs of Kanpur (Uttar Pradesh), Jodhpur (Rajasthan), Pune (Maharashtra), Jabalpur (Madhya Pradesh), Kolkota (West Bengal), Guwahati (Assam), Hyderabad (Andhra Pradesh), Bangaluru (Karnataka) and Patna (Bihar). The major pulse crops covered for the present analysis represent all three seasons namely *kharif* (pigeon pea, black gram and green gram), *rabi* (chickpea, lentil and field pea) and summer (green gram). The average performance data of CFLD were obtained for the above states for all the crops representing various growing seasons during the cropping seasons of 2016-17 and 2017-18. Thus, CFLD data were analyzed from across minimum of 13 states (green gram) and maximum of 19 states (black gram). The pulse crops included for the present analysis represented the crops of all three growing seasons namely *kharif* (pigeon pea-5556 ha, black gram-6067 ha and green gram-2689 ha), *rabi* (chickpea-8376 ha, lentil-3747 ha and field pea-1890 ha) and summer (green gram-3624 ha). The average performance data of CFLD were obtained for the above states for all the crops representing all three growing seasons during the cropping seasons of 2016-17 and 2017-18. The CFLD-P, though intended for ensuring productivity and profitability advantages at farmers' level, the unintended dividends emanated through these CFLDs were analyzed using the research variables like analysis and assessment of the quality produce obtained from CFLD, its anticipated level of spread and proportion of the quality produce availability as the planting materials for the total cultivable area of selected pulses to ascertain the diffusion effect. Further, the nutritional advantages were computed as the total availability of important nutrients like protein, carbohydrate, minerals and energy derived from the unit availability of these nutrients in different pulses multiplied by the actual quantity of the surplus pulses generated under CFLD. Similarly, the soil nutrient (esp N_2) generation by these pulse through large area anticipated diffusion was also estimated by considering the amount of N fixed by different pulses to soil on hectare basis (Jenson, 1987; People *et al.,* 1995 after). The economic impact of the programme was ascertained on the parameters of average annual growth rate of pulses production, export level, import level and per capita availability during the analysis

period i.e. 20012-13 to 2017-18 taken for the study as compared to the base years of 2005-06 to 2009-10. The data were subject for tabular analysis and the results so obtained are deliberated under the following subheads.

RESULTS AND DISCUSSION

Spread of quality produce: Since the CFLDs involved using improved varieties, the produce from those demonstration plots is best used as seed instead of as grain for mass consumption. The quantity of produce from the demonstration plots was estimated by multiplying the average yield advantage for each crop by the total area under demonstration plots of that crop (Table 1). The next step was to estimate the area that can be brought under improved varieties (Table 2) by assuming that (i) 25 per cent of the total produce from the demonstration plots would be used as quality seed for the next crop and (ii) 15 per cent of the total produce of that crop (the second generation) would again be used as seed. Finally, the probable overall (countrywide) impact of the produce from CFLDs was assessed by estimating the percentage of area that can be sown with seeds of improved varieties in the actual total area under the respective crop.

A total of 31951 ha was covered under CFLDs, the average aggregate productivity of which was 1.2 t/ha and the total yield was38 490 tonnes. The maximum share of the produce obtained was for chickpea (13020t) followed by pigeon pea (7910t), black gram (5160t), and summer green gram (3420t).

Table 1: Cluster frontline demonstrations of pulse crops in India: area and production

No.	Crop	Average yield from demo plots (q/ha)	Area (ha)	Total quality produce (t)
***Kharif* (rainy) season**				
1.	Pigeon pea	14.23	5556	7910
2.	Black gram	8.5	6067	5160
3.	Green gram	9.34	2689	2512
***Rabi* (winter) season**				
1.	Chickpea	15.54	8376	13020
2.	Field pea	17.07	1890	3226
3.	Lentil	8.67	3749	3248
Summer				
1.	Green gram	9.45	3624	3420
	Total/average	**11.83**	**31951**	**38490**

Diffusion theory stresses the importance of decentralized communication channels, through which knowledge and information are disseminated via informal networks, as essential elements for behaviour change (Rogers, 1983). Farmer-to-farmer seed diffusion mechanisms form part of those decentralized communication channels. Studies elsewhere (Cromwell, 1990; Ndjeunga *et al.,* 2000) has found that farmer-to-farmer seed exchange is an effective means of diffusing new varieties to smallholder farmers that formal seed systems were unable to cover. These studies concluded that informal seed systems are the main source of seed for smallholders even in situations where formal seed systems have a large number of seed outlets, and that the diffusion of new crop varieties is achieved primarily through these informal seed systems. FAO (2009) also synthesized the studies of seed systems and concluded the notion that small farmers, especially in vulnerable regions, strive at all costs to save their own seed, and that they get the bulk of what they sow from previous harvests.

The lower seed replacement rate in less favourable areas and cop than in more favourable areas and crop is evidence of the failure of formal seed systems to serve these environments (FAO, 1999). This rate of spread is lower than that reported by Witcombe *et al.* (1999) who found a spread from 3 to 41 villages in four years in Western India.

The informal farmer-to-farmer seed dissemination was an important vehicle for the diffusion of new barley varieties, which were grow on 27 per cent of the barley area of monitored farmers, despite a complete lack of extension support (Aden *et al.,* 2008). Similarly, from Indian context, Sah *et al.* (2018); Dubey *et al.* (2015); Sah *et al.* (2014) and Singh *et al.* (2013) and reported the considerable level of seed spread of pulses through informal Farmer-to-Farmer network for pigeonpea, chickpea and other pulses respectively.

By using some quantity of produce from the demonstration plots as seed over two generations as described above, approximately 12 per cent of the total area under pulses in India can be sown with seeds of improved varieties (Table 2). The percentage can be as high as of 40 per cent for pigeon pea ('one village, one variety' approach to avoid often cross pollination) or as low as 1 per cent for chickpea, probably because of the low and high seed rate, respectively.

Table 2: Estimated area that can be sown with seeds of improved varieties available from demonstration plots

No.	Crop	Total produce (t)	If 25% produce used as seed		Total quantity of produce (t) if yield is realized at average level	Area (ha) covered if only 15% produce used as seed	Likely share (%) of area sown with quality seed in total cultivable area of the country
			Quantity of seed (t)	Area covered (ha)			
***Kharif* (rainy) season**							
1	Pigeon pea	79 10	19 77.36	128 481.34	1 828 28.94	1 782 582.18	40.18
2	Black gram	51 60	12 90.46	83 800.99	712 30.84	694 500.70	12.68
3	Green gram	25 12	06 28.21	34 849.63	325 49.55	270 975.01	6.34
***Rabi* (winter) season**							
1	Chickpea	13020	32 55.58	40 676.97	632 12.01	118 522.52	1.14
2	Field pea	32 26	8 06.66	10 082.45	172 10.74	32 270.14	3.33
3	Lentil	32 48	8 12.12	36 951.41	320 36.87	218 651.65	14.19
Summer							
1	Green gram	34 20	8 56.12	42 802.95	404 48.79	303 365.89	7.04
	Total (3 seasons) per average	**384 90**	**9623.55**	**377 645.73**	**4 395 17.74**	**3 420 868.10**	**12.13%**

Production and trade: The impact of CFLDs for pulses on their production and trade (import, export, and availability in the domestic market) was estimated from secondary data by taking the average figures for the period 2005/06–2009/10 as the baseline and comparing them with those for the period 2012/13–2017/18 (Table 3). The average annual growth rate (AAGR) was calculated for both the periods. The results showed that the growth rate of production increased upto 7.44 per cent during the later period as compared to that base period (2.34%). Perhaps as a corollary, imports decreased to 15.30 per cent from 21.96 per cent and exports increased to 1.07 per cent from the negative growth rate of -30.74 per cent, increasing the availability of pulses in the domestic market to 8.54 per cent from 5.54 per cent.

Nutritional benefits: Nutritional benefits in absolute terms were calculated from the total surplus generated through CFLDs (Table 4) which amounted to gross energy of 10 billion kilocalories, 333.06 tonnes of proteins, 235.33 tonnes of carbohydrates, and 55.53 tonnes of minerals. Pigeon pea contributed the most to proteins and minerals and field pea, to carbohydrates and energy. Thus, the surplus availability of pulses conferred substantial nutritional advantages on the country. Ensuring nutritional security is always the prime concern in any agri-based interventions. Food security in rural areas as consuming such micronutrient rich food and, therefore, improving dietary diversity will substantially reduce micronutrient deficiencies (Chaudhary *et al.,* 2019; Renu *et al.,* 2020).

Additions to soil nitrogen: Given that all the six species can fix atmospheric nitrogen into their root nodules, which is later released into soil, the total nitrogen thus added to soil by the various pulse crops was estimated and expressed in physical terms (tonnes) as well as in monetary terms

Table 3: Impact of cluster frontline demonstrations on production, imports, exports, and availability of pulses in domestic market (million tonnes)

Period	Production		Imports		Exports		Availability	
	Average (Mt)	Average annual growth rate (%)	Average (Mt)	Average annual growth rate (%)	Average (Mt)	Average annual growth rate (%)	Average (Mt)	Average annual growth rate (%)
2005/06 to 2009/10	143.22	2.34	25.54	21.96	2.19	-30.74	166.57	5.54
2013/14 to 2017/18	188.10	7.44	48.95	15.30	2.33	1.07	234.72	8.54

Source: DGCI & S (2017/18)

Table 4: Impact of cluster frontline demonstrations on human nutrition

Crop	Gross nutritional advantage as a function of yield advantage (tonnes)			
	Protein	Minerals	Carbohydrates	Energy (million kilocalories)
Pigeon pea	94.17 (0.223g)[a]	14.78 (0.035g)	24.32(0.576g)	1414.6 (3.35)
Black gram	62.90 (0.240g)	8.39(0.032g)	15.62(0.596g)	909.5 (3.47)
Green gram	24.89 (0.245g)	3.55 (0.035g)	60.82(0.599g)	353.4 (3.48)
Chick pea	10.51 (0.208g)	13.64 (0.027g)	30.21(0.598g)	1879.5 (3.72)
Field pea	26.93 (0.197g)	3.01 (0.022g)	77.23(0.565g)	4305.8 (3.15)
Lentil	68.77 (0.251g)	5.75 (0.021g)	16.16(0.590g)	939.7(3.43)
Summer Green gram	44.89 (0.245g)	6.41 (0.035g)	10.97(0.599g)	637.5 (3.47)
All pulses (Total)	333.06t	55.53t	235.33t	10440

[a]numbers in parentheses are nutrient contents (g/kg or kilocalories) of the respective pulses

Table 5: Benefits of cluster frontline demonstrations on soil nitrogen enhancement in physical and monetary terms.

Crop	Total area likely to be sown to improved varieties (ha)	Quantity of N fixed[a] (t/ha)	Total quantity of nitrogen fixed (thousand tonnes)	Impact in monetary terms[b] (Rs billion)
Pigeon pea	128 481.34	0.235	30.19	0.767
Black gram	83 800.99	0.140	11.73	0.298
Green gram	34 849.63	0.112	03.91	0.099
Chick pea	632 120.11	0.141	89.13	2.264
Field pea	172 107.40	0.244	41.99	1.067
Lentil	320 368.72	0.192	61.51	1.562
Summer Green gram	404 487.86	0.112	26.93	0.684
All pulses	4 395 177.43	0.168	738.89	6.741.00 ($8.82 million)[c]

Source: [a]Jensen (1987); Peoples *et al.* (1995); [b]market price of nitrogen (Rs 2540 per tonne); [c]one dollar = 76.47 rupees

(value of the nitrogen in rupees) (Table 5). It was also a fact that the nitrogen required by the respective pulse crops was supplied from the external sources. Chickpea contributed the most (0.14 t/ha, 89130t over the entire area, 226.4 million rupees). The total monetary value came to Rs 6.7 billion, or $8.82 million.

CONCLUSION

The CFLD-P programme has both explicit and implicit advantages in the pulses development scenario of the country. On one hand, the programme resulted in convincing the farmers about the yield potential of improved pulses varieties and technologies through impressive yield advantages, the huge quantum of quality produce obtained through these demonstrations was also implicated for increased seed replacement rate in pulses in India on the other hand. By making very conservative estimate, more than 12 per cent area may be anticipated to brought under improved pulses varieties in a couple of years. Likewise, there was enormous magnitude of nutritional security to be obtained for the Indian population in terms of major nutrients supplemented by the different pulses generated through CFLD-P. Not only the human nutrition, the soil nutrient especially N_2 has been worked out to be immensely added to soil through the natural process of N_2 fixation by the pulse crops which has very significant economic value. And finally, on economic front, the data from Government record showed that pulses import has been halted and export has been marginally increased and this has become possible mainly because of the large scale demonstration and development programme for the pulses as rolled out by the Government of India.

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Constraints Perceived by Rural Youth in Adoption of Button Mushroom Cultivation and its Success in District Barnala

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ABSTRACT

White Button mushroom is cultivated during winter season in Punjab and it is also cultivated throughout the year under controlled environmental conditions of temperature range of 24±2°C for spawn run with a relative humidity of 85-90 per cent. The cultivation of button mushroom as a subsidiary occupation among rural youth is promoted by Krishi Vigyan Kendra (KVK), Barnala through different vocational training programmes, demonstrations and implementation of projects. However, the production of button mushroom in the district is still low as compare to the other adjoining districts of Punjab state. So, it was worthwhile to study the major constraints in the adoption of white button mushroom cultivation by rural youth of district Barnala. The results of the present study revealed that issues related to agro processing unit (89.36%), constraint related to market at village level (86.20%) were the major constraints in adoption of this venture. In order to find out the relationship between ranks accorded by groups of respondents to different categories of constraints, rank order correlation was also calculated. The promotion of cultivation of button mushroom and to solve the problems of rural youth the vocational trainings were given under various schemes viz. Attaining and retaining of rural youth in agriculture (ARYA) Project and Agriculture skill council of India (ASCI) by KVK, Barnala.

Keywords: ARYA, ASCI, Button mushroom, Constraint, Rural youth

INTRODUCTION

White Button Mushroom (*Agaricus bisporus*) is an edible fungus. It have domed cap like structure on a stalk and it have gills present on the underside of the cap. Button mushroom is cultivated on locally available resources compositions such as wheat and rice straw, wheat flour, farm yard manure (FYM), ash and soil; which is low in cost and eco-friendly. Button mushroom is cultivated during the months of September end to March in district Barnala, Punjab. Button Mushroom production business is a quiet labour intensive and it may helps to generate jobs for unemployed rural and urban youth, provides support to rural women and other weaker section of the society. During the year 2019, total production of button mushroom in Punjab state was 9376 Mt. Anonymous (2019). Mushrooms have vast contribution in meeting the human food requirement as well as it have an enormous medicinal and pharmaceutical property. Mushrooms are rich in protein, carbohydrate, dietary fiber, vitamins and minerals. On dry basis, total carbohydrate content in mushroom is ranged from 26-82 per cent in different types of mushrooms. The crude fibre found in mushroom is partially digestible polysaccharides and chitin. Mushrooms do not have cholesterol; instead they have ergosterol which acts as a precursor for the synthesis of Vitamin D in the human body (Manikandan, 2010). Owing to its cholesterol-reducing property, mushrooms are ideal for the persons who worried about their fattiness. The absence of starch in mushroom also makes it an ideal food for diabetic patients. Moreover, polysaccharides present in mushrooms have an anti-tumour and immunological property. Among the edible mushrooms 2,000 species of macrofungi has been reported, out of these around 80 species are grown under experimentally controlled conditions, 40 species are cultivated as commercially and only 5 species of mushrooms are cultivated at industrial scale. Amongst the commercially

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cultivated mushrooms, button mushroom (*Agaricus bisporus*) is extensively cultivated and it contributes more than 15 per cent of the total mushrooms produced world-wide. Mushroom cultivation adoption has major constraints such as 'Lack of proper marketing channel', 'Lack of support for mushroom enterprise from government side', 'marketing constraints', 'technological constraints' etc. are crucial among all constraints which are responsible for low and non adoption of mushroom production enterprise in other region of India (Sharma *et al.,* 2016 and Singh, 2017). So keeping in the view, the present study was planned with the objective to extend in adoption of area under the cultivation of button mushroom and perceived constraints related to the button mushroom cultivation.

MATERIALS AND METHODS

The present study was conducted by Krishi Vigyan Kendra, Barnala (Punjab) during the year 2017 to 2020. To collect the primary data 116 participants trained under mushroom training by KVK, Barnala from different blocks i.e. Mehal kalan, Barnala and Sehna were selected purposively. The data was collected through personal interview method. The interview schedule was prepared by keeping the objectives of the study in mind. The necessary care was taken to collect the un-biased and correct data. The data were selected with the help of well-structured. The schedule consisted major four items like input, technical guidance, socio-culture and post-harvest. The responses were obtained on three-point continuum scale in case of prospects (More bright, somewhat bright and not at all bright) and scores were given as 3, 2 and 1, respectively. After that frequency was multiplied with the score (3, 2 or 1) and total weighted score was obtained and total weighted score was divided by total respondents (116) for weighted mean score. In case of mean score which is expressed in percentage, total cumulative frequency was divided by total possible score. The data were analyzed with frequency, weighted frequency, cumulative frequency, weighted mean score, mean score expressed and rank order (Sohi *et al.,* 2018)

RESULTS AND DISCUSSION

The data presented in Table 1 revealed that, A total 40 respondents were joined training course on 'Mushroom Grower' sponsored by ICAR in scheme programme *i.e.,* ASCI under Pradhan Mantri Koshal Vikas Yojana programme; 20 respondents joined under ARYA project showed in Plate 1; 29 respondents joined the training course to adopt mushroom cultivation as an enterprise; 6 respondents were interested to learn about the mushroom production technologies; 12 respondents joined the training course to get the certificate; 9 respondents to teach their fellow farmers about the mushroom production and its cultivation. It was evident that majority of respondents joined the training course to adopt mushroom growing as an enterprise (Suharban *et al.,* 1991).

Table 1: Reasons for participation in mushroom production technologies training programme

Agenda behind the training	No.	Percentage
Mushroom Grower training under ASCI*	40	34.48
ARYA** Project	20	17.24
To start a new mushroom entrepreneur	29	25.00
To learn about mushroom production techniques	6	5.17
To get mushroom production certificate	12	10.34
To teach his fellow farmers about mushroom growing	9	7.75

***** ASCI – 40 Farmers were trained during the year 2018-19 and 2019-20.

** ARYA project – This project has sanctioned by ICAR during the year 2019-20 and 20 trainees were selected under this programme.

Constraints related to inputs: The results obtained regarding the constraints related to inputs which the rural youth of district Barnala has faced to produce a quality and quantity of white button mushroom at their respective farms and houses has shown in Table 2. New strains of button mushroom such as U3-54, NBS-1 and NBS-5 etc. has been released already by Directorate of Mushroom Unit, Solan, Himachal Pradesh. The use of latest varieties/strains has a potential to yield earlier as they are fast growing and escape the attack of various harmful diseases with slow growing rate. The continuous updates in knowledge and availability of latest mushroom strains has a biggest constraint with mean score of 80.16 per cent followed by the non availability of fresh cultured spawn to the rural youth with a mean score of 71.26 percent. Quality spawn production has required a well

Plate 1: Rural youth participated in ASCI (A) and ARYA project (B) training programme at KVK, Barnala

Table 2: Constraints related to inputs (n=116)

S. No.	Constraints	Constraints level	Frequency	Weighted frequency	Cumulative frequency	Weighted mean score	Mean score expressed (%)	Rank order
1	Non availability of latest mushroom strains	High	73	219	219	2.40	80.16	I
		Medium	17	34	253			
		Low	26	26	279			
2	Non availability of mushroom spawn culture laboratory	High	37	111	111	2.14	71.26	II
		Medium	58	116	227			
		Low	21	21	248			
3	Lack of financial support by government	High	38	114	114	1.86	62.06	II
		Medium	24	48	162			
		Low	54	54	216			
4	Shortage of Skilled labor	High	17	51	51	1.56	52.01	IV
		Medium	31	62	113			
		Low	68	68	181			
5	Lesser availability of compost and packaging material	High	6	18	18	1.19	39.94	V
		Medium	11	22	40			
		Low	99	99	139			

equipment facilities lab and material, the rural youth with no financial support by the government and subsidy to start mushroom unit as a new business has to be consider as constraint with mean score of 62.06 per cent. In making the compost of button mushroom the skilled labor is required which could handle the compost for better yield, out of 116 selected respondents 52.01 per cent rural youth faced problem to hire a skilled labor for mushroom production. The compost which was produced indoor through chamber method has a better capability to increase the productivity of button mushroom due to their higher nitrogen level i.e. >2 and the chamber also produce more compost in comparison to long method of compost production. The rural youth obtained the compost and casing material from other districts of Punjab and Haryana which cost them higher as it include transportation and other labour charges has put this constraint at number five with a mean score of 39.94 percent. The study gets support from findings of Biswas and Jamir (2015) who reported that unavailability of quality input material was a serious constraint in kitchen gardening techniques in Mokochung district of Nagaland by Sharma *et al.* (2011) who highlighted that input constraints were serious constraint in kitchen gardening.

Constraints related to technical guidance: Now a day's button mushroom production is a multi rupee

business and with the updating of technologies and skills the mushroom units are equipped with sensors which can judge the relative humidity (RH), temperature (°C), Light (LUX), Carbon dioxide (CO_2) and incidence of diseases and insect/pest at accurate precision and alert the caretaker through an app on their smart phones. These updated technologies not only save the time but also benefited the farmers to produce better and quality mushroom. Researchers and policymakers can further strengthening research work and promoting vegetable production in the country Singh *et al.* (2019). In table 3 the respondent rural youth leaving those with science background all other 93 rural youth was doubted with the knowledge of sensors that are available for mushroom unit with a mean score of 81.89 per cent (rank I) is biggest constraint to technical guidance. The mushroom industry scenario at world level has changed from white button mushroom to shiitake mushroom cultivation technology from the year 2013 onwards. After harvesting the mushroom are need to pack as per the market demand i.e. washed, unwashed, packing size and material used for packaging. The farmers often use chemicals like sodium hypochloride (not to be use) for better the shine of mushrooms. The washed mushrooms need to air dry to reduce the microbial activities which later change the colour of mushrooms and market unacceptable. The grading process of mushrooms range from small, medium and large (2.5 to 4 cm size of mushroom cap) is to be done before the packaging. Punnets, Polypropylene bags 100 to 150 gauge, cling films with 5 per cent perforation is idle for distant market. The knowledge of type of demand in the market of mushroom is important for the rural youth but they faced constraint, rank II with mean score of 80.45 per cent due to improper established market, strategies and non availability of packaging material in the local market. The attack of insect pest in 60 x 40 feet bamboo based structure for seasonal mushroom production is higher; diseases like green mould is quiet common in mushroom units; larve of flies, nematode, spider and other species cause huge damage to mushroom caps. The use of Bavistin, Chlorinated water, Malathion is generally recommended during the compost production and yellow sticky tray to be use during the mushroom cultivation as the chemical leaves residue in the mushrooms; sanitation and regular monitoring to check any foreign object entering the mushroom unit is a better solution to avoid the attack of insect pest and diseases with weighted mean score 2.31. The use of cocopeat in casing material production, indoor compost production,

Table 3: Constraints related to technical guidance (n=116)

S. No.	Constraints	Constraints level	Frequency	Weighted frequency	Cumulative frequency	Weighted mean score	Mean score expressed (%)	Rank order
1	Lack of knowledge about the different sensors i.e. relative humidity (RH), temperature (°C) and light (LUX) etc. in mushroom unit.	High	76	228	228	2.45	81.89	I
		Medium	17	34	262			
		Low	23	23	285			
2	Post Harvest Management of mushroom and its packaging	High	70	210	210	2.41	80.45	II
		Medium	24	48	258			
		Low	22	22	280			
3	Lack of knowledge regarding major pests and diseases identification and their control	High	68	204	204	2.31	77.29	III
		Medium	17	34	238			
		Low	31	31	269			
4	Lack of knowledge about current advance technologies	High	62	186	186	2.23	74.42	V
		Medium	19	38	224			
		Low	35	35	259			
5	Lesser knowledge regarding of adequate irrigation	High	14	42	42	1.78	59.48	VI
		Medium	63	126	168			
		Low	39	39	207			

use of growth hormones and growth regulators to boost mushroom production are the latest technologies and to update the knowledge to learn latest techniques the rural youth has to approach for regular learner either through KVK help, magazine, articles, news and research papers. Considering the rural youth of district Barnala has faced constraint to update their knowledge regularly with mean score of 74.42 per cent. Use of quality water is required for fresh mushroom production, pH of water should be normal ranges 7.0 to 7.5, should be free from any chemicals, avoid stagnated water and water is to be sprinkled in a very minute form with the help of nozzle mounted with hose pipe of sprayer. The concept of irrigation is to manage the relate humidity of the unit with range of 80-85 RH. In bamboo based unit the use of humidifier can be placed for control of temperature and humidity of better mushroom production. The rural youth has to water the mushroom unit twice or thrice a day rather than watering in a bulk at single time and the farmers using digital meters to maintain room RH and temperature with weighted mean score of 1.78. Findings are in agreement with the Samantaray *et al.* (2009) who reported that lack of advance technologies as major constraint in vegetable production faced by tribal vegetable growers.

Constraints related socio-culture: To start any business the understanding of the functioning of the model entrepreneur its market demand, success stories, future prospects and financial support has required. Farmers have fear to start any business at commercial level as the ratio of marginal farmers is around 70 per cent in Punjab state. To understand the mushroom cultivation model the rural youth has to done the mushroom cultivation at their own farm level right from the compost production, spawning, casing, harvesting and marketing. The constraint related to socio-culture is represented in Table 4 and the rural youth has a bigger fear of loss in business with weighted mean score (WMS) of 2.40 followed by the moral will to adopt new entrepreneur with WMS of 2.33 as the most of the RY are in dilemma to opt a new business. The rural youth has tendency of non practicing until the other farmers in their vicinity opt for the business with WMS of 2.18 as for example when one starts growing potato in a village the numbers of grower increased with time as the confidence, market channel, success story and knowledge relate to that business increases. The interest to move abroad towards developed countries and dependency on the parents resulted in reduce their interest to any work on new business has WMS of 1.79. In district Barnala the Mushroom units has no subsidy which attracted the RY to start with new entrepreneurship has weight mean score of 1.42. These findings are in conformity with study of Sharma *et al.* (2011) who reported that farmer are growing vegetables by traditional

Table 4: Constraints related to socio-culture (n=116)

S. No.	Constraints	Constraints level	Frequency	Weighted frequency	Cumulative frequency	Weighted mean score	Mean score expressed (%)	Rank order
1	Fear of loss in new business	High	76	228	228	2.40	80.17	I
		Medium	11	22	250			
		Low	29	29	279			
2	Lack of initiative to adopt new entrepreneur	High	70	210	210	2.33	77.87	II
		Medium	15	30	240			
		Low	31	31	271			
3	Farmers' tendency of non practice until other farmers in the vicinity opt for the business	High	58	174	174	2.18	72.98	III
		Medium	30	60	234			
		Low	28	28	254			
4	Lack of interest among rural youth and farmers	High	30	90	90	1.79	59.77	IV
		Medium	32	64	154			
		Low	54	54	208			
5	Lack of financial support and subsidy	High	13	39	39	1.42	47.41	V
		Medium	23	46	85			
		Low	80	80	165			

Table 5: Constraints related to post-harvest (n=116)

S. No.	Constraints	Constraints level	Frequency	Weighted frequency	Cumulative frequency	Weighted mean score	Mean score expressed (%)	Rank order
1	Absence of agro-processing units	High	87	261	261	2.68	89.36	I
		Medium	21	42	303			
		Low	8	8	311			
2	Lack of marketing at village level	High	83	249	249	2.58	86.20	II
		Medium	18	36	285			
		Low	15	15	300			
3	Lack of knowledge regarding value added products from mushroom	High	54	162	162	2.31	77.01	III
		Medium	44	88	250			
		Low	18	18	268			
4	Shortage of storage facilities for distant market	High	10	30	30	1.55	51.72	IV
		Medium	44	88	118			
		Low	62	62	180			
5	Lack of knowledge to harvest the mushroom	High	10	30	30	1.35	45.11	V
		Medium	21	42	72			
		Low	85	85	157			

methods and farm women showed less interest in the gardening.

Constraints related to post-harvest: Post Harvest Management of button mushrooms; its value added products such as mushroom muraba, pappad, biscuit and pickle etc.; canning, steep preservation, freezing, radiation preservations and storage under modified atmosphere conditions and control atmosphere in a bulk is necessary for the regular support in the market for year round mushroom production. Data in Table 5 showed that absence of such agro-processing units put this constraint with WMS of 2.68 at rank I. Rural areas of district Barnala, Punjab has less awareness about the nutritive value of mushrooms and has less importance is given to mushroom in their daily routine dietary meal. The sale of mushroom regularly in a bulk is not possible at village level as per the 83 respondent with WMS of 2.58 followed by the knowledge regarding value added products from mushroom with WMS of 2.31. Mushroom is highly perishable and it cannot be store for longer period at ambient conditions and the markets lack with adequate storage facilities has a constraint with WMS of 1.55. Mushrooms are harvest by twisting the cap of mushroom using two fingers and thumb after removal of mushrooms the surface beneath the harvesting area must be cover with additional casing material. Farmers are generally practicing this procedure and have lower constraint with WMS of 1.35. Information communication technologies (ICT) facilities can also play great role in mitigating these constraints. The present studies are agreement the findings of Paramasivan and Pasupathi (2017) who also reported that absence of agro-processing units are the major concerns.

CONCLUSION

The results of present study concluded that absence of agro processing unit was consider as the major constraint related to post harvest management, while lack of knowledge about sensors and current advance technologies were also serious constraints pertaining technical guidance. Fear of loss in start new enterprise relation to socio-culture, continuous adoption of traditional practices system and lack of the availability of skilled labour were another constraint. Besides, higher costs for establishment of mushroom unit without government support are a very difficult task were major general constraints perceived by rural youth. So, the government should address the problem of better technical support and credit facilities for wider adoption mushroom business. The ARYA project, mushroom grower training under ASCI, vocational trainings oriented by KVK, Barnala has found important to curtail the constraint faced by the rural youth upto some extent.

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Scope, Opportunity and Importance of Contract Farming in India

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ABSTRACT

In India contract farming is operated or present from many year ago and it involves in commercial agricultural production of both large-scale and small-scale farmers. Interest in it continues to expand, particularly in countries that previously followed a central planning policy and in those countries that have liberalized marketing through the closing down of marketing boards. In modern day there is changing in consumption habits, such as the increasing number of fast-food outlets, the growing role played by supermarkets in many countries, and the continued expansion of world trade in fresh and processed products; have also provided the impetus for further development of this mode of production. Contract farming is proving to be a viable option for overall agricultural development in India. Contract farming help or ensures in food and nutritional security to the increasing population, raw material for an expanding industrial base, surpluses for exports, and a fair and equitable reward system for the farming community requires commitment driven contract farming which clearly is a viable alternative farming model. In India various Indian and multinational companies have begun contract farming successfully. The success of contract farming in any country dependent on a profitable market, the physical and social environment, and government support. However, effort is needed to reduce negative impacts which arise from contract farming via the active involvement of institutions governing the contract farming business. The overall future of contract farming in India is quite promising due to increasing trend for organised retailing amongst the burgeoning middle class population and the food safety requirements of the export market in developed countries.

Keywords: Contract farming, Co-operative farming, Corporate farming, Marketing contract, Private farming

INTRODUCTION

Agriculture is the backbone of Indian economy and about 65 per cent of Indian population depends directly on agriculture. It has to support almost 17 per cent of world population from 2.3 per cent of world geographical area and 4.2 per cent of world water resources. Through its contribution to the overall gross domestic product (GDP) of the country has fallen from about 30 per cent in 1990-91 to less than 15 per cent in 2011-12 a trend that is expected in the development process of any economy, agriculture yet forms the backbone of development (Annual Report, 2013-14). Contract farming is generally defined as farming under an agreement between farmers and a sponsor (processor, exporter and marketing firm) for the production and supply of agricultural products under forward agreement often at pre-determined price. The basis of the relationship between the parties is a commitment on the part of the farmer to provide a specific commodity in quantities and in quality standards determined by the purchaser and an undertaking of the sponsor to support farmers the production and to purchase the commodity. It has the potential of combining small farmer efficiency utilizing corporate management skill, providing assured markets and reducing transaction costs in the value chain by ensuring vertical integration (Singh, 2005). For successful of any contract depends on long-term commitment/faith from both parties. Exploitative arrangements by managers are likely to have only a limited duration and can jeopardize agribusiness investments. Similarly, farmers need to consider that honouring contractual arrangements is likely to be to their long-term benefit. The phenomena of contract farming revokes around three main needs *i.e.* (a) Predetermined quantity, (b) Predetermined quality, (c) Predetermined

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price. Agriculture derives its importance from the fact that it has vital supply and demand links with the manufacturing sector and currently agriculture are facing the problem of decline productivity in this context contract farming is one of the solution.

OBJECTIVE OF CONTRACT FARMING

There are various objective of Contract Farming which is as fallows. 1). To achieve consistent/better quality. 2). To achieve continuous supply 3). To maintain and improve quality of produce. 4). To stabilize the agro-raw produce. 5). Price is not affected by market prices i.e. regulated market.

WHAT IS CONTRACT FARMING?

Contract Farming can be defined as the agreement between a buyer and farmers, which establishes conditions for the production and marketing of a farm product or products. It system for the production and supply of land based and allied produce by farmers/primary producers under advance contracts, the essence of such arrangements being a commitment to provide an agricultural commodity of a type, at a specified time, price, and in specified quantity to a known buyer (Singh, 2005). It is an agreement that involves producers/farmers, intermediaries, processing and or marketing firms, to provide the farm produce at predetermined prices and quality, at specified places, after a specified duration. Typically, the farmer agrees to provide agreed quantities of a specific agricultural product. These should meet the quality standards of the purchaser and be supplied at the time determined by the purchaser. In turn, the buyer commits to purchase the product and, in some cases, to support production through, for example, the supply of farm inputs, land preparation and the provision of technical advice. The details of a contractual arrangement vary according to the depth and complexity of the provisions in each of the following areas (Paty, 2005; Minot, 1986; Eaton and Shepherd, 2001). In general, Contractual arrangement between parties varies according to the depth and complexity of the provisions in each of the following three areas:

a. *Market provision:* The grower and buyer agree to terms and conditions for the future sale and purchase of a crop or livestock product.

b. *Resource provision:* In conjunction with the marketing arrangements the buyer agrees to supply selected inputs, including on occasions land preparation and technical advice.

c. *Management specifications:* The grower agrees to follow recommended production methods, inputs regimes, and cultivation and harvesting specifications. (Chakrabarti, 2015)

In the overall, the concept of contract farming promises i) to provide a proper linkage between the farm and market, ii) promote high degree of competition at the supply and market end, and iii) minimize intermediaries in order to increase famer's income (Sita Ram and Kumawat (2013).

PROGRESS OF CONTRACT FARMING IN INDIA

Contract Farming was introduced for the first time in Taiwan in 1895 by the Japanese Government. In India, the first known evidence of contract farming in India dates back to the British colonisation; The East India Company had contractual farming arrangements in the coffee and tea estates. As such, the concept of contract farming is not new to India but there are new forms and models of contractual arrangements which have prevailed post-independence Ghosh (2003). The total area covered by contract farming is less than 2 per cent of the total cultivable land. However, if one were to consider purely corporate contracts with farmers for their crops, then this figure would barely touch 0.05 per cent of total cultivable land. Contract farming in India is changing towards this corporate contract model as reflected by the entry of many Multinationals such as, Cadbury, Pepsi, Unilever, ITC Ltd., Cargill and Frito Lay. Similarly, domestic corporations like Ballarpur Industries Limited (BILT), JK Paper, and Wimco, Green Agro Pack (GAP) Ltd., VST Natural Products, Global Green, Interrgarden India, Kemps City Agro Exports and Sterling Agro, United Breweries (UB), Nijjer Agro, Tarai Foods, A I M Todd, McCain India are also entering into contract farming (Singh, 2000; Dileep *et al.,* 2003 and Paty, 2005).

ITCs contracts with the farmers of Andhra Pradesh for growing Virginia tobacco during the 1920s, Contract Farming by PepsiCo for the cultivation of vegetables particularly tomatoes and potatoes in Hosiarpur Taluk of Rajasthan in 1927, emergence of seed companies during the 1960s, the green revolution during the 1970s and finally the tomato farming contracts by PepsiCo in

Punjab during the 1990s can be quoted as some of the milestones in the emergence of Contract Farming in India. Several cash crops like tea, coffee, rubber, indigo etc are introduced in various parts of the country, mostly through a central expatriate-owned estate surrounded by small out grower's model. Since the Green Revolution, the Central Government started the largest Contract Farming model, through which it subsidized fertilizers, provided new hybrid variety seeds, provided training and also guaranteed the procurement by State agencies with a minimum support price. The Model Agricultural Produce Marketing (Regulation) Act circulated by the Central Government to the States in 2003 for implementing marketing reforms has provisions for the registration of Contract Farming sponsors and recording of Contract Farming agreements with the Agricultural Produce Marketing Committee (APMC) or a prescribed authority under the Act, protection of title or rights of the farmers over the land under such contracts, dispute settlement mechanism and a model draft agreement suggesting various terms and conditions. To help States in the formulation of rules in this regard, the Ministry of Agriculture has also circulated a set of Model APMC Rules to them for adoption. By now, relevant provisions have been made by several state governments in their respective APMC Acts for providing a legal framework to Contract Farming. Agricultural Produce Marketing Committee (Development and Regulation) Act, 2003 laid down the foundation of a model contract agreement. Procedures and form of contract farming agreement were laid down in this act which led to the effective follow up of the agreements. The Government of India's National Agriculture Policy 2000 envisages that private sector participation will be promoted through contract farming and land leasing arrangements to allow accelerated technology transfer, capital inflow and assured market for crop production, especially of oilseeds, cotton and horticultural crops.

Need for Contract Farming in India: In India, post-harvest losses of agriculture produce is a very big challenge for everyone, and there is more influence of middle man between farmers and consumers as a results famers day by day become poor and actual price of produce are not meet to the farmers, production and marketing are very critical in India, overcome inadequate linkages with market, lack of capital, poor infrastructure, technology transfer etc., to avoid post-harvest losses, unfavourable conditions for procurement and to avoid migration. Keeping this view in mind contract farming is the most suitable option or need for farmers and company in present scenario.

Types of Contract: There are three type of contract exist in India, which are as follows (Singh, 2005).

1. Marketing contract or procurement contracts- under which only sale and purchase conditions are

Table 1: State-wise total cropped area and area under contract farming in India

States/UTs	Total Cropped Area (2003-04) (in ' 000 ha)	Area under Contract Farming (2007) (ha)	Area under Contract Farming (As on April, 2010) (%)*
Andhra Pradesh	12366	-	66** (of total horticultural area)
Assam	3962	160	-
Bihar	7882	20	-
Chhattisgarh	5707	-	-
Goa	169	1924	-
Gujarat	11311	2000	-
Haryana	6388	1416	0.24 (of total area under Barley)
Mizoram	98	2447	28.30*** (of total area under Cotton)
Orissa	8637	5900	-
Punjab	7931	121457	1.05
Tamil Nadu	5316	236610	Negligible (Oil Palm only)
West Bengal	9707	-	Negligible
India	**190641**	**425834**	-

Note: *: As reported by different states, **: Under horticulture crops, ***: Area under cotton.
Source: http://www.indiaagristat.com/table/agriculture/2/agriculturalarealanduse/152/426251/data.aspx *source:* (Haris Manzoor, 2014)

specified**:**

- Only purchase at predetermined price
- No input supply

2. Partial contract

- Provides only some inputs at predetermined price
- Purchase of produce

3. Total contract

- All the inputs at predetermined price
- Purchase of produce

The first type of contract is generally referred to as marketing contracts the other two are types of production contracts (Scott, 1984; welsh, 1997). The relevance and importance of each type varies from product to product and over time and these types are not mutually exclusive (Hill and Ingersent. 1987; Key and Runsten, 1999). But there is a systematic link between product and factor markets under the contract arrangement as contracts require definite quality of produce and therefore specific inputs (Scott, 1984; Little, 1994). Also different types of production contracts allocate production and market risks between the producer and the processor in different ways.

Types of farming: Difference between various types of farming is given in Table 2.

Scope and opportunities of contract farming

There is big scope and opportunities of contract farming in developing country like in India especially in dairy, Poultry, fruit and vegetable sector there details is as fallows.

Dairy– The development of the dairy sector in India has been primarily with the cooperatives. Operation flood (1970-1996) was a major breakthrough in the Indian dairy sector that rendered dairying a profitable occupation for millions of farmers resulting in a significant impact on the livelihoods of small and marginal farmers. However, with the amendment of the MMPO in March 2002, a number of private companies have entered the dairy market and are scaling up their procurement and processing activities Nestle India, Limited, which started operations in 1961 in Moga district of Punjab with just 180 farmers now has more than 98,000 contract farmers to source its daily requirements of liquid milk (Nestle, 2006). Recently reliance has ventured into dairying also starting its operations from Punjab and there are reports of it rapidly expanding procurement volumes of liquid milk and network of contract farmers.

Poultry– The recent time poultry sector is highly demanded sector because in Indian culture non-vegetarian population increase day by day and those farmers join these sector must be in profitable particularly of small farms. But in These sector some risks also threaten specially of the industries engaged in breeding of chicks and manufacturing of feed, Vaccines and medicines. In order to minimize the risks to the producers and sustain the growth and profitability of the industry some large poultry firms (for example Venkateshawara hatcheries Ltd. Suguna poultry farm Ltd. And godrej agrovet Ltd.) began vertically integrating breeding hatchery, feed and veterinary enterprise with broiler production venkateshawara hatcheries starded its contract broiler

Table 2: Private Farming vs. Co-operative farming vs. Contract Farming vs. Corporate Farming

Items	Private Farming	Co-operative Farming	Contract Farming	Corporate Farming
Ownership	Held by Private Farmer	Held by Private farmer	Held by Farmer	Held by the Company
Risk Sharing	Entirely born by the farmer	Collectively born by the group of farmers	Mostly by farmer as most contracts Are one sided.	Entirely by the Company.
Ease of credit	Difficult among the four Alternatives.	Slightly easier than private Farming.	Easier as contract can be showed as Collateral.	Easier for the company as banks See lesser risk.
Capital	Invested completely by the Farmer.	Invested by the group of farmers Collectively.	Invested by the farmer and firm according to the Contract terms.	Entirely invested by the contracting Firm.
Farm-firm flow	Many intermediaries	Same as private farming but comparatively better bargaining power due to Cohesiveness.	Very less or no middle men between farmers and firm.	No intermediaries as firm directly Take the produce.
Access to the market	Difficult and uncertain to get a Reliable route.	Better than private farming due to more bargaining power	Reliable access, assuming no default by the Firm.	Fool proof access as farming is done by the firm itself.
Use of Technology	Comparatively Unsophisticated.	Scope of new technology due to Collective funds.	Access to new technology inputs from the Firms.	Application of Latest technologies for higher Productivity.
Role of the Government	Regularities for credit / seed inputs, sale in mandis.	Regularities fo rcredit / seed inputs, sale in mandis.	In facilitating contracts, contract laws, Credit issuing.	Leasing laws and facilitating firms Entry.
Sustainability of the farming	Hard for marginal farmer to remain Profitable.	Comparatively better than private farmer, with collective Resources.	Short term innature, affected by government policies	Long term in nature, affected by government Policies.
Social effects	No dramatic changes from the status quo of the Society.	Unity, self sufficiency among the farmer Community.	Skewed contracts leading towards arm twisting of small farmers and Corporate might end up dictating what to grow and What to eat.	Indiscriminate corporate farming leads to the suppression of smaller players /farmers in the Market.
Economic effects	Marginal farmers entrapped in vicious debt Circle.	Scope for greater earning and a lot of bargaining Power.	Farmers become too dependent due to market imperfection arising as because one sided Contract.	Good use of waste/ unutilized lands and Concentration on power to few MNCs if used Indiscriminately.
Tenancy law	Affect the leasing	Affect the leasing	Affect farmer leases	Affect the firm.
Environmental impact	Judicious use of land can improve Fertility of land.	Judicious use of land can improve Fertility of land.	Fertility of lands might be squeezed out due to myopic view of firms.	Fertility of land may be maintained, due to long term orientation of the Firm.
Involvement of the Politics	Have become a tool for votes, affected by the wavering decisions of various Governments.	Welcomed by all the sections of the Society.	Government facing opposition for APMC model act, brought out for helping Contracts.	Might face a lot of opposition for Implementation.

operations during the Mid 1990s in south and western India. In their model, broiler prices are fixed by Bromark grower's also receiving a share of any additional profits earned due to rise in markets prices as well as an incentive for better feed conversion efficiency.

Fruit and vegetables- For double farmer's income, fruits and vegetable contribution are very important. If its transport is easy than it can easily achieve, for that purpose farmers get more benefited if it grows via contract farming. Especially in fruits and vegetables being led by cooperatives farmer groups and private firms both multinational and domestic industries. For example mother dairy organised as a cooperative is one of oldest sectors, entering into retailing of fresh fruit and vegetables and some processed items under the 'safal' brand in

Delhi in 1988. Maha grapes is an example of contract farming led by a farmers group in Maharashtra. In an example of a public private partnership the council for citrus and agri juices in Punjab has ventured into contract farming of citrus orchards to supply 'Tropicana' juices, a product of Pepsico. In Bihar Bhagalpur district of Kahalgoan, Perpanthi and Sabour there is cultivation of chilli on the basis of contract farming (https://www.slideshare.net/AmitBishnoi8/amit-seminar-on-contract-farming)

An on-site study was conducted by NRC on Litchi, Muzaffarpur, Bihar during the year 2007-08 to 2011-12 at the farmers field in five locations (5 districts of Bihar). The rejuvenation technology in an economically viable way, when comparative analysis made after taking into consideration the benefits and costs of the technology operation/implementation. The enhanced level of quality fruit production and increased benefit cost ratio provided better avenues for wider and successful adoption of the technology (Kumar Rajesh, 2014).

The study was conducted in Karnataka, which is said to be the seed hub of India. Corporate sector has introduced the contract farming of vegetable for seed purpose in Northern Karnataka during 1985-86. In Karnataka, the districts namely Haveri and Koppal were purposively selected based on the presence of hybrid vegetable seed producers and vegetable seed companies. From each district, two blocks were selected purposively. Four villages from each block were selected randomly. Fifteen hybrid vegetable seed producers from each village (120 seed producers each from the purposively selected districts), fifty seed organizers (25 each from the purposively selected districts), and fifty personnel's from seed companies (25 each from the purposively selected districts) were selected. Thus, a total of 340 respondents were comprised the sample for the study. Result obtained after some time that how scientific know-how of hybrid vegetable seed production, availability of skilled and semi-skilled manpower, increased adoption of hybrid vegetable crops by the Indian farmers and rise in demand for good quality high value low volume crops, were found to be significant in influencing the growth of vegetable seed industries (Parthiban *et al.,* 2019).

IMPORTANCE OF CONTRACT FARMING

There are following major importance of the contract farming which help in stable income, higher income than non-contract farming market certainty, delivery service for inputs, ease of obtaining input. Loan made available though financial institutions, learning new technology, infrastructure, road and ditch, information, news and networking quality development, risk uncertainty is less improved access to local markets, assured markets and prices (lower risks) especially for non-traditional crops assured and often higher returns enhanced farmer access to production inputs mechanization and transport services and extension advice provision of inputs and production services access to credit introduction of appropriate technology, skill transfer, guaranteed and fixed pricing structures etc.

WHY CONTRACT FARMING IN INDIA?

- Generally farmers are less knowledge about modern and traditional technology and its management practices and hence face the problems and farmers have a little bargaining power with input supplier and own produce in markets bought at less price and also lack of modern market information, many farmers are poor therefore there is inadequate infrastructure where own produce store at long time.
- Farmers have less management expertise, poor package of produce and inadequate capital to grow a quality crop. They are willing to increase for better living standards.
- Contract farming helps especially small farmers to participate in the production of high value crops like vegetables, flowers, fruits etc. and benefit from marketed growth.

- In contract farming extensive areas are required for an intensive cultivation of any crop for uniform method of cultivation as a result reduces their production cost and transaction costs with the growers.
- In contract farming, effective & efficient monitoring of production operations are require and extension activities and credit delivery in a conjugal area are more easy.
- Contract farming will maximize the profits to the farmers and minimize risk in farming like production related risks, transfer price risk and produce risk.
- There is a tendency among the users to go in for environmental friendly, value added quality agro products in their daily life.
- The farmers find it easy to get under one roof inputs technological & extension services postharvest processing facilities and more importantly, the marketing of their produce with assured cash returns.
- Contract farming facilitates more and more private companies to develop backward linkages with the farmers.
- Access to crop loans at attractive terms through tie-ups with banks is facilitated through contract farming.
- There is a tendency amongst farmers to go in for an alternate cropping system for better monetary return.

ADVANTAGES AND PROBLEMS OF CONTRACT FARMING (Chakrabarti, 2015)

Advantages of Contract Farming

Advantages for the farmers

The main advantage of a contract agreement for farmers is that the sponsor will give undertake to farmers and purchase all produce grown by farmers, within specified quality and quantity parameters. Contracts can also provide opportunity to farmers to access a wide range of technical and extension services. Farmers can also use the contract agreement as for arranging the credit with a commercial bank for fund inputs purchase. Thus, there are various possible advantages of Contract Farming for farmers welfare in which, some are given below–

i. Provision for better inputs and production services: For ensuring a proper crop husbandry practices by farmers for achieve projected yields in target qualities many contractual arrangements involve for supply of basic inputs such as seed and fertilizer. Sponsors may also provide land preparation, field cultivation and harvesting as well as free training and extension.

ii. Easy access to Credit: In contract farming farmers are usually poor and they are unable to purchase of inputs such as seed and fertilizer for that situation many agricultural development banks, allows farmers access to some form of credit to finance production inputs. Arrangements can also be made with commercial banks or government agencies through crop liens that are guaranteed by the sponsor, i.e. where the contract serves as collateral.

iii. Application of better technology: many villagers' farmers cultivate the crop by traditional technology/ method but in coming of contract farming many new production techniques come which help in increase productivity as well as to ensure that the commodity meets market demands. However, small scale farmers are frequently reluctant to adopt new technologies because of the possible risks and costs involved. Private agribusiness will usually offer technology more diligently than government agricultural extension services because it has a direct economic interest in improving farmer's production.

iv. Improvement in skills of the farmers: The skills the farmer learns through contract farming may include record keeping, the efficient use of farm resources, improved methods of applying chemicals and fertilizers, knowledge of the importance of quality and the characteristics and demands of export markets. Farmers can gain experience in carrying out field activities following a strict timetable imposed by the extension service. In addition, spill over effects from contract farming activities could lead to investment in market infrastructure and human capital, thus improving the productivity of other farm activities. Farmers often apply techniques introduced by management (ridging, fertilizing, transplanting, pest control, etc.) to other cash and subsistence crops.

v. Guaranteed pricing system: The returns from produce, farmers receive capital from open market depend on the prevailing market prices as well as on their ability to negotiate with buyers. This can create considerable uncertainty which a certain extent, contract farming can overcome this situation. Frequently, sponsors indicate in advance the price(s) to be paid and these are

specified in the agreement. Thus Contract Farming ensures guaranteed and fixed pricing structures.

vi. Easy access to reliable market: Farmers will not cultivate unless crop and their market demand is less and also traders or processors will not invest in ventures unless they are assured that the required commodities can be consistently produced. Contract farming offers a potential solution to this situation by providing market guarantees to the farmers and assuring supply to the purchasers. In this situation contract farming can offer significant advantages to farmers.

ADVANTAGES FOR THE SPONSORS

The possible advantages for the sponsors are as follows–

i. Political Acceptability: Contract farming, particularly when the farmer is not a tenant of the sponsor, is less likely to be subject to political criticism. It can be more politically expedient for a sponsor to involve smallholder farmers in production rather than to operate plantations. In recent years, many African governments have promoted contract farming as an alternative to private, corporate and state owned plantations.

ii. Overcoming barriers on land restrictions: The majority of the world's plantations were established in the colonial era when land was relatively abundant and the colonial powers had little conscience about either simply annexing it or paying landowners least compensation. However, in present days most large tracts of suitable land are either traditionally owned, costly to purchase or unavailable for commercial development. Contract farming, therefore, offers access to crop production farm land that would not otherwise be available to a company, with the additional advantage that it does not have to purchase it.

iii. Production consistency and shared risk: Working with contracted farmers facilitates sponsors to share the risk of production failure due to poor weather, disease, etc. The farmer takes the risk of loss of production while the company absorbs losses associated with reduced or nonexistent throughput for the processing facility. Where production problems are widespread and no fault of the farmers, sponsors will often defer repayment of production advances to the following season. Both estate and contract farming methods of obtaining raw materials are considerably more reliable than making purchases on the open market.

iv. Quality assurance: A steady markets for fresh and processed agricultural produce require reliable quality standards. Moreover, these markets are moving increasingly to a situation where the supplier must also conform to regulatory controls regarding production techniques, particularly the use of pesticides. Both estate and contracted crop production require close supervision to control and maintain product quality, especially when farmers are new with innovative harvesting and grading methods.

PROBLEMS OF CONTRACT FARMING

Problems Faced by the Farmers

The potential problems as confronted by the farmers due to Contract Farming are given below:

i. Possibility of greater risk: Farmers who were entering into a new contract farming venture should be prepare themselves to assess the prospect of higher returns against the possibility of greater risk. Such risk is more expected when the agribusiness venture is introducing a new crop to the area. There may be production risks, particularly where prior field tests are inadequate, resulting in lower-than-expected yields for the farmers. Market risks may occur when the company's forecasts of market size or price levels are not accurate.

ii. Outdated technology and crop incongruity: The introduction of a new crop to be grown under conditions meticulously controlled by the sponsor can cause disruption to the existing farming system. Again, the introduction of sophisticated machines (*e.g.* for transplanting) may result in a loss of local employment and overcapitalization of the contracted farmer. Furthermore, in field activities such as transplanting and weed control, mechanical methods may produce less effective results than do traditional cultivation methods. Therefore, Field extension services must always ensure that the contracted crop fits in with the farmer's total cropping regime, particularly in the areas of pest control and field rotation practices.

iii. Manoeuvring in quotas and quality specifications: Incompetent management can lead towards production exceeding original targets. For example, failures of field staff to determine fields following transplanting can result in gross over planting. Sponsors may also have unrealistic expectations of the market for their product or the market may crumple unexpectedly owing to transport

problems, civil unrest, change in government policy or the arrival of competitors. In some situations management may be tempted to manipulate quality standards in order to reduce purchases for honouring the contract. Such practices may cause sponsor-farmer confrontation, especially if farmers have no method to dispute grading irregularities. Therefore, all contract farming ventures should have forums where farmers can raise concerns and grievances relating to such issues.

iv. Corruption: Problems occurs when staff responsible for issuing contracts and buying crops taking undue advantages of their position. Such practices result in a collapse of trust and communication between the contracted parties and soon undermine any contract. In a large contract, the sponsors can themselves be dishonest or corrupt. Governments have sometimes fallen victim to dubious or "fly-by-night" companies who have seen the opportunity for a quick profit. Therefore, in every case farmers who make investments in production and primary processing facilities run the risk of losing everything.

Problems faced by the Sponsors- The possible problems as confronted by the Contract Farming Developers are outlined below–

i. Limitation on land availability: Farmers should have a suitable cultivable land on which they are to cultivate contracted crops. But problems can arise when farmers have minimal or no security of tenure as there is a possibility of drainage in sponsor's investment as a result of farmer - landlord disputes. Difficulties may also arise when sponsors lease land to farmers. Some contract farming ventures are dominated by customary land usage arrangements negotiated by landless farmers with traditional landowners. While such a situation allows the poorest cultivator to take part in contract farming ventures, discrete management measures need to be applied to ensure that landless farmers are not exploited by their landlords. Before signing a contract, the sponsor must ensure that access to land is secured, at least for the term of the agreement.

ii. Social and Cultural constraints: Promoting Contract Farming is a cultural, customary beliefs and religious issues. In communities where custom and tradition play an important role, difficulties may arise when innovative farming is introduced. Therefore, before introducing new cropping practices, sponsors must consider the social attitudes and the traditional farming procedures of the community and decide how a new crop can be introduced.

iii. Farmers disgruntlement: Sometimes, situations may crop up which may leads towards farmer discontent; e.g. biased buying, late payments, incompetent extension services, poor agronomic counsel, undependable transportation for crops, a mid-season change in pricing or management's impoliteness to farmers will all normally aggravate the relationship between sponsors and the farmers. If not readily addressed, such circumstances will cause antagonism towards the sponsors that may result in farmers withdrawing from projects.

iv. Below quality agro-inputs: Sometimes farmers are forced to use inputs supplied under contract for the purposes other than those they were intended for. They may choose to utilise the inputs on their other cash and subsistence crops or even to sell them. As a result contracted crop's yields were reduced and the quality is affected. Improved monitoring by extension staff, farmer training and the issuing of realistic quantities of inputs can resolve the matter successfully. Majority of farmers conform to the agreement when they have information that the contract has the advantages of technical inputs, cash advances and a guaranteed market. However, until a project is very poorly managed, input diversion is usually an infuriation rather a serious problem.

v. Sale of crops by the farmers beyond contractual agreement: The sale of produce by farmers to a third party, outside the terms of a contract, can cause major problem to the sponsors. However, extra-contractual sales are always possible when there is an alternative market. The outside buyers offered cash to farmers as opposed to the prolonged and difficult collection of payments negotiated through the cooperative. Sometimes the Sponsors may encourage extra-contractual practices as there are several companies working with the same crop (e.g. cotton in some southern African countries) and they could collaborate by establishing a register of contracted farmers. Managers must be aware of the situation when produce were sold outside the project and also when produce from outside being forced into the buying system. This happens when non-contracted farmers take advantage of higher prices paid by a well-known sponsor. Non-contracted crops are filtered into the buying system by outside farmers through friends and family who have

crop contracts. Such practices make it difficult for the sponsor to regulate production targets, chemical residues and other quality aspects.

CONTRACT MODELS IN INDIA AND PRECONDITIONS FOR THEIR SUCCESS

Eaton and Shepherd (2001) classified 5 major models in which contractual arrangements occur between the firm and farmers. A sponsor (defined as the contracting firm/ corporation) decides to follow a model depending on the market demand, production and processing requirements, and economic and social viability of the farmers Paty, 2005.

I. Centralized Model: In a centralized model, a sponsor (a processor/ packer) buys from large number of small farmers (Figure 1). The quantity that will be bought is usually predetermined at the beginning of the sowing season and quality standards are strictly monitored and enforced Bijman Jos. (2008). The firm provides inputs such as seeds, fertilizers, pesticides, credit and machines, etc. This model was used for annual crops and crops which often require a high degree of processing. Centralized Model contracts are also found concerning products where market requirements necessitate frequent changes in the farm technology with fairly intensive farm-level support from the sponsors. Sponsors involvement in production varies from minimal input provision to the opposite extreme where the sponsor takes control of most of the production aspects such as tomato processing by PepsiCo in Punjab. It is same as the Type I contract farming in the contract farming classification given in a study by the National Institute of Agricultural Marketing Paty, 2005.

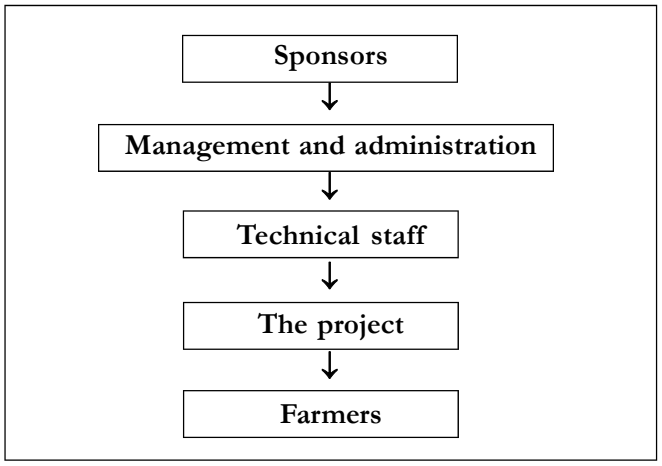

Figure 1: Centralized model

II. Nucleus Estate Model: Nucleus estate model (Figure 2) is a variation of the centralized model where the sponsor also manages a central estate or plantation. The central estate is usually used to guarantee throughput for the processing plant but sometimes the estate is used only for research or breeding purposes. The sponsor provides a significant amount of material and helps with the management inputs. This model is appropriate for crops such as tea, coffee, rubber, cocoa, sugar and oil palm, crops with which farmers may have had little or no experience.

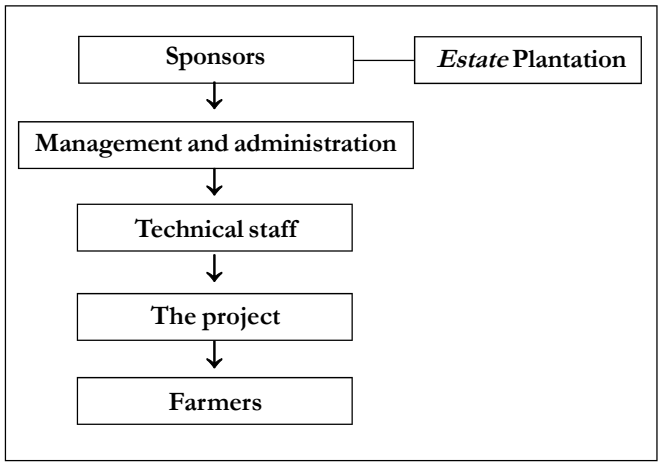

Figure 2: Nucleus estate model

CONTRACT FARMING BUSINESS MODELS

Informal model- This model is the most transient and speculative of all contract farming models, with a risk of default by both the promoter and the farmer". However, this is depends on the situation: interdependence of contract parties or long-term trustful relationships may reduce the risk of opportunistic behaviour. Special features of this CF model are:

- Small firms conclude simple, informal seasonal production contracts with smallholders.
- The success often depends on the availability and quality of external extension services.
- Embedded services, if at all provided, are limited to the delivery of basic inputs, occasionally on credit; advice is usually limited to grading and quality control.
- Typical products: requiring minimal processing/ packaging, vertical coordination; e.g. fresh fruit/ vegetables for local markets, sometimes also staple crops.

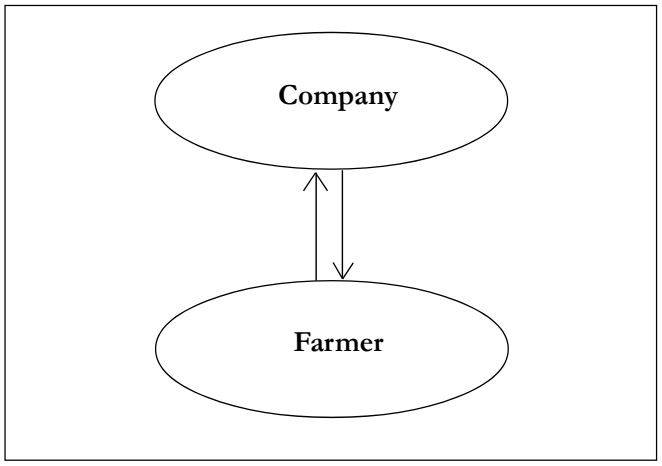

Figure 3: Informal model

Intermediary model- In this model, the buyer subcontracts an intermediary (collector, aggregator or farmer organisation) who formally or informally contracts farmers (combination of the centralised/ informal models). Special characteristics of this CF model are:

- The intermediary provides embedded services (usually passing through services provided by buyers against service charges) and purchases the crop.
- This model can work, if well-designed and if incentive-structures are adequate and control mechanisms are in place.
- This model can bear disadvantages for vertical coordination and for providing incentives to farmers (buyers may lose control of production processes, quality assurance and regularity of supplies; farmers may not benefit from technology transfer; there is also a risk of price distortion and reduced incomes for farmers).

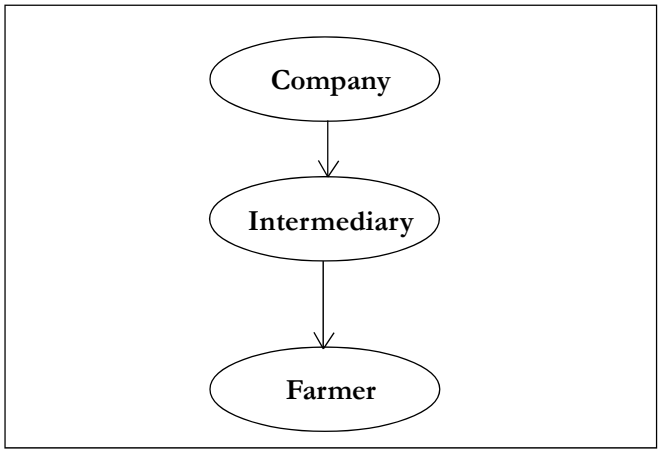

Figure 4: Intermediary model

Multipartite model- This model can develop from the centralised or nucleus estate models, e.g. following the privatisation of para- statals. It involves various organisations such as govern- mental statutory bodies alongside private companies and sometimes financial institutions. Special features:

- This model may feature as joint ventures of parastatals/community companies with domestic/ foreign investors for processing.
- The vertical coordination depends on the discretion of the firm. Due attention has to be paid to possible political interferences.
- This model may also feature as farm-firm arrangement complemented by agreements with 3rd party service providers (e.g. extension, training, credits, inputs, logistics).
- Separate organisations (e.g. cooperatives) may organise farmers and provide embedded services (e.g. credits, extension, marketing, sometimes also processing).
- This model may involve equity share schemes for producers.

Centralized model- In this model, the buyers' involvement may vary from minimal input provision (e.g. specific varieties) to control of most production aspects (e.g. from land preparation to harvesting). This is the most common CF model, which can be characterised as follows:

- The buyer sources products from and provides services to large numbers of small, medium or large farmers.
- The relation/ coordination between farmers and contractor is strictly vertically organised.

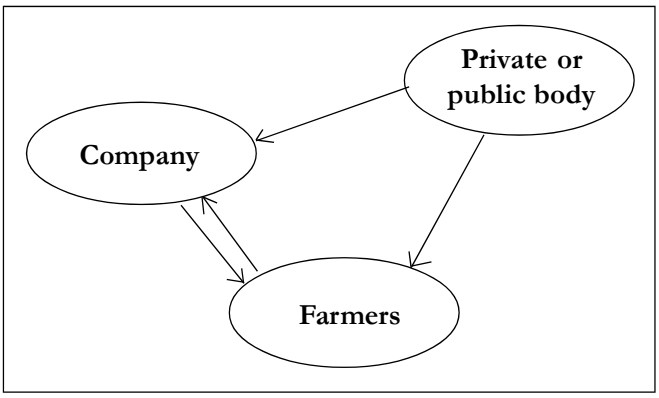

Figure 5: Multipartite model

- The quantities (quota), qualities and delivery conditions are determined at the beginning of the season.
- The production and harvesting processes and qualities are tightly controlled, sometimes directly implemented by the buyer's staff.
- Typical products: large volumes of uniform quality usually for processing; e.g. sugar cane, tobacco, tea, coffee, cotton, tree crops, vegetables, dairy, poultry.

Nucleus estate model- In this model, the buyer sources both from own estates/plantations and from contracted farmers. The estate system involves significant investments by the buyer into land, machines, staff and management. This CF model can be characterised as follows:

- The nucleus estate usually guarantees supplies to assure cost-efficient utilisation of installed processing capacities and to satisfy firm sales obligations respectively.
- In some cases, the nucleus estate is used for research, breeding or piloting and demonstration purposes and/ or as collection point.
- The farmers are at times called 'satellite farmers' illustrating their link to the nucleus farm. This model was in the past often used for state owned farms that re-allocated land to former workers. It is nowadays also used by the private sector as one type of CF. This model is often referred to as "out grower model".
- Typical products: perennials

Suggestion for Development of Contract Farming model of agriculture in India (Chakrabarti, 2015)

Based on the above study, the following recommendations are made for an improved Contract Farming Model of agriculture in India-

i. Present provisions of institutional arrangement to record all contractual arrangements should be made effective. This will promote and strengthen confidence building between the parties and also help to solve any dispute arising out of violation of contract.

ii. There should be a contract farmers association or cooperatives at the plant level which will improve bargaining power of the farmers and the sponsors and promote equality of partnership. It will also minimise the role of middlemen or commission agents who are involved in marketing of the contract commodities on behalf of the company.

iii. The selection of appropriate plant genotype is one of the crucial factors for Contract Farming. Unless the plant material is of good quality and high yielding and also less prone to pests and diseases, the contract farmers may lose their confidence and discontinue the cultivation of contracted crop.

iv. Every contract farming agreement should have a provision for both forward and backward linkages. Unless both input supply and market for the produce are assured, small farmers are not encouraged to participate in contract farming.

v. Bank finance to small and marginal farmers should be on easy terms and condition there are no any difficulty face by farmers during taking the agricultural loan.

vi. A sustainable contract farming requires adequate infrastructure facilities e.g. roads, public transport, telephones, postal services, stable power and water supplies, cold storage facilities, etc. Therefore, it is the responsibility of the governments to provide the minimum necessary infrastructure facilities like roads, electricity, cold storage, and market yards so that there produce quickly reached in market.

vii. The contracts should be managed in clear and participatory manner so that there is greater social consensus in handling contract violation from either side without getting involved in costly and lengthy process of litigation. Also the terms of contract need to be more comprehensive and flexible.

viii. In many parts of the country, agricultural tenancy is legally banned, although concealed tenancy exists. Tenants who do not enjoy security of tenure are unable to participate in contract farming. Hence, legalisation of tenancy is a prerequisite for the tenant farmers who will enter into contract farming. Although different forms of land tenants including share-croppers can be adopted to maintain the contract farming but security of tenure is a must.

ix. As assured market of the farm motivates a farmer to enter into contract with a company, similarly market prospect for the processed products of the company should exist. Ultimately, it is the success of the company's product in national or international

market, which decides whether contract farming for any particular crop or commodity would sustain.

x. The government must ensure that contract farming, which is generally a commodity specific and tends to promote monoculture, does not grow beyond certain limit which will destroy biodiversity and agricultural ecology.

xi. The Central Warehousing Corporation and the State Warehousing Corporations should develop commercially acceptable quality standards in respect of various commodities in order to ensure quality maintenance of the stored goods over a sufficiently longer period of time.

xii. Updated database of contract farmers along with other relevant details such as the area & crops under contract, contracting agency, etc. should be maintained at various state levels and should be available to the public through an website.

xiii. Agreements written in vernacular language should be given priority so that the local farmers can understand the terms of contract. To suite the other party, it can be made bilingual. Standard formats for farmer-friendly agreement should be designed and mandated by the governments.

xiv. Contract Farming in lands recognized under Forest Rights Act is a virtual control of a person or agency other than the right-holder himself/herself and this lead towards violation of the spirit & mandate of the Act; therefore governments should take protective measures in this context.

xv. Liability of the contractor for any environmental losses should be fixed by the government, and in case such losses occur, the penalty realized in a proportionately appropriate amount should be spent for restoring the concerned area, preferably through the local Palli sabha/Gram sabha.

CHALLENGES OF CONTRACT FARMING

- Contract farming exploiting the marginal/small farmers and it favours large and influence farmers.
- Problems faced by growers like undue quality cut on produce by firms, delayed deliveries at the factory, delayed payments, low price and pest attack on the contract crop which raised the cost of production.
- Contracting agreements are often verbal or informal in nature, and even written contracts often do not provide the legal protection in India that may be observed in other countries . Lack of enforceability of contractual provisions can result in breach of contracts by either party.
- Single Buyer – Multiple Sellers (Monopsony).
- Adverse gender effects – in contract farming women have less influence or access than men.

POSITIVE AND NEGATIVE IMPACTS OF CONTRACT FARMING

As depicted in the (Table 3), the proponents of contract farming argue that contract farming can lead to significant increases in incomes and employment in poor agricultural regions and can eliminate low levels of productivity and instability in production. The benefits of contract farming can thus put the local economy on the path of growth and development. Below we point out the positive and negative impacts of contract farming.

THE FUTURE STRATEGIES OF CONTRACT FARMING

The future of contract farming in India is quite promising, thanks to the increasing awareness about food quality and safety among the rising middle class population coupled with rising domestic disposable income and the stringent food safety requirements of the export market of the developed countries. As the Indian economy grows, there will be an increase in the number of people with high disposable income and consciousness about quality and health who will demand food products of certain specifications Singh (2005).

Farmers- Farmers joining a contract farming scheme are responsible to provide a specific Contract production tends to shift farm production in favour of export-oriented and cash crops at the cost of basic food crops for the poor. This can lead to higher prices of the food commodities and products, especially for non contract farmers and the labour households who do not benefit from higher incomes attained by contract farming. Even regional differentiation tends to increase as the firms choose relatively better-off areas for implementing contract farming schemes (Little and Watts, 1994; White, 1997).

Table 3: Positive and negative Impacts of contract farming

Positive Impacts	Negative Impacts
Due to better use of resources, better management of the new technology and improved access of produce to market in Contract farming, participating farmers increases their own income.	Simmons (2003) agribusinesses corporations based, mostly prefer to deal the contracts with large farmer groups than small farmers groups because they have lower average costs and are more reliable suppliers in terms of quality and quantity
Contract farming increase benefits by provide rural employment and providing additional employment opportunities through processing of produces.	Most contract farming schemes occur only in the regions where, commercial agriculture is already established and offering reliable infrastructure and access to markets
Contract farming helps in improving farmer's production through the provision of appropriate technology adoption and through the creation of structured, efficient farming operations.	Due to unequal power in terms of bargaining, negotiating, or contract enforcement contracts between agribusiness firms and farmers tend to be unfair and lead to exploitation
Agribusiness firms enable the farmers to reduce their price risk through predetermined prices, production risk through provision of technology, extension services and diversification of farm activities.	Sometimes contract farming may act as catalyst for gender conflict within the household due to the condition that the agreement is usually through man though women do the bulk of the farm work.

(*Source:* Manjunatha, 2016)

CONCLUSION

Contract farming is no doubt a viable alternative farming model in India, which can provide assured and reliable input services to the farmers and desired farm produce to the contracting firms. Several Indian and multinational companies have already begun such initiatives in India and have demonstrated repeated success. The successful cases of contract farming should provide a blueprint for further expansion of contract farming in order to increase the quality of agricultural produce as well as to increase the incomes of rural farm communities. It is important to note that the success of contract farming depends on a profitable market, the physical and social environment and government support. Contract farming can be proving successful in mitigating the problem of access the market in a farming structure. The contracting firms must consider physical infrastructure, telecommunications infrastructure, land availability and tenure, input availability, and social considerations. Contract farming has both positive and negative aspects but benefits overweigh the negative effects which can be addressed through the involvement of institutions related to the governance of the contract farming business. It could be evaluated as a way of providing earlier access to credit, input, information and technology and product markets for the small scale farming structure. However, in the present context, contract farming is clearly a win -win situation for both the companies and the farmers. The future of contract farming in India is quite promising due to increasing consciousness about food safety and quality among the rising middle class population and the quality demands of the export market in the developed countries.

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Reduction in Food Loss Through Storage of Pulses in Hermatic Bags

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ABSTRACT

Pulses are precious commodities used around the globe in variety of cuisines. They are rich source of plant proteins and contribute in improving nutrition security. But the post harvest losses are linked to insufficient and poor storage facilities, lack of knowledge of advanced technology in post harvest pulse management and harsh climatic conditions. Hermetic grain storage can be an appropriate method for many subsistence farmers and farm women. Keeping in view these facts, the study was carried out to evaluate the suitability of hermetic storage for pigeonpea to minimize postharvest losses thereby to improve the end-use qualities of pulses. To measure the effectiveness of the technology under farm women's conditions, neem leaves (T2) and hermetic bags (T3: Grain pro-super bags) were compared to standard farm women's practice (T1: Gunny bags). The storage period was 90 days, with six evaluation periods. The percent of infestation of pigeonpea seeds in grain pro bags after three months of storage was lowest (2.4%) in T3 treatment as compared to 22.1 and 15.4 per cent in T1 and T2, respectively. The results indicated that the maximum germination percentage was recorded from pulse stored in grain pro bag with 91.3 per cent of germination, whereas, the lowest germination percentage 66.5 per cent was from stored in gunny bag. The results indicated that the maximum moisture content 15.5 percent was recorded from pulse stored in gunny bag. Grain weight loss was significantly higher in the T1 and T2 treatments, than in the hermetic bags. From the three attributes assessed by the farm women, the results showed that the quality of the stored pulse was significantly better for T3 treatment over T1 and T2 treatment groups. Thus hermetic storage bags such as grain pro bags are safer ways to preserve pigeonpea than traditional methods of storage. Using better agricultural practices and adequate storage technologies can significantly reduce the losses and help in strengthening food security.

Keywords: Farm women, Hermetic grain storage, Moisture, Post harvest losses, Pulses

INTRODUCTION

Pulses are precious commodities used around the globe in variety of cuisines. They are rich source of plant proteins and contribute in improving nutrition security. They are now gaining attention in value added food market as functional ingredients and in nutraceutical industries (Lopez-Barrios *et al.,* 2014). They are high in dietary fiber, resistant starch, protein, vitamins and minerals. The high lysine content in pulse protein and the high folate content make pulse flour ideal for blending with other commodities. They also contain health-promoting antioxidants such as carotenoids and phenolic compounds. The level of antioxidants occurring in pulses is quite high, including phenolic acid, polyphenols, flavonoids, and tannins (Udahogora, 2012).

But the shortage of food results from low productivity, climate change, financial constraint, and postharvest losses (World Bank, 2011). These losses are linked to insufficient and poor storage facilities, lack of knowledge of advanced technology in post harvest pulse management and harsh climatic conditions particularly in developing countries like India (Singh and Larson, 2016). Postharvest loss accounts for direct physical losses and quality losses that reduce the economic value of crop, or may make it unsuitable for human consumption. In severe cases, these losses can be up to 80 per cent of the total production.

Hermetic grain storage can be an appropriate method for many subsistence farmers. It eliminates the need for insecticides, which are costly and often inaccessible for these farmers. Misuse of insecticides by farmers is common and can cause health and environmental problems (Baributsa *et al.,* 2010). Hermetic storage bags kill insect pests introduced with harvested grain through suffocation

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and dehydration within a few days of bag closure (Murdock and Baoua, 2014). The effectiveness of hermetic storage depends primarily on veracity of the hermetic seal, the commodity stored, agro-climatic conditions, type and prevalence of insect pests, and mechanical strength of the barrier material (Njoroge *et al.,* 2014). With careful use, the bag will last for about five cycles. Punctures can be repaired with tape (Villers 2010). Keeping in view these facts, the study was carried out to evaluate the suitability of hermetic storage for pigeonpea to minimize postharvest losses thereby to improve the end-use qualities of pulses.

MATERIALS AND METHODS

The study was carried out in the adopted villages of Morena district of Madhya Pradesh during 2018-19. Grain samples were collected from the middle bag, after mixing thoroughly, for quality analysis. The germination percentages were tested 10 times with 20 seeds each before and after the experimentation. To measure the effectiveness of the technology under farm women's conditions, neem leaves (T2) and hermetic bags (T3: Grain pro-super bags) were compared to standard farm women's practice (T1: Gunny bags). To avoid selection bias between users and non-users of the new technology, farm women were randomly assigned to either treatment or control. The treatment farm women were given hermetic bags to store all their pulse for one season. Pulses stored in three ways were used.

The storage period was 90 days, with six evaluation periods. Three units of each storage system (hermetic and non-hermetic) were evaluated every 15 days. To determine the moisture content of the grains, the method of the oven drying at 105±3°C with natural air circulation was used for a total period of 24 hours. The results were expressed as percentage of moisture content, on wet basis.

RESULTS AND DISCUSSION

The traditional method for on-farm storage typically includes mud and thatch stores or simple gunny sacks. Hermetic storage technology is an alternative, often pesticide-free method that eliminates insects and molds by depleting oxygen levels and producing carbon dioxide within the storage unit. The hermetic technology essentially uses natural respiration processes coupled with the impermeability of containers to alter the ambient environment where pests otherwise would thrive. An air-tight enclosure effectively suffocates insects by forcing them to use up the available oxygen. Hermetic principles may be applied to hard containers or flexible materials, such as bags.

Quality assessment parameters under storage

Infestation: Some species of insects attacking pigeonpea seeds were observed during the process of experimentation. The percent of infestation of pigeonpea seeds in grain pro bags after three months of storage was lowest (2.4%) in T3 treatment as compared to 22.1 and 15.4 per cent in T1 and T2, respectively (Figure 1). The number of insects in pigeonpea seeds was strongly affected by different methods of storage. At three months of storage, grain damage was much lower in the hermetic bags than in the other two treatments. Although hermetic bags are evidently not perfect, they significantly reduced grain damage by insect pests and therefore preserve the quality of the stored pulse.

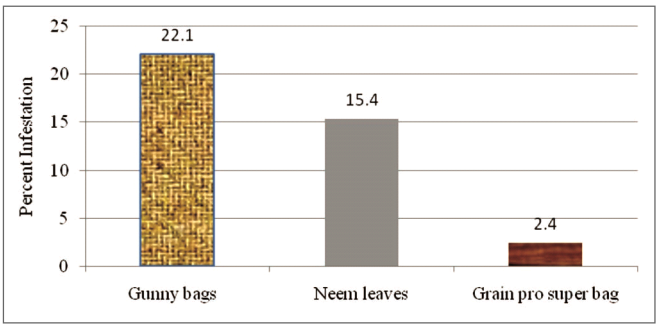

Figure 1: Infestation percent of stored pulse

Germination: The germination of pigeonpea was used as an indicator for deterioration during storage as germination is more sensitive to quality changes. Germination is the first factor that gets affected due to improper storage conditions. The initial germination was around 98.6 per cent for all the initial moisture contents of pigeonpea stored at different temperature. Figure 2 shows the changes in germination of pigeonpea stored at three different storage conditions.

The results indicated that the maximum germination percentage was recorded from pulse stored in grain pro bag with 91.3 per cent of germination, whereas, the lowest germination percentage 66.5 per cent was from stored in gunny bag. Regarding the methods of storage, there was a clear difference amongst treatments at three months of storage. These results are confirmed by Singh *et al.* (2000) who reported that 5-17 per cent reduction in seed germination when grain was stored approximately for five months.

Moisture content: Data obtained on moisture content during storage of pigeonpea in different types of packing

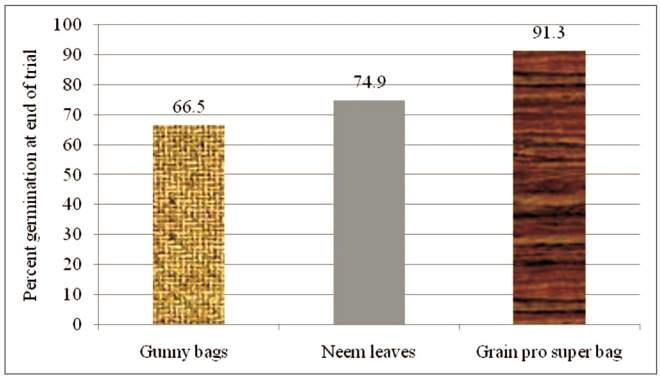

Figure 2: Germination percent at end of trial of stored pulse

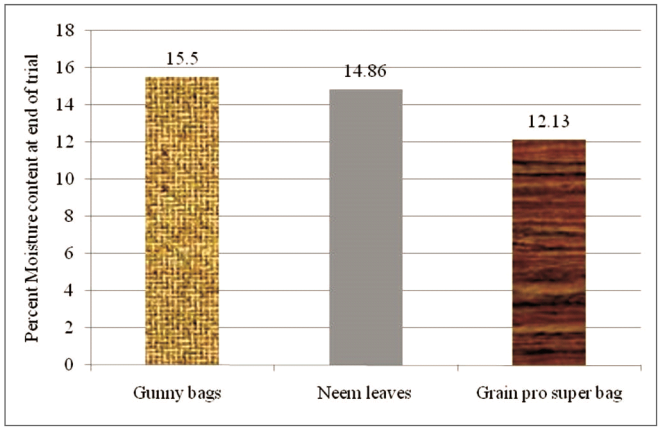

Figure 3: Moisture percent at end of trial of stored pulse

materials are presented in Figures 3. The results indicated that the maximum moisture content 15.5 per cent was recorded from pulse stored in gunny bag, the lowest moisture content 12.13 percent was from pulse packed in grain pro bag. The moisture content gradually decreased in all three types of packing materials throughout the storage period. This variation was probably due to the tendency of the grains to come to hygroscopic equilibrium with the storage environment.

Whole grain: Grain weight loss was significantly higher in the T1 and T2 treatments, than in the hermetic bags (Figure 4). At three months of storage, the whole grain at end of trial in the T1 treatment was 65.3 per cent, compared to 89.9 per cent in the hermetic bags.

The yields of pulse crops can be increased by adopting the recommended improved practice. Extension gap in pulse crop production emphasized the need for farmers' education through training for the adoption of improved technologies (Singh *et al.,* 2019).

Cost benefit analysis: The hermetic bag resulted to a net return of Rs. 73515/unit which was Rs. 43210/unit

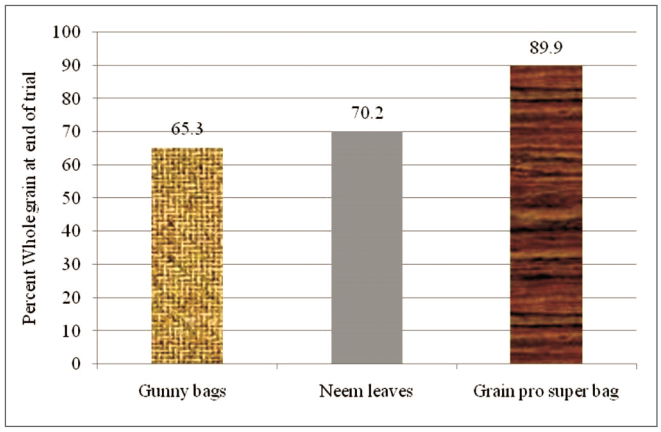

Figure 4: Whole grain percent at end of trial of stored pulse

and Rs. 52510/unit in other two treatments (Table 1). Compared to farm women's practice of storing pulses in gunny bags, the hermetic bags are more effective in controlling postharvest infestation of pigeonpea and preserving the quality of the stored pigeonpea. Investing in hermetic bags is economically viable with a benefit cost ratio of 4.02. From the farm women's perception on the quality of their own stored pigeonpea, the hermetic bags scored significantly higher than the control farm women. This implies that hermetic bags are economically viable even if they were to be used for one season only. The economic viability is expected to increase with increased length of storage, higher grain values, lower costs of the inner lining, and when the bag is re-used for subsequent seasons.

Farm women's perception on the quality of the stored grains

Based on the physical observation and consumption of the stored pulse, farm women's were asked if they agreed or disagreed if the quality of the grain in storage had been maintained after three months of storage. Approximately 62 per cent of the farm women strongly agreed that the odor, taste and appearance of the stored pulse was maintained, 33 per cent just agreed that the quality was maintained while roughly 5 per cent just disagreed. There

Table 1: Cost benefit analysis of stored pulse

Parameters	Yield per unit	Incremental income (Rs/unit)	Net return (Rs/unit)	B:C ratio
T1	14.2	63040	43210	2.94
T2	15.62	72340	52510	3.65
T3	20.8	97860	73515	4.02

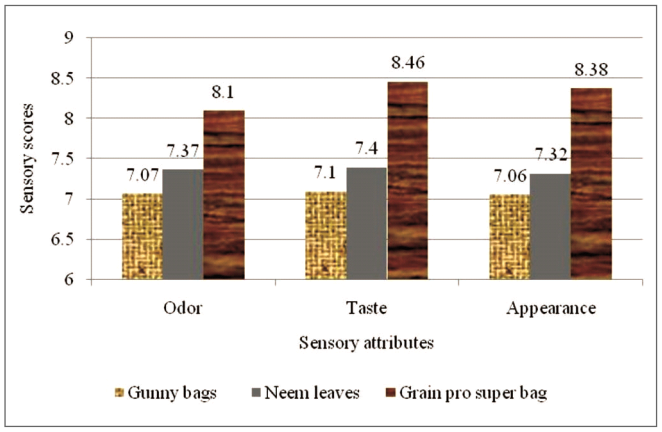

Figure 5: Mean sensory scores of cooked pulse

were no any treatment farm women who strongly disagreed that the quality of the stored pulse was maintained. From the three attributes assessed by the farm women, the results showed that the quality of the stored pulse was significantly better for T3 treatment over T1 and T2 treatment groups (Figure 5), for all three criteria. This indicates that farm women consider the hermetic bags to be effective in maintaining pulse quality over the three months storage period. In regards to storage of produce, women were involved in decision making related to the storage of farm produce. Advice of 38.75 per cent respondents was taken and was fully accepted for thirty per cent of respondents (Ball and Bisht, 2019).

CONCLUSION

Hermetic storage bags such as grain pro bags are safer ways to preserve pigeonpea than traditional methods of storage. These hermetic bags are able to minimize or eliminate postharvest losses. These hermetic bags could be reused by farm women. This technology should be promoted among the small scale farm women and farmers as its potential to improve their food security and income is high. For one to achieve these benefits, it is important that the process of drying, loading the pigeonpea in the bags for storage and sealing them is adhered to ensure hermetic conditions are maintained throughout the storage period. Access to safe, affordable grain storage technology therefore provides small-scale farming families the option of storing pulses for household consumption year round, or selling when market prices are more favorable. Using better agricultural practices and adequate storage technologies can significantly reduce the losses and help in strengthening food security, and poverty alleviation, increasing returns of smallholder farmers and farm women.

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Interpersonal Relations of Old Aged People with Their Families in Punjab

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ABSTRACT

Old age is the closing period of the life span. It is a period when people 'move away' from previous more desirable periods or times of 'usefulness'. The present study was conducted in three cultural zones of Punjab. An equal number of males and females were taken from three cultural zones. A total of 150 respondents was randomly selected. The findings revealed that more than half of the respondents belonged to the age group of 60-70 years, were illiterate (47.33%), had family size of 6-8 members (57.33%) and engaged in agriculture (49.33%). In the total sample, 57.33 per cent of the respondents were not working at present while 42.66 were working. Furthermore majority (74%) of the respondents spend their time by gossiping with friends. Regarding interpersonal relations, males had very cordial relations with grandchildren while female had very cordial relations with daughters.

Keywords: Ageing, Family, Interpersonal relations, Old people

INTRODUCTION

Old age is the closing period of the life span. It is a period when people 'move away' from previous more desirable periods or times of 'usefulness'. Ageing is natural universal and inevitable with passage of time. It is developmental phase in the life process which begins at conception and ends with death. Generally, the aged are knows as "elderly", old people or senior citizens who are generally taken to the people above the age of 60 years. This age group is called as "Geriatric Age Group" (Pandey *et al.,* 2015). Age is not only a biological fact but it is also a matter of socio-psychological concern. Health deteriorates and mental functions decline but more crucial is a setback to psychotically functions which pose serious threat to social and personal adjustment of the aged within the family. In the advancing age, when the aged has lost many things including friends, spouse, job, status, power, income, health etc. that cannot be replaced brings rigidity of attitude and suspicion. This shift in their psychological make up makes their living and relations in the family and society more problematic. The peace of the whole family and the society at large floats in danger. The problem has begun with a change in social power from the aged to the youth. The youth oriented society has started dislocating them. This is being reflected in their attitude towards the aged people. They call them conservative, out of date or old fashioned. They think that most old people bore others by their insistence on talking about the good old days. Younger ones do not like their habit of prying into affairs of others and in giving unsought advice. Old age is called "dark" not because the light fails to shine but because people refuse to see it (Gowri, 2003).

Family is the main source of care giving to all its members. One's need for and ability to care is negotiated by one's place in family lifecycle. Ageing of population is an obvious consequence of the process of demographic transition. In a globalizing world, the meaning of old age is changing across cultures and with in countries and families (Bergeron, 2001). Family life can be traced even to primitive times. It is considered as the strongest and most stable of all the social groups. In Indian society, till now where joint family system prevails, the aged continue to enjoy respect and power. The obligation of the family to look after the aged and to honour and respect them still continues. However recent developments have given rise to some stresses and strains which have made the position of the elderly more problematic.

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MATERIAL AND METHODS

The study was conducted in Punjab by taking three socio-cultural zones i.e. Malwa, Doaba and Majha into an account. A Multi-stage random sampling technique was used. At the first stage one district i.e. Ludhiana, Jalandhar and Amritsar from each zone was randomly selected. Three blocks namely. Jagraon, Nakodar and Baba Bakala were randomly selected from each district. At the second stage, five villages from each zone namely Boparai Kalan, Pona, Ramgarh, Sidhwan Bet and Talwandi Khurd from Jagraon block of Ludhiana. Similarly, Meheru, Mahunwal, Khambra, Lohgarh, Nawan Pind Araian and Nurpur from Nakodar block of Jalandhar were selected randomly. Furthermore Dhardeo, Gaggar bhana, Jabbowal, Kaleke and Malik Nangal from Baba Bakala block of Amritsar were randomly selected comprising 15 villages in total. At the third stage, 10 aged (5 men and 5 women) from each village were selected randomly comprising a sample of 150 respondents for the study. The data were collected through structured interview schedule at their residence. The data were analyzed with the statistical tools like frequency and percentages.

Operational Definitions

Family: A family is a group of people related by blood, marriage or relation.

Interpersonal relationships: An Interpersonal relationship is a relatively long term association between two or more people. In this research, it means relationships between elderly persons and their children as well as grand children.

Elderly: Age 60 is considered a milestone and the beginning of late adulthood.

RESULTS AND DISCUSSION

Social Background

Age: In this study, old aged people of all the ages were taken into consideration. The age has been divided in to three categories. It was observed from the total sample that more than half of the respondents belonged to the age group of 60-70 years. The findings were in line with Dubey *et al.* (2011). Only 10 per cent of the respondents were 80 years and above. Majority of the respondents in the three cultural zones belonged to the age group of 60-70 years followed by the age group of 70-80 years.

Education: The extent of literacy of a person determines the outlooks, attitudes, values and views of life. In the total sample, about half of the respondents were illiterate. Twenty per cent of the respondents were educated up to primary and matric level. Khan *et al.* (2018) in their study found that 51 per cent had passed high School or higher secondary while Chandran *et al.* (2018) revealed that majority of the respondents with education either up to primary (36 percent) or middle school (29%) level. Overall view of the three cultural zones shows that mostly the respondents were illiterate. It may be due to the fact that there were few schools in earlier days. Generally these rural people were not able to get higher education due to non-availability of higher institution nearby their native place. Contrarily Sharma *et al.* (2012); Singh (2012) and Kaur (2014) reported that respondents in their study were literate.

Family size: The size of the family largely determines the standard of living of the family. More than half of the respondents had family size of 6-8 members while 28.66 per cent had large family i.e. nine members and above. Only 14 per cent of the respondents had smallest family size (up to 5 members).

Marital status: An aged needs his/her spouse badly in the later years of life when most of the familial bonds are shattered and become more or less dependent. There were more widow respondents from Doaba (48%) than Majha (40%) and Malwa (32%). Similarly, the number of widower was also more in Doaba (48%) than Majha (36%) and Malwa (24%). Overall view of the data revealed that about two-third of the couple were alive followed by widow (20%) and widower (18%), respectively.

Caste: The caste system is still prevailing in rural areas of Punjab. It is revealed from the Table 1 that about two-third of the respondents belonged to general category followed by SC (26.66%) and (12.66%). Same trend was followed in all cultural zones. The results are in conformity with the findings of Pandey *et al.* (2015) which stated that respondents in their study belonged to general category.

Family occupation: In the rural area of Punjab, majority of the people are engaged in agriculture. Same data revealed in Table 1 that about half of the sampled respondents were engaged in agriculture. The findings were in line with Kumar *et al.* (2017) and Khan *et al.* (2018) who

Table 1: Socio-personal characteristics of the elderly (n=150)

Characteristics	Male			Female			Total
	Majha	Malwa	Doaba	Majha	Malwa	Doaba	(150)
Age							
60-70	12(48)	16(64)	13(52)	13(52)	13(52)	15(60)	82(54.66)
70-80	10(40)	8(32)	11(44)	8(32)	8(32)	8(32)	53(35.33)
80 and above	3(12)	1(4)	1(4)	4(16)	4(16)	2(8)	15(10)
Education							
Illiterate	8(32)	13(52)	11(44)	12(48)	15(60)	12(48)	71(47.33)
Primary	7(28)	5(20)	4(16)	5(20)	4(16)	5(20)	30(20)
Middle	4(16)	3(12)	3(12)	4(16)	2(8)	3(12)	19(12.66)
Matric	6(24)	4(16)	7(28)	4(16)	4(16)	5(20)	30(20)
Family size (members)							
Up to 5	4(16)	2(8)	6(24)	3(12)	2(8)	4(16)	21(14)
6-8	10(40)	16(64)	15(60)	11(44)	16(64)	18(72)	86(57.33)
9 and above	11(44)	7(28)	4(16)	11(44)	7(28)	3(12)	43(28.66)
Marital status							
Married and both alive	16(64)	19(76)	13(52)	15(60)	17(68)	13(52)	93(62)
Widower	9(36)	6(24)	12(48)	-	-	-	27(18)
Widow				10(40)	8(32)	12(48)	30(20)
Caste							
General	13(52)	13(52)	17(68)	17(68)	16(64)	15(60)	91(60.66)
SC	8(32)	7(28)	7(28)	6(24)	5(20)	7(28)	40(26.66)
Others	4(16)	5(20)	1(4)	2(8)	4(16)	3(12)	19(12.66)
Occupation							
Agriculture	12(48)	12(48)	14(56)	12(48)	11(44)	13(52)	74(49.33)
Transport	1(4)	2(8)	3(12)	1(4)	1(4)	2(8)	10(6.66)
Service	3(12)	1(4)	2(8)	1(4)	2(8)	1(4)	10(6.66)
Driver	1(4)	1(4)	1(4)	1(4)	1(4)	1(4)	6(4.00)
Shop	5(20)	5(20)	3(12)	4(16)	5(20)	4(16)	26(17.33)
Labour	3(12)	4(16)	2(8)	6(24)	5(20)	4(16)	24(16)

found that majority of the respondents were involved in farming. Seventeen per cent of the respondents were having shops of stationery, grocery, agricultural implement, medical store, cycle/scooter repair, tea stall. Furthermore 16 per cent of the families were engaged in labour. Overall it was observed that all family of the respondents were occupied in different types of occupation in villages but farming was main family occupation.

Present Occupation: The present occupation of the respondents was also observed in Table 2. In the total sample, 57.33 per cent of the respondents were not working at present while 42.66 were working. Majority of the respondents on an average were working part time while 39.06 were working full time. Regarding income, 43.75 per cent of the respondents earned income up to Rs.1000/- per month while 39.06 per cent of the respondents earned income in the range of Rs.1000-2000/-per month. Only seventeen per cent of the respondents earned Rs.2000 and above.

All the respondents have to work due to one or other reason. They even stated that their children would not ask them if they will not work. Some of them worked as

Table 2: Present status of working of old aged and its reasons (n=150)

Characteristics	Male			Female			Total
	Majha (n=16)	Malwa (n=15)	Doaba (n=17)	Majha (n=5)	Malwa (n=5)	Doaba (n=6)	(n=64)
Status of working							
Full time	7(46.66)	7(46.66)	7(41.11)	1(20)	1(20)	2(33.33)	25(39.06)
Part time	9(56.25)	8(53.33)	10(58.88)	4(80)	4(80)	4(66.66)	39(60.93)
Income (Rs/month)							
Up to 1000	9(56.25)	7(46.66)	5(29.41)	2 (40)	4(80)	1(16,66)	28(43.75)
1000-2000	4(25)	5(33.33)	8(47.05)	3(60)	1(20)	4(66.66)	25(39.06)
2000 and above	3(18.75)	3(20)	4(23.52)	-	-	1(16.66)	11(17.18)
Reasons of working							
Pressed by children	2(12.5)	2(13.33)	3(17.6)	-	-	1(16.66)	8(12.5)
To keep busy	8(50)	4(26.66)	4(23.52)	1(20)	2(40)	2(33.33)	21(32.81)
Economic necessity	6(37.5)	9(60)	10(58.88)	4(80)	3(60)	3(50)	35(54.68)
No work	9(36)	10(40)	8(32)	20(80)	20(80)	19(76)	86(57.33)

Table 3: Distribution of the elderly according to the way of spending their leisure time

Leisure activities	Male			Female			Total
	Majha	Malwa	Doaba	Majha	Malwa	Doaba	
Playing cards	15(60)	24(96)	17 (68)	-	-	-	56(37.33)
Gossiping	13(52)	20(80)	17 (68)	19(76)	21(84)	21(84)	111(74)
Reading newspaper	6(24)	6(24)	8 (32)	1(4)	1(4)	-	22(14.66)
Listening radio	18(72)	16(64)	15 (60)	4(16)	-	2(8)	55(36.66)
Watching TV	6(24)	3(12)	6 (24)	5(20)	3(12)	6(24)	24(16)
Sitting idle on charpal	13(52)	11 (44)	11 (44)	9(36)	11(44)	12(48)	67(44.66)
Doing religious chores	9(36)	6 (24)	10 (40)	13(52)	19(76)	18(72)	75(50)

Multiple response

their children compelled them, to keep themselves busy and due to economic necessity. More than half of the respondents worked for economic necessity while 32.81 per cent of the respondents worked to keep themselves busy. Only 12 per cent of the respondents worked as pressed by children.

Leisure time: The perusal of the Table 3 revealed that majority (74%) of the respondents spend their time by gossiping with friends or neighbours by sitting idle on charpai or nap (44.66%) under the tree or in house. It was the best way for elderly to spend their leisure time. Half of the respondents performed different religious chores. One –third of the respondents spend time by playing cards (37.33%) and listening radio (36.66%). Very few (14.66%) of the respondents read newspaper. It may be due to the fact that majority of the respondents in the present study were illiterate.

Interpersonal relations: Recent developments have given rise to some stresses and strains which have made the position of the elderly more problematic. Thus a lot of changes are taking place in relationship of aged with family members. In present study, the variables used were very cordial, cordial, not cordial and need based were assessed in Table 4 to know interpersonal relations. According to data presented in Table all the three culturally zones elderly males had very cordial relations with grandchildren followed by daughters. Majority of them had not cordial relations with sons. The reason may be due to the fact that new generation did not have good rapport with the parents.

Table 4: Interpersonal relations of the old aged within the family

	MAJHA				MALWA				DOABA			
	VC	**C**	**NC**	**NB**	**VC**	**C**	**NC**	**NB**	**VC**	**C**	**NC**	**NB**
Male												
Spouse	3(12)	4(16)	6(24)	2(8)	4(16)	8(32)	12(48)	11(44)	4(16)	6(24)	4(16)	5(20)
Son	3(12)	3(12)	8(32)	12(48)	3(12)	4(16)	6(24)	6(24)	2(8)	3(12)	14(56)	12(48)
Daughter	5(20)	11(44)	-	-	6(24)	7(28)	1(4)	2(8)	6(24)	8(32)	-	1(4)
Daughter in law	2(8)	2(8)	8(32)	9(36)	2(8)	3(12)	4(16)	5(20)	1(4)	1(4)	5(20)	6(24)
Grand children	12(48)	4(16)	3(12)	2(8)	10(40)	2(8)	2(8)	1(4)	12(48)	7(28)	2(8)	1(4)
Female												
Spouse	3(12)	4(16)	6(24)	3(12)	3(12)	5(20)	6(24)	4(16)	5(20)	6(24)	6(24)	7(28)
Son	5(20)	6(24)	8(32)	6(24)	3(12)	5(20)	6(24)	6(24)	3(12)	6(24)	6(24)	7(28)
Daughter	11(44)	8(32)	1(4)	-	9(36)	7(28)	2(8)	1(4)	10(40)	7(28)	-	2(8)
Daughter in law	1(4)	1(4)	8(32)	15(60)	2(8)	2(8)	9(36)	13(52)	=	2(8)	11(44)	9(36)
Grand children	5(20)	6(24)	2(8)	1(4)	8(32)	6(24)	2(8)	1(4)	7(28)	4(16)	2(8)	-

In case of females, it was found that in all cultural zones, old aged females had very cordial relations with daughters followed by grandchildren. This may be because of the reason that mothers were very close to their daughters. However, the relation of female especially with daughter-in-law was need based in all the regions. They reported that their daughter in law do not ask them anything, want to enjoy alone and don't want to live with them. Litwin and Shiovitz (2006) in their study stated that stressful family relationships and lack of family care precipitates the eldery's poor psychological well- being.

CONCLUSION

The elderly citizens are in need of urgent attention. They do not need our pity, but the understanding love and care of their fellow human beings. It is our duty to see that they do not spend the twilight years of their life in isolation, pain and misery. The advice of the old persons may be taken into account and if needed be modified accordingly. Older persons are, therefore, in need of vital support that will keep important aspects of their lifestyles intact while improving their over-all quality of life. Grandchildren should come into picture for the welfare of the aged so that they can explain their problem to them. They should spend some time with aged persons so that they may not feel neglected or alone. It is recommended that relationships are delicate social assets which should be carefully woven into tapestry of the threads interlinking youngsters to the aged person.

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Value Addition in Arecanut for Enhancing Income Among Arecanut Growers with Special Reference to Meghalaya

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ABSTRACT

The research study found that adding value to the arecanut and its by-products namely dry leaf sheath, dry stem, inner strips of dried mature stem, nut, coir etc. for making crafts items and as raw material for furniture and textiles industries is a feasible economic activity for the region. Areca leaf disposable plates are becoming common and highly demanded. Moreover the demand of eco-friendly products is gaining importance in global market. Taking up value addition activity as income enhancing may be feasible option for many arecanuts growers/ entrepreneurs. The arecanut growers were given hands on training especially on arecanut craft. A Pre test and Post test were conducted before and after the intervention in intervention and controlled group.

Keywords: Arecanut, Income, Intervention, Market, Value addition

INTRODUCTION

Arecanut is a long standing plantation crop in palm species. Palms offer a multiplicity of uses in a rural agrarian economy. They provide fodder for cattle, edible fruits, building materials, fuels and fibers (Croucher, 2002). In Meghalaya, Arecanut is cultivated in almost all the districts. Arecanut is also one of the important plantation crops in north eastern states, especially in Meghalaya and Assam, and also plays significant role in the livelihood of the people. Assam stands first in area and production followed by Meghalaya, Mizoram, Tripura and Nagaland (Shil, 2013). Most of the houses do Areca nut cultivation. From selling seedlings to harvested nut raw as well as fermented nut (*Moja*) they earn their living. The price of arecanut varies according to the season, size, taste or raw or fermented.

The market of arecanut can be enhanced and strengthened by adding value to arecanut and its by-products. Analysing each part of the arecanut plant, one can utilise the by-products of arecanut for making crafts items as well as for raw material in many industries. Arecanut leaf sheath fiber is more fibrous than the other fibers which will show better mechanical properties (Poddar, 2016). Moreover the demand of eco-friendly products is gaining important in global market. The banning of pan-masala, ghutka, areca containing products may make the value added crafts products from arecanut more feasible and may be an option.

MATERIALS AND METHODS

The study was carried out in West Garo Hills district, Meghalaya. Three blocks i.e. Gambegre block, Rongram block and Selsella block were covered in the study. From three blocks five villages were randomly selected. Samples of One hundred twenty (120) arecanut growers were interviewed. A pre-tested interview schedule was used to collect the primary data from the 120 samples (Table 1). Sixty samples were put under controlled group and another Sixty were given intervention on value addition in arecanut especially crafts. A Pre test and Post were conducted before

Table 1: Distribution of respondents under Intervention and Controlled group

Group	No. of samples (%)
Intervention	60 (50)
Controlled	60 (50)
Total	**120 (100)**

Source: Primary Data

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and after the intervention activity in both intervention and controlled group respectively.

RESULT AND DISCUSSION

Value addition potential: Arecanut being a palm species has multiple uses. Adding value to arecanut and by products can expand the market. The paper boards made with more arecanut sheath materials had more resistance to water absorption (Raghupathy, 2002). Analysis each part of the arecanut plant many crafts products can be made. The present vibrant e-market or virtual market in the country does add significant advantage for the products. The Government of India is also giving emphasis to showcase, sale and exhibit the strengths and the potentials of the North East, especially in the fields of Handicrafts/Handlooms. Many programmes such as Skill India, Stand Up India Scheme etc. will be a helping hand to the budding potential entrepreneurs of the region. Annamalai (2004) reported that areca nut and its by-products can be used for making many item. Tannins from areca nut were used for dyeing clothes, rope, leather, as adhesive in ply board manufacturing etc. thick boards, fluffy cushions and non-woven fabrics. Ramappa (2013) in his study mentioned that alternate use of areca nut should be looked for and promoted. The by-products from nuts can be used for tanning leather. From husk- fibre, thick board, wrapping papers can be made. From leaf sheath paperboards can be manufactured. Nails from areca stem can be utilised in furniture industry and organic manure can be prepared from leaf.

Value added products for enhancing income: The leaf sheath of arecanut tree can be used to make disposable plates, bowls, cup, glass etc. Few entrepreneurs started the venture in the district in a very small scale. The products are highly demanded and can be exported to other neighbouring states such as Manipur, Nagaland, Sikkim etc. Further the leaves can be made into flower by drying it properly which requires simple tools moreover not much huge investment. The product gives a traditional and natural aesthetic look. The value added products especially from the arecanut and its by-products possess the keeping quality. The added advantage is that these products are biodegradable and don't harm the environment as compare to other similar plastic crafts.

Arecanut growers used to make nursery for raising the palm. During the study it was found that twenty to twenty five percent of the nuts are not germinated. They used to throw away those nuts, those nuts and leaf bark can be dried and used as raw material for crafts products such as dry flower, vase, dry flower arrangement, stationary stand, as a stick for incense sticks (agarbati), decorative hair bands etc. The value added craft product from arecanut is not limited to the above mentioned. Many items such as garland, bracelet, curtain dangler, and miniatures etc. can be made out of it. These products can be made by using simple raw material and small tools. The husk of the nut can also be used for making dry flowers. Table 2 highlight some of the feasible products from arecanut and its by-product. In the district the stem of the arecanut tree are used as firewood, poles, irrigating water by slitting in the middle half longitudinally. Some of the stem can be value added for making vase, scale and other decorative items. Swain (2016) noted that arecanut timber can be used for making a variety of elegant utility articles like rulers, shelves and waste-paper baskets, due to its hardness. The interior strips of the stem can be utilised for making incense stick (agarbati). It is seen that arecanut has multiple uses especially its by-product. Rather throwing as waste one should utilise this resource as a raw material for making some useful product. The leaves or sheath of arecanut can be utilized as substrate in vermicomposting. Rajshree (2008) vermiculture is the process of using earthworms to convert vegetable and animal waste into useful product, namely vermicompost. It has been proved that this eco-friendly vermi-compost produces organic manure containing all the nutrients in an available form which is necessary for the plant growth.

Table 2: Feasible Products from Arecanut and its by-products

Name of the by product	Product
From leaf bark	Flowers of different shape & size
From leaf (after dipping & drying)	As a filling for pillow/cushion
From leaf (cut into small pieces)	As substrate in vermicomposting
From dry stem	Vases, stationary stand etc.
From inner strips of dry stem	As a stick for incence sticks (Agarbati)
From raw coir	Dry flower
From nut	Rubber band, garland, decorative articles etc.
From fermented & dried coir	Dry flower, as a filling for pillow and cushion
From very mature dry stem	Small furniture (stool/moorah)

Source: Primary Data

Fermentation of arecanut, a value addition in arecanut is a practice among the farmers but few farmers are undergoing. The fermented *(moja)* nuts are highly demanded in the region itself. Farmers should incline towards the value added products *(moja)* to gain more price and profit. Value added products have more potential market than traditional ones. The price is also more and requires few raw material/investment. The nuts which are fermented in a tank are highly demanded because of its taste. Fermentation is done in big bucket, basket, tank or katcha by digging on the ground. The time required for fermentation is three to six months. The price is much more as compared to a raw ripe mature nut.

Pre-test and Post Test: It was revealed from the Table 3 that none of the areca nut growers were having the idea of utilising/selling the by-products of areca nut. During the pre-test they were found not aware of utilizing by-products such as bark, leaf sheath, stem, inner strip of stem, coir etc.

It can be observed from the Table 3 that 50 per cent of the areca nut farmers gained the knowledge or idea for selling the by-products of areca nut after the intervention programme. They belong to Gambegre Block and Rongram Block, who were given the intervention (training) on Value addition on Areca nut and its by-products. It can be said that in the training they have learned to make dried flowers from leaf sheath, vase or stationary stand from dry stem, rubber band from ungerminated nuts. Not only these, they also got the idea of utilising the by-products for filling for cushion/pillow, as substrate in vermicomposting, as stick for agarbati making etc.

During the post test in the control group, it was found that 47.5 per cent of the areca nut farmers still don't have the idea because they were kept under controlled group. Among the control group surprisingly, 2.5 percent i.e. three respondents were found to have the knowledge of utilizing the by-products for making craft items. Two of them belong to Gambegre block and the other belongs to Rongram block. The reason may be the intervention in both the block's villages does have an influence in the control group too. To measure the impact of the training before (Pre) and after (Post) and comparing the intervention and control group respondents, Paired t test was used. The statistical result of the Paired t test is as follows in Table 4(a), 4(b), 5(a) & 5(b).

In the Intervention group (Table 4(b)), It is observed that there is strong evidence (t= 20.243, p=0.000) that the

Table 3: Knowledge of craft during pre test and post test

Knowledge	Pre test (Before)		Post test (After)	
	Intervention Frequency (%)	Control Frequency (%)	Intervention Frequency (%)	Control Frequency (%)
Yes	0 (0)	0 (0)	60 (50)	3 (2.5)
No	60 (50)	60 (50)	0 (0)	57 (47.5)
Total	**120 (100)**		**120 (100)**	

Source: Primary Data

Table 4(a): Paired Samples Statistics (Intervention Group)

	Mean	N	Std. deviation	Std. error mean
Pair 1 Post Test	1.9500	60	.74618	.09633
Pre Test	.0000	60	.00000	.00000

Table 4(b): Paired Samples Test (Intervention Group)

	Paired differences					t	df	Sig. (2-tailed)
	Mean	Std. deviation	Std. error mean	95% confidence interval of the difference				
				Lower	Upper			
Pair 1 Post Test Pre Test	1.95000	.74618	.09633	1.75724	2.14276	20.243	59	.000

Table 5(a): Paired Samples Statistics (Control Group)

	Mean	N	Std. deviation	Std. error mean
Pair 1 Post Test	.0667	60	.25155	.03247
Pre Test	.0000	60	.00000	.00000

Table 5(b): Paired Samples Test (Control Group)

	Paired differences					t	df	Sig. (2-tailed)
	Mean	Std. deviation	Std. error mean	95% confidence interval of the difference				
				Lower	Upper			
Pair 1 Post Test	.06667	.25155	.03247	.00168	.13165	2.053	59	.045
Pre Test								

training improves the knowledge/skill on craft because p value is less than 0.05 in fact it is 0.000. Whereas, in the control group the p=.045 though less than 0.05 almost negligible difference. Shruti (2019) training is a systematic process which involves improvement of knowledge and skills in order to helps the participants to function effectively and efficiently in their given task on completion of the training. It can be said that intervention group have gained knowledge and idea of utilising the by-products of areca nut for many useful products.

CONCLUSION

The farmer/areca nut grower can form a SHGs and cooperative society and linked with the District agencies for marketing their products. For marketing the product tourist spots, hotels, resort, craft centre are a good avenues. Thus, it can be concluded that there is a tremendous potential of application of areca nut and its by-products in many industries. The areca nut grower in the region should take the advantage of it and can enhance their income. Hands on training is an effective measure for better marketing of areca nut and its by-products in the district.

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Assessing the Adoption Level of Recommended Technologies and Finding the Major Causes of Decline in Darjeeling Mandarin Cultivation

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ABSTRACT

The Darjeeling mandarin is the major cash crop for hill ecosystem of West Bengal. But the cultivation of mandarin is gradually declining due to diverse bio-physical and socio-economic stresses. The farmers in the region expressed their helplessness orientation towards continuation of mandarin cultivation and shifting to alternative farm and non-farm activities. The present study was conducted to understand the field level scenario on extent of decline in different mandarin growing belt of Darjeeling and Kalimpong hills. The study tried to understand the adoption level of recommended technologies and the major causes of decline. Total five hundred farmers were surveyed over a period of three years from 2017-2020. The findings revealed significant loss of area under mandarin crop from 40 to 90 per cent and even complete disappearance in few areas from the traditional agro-ecosystem. The adoption level of recommended technologies was very poor with mean adoption score of 1.47 in a scale of 3. The farmers perceived problem of insect and disease problem (3.57) as major technological factors, emergence of new pest and diseases with changing climate (2.48) as major climatic factors, non-adoption of scientific mandarin cultivation technologies (2.79) as major social factor, poor economic condition of farmers (MS=2.73) as major economic factor and poor access to private as well public extension service as major institutional factor (2.90) for the present crisis in mandarin cultivation. Therefore, the policy makers should take into account these diverse factors in mind before formulating any technology outreach programme or re-plantation drive for revival of Darjeeling mandarin cultivation in the region.

Keywords: Darjeeling mandarin, Adoption, Causes of decline

INTRODUCTION

Apart from the pleasant weather and aromatic tea, Darjeeling is also a great destination of world famous mandarin or orange. The valleys of Teesta and Rangit rivers and their tributaries of Sikkim and adjoining Darjeeling district of West Bengal offer an ideal Himalayan climate for the cultivation of mandarin. The cultivars 'Darjeeling mandarin' or 'Khasi mandarin' are popular for its excellent quality and have good export potential (Ghosh and Singh, 1993). The crops played an important role in the life of farmers as it is the main source of their livelihood. It made hill agriculture vibrant and potentiate the economic condition of the farmers of this region. The area under mandarin in Darjeeling hill was 3.935 ha with annual production of 38.60 MT (JIT Report, 2016-17). At national level, the average yield of orange was declining due to the problem of citrus decline and it was as low as 9.3 Mt/ha as compared to other countries like USA (32.6 Mt/ha), Brazil (24.7 Mt/ha) and China (13.7 Mt/ha) (NHB 2012-2013; Singh *et al.,* 2016). The situation in Darjeeling is more alarming than the national scenario. In 1999-2000, the mandarin cultivated area in Darjeeling was 30,000 ha. In 2007-08, it was 1972 hectare and now only 1600 hectare is under Darjeeling Mandarin (Tarafdar *et al*., 2017). It has been reported that more than 50 per cent of the total area under mandarin cultivation has already been converted to vegetables cultivation, spices (large cardamom), tourism and other crops in different areas of hills (Acharya, 2019).

The finding of primary survey vis-a-vis secondary reports (Mukhopadhyaya *et al*., 1986; Roy *et al*., 2018;

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Upadhayay, 2000; Yadav, 2000; Singh *et al.,* 2016) revealed that major problems faced by the farmers were-widespread occurrence of multiple pest and disease incidence. According to the orchard owners, production has almost halved due to pest attack, climatic fluctuations, fungal infection and lack of government support. Most of the past studies focused only on the bio-physical and technological aspect of the problem ignoring other socio-economic and climatic factors. Further, the adoption of scientific mandarin cultivation technologies and practices are very minimal among the farming communities. It has been observed that farmers were engaged in diverse faulty practices which were driving forces behind decline of mandarin cultivation. Tarafder *et al.* (2017) also mentioned that farmers in the region were not aware regarding scientific management of the orchard like judicious application of macro and micro nutrients, management of pests and disease, proper choice of inter cropping and use of organic manure. But very few studies so far has been conducted to understand the adoption gap on recommended technologies for mandarin cultivation. Keeping all these in mind, the present study was conducted to find out the extent of decline, technology adoption gap and major factors for decline of mandarin cultivation in the region.

MATERIALS AND METHODS

The study was conducted in the mandarin growing belt of Eastern Himalaya in West Bengal. Two districts namely Darjeeling and Kalimpong were purposively selected as the mandarin is mainly cultivated in these two districts. Further major mandarin growing blocks viz. Kurseong, Mirik, Jorebunglow sukhiapokhri, Rangli Rangliot, Kalimpong I, Kalimpong II, and Gorubathan were purposively selected for survey and eight mandarin growing belt (Table 1) which was once considered as the major hotspot of mandarin were identified for further study. Thereafter, the villages where significant loss of area under mandarin were reported and a visible shift in cropping pattern was experienced was selected for present survey. Thus, total 25 villages or village clusters were selected for the study. A list of mandarin growers was collected from state government officials/NGOs and local contact farmers for each selected village. From the list, 20 farmers were randomly selected and thus total 500 farmers constitute the sample size for the present survey. Extent of adoption was measured on a three point scale from fully adopted (3) to partially adopted (2) to not-adopted at all (1). The most prominent factors were identified based on preliminary survey using exploratory research design and the contribution of each factors in decline was assessed based on perceived seriousness in a four point scale from most serious reason (4) to serious reason (3) to minor reason (2) to no reason at all (1). The data was analyzed using descriptive statistics like mean, percentage and frequency.

RESULTS AND DISCUSSION

In West Bengal, mandarin occupies an area of 4.14 thousand ha with a production of 40.18 thousand tons and productivity of 9.71 tons per ha (Horticultural Statistics, 2018). However, the area and production of mandarin has been decreasing over the years. To understand the field level scenario on decline of mandarin cultivation, numerous survey was conducted over a period of 3 years from 2017-2020. The findings revealed a heartbreaking scenario as many areas reported even complete desertion of Darjeeling mandarin from the agricultural landscape in the region.

From the Table 1, it can be found that majority of the farmers (90%) left mandarin cultivation in Mangmaya belt.

Table 1: Extent of decline in mandarin cultivation (n=500)

Mandarin growing belt	Villages	Perceived decline in area (%)
Mangmaya	Bara Mangamaya and Chota Mangmaya	90
Sukyapokhri and Sonada	Malat raigaon, Dhulre balason, Avongrove and Dhoja tea estate, Sampripani, Dhajey basti, Orange villa, Munda and Nagori farm	60
Sunatalabari	Takling, Bardada, Kolbung, Lingding, Rongli, Oreng, Takda	40
Kalimpong	Poshyor basti, Bongbasti, Mangaldara, Ichey gaon, Samalbong, Pabung, Suruk, Samthar and Sinji	70
Sitong	Latpanchar, Sitong I, II and Selpu	50
Mungpoo	Chowrasta, Simley, Challish dhura, Rasab gaon, Labda gaon	80
Mirik	Mirik basti, Soureni, Marma	75

The farmers from Mungpoo region too reported that 80 per cent area under mandarin orchard was diverted to other farm and non-farm use within last decade. Similarly other popular belt of mandarin like Mirik and Sitong in Kurseong block witnessed 75 per cent and 50 per cent decline in orange cultivation respectively. The villages in Kalimpong like Poshyor basti, Bongbasti, Mangaldara, Ichey gaon, Samalbong, Pabung, Suruk, Samthar and Sinji experienced a decline to the tune of 70 per cent in mandarin cultivation. The villages of Sukhia and Sonada were known for its quality orange cultivation. But the farmers from villages namely Malat raigaon, Dhulre balason, Avongrove and Dhoja tea estate, Sampripani, Dhajey basti, Orange villa, Munda and Nagori farm told that the 60 per cent area under mandarin cultivation were diverted to different alternative farm and non-farm activities. The farmers from Takling, Bardada, Kolbung, Lingding, Rongli, Oreng, and Takda of Suntalabari reported a decline of 40 per cent area under mandarin cultivation.

The 'extent of adoption' concept has been defined as whether the farmer has fully adopted a technology as per recommendation or only a part of it or not at all. It is highly important to adopt the recommended technologies at community level for successful cultivation of ecologically sensitive crops like Darjeeling mandarin. For this, a pre-planned sound extension intervention is needed. Otherwise, the benefit of full adoption may not be realized by the farming communities and consequently they will either not adopt the technology or will discontinue after adoption. Hence, there is an urgent need to understand the adoption dynamics behind the present crisis to devise suitable extension strategies and policies.

The findings revealed that overall adoption level of recommended technologies in Darjeeling Mandarin cultivation was very low (1.47) and this adoption gap was perceived as one of the major factors for decline in mandarin cultivation in the region. Similar view expressed by Roy *et al.* (2018) regarding adoption of improved mandarin production technologies and reported that there was huge gap between the yield of mandarin orchard at the research farm and at farmer's field. The present study found that majority of the farmers followed only few simple agronomic practices like timely pruning (1.83), maintaining plant to plant spacing (1.76), soil testing (1.70) and weeding (1.69) as per the recommendation. Meena *et al.* (2017) in this regard reported that maximum adoption was found in case of variety and inter crops with mean percent score (MPS) of 100 and 82.50, respectively. Further probing during the present study revealed that though the farmers tested their soil under the soil test health scheme but they did not follow the soil test based fertilizer recommendation. This can be verified from the fact that for statement number 3 on application of recommended N, P and K fertilizer in mandarin orchard the mean adoption score was only 0.83. The findings in Table 2 indicated that farmers were reluctant to apply chemical based fertilizer and pesticide in the orchard. The low mean weighted adoption score for recommended technologies like application of chemical pesticide for pest and diseases (1.50), 1 per cent burdeaux paste application before and after monsoon (1.37), scrapping the gum oozing bark and applying fungicide thereon (1.37), use of micronutrient (1.34), application of lime (1.24), nematode management (1.07) etc. proved the above mentioned hypothesis. Yadav *et al.* (2013) in his study too mentioned about low adoption of "manure and fertilizer" and "plant protection measures" by mandarin growers. He figured out some factors like high cost of fertilizer and pesticide, untimely availability of fertilizers, lack of credit facility, and lack of knowledge about irrigation management as some possible factors for low adoption of these practices. Beside these factors, the current study found that the farmers' reluctance to apply chemical based fertilizer or pesticide and their inherent tendency towards organic farming as major limiting factor for non-adoption of chemical based recommended technology in mandarin cultivation. The findings of Tarafder *et al.* (2017) supported the above proposition when he reported that most of the farmers applied only FYM @ 20 to 30 kg/plant once in year depending upon availability. He further came out with the findings that the farmers did not apply any chemical fertilizer or micro-nutrient or lime to rectify the soil nutrient status which is ideal for mandarin cultivation. The available Zn in the areas varied from 0.14 to 0.43 ppm which indicates low availability. The available Boron content of the soils was found between low to medium range. Further in-depth investigation under present study discovered that majority of the farmers did not follow even any organic farming principle and practices for successful mandarin cultivation. For example, the adoption score of pheromone trap (1.60), mulching (1.68) or permissible chemical like burdeaux paste (1.37) or lime (1.24) for controlling pest and disease was very low. It was observed that farmers simply followed natural farming and harvested whatever is produced as nature or God's gift. The farmers in the region also lagged

Table 2: Extent of adoption recommended technologies (n=500)

SN	Recommended technologies	Fully adopted f(%)	Partially adopted f(%)	Not adopted at all f(%)	Mean score ($\bar{x}$)	Rank
1	Plant to plant spacing	58 (11.6)	265 (53)	177 (35.4)	1.76	II
2	Double ring irrigation in case of non-installation of drip system	12 (2.4)	57 (11.4)	431(86.2)	1.16	XVI
3	N,P,K application as per schedule and recommended dose	0 (0)	86 (17.2)	414 (82.8)	0.83	XVIII
4	Pruning of dead wood with secauteur followed by spray of fungicide	38 (7.6)	213 (42.6)	249 (49.8)	1.58	IX
5	1% burdeaux paste application before and after monsoon	39 (7.8)	108 (21.6)	353 (70.6)	1.37	XIII
6	Light trap/other trap for fruit sucking moth	58 (11.6)	183 (36.6)	259 (51.8)	1.60	VIII
7	Application of chemical pesticide for pest and diseases	47 (9.4)	157 (31.4)	296 (59.2)	1.50	XI
8	Grass or plastic mulch in summer for moisture conservation	78 (15.6)	183 (36.6)	239 (47.8)	1.68	V
9	Micro irrigation in winter season	67 (13.4)	191 (38.2)	242 (48.4)	1.65	VI
10	Use of micronutrient	28 (5.6)	114 (22.8)	358 (71.6)	1.34	XIV
11	Scrapping the gum oozing bark and applying fungicide thereon	18 (3.6)	151 (30.2)	331 (66.2)	1.37	XIII
12	Soil testing	95 (19)	158 (31.6)	247 (49.4)	1.70	III
13	Removing water shoot	74 (14.8)	173 (34.6)	253 (50.6)	1.64	VII
14	Timely pruning	113 (22.6)	187 (37.4)	200 (40)	1.83	I
15	Application of lime	18 (3.6)	82 (16.4)	400 (80)	1.24	XV
16	Nematode management	0 (0)	37 (7.4)	463 (92.6)	1.07	XVII
17	Timely weeding	78 (15.6)	189 (37.8)	233 (46.6)	1.69	IV
18	Production of nucellar seedling	62 (12.4)	136 (27.2)	302 (60.4)	1.52	X
19	Production of side grafted or T budded healthy plant	23 (4.6)	143 (28.6)	334 (66.8)	1.38	XII
20	Mean adoption score				1.47	

behind in terms of adoption of recommended agronomic technologies and practices in mandarin cultivation for higher yield and productivity. Very few farmers followed double ring method of irrigation (1.16), pruning of dead wood with secateurs followed by spray of fungicide (1.58), micro- irrigation in winter season (1.65), removing water shoot (1.64), production of side grafted or T budded healthy plant (1.38). In another context, Meena *et al.* (2017) reported about similar status of adoption for FYM dose application rate, method of application of FYM, removal of dry sticks after harvesting the fruit, use of plant protection measures, grading of fruits, method of application of fertilizers, use of IPM schedule and use of Bordeaux paste in mandarin cultivation. Therefore, intensive extension efforts to educate the mandarin growers on recommended technologies and practices is the most urgent need for revival of mandarin farming as the adoption decision to a large extent depends on the awareness and knowledge level of the respondents.

The study followed an exploratory approach to initially document different factors for mandarin cultivation and then categorized them in technological factors, social factors, climatic factors, economic factor and institutional factors. Thereafter, the perceived seriousness of each factor was measured on four point scale for their contribution towards decline in mandarin cultivation.

The Table 3 listed out the major technological factors for which the farmers were forced to leave the mandarin cultivation in the region. From the table, it can be inferred that majority of the farmers (57%) perceived insect and disease problem as the most serious reason for decline of mandarin cultivation with mean score of 3.57 followed by lack of healthy planting materials (34.6%) for rejuvenating the old orchard with a mean score of 3.13. Different past studies also mentioned the occurrence of different pest and diseases as the major biological stress in mandarin cultivation. For example, Ahlawat and Pant (2003) reported that citrus was infected with large number of viruses and virus likes pathogens worldwide and in India too. They reported that the major factors for decline of citrus were insect/pest, some viral, fungal and bacterial diseases and nutritional deficiency. Biswas *et al.* (2008) and

Table 3: Technological factors for decline of mandarin cultivation (n=500)

SN	Technological factors	Most serious reason f(%)	Serious reason f(%)	Minor reason f(%)	No reason at all f(%)	Mean score ($\bar{x}$)
1	Non availability of healthy planting materials	173(34.6)	217(43.4)	110(22)	0(0)	3.13
2	Problem of insect and diseases	285 (57)	215(43)	0(0)	0(0)	3.57
3	Water crisis specially in winter season	154(30.8)	198(39.6)	113(22.6)	35(7)	2.94
4	Declining soil fertility	72(14.4)	183(36.6)	109(21.8)	136(27.2)	2.38
5	Lack of awareness and knowledge on scientific mandarin cultivation	126(25.2)	176(35.2)	174(34.8)	24(4.8)	2.81
6	Non availability of certified nursery	137(27.4)	181(36.2)	153(30.6)	29(5.8)	2.85
7	Non-availability of grafting expert	159(31.8)	194(38.8)	101(20.2)	46(9.2)	2.93
8	Old orchard	210(42)	169(33.8)	83(16.6)	38(7.6)	3.10
9	Lack of knowledge on nucellar seedling production	87(17.4)	232(46.4)	141(28.2)	40(8)	2.73
10	Lack of knowledge on side grafting or T grafting	86(17.2)	139(27.8)	188(37.6)	87(17.4)	2.45
11	Lack of research support to address the issue	117(23.4)	245(49)	93(18.6)	45(9)	2.87
12	Long vegetative period	54(10.8)	110(22)	253(50.6)	83(16.6)	2.27
13	High maintenance is needed	78(15.6)	121(24.2)	183(36.6)	118(23.6)	2.32
14	Profitable alternative large cardamom based cropping system	118(23.6)	157(31.4)	179(35.8)	46(9.2)	2.69
15	Declining productivity	83(16.6)	157(31.4)	139(27.8)	121(24.2)	2.40
16	Lack of standard package of practice	131(26.2)	169(33.8)	137(27.4)	63(12.6)	2.74

Mukhopadhyay *et al.* (1986) also reported that CTV causes severe loss in mandarin production in Darjeeling hills. Similarly, Ahlawat and Raychaudhuri (1998), Chakraborty *et al.* (1992), Biswas (2008) found that the mandarin cultivation in Darjeeling was declining due to various pathological, entomological and nutritional stresses. In this regard, Hore and Barua (2004) opined that plant protection measures against major pests and diseases were inadequate. Ghosh (1978); Upadhyaya (2000); Yadav (2000); Gurung *et al.* (2017) reported that general negligence, mixed planting and undesirable intercropping, improper spacing, vigorous weed growth, inadequate nutrition (particularly Zn and Ca), infection of *Phytophthora* root rot, gummosis, powdery mildew, canker, scab diseases and attack of insects and pests like borers, aphids, scales, mites, leaf miners were common in mandarin oranges and all these cumulatively speed up the declining process. Thapa *et al.* (1994) reported about the prevalence of nematode and non-adoption of any measures for its control as one of the important factors for decline of mandarin cultivation. He found that infested seedlings act as an important means of spread which could be controlled by treating the roots with 200 ppm of thimet (10 g) or nemacur (10 g) for 30 minutes. Nematode population in the orchard might be reduced by applying furadan (3g) or thimet at the rate of 100 g/tree twice in a year or by growing annuals, particularly cabbage, cauliflower, aster, zinnia and marigold etc. In the absence of any control measure, the situation was turning towards an epidemic as almost 84.30 per cent orchard were found to be infected by CTV (Ghosh *et al.,* 2014) in Darjeeling Hills. It is found that just less than half of the respondents (42%) reported the prevalence of old orchard as the most serious reason for decline of mandarin cultivation. Ghosh and Singh (1993) and Nayak (2015) in their study also reported that the age of the orchard in the district was ranged between 40-60 years old which need to be rejuvenated or replanted with new healthy plantation. But the lack of healthy planting materials was the constraint towards any restoration drive. Bishnoi *et al.* (2019) found similar situation for cultivating kinnow in Punjab and reported that lack of good and attractive quality planting materials (75%) was the key weakness for kinnow farming.

Other major technological factors as highlighted by the farmers were water crisis specially in winter season (2.94), non-availability of grafting expert (2.93), lack of research support to address the issue (2.87), non-availability

of certified nursery (2.85), lack of knowledge on nucellar seedling production (2.73), lack of standard package of practice (2.74), profitable alternative large cardamom based cropping system (2.69). The primary experience reveals that a good section of farmers in the region shifted towards large cardamom based cropping system leaving mandarin farming. The lack of standard package of practices, little attention from government department, problems of limited research, academic as well as policy support for mandarin cultivation in whole North-East region were raised in past also (Singh *et al.,* 2016). The availability of merely one report of tristeza virus (Bhagabati *et al.,* 1989) and one report of yellow mosaic virus (Ahlawat *et al*., 1985) based on simple survey and indexing in Khasi orange for the entire northeast region of India are testimony of this fact. Apart from this, Biswas (2008, 2010), Biswas *et al.* (2012) and Tarafdar *et al.* (2013) have characterized *Citrus tristeza virus* based on biological reaction and sequencing of viral genome. All these facts show that there is a need of strong multi-institutional special drive for research and outreach programme as well as technology mission in mandarin cultivation to bridge the technological and knowledge gap. Meena *et al.* (2017) found that among the technological constraints, high incidence of insect pest was observed as most serious constraints followed by citrus die back, lack of knowledge about package of practices and non-availability of trained labour respectively. Roy *et al.* (2018) highlighted that problem of trunk borer, fruit fly, leaf eating caterpillar, leaf miner (90%) and problem of foot and root rot, powdery mildew (88.67%) were the major biological reasons for mandarin decline. In the present study, few farmers also mentioned about the technological factors like Lack of knowledge on side grafting or T grafting (2.45), Declining productivity (2.40), declining soil fertility (2.38), High maintenance is needed (2.32), Long vegetative period (2.27) as the other reason for decline in mandarin cultivation.

It is well known fact that suitable agro-climatic condition is crucial for successful cultivation of any crops. The Himalayan climate provided the perfect growing condition of Darjeeling mandarin and its quality depends on this climate. However, farmers reported that the Himalayan tract of Kalimpong and Darjeeling witnessed a significant changes in climate like increase in temperature and changes in rainfall pattern. A section of farmers attributed the decline of mandarin cultivation to these changes on climate. The finding in Table 4 reveals that emergence of new pest and diseases in upper hill were observed with changing climate which earlier was never experienced by them (2.48). This was major threat to the farmers and was perceived as most important climatic factors in decline of mandarin cultivation. The climatic disaster like drying up of stream or springs (2.45), frequent landslide (2.26) and untimely hailstorm (2.11) was other major environmental or climatic stressor which played a catalytic role behind their decision to leave Darjeeling mandarin cultivation. The shift in climatic season (1.85), rise in temperature (1.83) and frequent events of erratic and uneven rainfall in recent past also make the Darjeeling mandarin cultivation unsuitable for a section of farming communities. Bihnoi *et al.* (2019) similarly reported that unpredictable weather was the major threat for all the kinnow growers in Punjab. Mahanta and Konwar (2014) similarly reported that maximum growers were facing climatic problems such as wind and storms, drought etc. in mandarin cultivation. De (2017) also reported that heavy and long spells of rainfall causes damage during flowering and fruit setting and favours development of mosses, lichens and fungal pathogens. In this regard, Roy *et al.* (2018) on the role of climate for present crisis came out with similar findings while he reported that mandarin growers had perceived long dry spells during winter lasting until flowering (84.67%) and drying springs or streams near

Table 4: Climatic factors for decline of Darjeeling mandarin cultivation (n=500)

SN	Climatic factors	Most serious reason f(%)	Serious reason f(%)	Minor reason f(%)	No reason at all f(%)	Mean score ($\bar{x}$)
1	Erratic or uneven rainfall	39(7.8)	74(14.8)	58(11.6)	329(65.8)	1.65
2	Increased temperature	48(9.6)	93(18.6)	85(17)	274(54.8)	1.83
3	Emergence of new pest and disease	79(15.8)	156(31.2)	189(37.8)	76(15.2)	2.48
4	Shift in season	57(11.4)	71(14.2)	111(22.2)	261(52.2)	1.85
5	Landslide	81(16.2)	106(21.2)	174(34.8)	139(27.8)	2.26
6	Untimely hailstorm	75(15)	83(16.6)	165(33)	177(35.4)	2.11
7	Drying streams or spring quickly	97(19.4)	134(26.8)	168(33.6)	101(20.2)	2.45

plantations (81.33%) were the major environmental reasons for mandarin decline.

The poor socio-economic scenario of the region quickened up the rate of decline and acted as major barrier in restoration drive of mandarin cultivation. The study found that non-adoption of scientific mandarin cultivation technologies and practices was perceived as the most serious societal reason for decline of mandarin farming by 29.2 per cent respondent with a mean score of 2.79. The findings in Table 5 indicates that low educational level of mandarin growers was perceived as most serious reason by 23.4 per cent respondents and serious reason by 35.2 percent respondents for decline in mandarin cultivation. Other major social factors behind decline of mandarin cultivation were cultural legacy for organic farming (2.54), following faulty cultivation practices (2.56), following faulty grafting methods (2.37), lack of interest of young generation towards farming (2.37). In this regard, Singh *et al.* (2006) reported that due to ignorance, difficulties in the cultivation in hilly terrain coupled with poor marketing facilities, the cultivators were reluctant to take care of their orange orchards. Roy *et al.* (2018) too reported that farmers perceived lack of irrigation facilities (93.33%) and low availability of hired labour (76.67%) as the major socio-economic reasons for decline in mandarin cultivation. Ghosh in Twelfth *ZOCV* Conference mentioned about the neglect of farmers towards modern farm technologies as one of the reason for decline in mandarin cultivation beside different biotic and abiotic factors. Whereas Meena *et al.* (2017) identified lack of awareness followed by cheating pesticide dealers, high cost of inputs and high cost of labour as the major socio-economic constraints for adoption of recommended technologies for mandarin cultivation.

The rural economy played an important role behind adoption of any successful commercially important crops and to follow a particular cropping pattern. The strong economic base of any region or society facilitated the cultivation of high value crops which has more market demand and which needs high monetary investment as well as risk bearing capacity. Therefore, the economic condition of the farmers and their risk bearing capacity determined the successful adoption of technologies to survive the crop in case of any epidemic or disaster or market failure. Similarly, the return from any particular crops also motivated the farmers for its care and maintenance. This is a reciprocal relation and misbalance in any component affects the others' survival. Hence, it becomes very important to understand the economic forces behind the decline of Darjeeling mandarin cultivation.

The findings in Table 6 indicated that poor economic condition of majority of hill farmers was the most serious reason for failure to rejuvenate the old orchard in the region ($\bar{X}$=2.73). Beside this, the high cost of healthy planting materials was another major reason for shifting from orange cultivation ($\bar{x}$ =2.64). Other major economic factors which blocked the farmers' efforts towards continuation of orange cultivation were Lack of market in Kalimpong and Darjeeling ($\bar{x}$=2.59), lack of farmers' organization for direct marketing ($\bar{x}$=2.53), lack of market intelligence ($\bar{x}$=2.52), high initial investment ($\bar{x}$=2.51). The economic factors like Lack of preservation, food processing and value addition technologies ($\bar{x}$=2.37), lack of credit support from bank ($\bar{x}$=2.35), lack of storage facility ($\bar{x}$=2.28), non-availability of approach land and tough geographic terrain ($\bar{x}$=2.26), high transportation cost ($\bar{x}$=2.23), presence of middleman ($\bar{x}$=2.11) had moderately influenced their decision making behavior towards

Table 5: Social factors behind decline of mandarin cultivation (n=500)

SN	Social Factors	Most serious reason f(%)	Serious reason f(%)	Minor reason f(%)	No reason at all f(%)	Mean score ($\bar{x}$)
1	Low educational level of mandarin growers	117(23.4)	176(35.2)	164(32.8)	43(8.6)	2.73
2	Cultural legacy for organic farming	89(17.8)	161(32.2)	179(35.8)	71(14.2)	2.54
3	Non adoption of scientific mandarin cultivation	146(29.2)	172(34.4)	113(22.6)	69(13.8)	2.79
4	Following faulty cultivation practices	127(25.4)	148(29.6)	103(20.6)	122(24.4)	2.56
5	Following faulty grafting methods	98(19.6)	118(23.6)	153(30.6)	131(26.2)	2.37
6	Lack of interest of young generation towards farming	136(27.2)	158(31.6)	121(24.2)	85(17)	2.37
7	More hard-work is needed	79(15.8)	137(27.4)	168(33.6)	116(23.2)	2.36

discontinuation of orange cultivation. However, the influence of economic factors like High cost of fertilizer and pesticide, Forced to sell the produce at very low rate, High marketing cost and Poor repayment history of borrower was minimum as their mean weighted score was below 2 in a scale of 4. In this regard, Rana (2019) reported that low repayment capacity, poor economic status and high interest rate/cumbersome procedure of banks were the three major problems for mandarin growers. The other constraint in this category was non-availability of credit with MPS of 45. The major marketing constraints were non-remunerative price for the produce, lack of regulated market and lack of market intelligence. The other constraints in this category were inadequate transportation facilities with higher transportation cost. Bishnoi *et al.* (2019) in a study on cultivation and marketing of kinnow in Punjab mentioned that lack of packing materials like corrugated fiber box and cling film were the major weakness.

The successful adoption of any crop or technology and its continuance depends on the strength of extension service behind that technology. Many instances in agriculture was cited in past on the introduction of new crops and its integration within a society through strong extension programme. Similarly, many examples was seen in which a potential technology failed to diffuse within a society due to poor extension and institutional support. Hence, a thorough investigation was needed on the extent of extension and institutional support or role played by them to arrest the decline of mandarin cultivation in the region. The findings in Table 7 revealed that poor access to private as well public extension service was most serious reason for decline in mandarin cultivation in the region ($\bar{x}$=2.90). Lack of training on scientific mandarin cultivation was cited as another major serious reason for decline of mandarin cultivation ($\bar{x}$=2.80). Beside these, institutional factors like poor policy support ($\bar{x}$=2.76), poor farmer to institution linkage ($\bar{x}$=2.71) were mentioned as important factors for decline of orange cultivation. The poor outreach of public extension system was an important extension issues in the region and played a vital role behind the decline of mandarin cultivation. Therefore, the policy makers should focus on strengthening the public extension system and its outreach to remote and difficult terrain of hilly region for successful revival of mandarin cultivation to its old glory. Few institutional and policy factors like

Table 6: Economic factors for decline of mandarin cultivation (n=500)

SN	Factors	Most serious reason f(%)	Serious reason f(%)	Minor reason f(%)	No reason at all f(%)	Mean score ($\bar{x}$)
1	Poor economic condition for rejuvenation of old orchard	98(19.6)	186(37.2)	200(40)	16(3.2)	2.73
2	High cost of planting materials	125(25)	151(30.2)	144(28.8)	80(16)	2.64
3	High cost of fertilizer and pesticide	33(6.6)	79(15.8)	137(27.4)	251(50.2)	1.79
4	Forced to sell the produce at very low rate	38(7.6)	47(9.4)	84(16.8)	331(66.2)	1.58
5	Lack of market in Kalimpong and Darjeeling	96(19.2)	158(31.6)	192(38.4)	54(10.8)	2.59
6	Presence of middleman	58(11.6)	97(19.4)	186(37.2)	159(31.8)	2.11
7	Lack of farmers' organization for direct marketing	87(17.4)	210(42)	82(16.4)	121(24.2)	2.53
8	High marketing cost	58(11.6)	97(19.4)	119(23.8)	226(45.2)	1.97
9	Lack of storage facility	78(15.6)	132(26.4)	143(28.6)	147(29.4)	2.28
10	Lack of preservation, food processing and value addition technologies	139(27.8)	145(29)	121(24.2)	95(19)	2.37
11	Non availability of approach land and tough geographic terrain	74(14.8)	128(25.6)	153(30.6)	145(29)	2.26
12	Lack of market intelligence	94(18.8)	157(31.4)	164(32.8)	85(17)	2.52
13	Lack of credit support from bank	78(15.6)	152(30.4)	139(27.8)	131(26.2)	2.35
14	High transportation cost	49(9.8)	147(29.4)	176(35.2)	128(25.6)	2.23
15	High initial investment	87(17.4)	172(34.4)	151(30.2)	90(18)	2.51
16	Poor repayment history of borrower	56(11.2)	83(16.6)	117(23.4)	244(48.8)	1.90

Table 7: Institutional factors for decline of mandarin cultivation (n=500)

SN	Institutional Factors	Most serious reason f(%)	Serious reason f(%)	Minor reason f(%)	No reason at all f(%)	Mean score ($\bar{x}$)
1	Poor access to private as well public extension service	138(27.6)	194(38.8)	149(29.8)	19(3.8)	2.90
2	Poor farmer to institution linkage	118(23.6)	187(37.4)	128(25.6)	67(13.4)	2.71
3	Fragile political system	92(18.4)	199(39.8)	137(27.4)	72(14.4)	2.62
4	Poor policy support	135(27)	176(35.2)	125(25)	64(12.8)	2.76
5	Double tier political system	105(21)	140(28)	179(35.8)	76(15.2)	2.55
6	Poor outreach of public extension system	113(22.6)	168(33.6)	179(35.8)	40(8)	2.71
7	No ICT based extension support system	87(17.4)	109(21.8)	162(32.4)	142(28.4)	2.28
8	Lack of FPOs	110(22)	153(30.6)	174(34.8)	63(12.6)	2.62
9	Lack of forward and backward linkages	86(17.2)	182(36.4)	170(34)	62(12.4)	2.58
10	Lack of training	124(24.8)	190(38)	146(29.2)	40(8)	2.80

lack of FPOs ($\bar{x}$=2.62), fragile political system ($\bar{x}$=2.62), double tier political system ($\bar{x}$=2.55), lack of forward and backward linkages ($\bar{x}$=2.58) were perceived as important factors behind the decline of mandarin cultivation. Meena *et al.* (2017) reported that lack of technical communication was observed as most serious constraints and was ranked as first with MPS 61.67. Roy *et al.* (2018) mentioned that lack of policy support for mandarin cultivation (94.67%), lack of extension services (92.67%) and lack of institution for growers were the major institutional reasons for decline in mandarin cultivation.

CONCLUSION

It can be concluded from the study that a significant area under mandarin cultivation has already been diverted to alternative uses. It needs immediate attention and special drive from ministry for its revival otherwise soon the crop may disappear from its agro-ecosystem and livelihood of millions of mandarin growers will be on stake. The adoption level of most of the recommended technologies was very poor and hence a special emphasis on state extension machinery as well farmer's organization need to be given for successful diffusion of scientific mandarin cultivation technologies. The study proved that it is not only the pest and disease issue which causes the present crisis. The role of social factors, economic factors, climatic and institutional factors cannot be ignored for present scenario. Therefore, a holistic approach taking into account technological, social, economical, institutional and climatic factors should be followed before formulating any policy strategy for revival of mandarin cultivation.

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Assessment of Food Security Among Urban Agriculture Practitioners of Hyderabad

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ABSTRACT

Urban agriculture is emerging as one of the most important and efficient way to ensure food and nutritional security of the urban population. The current study made an attempt to study the food security met out through urban agriculture practices by urban agriculture practitioners in Hyderabad city of Telangana. Assessment was done using semi-structured interview schedule and the data results were logically interpreted. Data of the results show that majority of the respondents grew their own fruits, meeting <25 per cent of their monthly requirement, vegetables to the extent of >50 per cent of the monthly requirement and negligible percentage of the respondents were into meat production and milk production, as part of urban agriculture activities. Dietary diversity of the respondents revealed that cent percent of them fell under acceptable level of food consumption score. Quantity of intake was not appreciable for almost all the food groups except for pulses and fats & oils as compared with the Recommended Daily Intake (RDI). Nutrients like energy, calcium, iron, vitamin A intake was also low as such, when compared with the Recommended Dietary Allowance (RDA). Overall food and nutritional security of the respondents is met out to a considerable extent, particularly for vegetables & fruits. Hence, there is a need to improve nutritional security of the respondents by popularizing the concept of urban agriculture among the urban and peri-urban dwellers and creating awareness through training programmes, campaigns etc. on the nutritional aspects.

Keywords: Food groups, Food security, Recommended daily intake (RDI), Recommended dietary allowance (RDA), Urban agriculture

INTRODUCTION

By the year 2030, more than 60 per cent of the world population will live in urban areas (Alexandratos and Bruinsma, 2012). The steady urban population growth will put an enormous pressure on sustainable planning and management of urban regions and their food security as mentioned by (Djordjevic *et al.,* 2011). It will lead to issues such as loss of greenfield, increase of energy usage associated with commuter traffic (Naphade *et al.,* 2011), reduction of fertile lands to deforestation, water pollution and the creation of peri-urban areas (Misra, 2011).

Apart from rural agriculture, the concept of 'Urban Agriculture' (UA) as a food security solution has emerged over the centuries, owing to the growing global population and to tackle increased urbanization (Game and Primus, 2015). By 2050, approximately 68 per cent of the world's population is expected to live in cities, hence agriculture will need to produce almost 50 per cent more food than in 2012 to feed the people of 9.73 billion around the world (FAO, 2017). Consequently, UA is increasingly being considered to be a major way for the future urban food security.

The contribution of urban agriculture is estimated at 100-200 million urban practitioners involved in ensuring food security worldwide, by producing and marketing fresh agricultural products (Orsini *et al.,* 2013). Rural communities with Nutri-garden had a positive impact on food security by providing micronutrient rich food and high dietary diversity substantially helps in reduction of micronutrient deficiencies (Jethi *et al.,* 2020). Majority of vegetables growers had never consulted the government and semi government institutions and their publications for acquiring information related to use of insecticides for cultivation of vegetable crop. This may be the reason that they were using non recommended practices of

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vegetable cultivation. So, there is need to create awareness among vegetable growers regarding authenticated sources of information in order to achieve the food security (Kaur *et al.,* 2012). With this background the present study was conducted to assess the extent of food security met out through urban agriculture practices by the urban practitioners in Hyderabad city.

MATERIALS AND METHODS

The present study focused on the assessment of food security met out through urban agriculture practices by active urban agriculture practitioners from the city of Hyderabad, Telangana. The survey was carried out during January to August, 2019. A total of 100 respondents who were actively engaged in urban agriculture practices were selected as the sample and the data were collected through the developed semi-structured interview schedule. Data on percentage of food security met out for different foods produced through urban agriculture, Food Consumption Scores (FCS), foods consumed by the respondents and their nutrient intake were collected from the respondents. The data was statistically analyzed using descriptive statistics i.e. mean, percentage and standard deviation (SD) and presented logically in detail under results and discussion section.

RESULTS AND DISCUSSION

This section discusses about food security met out through urban agriculture for the selected respondents, which includes information on percentage contribution of urban agriculture practices in meeting food security, food consumption pattern, percentage of different foods consumed, food consumption scores and intake of different food groups.

To ascertain percentage contribution of urban agriculture in meeting food security of the practicing respondents, the respondents were asked to indicate the quantity of different foods grown through urban agriculture and the quantity purchased from markets on a monthly basis. Accordingly, percentage was calculated and the percentages were categorized as <25 per cent, 25-50 per cent and >50 per cent for the seven food groups as presented in Table 1.

Percentage of food security through urban agriculture was highest for vegetables (81%) with >50 per cent of the requirement of different vegetables being met out from their own farm, whereas for 12 per cent of the respondents, vegetables requirement was met out to the extent of 25-50 per cent and for the remaining 7 per cent of the respondents, vegetables requirement was met out to the extent of <25 per cent from their own gardens. It was noticed that for majority of the respondents (85%), fruit requirement, calculated on a monthly basis, was met out only to the extent of <25 per cent through urban agriculture/own kitchen garden, followed by 10 per cent of the respondents who could meet >50 per cent of the fruits requirement from their own gardens, while another 5 per cent of them could meet upto 25 to 50 percent of the fruits' requirement that were grown by them at home.

Table 1: Percentage food security of different foods met out through urban agriculture

Food groups	Percentage contribution from urban agriculture			Total
	<25%	25-50%	>50%	
Vegetables	7	12	81	100
Fruits	85	5	10	100
Milk and milk products	-	1	-	1
Meat and meat products	-	-	1	1
Egg and poultry	-	-	-	0
Fish and other sea foods	-	-	-	0
Mushroom	-	-	-	0

From the above results, it is evident that majority of the respondents were able to grow their own fruits only to the extent of <25 per cent of the monthly requirement, vegetables >50 per cent of the monthly requirement and the least for meat and meat products (>50%) and milk and milk products (25-50%). The reason for the majority of the respondents to meet adequate requirement of fruits and vegetables through urban agriculture practices could be because of the easy availability of the seeds, narrow rooting system, easy maintenance, low space utilization with high productivity and short duration of the yield. It implies that the urban agriculture practitioners are able to address food as well as nutritional security through sufficient supply of fresh vegetables and fruits and thus also meeting the micronutrient requirement of vitamins and minerals, which is essential for the optimum health and well-being. However, there is also a need to encourage urbanites regarding livestock/dairying practices, fish cultivation, mushroom, aquaponics etc. to meet the requirement of macro nutrients such as protein, energy and fat. This will enrich their daily diet and also bring dietary diversity to the family's meal.

Table 2: Classification of the respondents based on Food Consumption Score (FCS)

FCS	Profiles	Frequency (n=100)	Percentage
0-21	Poor	0	0
21.5-35	Borderline	0	0
>35	Acceptable	100	100
	Total	**100**	**100**

Data regarding food consumption score was categorized into 3 categories i.e. poor, borderline and acceptable using FAO, 2011 FCS method. Seven days food consumption history of the respondents was recorded and decoded under different food groups, classified and presented in Table 2. From the results it can be noticed that cent per cent of the respondents (100%) fell under acceptable level of food consumption score for Individual Dietary Diversity (IDD) index. This implies that there was good diversity in the food basket of the respondents. This could be partly due to the availability of fruits and vegetables from their own home garden or due to the better purchasing capacity of the respondents or due to easy availability of diverse food, by being in cities and town.

It may however be noted that the food consumption scores are only qualitative assessment but not the quantitative. For example in Indian cooking, addition of spices and condiments is quiet common but their quantities are very less. Similarly, coriander leaves and curry leaves are used just for garnishing purpose in food preparation, which also will be recorded as green leafy vegetable consumption, but if we look into the quantities of these foods, it will be very less which adds negligible quantity of nutrients into the diet.

Table 3: Food groups included in the diet by the respondents (daily)

Food Groups	Frequency	Percentage
Cereals	100	100
Pulses and Legumes	91	91
Roots and Tubers	64	64
Green leafy vegetables	91	91
Other vegetables	96	96
Vitamin A rich fruits	72	72
Other fruits	96	96
Milk and milk products	94	94
Eggs	37	37
Fish	3	3
Meat and meat products	2	2

A detailed study about the intake of food per day was carried under different food group's category as indicated in Table 3. It can be seen from the results of this table that cereals intake was cent percent by the respondents followed by other vegetables (96%), other fruits (96%), milk and milk products (94%), pulses & legumes (91%), green leafy vegetables (91%), vitamin A rich fruits (72%), roots and tubers (64%), eggs (37%), fish (3%) and meat and meat products (2%).

The result on food consumption data reveals that cereals like rice, maize and other millets (ragi, jowar, foxtail etc.) are the staple food for the people of Telangana State and is consumed every day. It is followed by other vegetables as there is daily intake of curries along with cereal based meal. Most of the respondents can afford to have fruits which may be the reason for its consumption, milk & milk products was included on a daily basis either in the form of milk, curd, butter milk or tea/coffee. Pulses and legumes also formed an important part of their daily diet in the form of dal/sambar/chutneys which is included as breakfast meals, wherein a combination of cereals and pulses is used, e.g. idly, dosa, uttappam etc. Consumption of green leafy vegetables (GLVs) was also noticed to be high because curry leaves and coriander leaves are added to most of the recipes. A few other GLVs like spinach, gongura, amaranth etc. were also commonly consumed. Vitamin A rich fruits like papaya, mango etc. was less consumed as compared to other fruits and vegetables. Roots and tubers like carrots, potato and beet roots were also consumed by more than half of the respondents (64.0%) on a daily basis. Eggs, fish, meat and meat products were consumed by less percentage of the respondents, which is a major concern as they are good source of high quality protein, vitamin A, calcium etc.

The average intake of different food groups by the respondents was compared against the Recommended Daily Intake (RDI), NIN 2017 and is presented in Table 4. From the data of the above table, it is evident that the percentage adequacy of different food groups of the respondents was more than the recommended percentage for fats and oils (155.0%) and at par for pulses (101.66%). The least percentage adequacy was observed in vegetables A category (4.0%) followed by milk and milk products (17.33%) and meat and meat products (19.0%). The

Table 4: Food groups consumed by the respondents

Food Groups	Respondents Intake (g) (Average)	Percentage Adequacy	RDI* (g)
Cereals	210	77.77	270
Pulses	61	101.66	60
Vegetable-A	4	4.0	100
Vegetable-B	93	46.5	200
Fruits	93	93.0	100
Milk and milk products	52	17.33	300
Meat and meat products	19	19.0	100
Fats and oils	31	155.0	20
Sugars	13	65.0	20

*RDI= Recommended Daily Intake

percentage adequacy for cereals was still below the recommended intake (77.77%) in addition to other food groups like sugar (65.0%) and vegetables B category (46.5%). The daily intake of fruits was appreciable (93.0%).

Although result on food consumption score of Table 2 revealed acceptable level of food consumption score for cent percent of the respondents, yet the quantity of intake was not appreciable for most of the food groups except for pulses and fats and oils, the intake was low for the respondents as compared with the RDI.

The daily intake of different foods by the respondents was converted into nutrient intake and calculated as percentage. This nutrient intake of the respondents was compared with the Recommended Daily Intake (RDI) of the NIN and presented in Table 5. It was noticed that except for fat (110±65) and vitamin C (120±135), no other nutrients intake e.g. carbohydrate, energy, protein, calcium, iron and vitamin A was adequate. This is because of the fact that the food quantity intake as highlighted in Table 4 is not adequate and so is the nutritional adequacy.

Nutrients like energy, calcium, iron, vitamin A intake was low as compared to the RDA. So, if we compare and interpret the findings in Table 3 and Table 4, it can be concluded that although the dietary diversity of the respondents as indicated in Table 3 is fairly good for most of the food groups, but the results of Table 4, that reflects quantitative intake of different food groups, is not appreciable for most of the food groups. Hence it suggests that the overall food and nutritional security of the respondents is not adequate. Moreover, there is an excessive intake of vitamin C, the excess and unutilized vitamin C will be excreted from the body, but the high intake of fat is harmful, as it gets deposited in the body and causes various cardio-vascular diseases, obesity and related diseases.

The results suggest that though the contribution of urban agriculture practices is obvious in meeting food and nutritional security of the urban farming practitioners, particularly vegetables and fruits, yet they are nutritionally not adequate. This is due to inadequate intake of different foods.

CONCLUSION

The results of the study showed that urban agriculture practices have supplemented the food requirement of the respondents to a considerable extent, particularly for vegetables and fruits. This has a direct impact on the food and nutritional security of the urban practitioners. At the same time, it is also to be noted that urban faming is generally limited to urban horticulture, rather than being adopted for apiary, dairying, poultry, aquaculture etc. Here lies the untapped potential and scope of urban agriculture in the coming years. Also there is a need to promote such practices more and more in urban and peri-urban areas to address food & nutritional security of the urban dwellers. Government should organize training programs to create awareness among the urbanites for popularization of the practice. In the current times of COVID-19 pandemic, the food and nutritional security of the people in peri-urban areas was at stake. During this difficult time, many people were attracted towards home grown foods. Hence there is a lot of scope and need for UA in developing countries.

Table 5: Nutrient intake by the respondents

	Carbohydrate (g)	Energy (Kcal)	Protein (g)	Fat (g)	Calcium (mg)	Iron (mg)	Vitamin A* (mg)	Vitamin C (mg)
Respondents' Consumption	227±52	1296±320	46±16	22±13	356±159	10±3	818±1059	48±54
RDI	270	1900	55	20	600	21	4800	40
Adequacy (%)	84±19	68±17	84±29	110±65	59±27	48±14	17±22	120±135

*Calculated in the form of Beta-carotene

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Commodity Village Approach for Enhancing Knowledge and Adoption of Garlic (*Allium sativum* L.) Production Technology

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ABSTRACT

The present investigation was carried out in a commodity village adopted by Krishi Vigyan Kendra (KVK) Doda, Jammu & Kashmir for the promotion of garlic cultivation in the District. Trainings, demonstrations and awareness programmes were carried out in the village since 2016 for the farmers and the present study assesses the knowledge and adoption patterns of garlic production technology among them. Mean knowledge score of the farmers from the commodity village was found to be 1.04 whereas, in case of farmers from non-commodity village the calculated mean knowledge score was 0.79. Average knowledge level of the farmers from commodity and non-commodity villages were 52.21 and 39.58 per cent respectively and 12.62 per cent average difference in the knowledge level of both the categories of garlic growers has been found. Besides, mean adoption score of the farmers from commodity village was 0.86 whereas, in case of farmers from non-commodity village, calculated mean adoption score was 0.57. Average adoption level of the farmers from commodity and non-commodity villages were 42.93 and 28.35 per cent respectively and a difference of 14.58 per cent in the overall adoption level of both the categories of garlic growers has been found. A significant difference in both the knowledge and adoption levels of the farmers from commodity and non-commodity villages regarding garlic production technology has been found.

Keywords: Adoption, Commodity village, Garlic, Knowledge, Technology

INTRODUCTION

Garlic (*Allium sativum* L.) having originated in Central Asia from where it spread to the Mediterranean regions (Tindal, 1986), belongs to the family Alliaceae and is one of the most important bulb crops grown in the world and India as well. It was probably carried to the Western World by the Spanish, Portuguese and French (Jourdain and Lavigne, 1987) and is second most widely cultivated crop of Alliaeae family after onion (Pulseglove, 1972). It has underground bulb which comprises of small bulblets called cloves (Amans, 1989: Wadjito *et al.*, 1988). The typical odour of garlic is due to an organic sulphur compound *anicin* (Nonnecke, 1989). Several advanced agricultural techniques are followed in production of garlic all over the world. But due to natural havocs, drought, pests, diseases and unfavourable climatic conditions, the farmers do not get good value of money in production (Manoharan and Ramalakshmi, 2015). The world's area under garlic in the world is about 1620 thousand hectares (ABNEWSWIRE, 2017) with annual production 17,675 Thousand Metric ton (FAO, 2017). The worldwide average productivity is around 10.92 metric ton / ha. China is the leading producer and exporter of Garlic in the world (US-ITC, 2015) with 914 thousand hectares area, 13665 thousand metric ton production and productivity of 14.95 ton/ha. After China, other garlic producing countries include India, Korea, US Egypt, Spain etc. (Renoux, 2004). The total harvested area in garlic peaked in 2015 and is likely to continue its expansion in the immediate terms following rising demand for garlic globally (ABNEWSWIRE, 2017).

India ranks second in the world in area and production after China. Total area under garlic cultivation in India is 262.06 thousand hectares with total annual production of 1425.46 thousand metric ton. However, the average productivity is quite low i.e. 5.44 t/ha(ICAR- DOGR Pune, 2017). Gujarat, UP, MP etc are major garlic producing states of the country. Garlic grows better in regions with

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temperature variations of 12-24 degree Celsius. It is shallow rooted and hence good drainage conditions are essential especially when grown in sandy soils.

In Jammu and Kashmir, garlic has remained a marginalized crop with respect to promotional programmes and field extension services as much emphasis is given to the cereal based crops and vegetables. It is primarily grown in the hilly areas where congenial climatic conditions with suitable range of temperature, rainfall and humidity prevail though in small quantities on an area of 0.54 Thousand hectares with total production of 0.46 Thousand tons. However, the average productivity of garlic in J&K is 0.85 ton/ha. In District Doda, it is grown by majority of the farmers on a very small scale using local varieties famous for their peculiar quality, distinct aroma and large size cloves with minimum use of agro-chemicals.

Garlic produced from the district is of good quality, has great demand and an immense potential to supplement the income of small and marginal farmers but in spite of all these factors the farmers are reluctant to continue its cultivation which has been a major threat to the local varieties. KVK Doda through commodity village approach adopted village Malothi of the district during the year 2015-16 for extension interventions with the objective to promote scientific garlic cultivation. With all this in back ground, the present investigation has been undertaken to find out the impact of commodity village approach on the knowledge and adoption level of farmers in the commodity village regarding scientific garlic production technology.

MATERIALS AND METHODS

The present investigation was conducted in purposively selected District Doda of Jammu and Kashmir to study the impact of Commodity Village Approach wherein, village Malothi (Commodity village) of Bhalla Tehsil of District Doda was adopted by Krishi Vigyan Kendra (KVK) Doda during the year 2015-16 for promotion of scientific cultivation of a specific commodity i.e. garlic through extension interventions. Various trainings, demonstrations and awareness programmes on garlic production technology coupled with field visits were carried out in the village during 2015-16, 2016-17 and 2017-18 for the promotion of garlic production technology by the farmers. Besides, efforts were also made to promote linkage of the farmers with the market for assisting them in getting remunerative prices of the produce. From the commodity village, 48 garlic growing farmers were randomly selected. Besides, 48 garlic growing farmers from the adjoining village Droundi (non-commodity village) were also randomly selected thereby constituting total sample of 96 garlic growing farmers. Knowledge test consisting of 18 items was developed and standardized for assessing knowledge level of the farmers regarding garlic production technology as per university package of practices. Besides, a tool consisting of 14 items on garlic production technology was also developed and standardized for assessing adoption level of the farmers regarding garlic production technology. This comprehensive tool was utilized for assessing the knowledge and adoption level of the garlic growing farmers from both commodity and non-commodity villages. The data were collected from the selected farmers by the researchers using personal interview technique which were subjected to suitable statistical analysis to arrive at the specific conclusions.

RESULTS AND DISCUSSION

Knowledge level of the farmers regarding garlic production technology: Data incorporated in Table 1 reveals knowledge level of the farmers regarding garlic production technology from both the commodity and non-community villages under study. A perusal of data presented in Table 1 depicts that the mean knowledge score of the farmers from commodity village was 1.04 whereas, mean knowledge score in case of farmers from non-commodity village was 0.79. A difference of 0.25 in the mean knowledge score of the farmers between both the categories of garlic growing farmers has been found. Mean knowledge score of the farmers from commodity village varied from 0.38 to 1.73 while same in case of non-commodity village varied from 0.25 to 1.38. The average knowledge level of the farmers from commodity village was however 52.21 per cent. Whereas; the average knowledge level of the farmers from non-commodity village came to be 39.58 per cent. The average difference in the knowledge level of both the categories of garlic growing farmers has been calculated 12.62 per cent.

A further perusal of the data presented in Table 1 reveals that the highest knowledge level of the farmers from commodity village has been found with respect to the seed/planting material rate for sowing with calculated knowledge level of 86.46 per cent followed by knowledge

Table 1: Knowledge level of the farmers of regarding garlic production technology (n=96)

S.No.	Knowledge item	Mean Knowledge Score		Knowledge Level*		Knowledge difference*
		Commodity Village	Non-commodity Village	Commodity Village	Non-commodity Village	
1.	Climate requirements for garlic production	1.42	1.27	70.83	63.54	7.29
2.	Type of soil required for garlic cultivation	1.21	1.02	60.42	51.04	9.38
3.	Important varieties of garlic	0.60	0.48	30.21	23.96	6.25
5.	Appropriate planting time	1.56	1.23	78.13	61.46	16.67
6.	Seed/planting material rate	1.73	1.38	86.46	68.74	17.72
7.	Appropriate spacing and depth for planting	1.23	0.85	61.46	42.71	18.75
8.	Quantity of FYM and fertilizers required	0.94	0.73	46.88	36.46	10.42
9.	Time of manures and fertilizers application	0.96	0.69	47.92	34.38	13.54
10.	Water management/ irrigation scheduling	1.25	0.90	62.50	44.79	17.71
11.	Time of first intercultural operation	1.42	1.17	70.83	58.33	12.5
12.	Importance of hoeing before bulb formation	1.67	1.23	83.33	61.46	21.87
13.	Chemical method of weed management	0.54	0.35	27.08	17.71	9.37
14.	Major insects pests of garlic crop	0.48	0.33	23.96	16.67	7.29
15.	Management of insect pests of garlic	0.44	0.27	21.88	13.54	8.34
16.	Major diseases of garlic	0.58	0.40	29.17	19.79	9.38
17.	Management of diseases in garlic	0.38	0.25	18.75	12.5	6.25
18.	Harvesting and post harvest management	1.35	0.92	67.71	45.83	21.88
	Over all	**1.04**	**0.79**	**52.21**	**39.58**	**12.62**

n: Sample Size, * : In percent

regarding importance of hoeing for bulb formation with calculated knowledge level of 83.33 per cent. Appropriate planting time with 78.13 per cent knowledge score, climatic requirements for garlic production with 70.83 per cent knowledge score, time of first intercultural operation with 70.83 per cent knowledge score and harvest and post harvest management with 67.71 per cent knowledge score were the other knowledge items having highest knowledge level in case of farmers from the adopted garlic specific commodity village.

Moreover, items having fair knowledge level in case of farmers from the commodity village were; water management/irrigation scheduling, appropriate spacing and planting depth and; type of soil required with calculated knowledge level of 62.50, 61.46 and 60.42 per cent respectively. Besides, knowledge items with poor knowledge level in case of commodity village even after conducting trainings were disease management in garlic, management of insect pests of garlic, major insect pests of garlic, chemical weed management and varieties of garlic with calculated knowledge score of 18.75, 21.88, 23.96, 27.08 and 30.21 per cent respectively.

In case of the farmers from non-commodity village, knowledge level with respect to all the domains of garlic production technology has been found to be comparatively low to those from the commodity village. Knowledge difference of both the categories of the farmers with regards to the individual knowledge items has also been calculated. It has been found from further perusal of data presented in Table 1 that high difference in the knowledge level of the farmers from commodity and non-commodity villages was found with regards to harvesting and post harvest management, importance of hoeing before bulb formation, appropriate spacing and depth for planting, seed/planting material rate, water management/irrigation scheduling, appropriate planting time, time of manure and fertilizers application with calculated respective differences of 21.88, 21.87, 18.74, 17.72, 17.71, 16.67 and 13.54 per cent. Similar pattern of knowledge difference has also been found with regards to the other items of garlic production

technology which reflects that the farmers of the commodity village had enhanced knowledge of scientific garlic production technology as compared to their counterparts from non-commodity village. These results might have been the direct impact of the extension approaches practised in the commodity village for the garlic farmers.

These findings are supported by those of Kumari (2005) who also reported varying degrees of knowledge of garlic production technology possessed by both the categories of garlic growing farmers under study. Besides, Molaei (2014) and Haque (2013) also reported the impact of farmers' knowledge on garlic production and marketing.

Adoption level of the farmers regarding garlic production technology: Data presented in Table 2 reveal the adoption level of the farmers regarding garlic production technology in both the commodity and non-community villages under covered study. A perusal of data incorporated in Table 2 reveals that the mean adoption score of the farmers from the commodity village was 0.86 whereas; the mean adoption score in case of farmers from non-commodity village was 0.57. Difference of 0.29 in the mean adoption score of the farmers between both the categories of garlic growing farmers has been found. The mean adoption score of the farmers from commodity village varied from 0.29 to 1.48 whereas; same in case of non-commodity village varied from 0.19 to 1.17. Besides, the average adoption level of the farmers from commodity village was 42.93 per cent whereas, the average adoption level of the farmers from non-commodity village was 28.35 per cent. Moreover, average difference in the adoption level of both the categories of garlic growers was 14.58 per cent.

Further perusal of the data presented in Table 2 reveals that maximum 73.96 per cent adoption level of the farmers from commodity village was found with respect to recommended rate of seed/planting material for sowing followed by adoption of healthy and disease free planting material with 71.88 per cent adoption. Recommended time of planting with 66.67 per cent adoption, harvesting and post harvest management with 57.29 per cent adoption, recommended space and depth for planting with 53.14 per cent adoption and

Table 2: Adoption level of the farmers of commodity and non-commodity village with respect to scientific garlic production technology (n=96)

S. No.	Adoption items	Mean Adoption Score		Adoption Level*		Adoption difference*
		Commodity Village	Non-commodity Village	Commodity Village	Non-commodity Village	
1.	Recommended varieties of garlic	0.33	0.21	16.67	10.42	6.25
2.	Healthy and disease free planting material	1.44	0.77	71.88	38.54	33.34
3.	Chemical treatment of planting material	0.38	0.21	18.74	10.43	8.31
4.	Recommended rate of seed/planting material	1.48	1.17	73.96	58.33	15.63
5.	Recommended time of planting	1.33	1.08	66.67	54.17	12.5
6.	Appropriate spacing and depth for planting	1.06	0.60	53.14	30.21	22.93
7.	Recommended quantity of FYM and fertilizers	0.85	0.52	42.71	26.04	16.67
8.	Time of application manures and fertilizers	0.88	0.56	43.75	28.13	15.62
9.	Water management/irrigation scheduling	0.96	0.54	47.92	27.08	20.84
10.	Recommended intercultural practices	1.06	0.83	53.13	41.67	11.46
11.	Recommended methods of weed management	0.44	0.27	21.88	13.54	8.34
12.	Management of insect pests of garlic	0.38	0.21	18.75	10.42	8.33
13.	Management of diseases in garlic	0.29	0.19	14.58	9.38	5.2
14.	Harvesting and post harvest management	1.15	0.77	57.29	38.54	18.75
	Over all	**0.86**	**0.57**	**42.93**	**28.35**	**14.58**

n: Sample Size, * : In percent

recommended intercultural practices with 53.13 per cent adoption were other adoption items having higher adoption in case of farmers from commodity village.

Moreover, medium adoption was found regarding water management and irrigation scheduling, time for application of manures and fertilizers, recommended quantity of FYM and fertilizers with 47.92, 43.75 and 42.71 per cent adoption respectively. Besides, low level of adoption in commodity village even after the extension interventions was reported regarding disease management, recommended varieties, chemical treatment of planting material and management of insect pests in garlic with 14.58, 16.67, 18.75 and 18.74 per cent adoption respectively. In case of farmers from non-commodity village, adoption level with respect to all the domains of garlic production technology has been found to be comparatively low as compared to with those from the commodity village.

It is evident from further perusal of data presented in Table 2 that high degree of adoption difference was reported regarding healthy and disease free planting material, recommended depth and spacing for planting, water management and irrigation scheduling, harvesting and post harvest management, recommended rate of planting material and; time of manure and fertilizer application with adoption differences of 33.34, 22.93, 20.84, 18.75, 15.63 and15.62 per cent respectively. Almost similar pattern of adoption difference has also been found with regards to the other practices of garlic production technology which reflects that the farmers of commodity village had significantly high level of adoption of garlic production technology as compared to their counterparts from the non-commodity village which might have been due to the impact of extension interventions for promoting the garlic production technology among the farmers of commodity village. These findings are supported by those of Kumari (2005) who also reported different degrees of adoption of garlic production technology by both the categories of garlic growers under study. Besides, Kumar *et al.* (2017) also reported differential adoption levels among respondents. Sahoo *et al.* (2017) also reported overall significant impact of extension interventions on the development of stakeholders.

Significance of difference in knowledge level of the garlic growing farmers: A perusal of data presented in Table 3 reveals the mean knowledge score and standard deviation of commodity and non-commodity villages in respect of garlic production technology. The paired samples t-test for the knowledge shows the p-value as 0.00 which is less than conventional 5 per cent and 1 per cent level of significance. Therefore, it means that there was a significant difference in mean knowledge score obtained by the garlic farmers from commodity and non-commodity villages regarding garlic production technology. Hence, mean knowledge score of the farmers of commodity village regarding scientific garlic production technology was significantly different from the non-commodity village

Significance of difference in adoption level of the garlic growing farmers: Similarly, perusal of data incorporated in Table 3 depicts that the paired samples t-test for adoption of garlic production technology also has the p-value as 0.00 which is also less than the conventional 5 per cent and 1 per cent level, which means that there was a significant difference in the adoption level of the garlic growing farmers from commodity and non-commodity villages regarding garlic production technology. It can be concluded that the adoption of garlic production technology by the farmers from commodity village was significantly different from their counterparts from non-commodity village.

Therefore, it can be concluded that the commodity village approach of Krishi Vigyan Kendra for promoting garlic production technology had a significant impact on

Table 3: Significance of difference in the knowledge and adoption levels of farmers with respect to garlic production technology in commodity and non-commodity villages (n=96)

Variable	Commodity village			Non-commodity village			T value	*p* value (2-tailed)
	Mean score	Standard deviation	Standard error mean	Mean score	Standard deviation	Standard error mean		
Knowledge	1.044	0.140	0.020	0.7916	0.127	0.018	9.219	0.00
Adoption	0.858	0.190	0.027	0.5670	0.142	0.020	8.494	0.00

* Significant at 5% and 1% level

enhancing the knowledge and adoption of the garlic farmers in the adopted village which in turn would have a great contribution in enhancing the production of garlic and income of the farmers. These findings are in concordance with those of Kumari (2005) who also reported a significant difference in the knowledge and adoption of garlic production technology among both the categories of garlic growers.

CONCLUSION

It can be concluded form the above findings that commodity village approach followed by Krishi Vigyan Kendra Doda had a significant impact in enhancing the knowledge and augmenting adoption of garlic production technology among the farmers of the commodity village. However, more emphasis needs to be given to identified thrust areas especially pests, diseases, weed and nutrient management by organizing more number of skill oriented training programmes on these aspects for the farmers. This model of commodity village approach needs to be replicated in other villages having potential for garlic production. More number of commodity specific groups needs to be formed in other villages with their proper linkages with the input agencies and market for making garlic farming more remunerative. The identified thrust areas for extension interventions would be of immense help in augmenting not only vertical but horizontal spread of garlic production technology.

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Extension Service Delivery vis-à-vis Perception about Working and Living Conditions in Disadvantageous Settings: Evidences from the Northeastern Region of India

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ABSTRACT

The present study furnishes scientific evidences towards variations in extension service delivery outputs under the influence of differential perception of extension functionaries about their working and living conditions in disadvantageous Northeastern region (NER) of India. The study utilizes primary cross sectional data collected from *Krishi Vigyan Kendra* (KVK) functionaries across eight NER states through an online survey using a structured pretested questionnaire. It employs a correspondence analysis, and three statistical tests namely, Bartlett test of homogeneity of variance, Kruskal Wallis H test, and Dunn test to establish that - (i) perception about working and living conditions widely vary across NER KVK functionaries, and (ii) differential perception may not have significant association with technology assessment related activities but, may produce differences in technology dissemination related activities. The findings of the study have important policy implications in undertaking suitable welfare measures, infrastructure development, and thereby improving extension service delivery outcomes of KVKs in the region.

Keywords: Krishi Vigyan Kendra, Subject matter specialist, Compositional perceptual mapping, Correspondence analysis, Northeastern region

INTRODUCTION

Extension service delivery is an indispensable component of agricultural development. Though many studies highlight the critical roles of extension and advisory services in rural transformation (Som *et al.*, 2019; Bhattacharyya *et al.*, 2018), extension systems those especially in the developing countries generally receive constant criticisms as being ineffective (Kansiimea *et al.*, 2019; Ragasa *et al.*, 2016). The extension functionaries in the disadvantageous settings encounter formidable challenges day-in and day-out in providing extension education, managing technology transfer, and rendering advisory services to the most unreached and needy. There exists critical knowledge gap about how the extension functionaries perceive their working and living conditions under the hardships of disadvantageous areas, and whether the perception has any bearing on extension service delivery activities undertaken by them.

Farmers, farm women, and rural youth in the disadvantageous areas of the country are primarily dependent on government extension machineries like, the state agriculture and animal husbandry departments, state agricultural universities, farm science centres/ *Krishi Vigyan Kendras* (KVKs), and agricultural technology management agency (ATMA). KVK with its inclusive mandate and scientific outlook in addressing farm-based livelihoods is the most prolific extension agency in India having vast outreach, prominence, and visibility throughout the country (Kokate *et al.*, 2016). KVK although is a district level organization, functions at the grassroots level in participatory mode ensuring involvement of diverse stakeholders. A KVK is typically staffed by six Subject Matter Specialists (SMSs) from different disciplines of agriculture and allied sciences, guided and supervised by an in-charge designated as Senior Scientist and Head, KVK. The SMSs are expected to perform three major types of activities to fulfil the KVK mandate – (i) on farm trial

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(OFT) of newly released agricultural technologies of the National Agricultural Research and Education System (NARES), (ii) frontline demonstration (FLD) of established and proven agricultural technologies of the NARES, and (iii) capacity building of the stakeholders – farmers, farm women, rural youth, and extension workers through organizing training and extension programmes, and through distribution of critical farm inputs (Anonymous, 2019). The extension activities of KVKs have complex administrative, monitoring, and funding mechanisms. They are funded by the Indian Council of Agricultural Research (ICAR); guided and monitored by the Agricultural Technology Application Research Institutes (ATARIs) of the ICAR, and administratively hosted by different ICAR institutes, central and state agricultural universities, line departments of state governments, and NGOs. The overall agricultural development and sustainable livelihood of the farmers in the country in general and the marginalized farmers in the disadvantageous areas in particular to a great extent depends on effective functioning of these grass roots extension organizations (Ray *et al.*, 2020; Paul *et al.*, 2020). There exists variations among KVKs and among SMSs within KVKs in quality and quantity of extension output (Paul *et al.*, 2016a; Paul *et al.*, 2016b). The present study aims at understanding how the SMSs perceive about their working and living conditions around in the disadvantageous Northeastern region (NER) of India, and thereby to delineate whether their perception affect extension service delivery activities undertaken by them.

MATERIALS AND METHODS

Locale of the study and sampling plan: The study was conducted in the disadvantageous NER where more than seventy percent of the geographical area is hilly, sixty five per cent area falling under different types of forests (Anonymous, 2017) hindering developmental activities. Extension service delivery in the NER is quite challenging due to its inherent difficulties - hilly topography, dense forest cover, extreme remoteness, marginality of farmers, and dominance of ethnic groups (Paul *et al.*, 2017a). At present, there exists a network of seven hundred and sixteen KVKs in India (Anonymous, 2020). Eighty nine KVKs spread across the eight NER states - Arunachal Pradesh (16), Assam (26), Manipur (10), Meghalaya (7), Mizoram (8), Nagaland (11), Sikkim (4) and Tripura (7). We conducted an online survey during 2015-16 using a structured pretested questionnaire. We received complete feedback from two hundred and thirty one SMSs

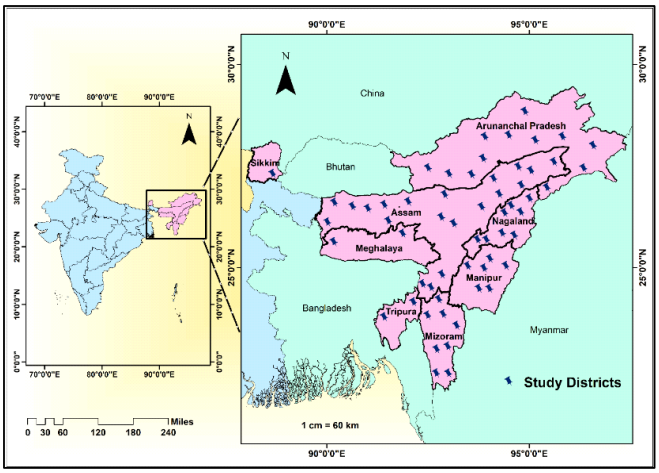

Figure 1: Locale of the study (*Source:* Authors)

representing fifty nine district KVKs from the eight states - Arunachal Pradesh (12), Assam (20), Manipur (6), Meghalaya (2), Mizoram (8), Nagaland (8), Sikkim (1), and Tripura (2) (Figure 1). Sample of the study therefore, comprises two hundred and thirty one respondent SMSs (n=231).

Perception analysis: We studied the perception of KVK SMSs about their working and living conditions in the NER through ten major indicators comprising thirty eight sub-indicators. They were identified after multi-stakeholder consultation, and grouped after an exploratory factor analysis guided dimension reduction (Paul *et al.*, 2017b; Kumar *et al.*, 2015). Individual perception was recorded in a six-point rating scale (0-5) ranging from very poor to very good.

Next, we applied correspondence analysis (CA) to the data for compositional perceptual mapping of the identified indicators. CA is an exploratory multivariate graphical technique aiding representation of contingency tables and non-metric data through compositional perceptual maps which are visual representation of respondents' perceptions of two or more dimensions or features (Bendixen, 2010). The functional form of the analysis is as follows (Anonymous, 2020):

1. We prepare a two-way contingency table (K= m X n) showing frequencies of responses under different categories. K represents a data matrix with n rows and m columns; K contains only non-negative elements, and none of the row and column total is zero.
2. We then prepare a proportion matrix, $P = \{p_{ij}\} = \left\{\frac{k_{ij}}{k}\right\}$; Where, k_{ij} = individual elements in the matrix K; k = total of all elements in the matrix K.

3. Now, we compute the vector of row total, r = P1, and the vector of column total, c = P′1.
4. We compute the inverse of diagonal matrix of square root of vector, r, $D_r = [Diag(r)]^{-1/2}$; and also the inverse of diagonal matrix of square root of vector, c, $D_c = [Diag(c)]^{-1/2}$.
5. The scaled matrix is calculated as $A = D_r P D_c$
6. We calculate the singular value decomposition (SVD) of matrix A: <B, W, C> = SVD (A).
7. The coordinate matrix for row, $F = D_r B W$, and the coordinate matrix for column, $G = D_c C W$.
8. Eigen value, V = WW′
9. $\text{Row distance, } d_i = \sum_j \left(\frac{1}{p_{.j}}\right)\left(\frac{p_{ij}}{p_{i.}} - p_{.j}\right)^2$;

   $\text{Column distance, } d_j = \sum_i \left(\frac{1}{p_{i.}}\right)\left(\frac{p_{ij}}{p_{.j}} - p_{i.}\right)^2$.
10. Weight for row vector, $w_i = \{r_i\}$; weight for column vector, $w_j = \{r_i\}$.

Analysis of extension service delivery vis-a-vis perception about working and living conditions: We first investigated into the extent of accomplishment by individual SMSs under the three most important mandated KVK activities, OFT, FLD, and training in the preceding three years of data collection. We grouped the SMSs in four different perception groups namely, poor, average, fair, and good based on modal categories of responses across the thirty eight variables administered to them. Then we applied the Bartlett's test of homogeneity of variances and Kruskal Wallis H test to find out if at all the perception groups had significantly differed from one another in extension service delivery. Although, a significant Kruskal–Wallis test would indicate that at least one group stochastically dominates over the other, it does not identify the exact group which dominates. Therefore, to analyze the specific sample pairs where the stochastic dominance exists, we performed the Dunn test. We used Microsoft Excel (MS 10.0) and the statistical language programming software R (ver. 4.0.1) in all the analyses.

RESULTS AND DISCUSSION

The present study assumes that extension service delivery is influenced by felt needs and extrinsic factors. Felt needs are structured hence, consciously addressed by the individuals for satisfactory fulfillment. On the other hand, employees of an organization hardly have control over the extrinsic factors which are mostly circumstantial in nature, only offering covariate advantages or disadvantages (Vyas *et al.*, 2020). In this specific context, it becomes increasingly important from a policy perspective to understand these factors from the KVK functionaries' viewpoints.

Compositional perceptual mapping of contextual factors: excerpts from the correspondence analysis: Although, a total of five components (dimensions) were produced by the CA, the first two components accounted for as high as 84.20 per cent of the variance indicating that the first two dimensions are sufficient to represent the data and interpret the results, and therefore, the CA factor map on dimension 1-2 is a true visual representation of the perception of KVK SMSs about the variables under study (Figure 2). The variables are better explained under dimension 1 among the two dimensions reported here under, as depicted by the squared cosine values.

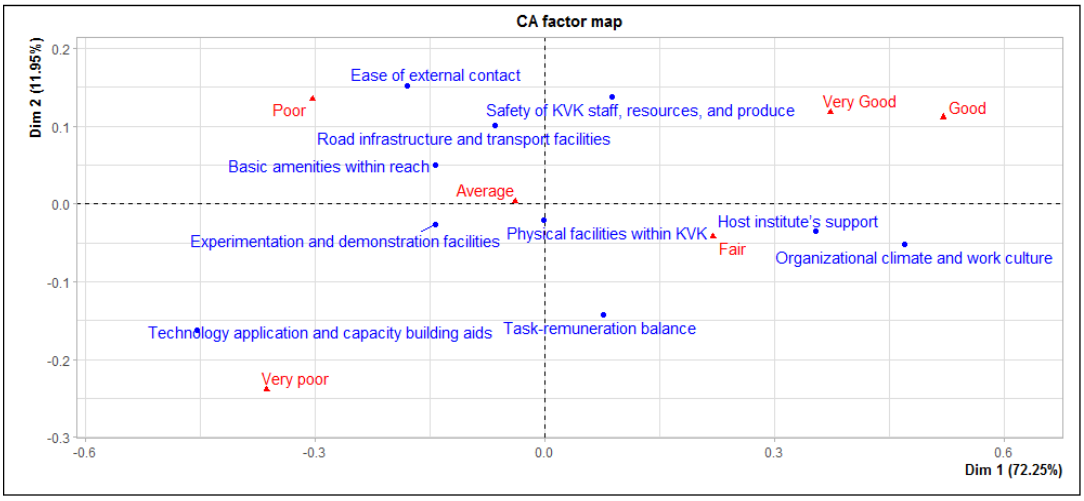

Figure 2: Correspondence map of overall perception about working and living conditions indicators (*Source:* R 4.0.1 software output of authors' data)

Perception of KVK SMSs most widely varied for the indicator technology application and capacity building aids (F-II) in comparison to the other nine indicators of working and living conditions as evident from their inertia (Table 1).

The stated indicator (F-II) has the highest inertia (24.337), thus explains the highest variance to total variability of the data. It indicates to the higher levels of disparities in resourcefulness existing among NER KVKs. Apart from the fact that the functional years under operation determine overall resourcefulness of an organization, the present result may also be a consequence of differential priorities attached by the ATARI and respective host institutes on the KVKs under their jurisdiction. Perception about the factor road infrastructure and transport facilities (F-III) has the lowest inertia (2.053) which means perception about it did hardly vary across the KVK SMSs. Infrastructural development in NER has not been able to keep pace with the rest of the country. Road and transport facilities in the NER states in general and in the hilly tracts in particular don't vary much. Hence, the perception regarding the roads and transportation do not vary across SMSs. Among the column variables, the rating 'poor' has the highest inertia (23.409) which means that the identified indicators most widely varied in terms of the rating 'poor' when compared to the other five kinds of ratings. The participants on the other hand mostly tried to rate the indicators 'average' as invariably as possible, depicted by the lowest inertia (2.847) of the rating category.

It is important to note from the CA factor map that overall the indicator technology application and capacity building aids (F-II) is perceived 'very poor', and ease of external contact (F-VIII) is perceived 'poor' by the functionaries (Figure 2). The overall perception about experimentation and demonstration facilities (F-VII) and physical facilities within KVKs (F-IV) is only 'average.' Basic amenities within reach (F-X) and road infrastructure and transport facilities (F-III) are perceived 'average' to 'poor.' However, organizational climate and work culture (F-I), host institute's support (F-VI), and task-remuneration balance (F-IX) are perceived 'fair.' The only factor that is perceived 'very good' is safety of KVK staff, resources, and produce (F-V). It is quite an important finding in fact, especially in the midst of all conventional perceptions about safety issues of working in the NER.

Table 1: Overall fit measures for correspondence between indicators and ratings in the first two dimensions after singular value decomposition

Character	**Dim. 1 (72.25%)**				**Dim. 2 (11.95%)**		
In rows	**Inertia**	**Coordi-nate**	**Contri-bution (%)**	**Squared cosine**	**Coordi nate**	**Contri-bution (%)**	**Squared cosine**
Organizational climate and work culture	22.754	0.470	34.261	0.968	-0.052	2.555	0.012
Technology application and capacity building aids	24.337	-0.455	32.056	0.847	-0.162	24.610	0.108
Road infrastructure and transport facilities	2.053	-0.066	0.671	0.210	0.101	9.568	0.495
Physical facilities within KVK	2.648	-0.001	0.000	0.000	-0.021	0.423	0.017
Safety of KVK staff, resources, and produce	4.172	0.087	1.177	0.181	0.138	17.765	0.453
Host institute's support	15.609	0.353	19.478	0.802	-0.036	1.195	0.008
Experimentation and demonstration facilities	2.775	-0.143	3.196	0.741	-0.027	0.683	0.026
Ease of external contact	6.966	-0.180	5.079	0.469	0.152	21.706	0.331
Task-remuneration balance	3.341	0.077	0.922	0.177	-0.143	19.134	0.331
Basic amenities within reach	4.335	-0.143	3.158	0.468	0.050	2.361	0.058
In columns							
Very Good	5.584	0.373	5.041	0.580	0.118	3.027	0.058
Good	18.381	0.520	19.232	0.673	0.111	5.345	0.031
Fair	19.316	0.220	25.938	0.863	-0.042	5.838	0.032
Average	2.847	-0.039	0.657	0.149	0.003	5.838	0.001
Poor	23.409	-0.303	29.891	0.821	0.135	35.653	0.162
Very poor	19.454	-0.364	19.241	0.636	-0.239	50.106	0.274

(*Source:* Authors' calculation)

Extension service delivery vis-a-vis perception about working and living conditions: Improvement in extension service delivery of the KVKs is a result of enhanced performances of their SMSs, who are to be provided with required facilities to carry out their jobs to perfection. Inefficiency of public run extension systems in many countries has resulted from serious operational and financial issues often interfering with the critical government roles in a pluralistic extension system in providing an appropriate regulatory framework in order to maintain quality standards and ensure fair competition (Som *et al.*, 2018; Rivera *et al.*, 2001). It is evident that human resource development and organizational development interventions for harnessing optimum performance of the KVK SMSs require larger attention (Paul *et al.*, 2016b). We analyzed extension service delivery in numbers of OFTs, FLDs, and training activities conducted by the KVK SMSs during the preceding three years of data collection. The results reveal that most of the SMSs conducted 1-5 OFTs (42.86%), 1-5 FLDs (38.10%), and 11-15 training programmes (40.69%) every year (Figure 3, 4, 5).

We applied the Kruskal Wallis H test to understand whether the extent of extension service delivery is affected by individual perception about working and living conditions. Results of the test indicate that extension activities pertaining to technology assessment did not differ significantly among the different perception groups – poor, average, fair, and good (KW χ^2= 2.730, p = 0.435) (Table 2).

It means that the SMSs having an overall fair or good perception about their working and living conditions did not necessarily conduct more number of technology assessment activities than the SMSs having average or poor perception about the same set of factors. It indicates that perception about working and living conditions perhaps may not have any relationship with technology assessment related extension service delivery. FGDs with different levels of KVK functionaries and their controlling authorities helped us to understand that the individual KVK

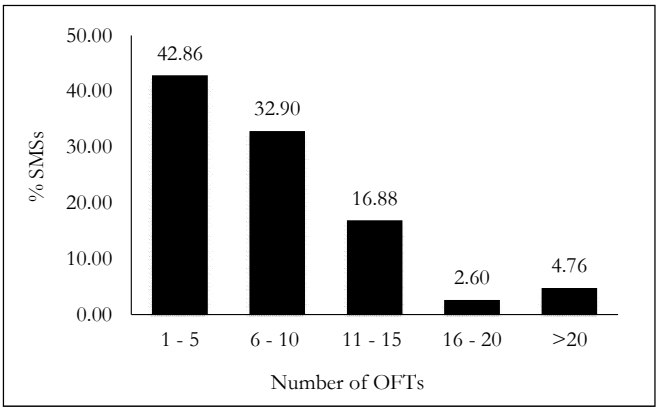

Figure 3: Distribution of SMSs according to number of OFTs conducted by them per year

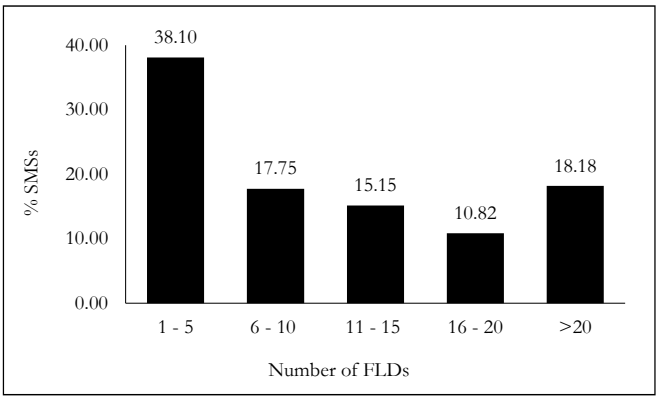

Figure 4: Distribution of SMSs according to number of FLDs conducted by them per year

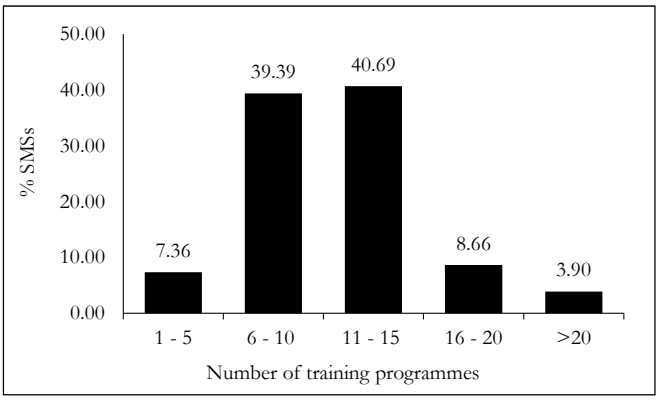

Figure 5: Distribution of SMSs according to number of training programmes conducted by them per year

Table 2: Testing statistical significance of differences in extension service delivery conditioned upon differential perception about working and living condition (n = 231)

Extension service delivery aspect	Bartlett's test of homogeneity of variances		Kruskal-Wallis H test	
Technology assessment	K^2 = 1.630	p = 0.653	KW χ^2= 2.730	p = 0.435
Technology dissemination	K^2 = 2.257	p = 0.521	KW χ^2 = 9.421	p = 0.024*

(*Source:* Authors' calculation)

Table 3: Results of Dunn Test showing significance of differences among different perception groups (n = 231)

Comparison between perception groups	Z value	p (Unadjusted)	p (Adjusted using Bonferroni correction)
Average - Fair	-1.868	0.062	0.371
Average - Good	-0.997	0.319	1.000
Fair - Good	-0.272	0.786	1.000
Average - Poor	1.047	0.295	1.000
Fair - Poor	2.760	0.006	0.035*
Good - Poor	1.492	0.136	0.814

(*Source:* Authors' calculation)

SMSs are assigned a target of technology assessment and major technology dissemination activities every year. The SMSs off course are free to perform more number of activities exceeding the original target assigned as per their will and need of the situation. The present finding makes a point very clear that a great perception about surrounding factors related to work and living perhaps is not enough to motivate the extension functionaries to design and execute more technology assessment activities. It may be due to the inherent complexities associated with the technology assessment procedure itself. It may also be due to lack of desirable technologies tailor-made for hill agriculture available in the region to be tested in the farmers' fields. It may further be due to lack of necessary skills and confidence among the SMSs to conduct more number of such activities even in comparatively conducive working and living conditions.

The same test however produced a different result for the technology dissemination activities. The test results suggest that at least one perception group significantly differed from the others in undertaking more number of technology dissemination activities (KW $\chi^2 = 9.421$, $p < 0.05$). We conducted a Dunn test to locate the stochastic dominance and found that the difference existed in between the groups 'fair' and 'poor' ($Z=2.760$, $p <0.05$) (Table 3).

The result readily indicates that the group having a fair perception about their working and living conditions perform more number of technology dissemination activities than the group having poor perception about the same.

CONCLUSION

The present study focusses on extension service delivery under differential perception about working and living conditions in the disadvantageous NER. Keeping in view the harsh climatic conditions, topographical disadvantages and other related extremities which act as hurdles to effective extension service delivery in the region, there is a need to provide requisite supports to the KVKs and their functionaries in a timely manner in order to sustain their motivation and improve upon their performance. We draw the following three major policy implications from the findings of the study:

1. Since technology application and capacity building aids contribute the second highest variance to overall variability of data implying that the factor is perceived highly important by the KVK SMSs for effective extension service delivery, and as it is rated 'very poor' in terms of access, there is an urgent need to increase contingency funds for the KVKs, and to review the purchase procedure for any complexities, if exist. Urgent redressal of the issue by the competent authority in fact is crucial as technology application and capacity building is a major mandated activity of KVK.
2. The factors organizational climate and work culture (F-I) and host institute's support (F-VI) have larger correspondence to somewhat middle of the continuum (fair category of perception), therefore, there is a need for periodic organizational review in hastening necessary organizational and administrative reforms in KVK functioning and monitoring mechanisms. It may be improved through the provision of quality mentorship and structured guidance. The KVK SMSs may be attached to the scientists of nearby ICAR institutes in a phased manner for a specific period of time for 'lab-to-land' idea sharing, technology evaluation competence development, and collaborative problem solving.
3. Technology assessment related extension service delivery does not improve even under conducive

perception regarding facilitating factors. It implies that there is a need for capacity development of the KVK SMSs in technology assessment methods. In conjugation with the point no. 2, technology assessment workshops may be organized by the ATARI and host institutes borrowing the expertise of ICAR scientists, and KVK SMSs from the other parts of the country.

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Evaluation of Cherry Tomato (*Solanum lycopersicum* L. var. *cerasiforme*) Genotypes for Yield and Quality Traits

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ABSTRACT

The present investigation was carried out at the Experimental Field, Division of Vegetable Science, SKUAST-K, Shalimar during *kharif* 2018. The experiment was laid out in randomized complete block design (RCBD) with three replications. Twenty nine genotypes were evaluated for various quantitative traits viz., plant height, number of primary branches, number of flowers cluster^{-1}, number of fruits cluster^{-1}, days to first flowering and yield hectare^{-1}. Analysis of variance revealed significant differences among genotypes for all the traits studied except number of locules fruit^{-1}. Among the twenty nine genotypes used the highest plant height was found in genotype SK-CT-05 (157.26 cm) while, number of primary branches was found to be highest in SK-CT-06 (31.56). The highest number of flowers cluster^{-1} and fruits cluster $^{-1}$ was found in SK-CT-15 i.e., (8.86 and 8.20) respectively. The earliest days to first flowering was recorded in SK-CT-07 (19.40 days). The genotypes viz; SK-CT-27, SK-CT-16 and SK-CT-15 showed higher yield potential of 160.86 q ha^{-1}, 156.35 q ha^{-1} and 153.53 q ha^{-1} which was significantly higher than SK-CT-08 (23.73 q ha^{-1}).

Keywords: Cherry tomato, Genotypes, Quantitative traits

INTRODUCTION

The production of vegetables in India has been increasing continuously since the past two decades. India is the second largest producer of vegetables in the world, next to China. Vegetable crops are vital for ensuring nutritional and food security for growing population of India. The per capita availability of vegetables in India is 230 g per day as against 300 g recommended dietary allowance recommended by Indian Council of Medical Research (Singh *et al*., 2019). Cherry tomato (*Solanum lycopersicum* L. var. *cerasiforme*) is regarded as a botanical variety of the cultivated tomato belonging to family Solanaceae. The wild cherry tomato was first found throughout tropical and subtropical America and then propagated in the tropics of Asia and Africa (Gharezi *et al*., 2012). Presently cherry tomatoes are widely cultivated in Central America and are distributed in California, Korea, Germany, Mexico and Florida (Renuka *et al*., 2014). The first tomatoes cultivated in Europe in the 16th century were yellow cherry tomatoes. Cherry tomatoes have been popular in the United States since at least 1919. The cherry tomato can still be found growing wild in the coastal mountains of Peru, Ecuador and Northern Chile. In India, cherry tomatoes are mostly grown in Hyderabad, Gujarat, Andhra Pradesh, Rajasthan, Karnataka, Bihar etc.

Cherry tomato has become more popular all over the world because of a good source of vitamin A, vitamin C, solids content and good taste (Prema *et al*., 2011a). Its fruits are consumed more as fruit rather than vegetable. Cherry tomato is also called as "salad tomato". Cherry tomato is also beneficial to human health because of its high content of antioxidant and phytochemical compounds, including lycopene, beta-carotene, flavonoids, vitamins and many essential nutrients (Rosales *et al*., 2011). They have high bio flavonoid content that helps in treating soreness of the joints such as arthritis. They are also a good food for diabetic patients as they help to lower blood cholesterol levels due to their potassium content. Due to presence of dietary fibre and high water content, they also help in weight management. Lycopene present in them helps to give protection against various cardio vascular

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diseases. High contents of vitamin C, vitamin A, Potassium and Iron help in maintaining normal blood health. Large amounts of anti-oxidants lower the risk of cancer, especially lung, stomach and prostate cancers.

Cherry tomato is generally considered to be similar but not identical to the wild relatives of the domestic tomato. Cherry tomato is a rounded, small fruited tomato believed to be an intermediate genetic admixture between wild currant-type tomatoes and domesticated garden tomatoes. It ranges in size from a thumb tip up to the size of a golf ball and can range from being spherical to slightly oblong in shape. Although usually red, other varieties such as yellow, green and black also exist. The more oblong ones often share characteristics with plum tomatoes, and are known as grape tomatoes. Cherry tomato being the most promising crop under protected structures but there are several constraints and problems which restrict its cultivation (Ghanghas, 2019).

MATERIALS AND METHODS

The present investigation was carried out at Vegetable Experimental Farm, Division of Vegetable Science, Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir, Shalimar (J&K), Srinagar during *kharif* Season 2018. The experimental site is situated at an altitude of 1685 metre above mean sea level and situated at an latitude of 34.1° North and longitude of 74.8° East. January and February are the coldest whereas June and July are the hottest months. The maximum precipitation in the area is received between March to April. Twenty nine diverse lines/genotypes of cherry tomato, maintained by the division were evaluated for various yield and yield attributing traits. The experiment was laid in Randomised Block Design with three replications. The plots of size 3 × 2 m (6 m^2), consisted of one row of each genotype in each replication at spacing of 100 × 40 cm. The observations were recorded on twenty quantitative and qualitative traits *viz.*, Plant height (cm), Number of branches, Days to first flowering, Number of flowers $cluster^{-1}$, Number of fruits $cluster^{-1}$, Average fruit length (cm), Average fruit width (cm), Pericarp thickness (mm), Number of locules $fruit^{-1}$, Days to first fruit harvesting, Average fruit weight (g), Fruit yield $plot^{-1}$ (kg), Fruit yield $hectare^{-1}$ (q), TSS content (°Brix), Juice to pulp ratio, 100 Seed weight (g), Ascorbic acid (mg 100 g^{-1}), Acidity (% citric acid), Lycopene content (mg 100 g^{-1}) and total carotenoids (mg 100 g^{-1}) in order to study the magnitude of genetic variability existing in the materials under study. Five competitive plants were selected at random from each replication and tagged for recording the biometrical observations. Mean values for all the characters were worked out. Observations were recorded at the appropriate developmental stages of plant growth. The data collected was analysed using the software Windostat 9.1.

RESULTS AND DISCUSSION

The estimates of mean values from Table 1 and 2 revealed that no genotype was superior for all the characters under study. However genotypes like SK-CT-05 (157.26 cm) followed by SK-CT-06 (156.80 cm) and SK-CT-08 (134.83 cm) were superior for plant height; SK-CT-06 (31.56) followed by SK-CT-09 (31.13) and SK-CT-05 (30.86) were superior for number of branches; SK-CT-15 (8.86) followed by SK-CT-26 (8.86) and SK-CT-06 (8.66) for number of flowers $cluster^{-1}$; SK-CT-15 (8.20) followed by SK-CT-27 (8.06) and SK-CT-09 (8.00) for number of fruits $cluster^{-1}$; SK-CT-25 (3.59 cm) followed by SK-CT-23 (3.34 cm) and SK-CT-04 (3.20 cm) for average fruit length; SK-CT-03 (3.34 cm) followed by SK-CT-04 (3.18 cm) and SK-CT-02 (3.01 cm) for average fruit width; SK-CT-02 (2.77 mm) followed by SK-CT-04 (2.77 mm) and SK-CT-03 (2.72 mm) superior for pericarp thickness; SK-CT-25 (3.60) followed by SK-CT-24 (3.40) and SK-CT-03 (3.2) for number of locules $fruit^{-1}$; SK-CT-07 (19.40) followed by SK-CT-11 (19.73) and SK-CT-13 (20.73) for days to first flowering; SK-CT-25 (71.93) followed by SK-CT-26 (72.86) and SK-CT-23 (74.53) were superior for days to first fruit harvesting; SK-CT-24 (18.72 g) followed by SK-CT-16 (17.87 g) and SK-CT-04 (17.17 g) for average fruit weight; SK-CT-27 (9.65 kg) followed by SK-CT-16 (9.38 kg) and SK-CT-15 (9.21 kg) for fruit yield $plot^{-1}$; SK-CT-27 (160.86 q) followed by SK-CT-16 (156.35 q) and SK-CT-15 (153.53 q) for fruit yield $hectare^{-1}$; SK-CT-14 (8.20 °Brix) followed by SK-CT-29 (7.32 °Brix) and SK-CT-21 (7.21 °Brix) for TSS content; SK-CT-10 (3.43) followed by SK-CT-20 (2.44) and SK-CT-17 (1.91) for juice to pulp ratio; SK-CT-04 (0.96 g) followed by SK-CT-03 (0.91 g) and SK-CT-23 (0.91 g) for 100 seed weight; SK-CT-21 (58.56 mg 100 g^{-1}) followed by SK-CT-11 (52.84 mg 100 g^{-1}) and SK-CT-27 (47.78 mg 100 g^{-1}) for ascorbic acid; SK-CT-27 (0.88%) followed by SK-CT-29 (0.82%) and SK-CT-13 (0.78%) for tritrable acidity; SK-CT-15 (2.71 mg 100 g^{-1}) followed by SK-CT-13 (2.10 mg 100^{-1}) and SK-CT-25 (1.18 mg 100^{-1}) for lycopene; SK-CT-09 (2.48 mg 100 g^{-1}) followed by SK-CT-25 (2.42 mg

Table 1: Mean performance of cherry tomato genotypes for various growth, maturity, yield attributing and quality characters

S.No.	Genotypes	Plant height (cm)	No. of branches	Days to first flowering	No. of flowers cluster^{-1}	No. of fruits cluster^{-1}	Average fruit length (cm)	Average fruit width (cm)	Pericarp thickness (mm)	No. of locules fruit^{-1}	Days to first fruit harvesting
01	SK-CT-1	116.46	22.13	25.66	8.00	5.00	2.71	2.28	2.36	2.00	82.80
02	SK-CT-2	92.83	21.40	26.86	5.60	4.26	2.68	3.01	**2.77**	2.40	77.33
03	SK-CT-3	109.43	22.80	27.06	8.06	4.33	2.94	**3.34**	2.72	3.20	77.46
04	SK-CT-4	92.56	19.16	27.56	5.66	5.00	3.20	3.18	**2.77**	3.00	77.33
05	SK-CT-5	**157.26**	30.86	28.46	8.46	7.40	1.52	1.37	0.12	2.00	81.46
06	SK-CT-6	156.80	**31.56**	27.93	8.66	7.33	1.56	1.38	0.12	2.00	81.20
07	SK-CT-7	106.10	24.46	**19.40**	6.26	5.33	1.58	1.58	0.32	2.40	77.60
08	SK-CT-8	134.83	30.53	24.86	6.66	4.53	2.20	2.07	0.45	2.00	77.46
09	SK-CT-9	114.28	31.13	27.20	8.46	8.00	1.93	2.10	0.60	2.00	77.60
10	SK-CT-10	124.46	26.00	21.80	6.86	6.00	1.32	1.26	0.64	2.00	74.73
11	SK-CT-11	134.32	27.86	19.73	6.80	6.13	1.46	1.58	0.70	2.00	79.40
12	SK-CT-12	122.13	27.60	21.13	7.93	7.20	1.44	1.49	0.67	2.00	78.30
13	SK-CT-13	116.00	24.53	20.73	8.66	5.93	2.94	2.08	2.43	2.00	76.56
14	SK-CT-14	106.83	24.36	24.80	8.06	7.60	2.84	1.86	2.04	2.60	77.53
15	SK-CT-15	119.33	27.33	28.53	**8.86**	**8.20**	2.82	2.47	2.33	2.50	83.40
16	SK-CT-16	126.30	25.86	28.80	6.26	5.80	2.90	2.98	0.31	2.00	77.73
17	SK-CT-17	133.63	29.43	28.53	7.80	7.13	1.49	1.63	0.60	2.00	77.73
18	SK-CT-18	116.73	25.50	29.06	7.73	6.66	2.07	2.08	2.14	2.60	78.13
19	SK-CT-19	119.26	25.73	30.03	7.20	6.40	2.16	2.02	2.22	2.40	77.46
20	SK-CT-20	87.33	20.80	22.40	8.40	6.66	2.28	2.40	1.22	2.00	74.80
21	SK-CT-21	122.16	28.13	21.66	8.60	7.93	3.10	2.35	1.52	2.00	81.46
22	SK-CT-22	117.50	30.60	22.33	8.33	6.80	1.75	1.73	0.90	2.80	75.40
23	SK-CT-23	96.30	26.60	23.30	8.46	4.20	3.34	2.86	2.19	3.00	74.53
24	SK-CT-24	97.36	22.86	26.46	8.60	6.73	2.84	2.14	1.71	3.40	84.63
25	SK-CT-25	85.83	22.40	32.60	6.26	5.80	**3.59**	2.82	2.32	**3.60**	**71.93**
26	SK-CT-26	124.70	18.73	28.70	**8.86**	5.53	1.67	1.80	1.35	2.60	72.86
27	SK-CT-27	131.50	23.80	31.26	7.06	8.06	2.44	2.10	2.42	2.00	75.40
28	SK-CT-28	100.80	20.86	31.66	8.60	5.13	3.03	2.02	2.34	2.40	85.86
29	SK-CT-29	97.16	19.13	31.73	7.33	6.73	2.12	2.00	2.31	2.60	82.53
	Mean	**115.87**	**25.24**	**26.21**	**7.67**	**6.27**	**2.34**	**2.14**	**1.54**	**2.39**	**78.30**

Table 2: Mean performance of cherry tomato genotypes for various growth, maturity, yield attributing and quality characters

S.No	Genotypes	Average fruit weight (g)	Fruit yield plot^{-1} (kg)	Fruit yield hectare^{-1} (q)	Total soluble solids (^{o}Brix)	Juice to pulp ratio	100 seed weight (g)	Ascorbic acid (mg 100 g^{-1})	Titrable acidity (% citric acid)	Lycopene (mg 100 g^{-1})	Total carote-noids (mg 100 g^{-1})
01	SK-CT-1	10.01	2.00	33.37	6.38	1.02	0.74	45.53	0.42	1.44	0.08
02	SK-CT-2	13.56	1.96	32.77	2.76	1.37	0.76	20.02	0.33	0.24	0.07
03	SK-CT-3	12.84	2.11	35.30	2.45	1.19	0.91	24.65	0.34	0.25	0.09
04	SK-CT-4	17.17	2.14	35.76	3.32	1.61	**0.96**	22.76	0.38	0.27	0.13
05	SK-CT-5	2.27	1.53	25.53	6.82	1.54	0.65	30.66	0.47	0.28	1.97
06	SK-CT-6	2.45	1.72	28.77	6.24	1.50	0.76	33.66	0.42	0.26	1.96
07	SK-CT-7	3.40	3.74	62.39	4.57	1.32	0.67	30.63	0.69	0.90	1.48
08	SK-CT-8	4.01	1.42	23.73	3.87	1.40	0.84	35.00	0.31	1.13	1.99
09	SK-CT-9	4.34	4.64	77.44	6.10	1.01	0.16	43.77	0.57	0.74	**2.48**
10	SK-CT-10	3.44	1.84	30.69	7.10	**3.43**	0.83	30.39	0.63	0.51	2.10
11	SK-CT-11	2.96	3.09	51.54	7.18	1.41	0.80	52.84	0.52	1.02	1.05
12	SK-CT-12	3.54	1.82	30.43	5.23	1.72	0.80	45.73	0.49	1.12	0.07
13	SK-CT-13	9.97	5.23	87.25	6.90	1.80	0.72	32.73	0.78	2.10	0.16
14	SK-CT-14	16.03	9.11	152.27	**8.20**	1.59	0.74	31.09	0.69	0.36	0.15
15	SK-CT-15	15.35	9.21	153.53	6.88	1.10	0.75	33.98	0.49	**2.71**	0.06
16	SK-CT-16	17.87	9.38	156.35	4.29	1.55	0.80	37.61	0.40	1.09	0.11
17	SK-CT-17	4.60	3.68	61.33	5.03	1.91	0.69	45.34	0.47	1.02	1.86
18	SK-CT-18	9.00	4.27	71.29	4.86	1.56	0.78	24.01	0.63	0.34	1.66
19	SK-CT-19	8.11	4.41	73.65	5.94	1.17	0.76	46.64	0.36	0.28	0.47
20	SK-CT-20	9.09	3.63	60.59	3.30	2.44	0.90	22.85	0.35	0.32	0.31
21	SK-CT-21	9.05	4.84	80.71	7.21	1.30	0.89	58.56	0.45	1.11	1.07
22	SK-CT-22	7.17	3.22	53.79	7.10	1.75	0.90	37.78	0.55	1.15	2.36
23	SK-CT-23	7.87	1.53	25.56	3.12	1.01	0.91	35.66	0.61	0.28	0.10
24	SK-CT-24	**18.72**	3.27	54.59	2.68	1.08	0.76	30.50	0.38	0.96	0.49
25	SK-CT-25	5.52	1.18	19.77	2.35	1.33	0.87	25.84	0.57	1.18	2.42
26	SK-CT-26	10.73	3.75	62.62	3.95	1.26	0.81	31.80	0.76	0.86	0.28
27	SK-CT-27	16.36	**9.65**	**160.86**	6.70	1.62	0.86	**47.78**	**0.88**	0.34	0.24
28	SK-CT-28	13.53	6.76	112.74	6.43	1.14	0.85	32.84	0.66	0.24	0.12
29	SK-CT-29	15.72	6.68	111.36	7.32	1.36	0.87	34.34	0.82	0.91	0.10
	Mean	**9.47**	**4.06**	**67.79**	**5.32**	**1.50**	**0.78**	**35.34**	**0.53**	**0.81**	**0.88**

100 g^{-1}) and SK-CT-22 (2.36 mg 100 g^{-1}) each were superior for total carotenoids. Since no genotype could be identified to have superior performance for all the characters, the genotype with diverse characteristics could be used in a well planned hybridization programme to select superior performing lines in the successive segregating lines. Similar results have also been reported by Nitzsche *et al.* (2003); Ramya *et al.* (2016); Renuka *et al.* (2017); Maciel *et al.* (2018); Najeema *et al.* (2018) and Venkadeswaran *et al* (2018).

CONCLUSION

In the present study based on overall performance of genotypes revealed that SK-CT-05, SK-CT-06 and SK-CT-14 exhibited superior performance for some important traits. SK-CT-05 was superior for plant height (157.26 cm), number of branches (30.86), number of fruits $cluster^{-1}$ (7.40), total carotenoids (1.97 mg 100^{-1} g), TSS (6.82 ^{o}Brix), SK-CT-06 was found superior for number of branches (31.56), plant height (156.80 cm), number of flowers $cluster^{-1}$(8.66), number of fruits $cluster^{-1}$(7.33), total carotenoids (1.96 mg 100 g^{-1}) and SK-CT-14 for number of fruits $cluster^{-1}$ (7.60), average fruit length (2.84 cm), number of locules $fruit^{-1}$ (2.60), average fruit weight (16.03 g), fruit yield $plot^{-1}$ (9.11 kg), fruit yield $hectare^{-1}$ (152.27 q), TSS content (^{o}Brix), juice pulp ratio (1.59) and tritrable acidity (0.69% citric acid). Hence, these genotypes could be better utilized for further breeding programmes for the improvement of fruit yield and quality traits.

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Performance Evaluation of Black Gram (*Vigna mungo* L.) under Cluster Front Line Demonstration Programme in Samastipur District, Bihar, India

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ABSTARCT

The Cluster Front Line Demonstration (CFLD) programme on black gram was carried out during 2017-18 in operational area of Krishi Vigyan Kendra, Samastipur. The plots were selected from different villages/clusters (each of 0.2-0.4 ha) from the district. The variety 'PU-31' was used in both the demonstrated plots and farmers fields. Fertilizer, herbicides, irrigation application and plant protection measures were taken as per improved package of practices. During the CFLD programme, it was found that the seed yield of black gram was 9.80 q/ha in demonstrated fields as compared to 6.10 q/ha seed obtained from farmers field. The technology gap was found to be 2.20 q/ha and extension gap 3.70 q/ha extension gap was found in that year. The technology index was 18.33 per cent. Higher gross returns (Rs 39200/ha), net return (Rs. 21600/ha and benefit-cost ratio of 2.22 were found in demonstrated fields as compared to benefit-cost ratio of 1.52 in case of local check. The significant yield is attributed due to introduction of new variety and management in cluster mode which facilitated better crop management.

Keywords: Black gram, CFLD, Yield, B:C ratio, Technology index

INTRODUCTION

Pulses are one of the important segments of Indian agriculture after cereals and oilseeds. In India, it is cultivated over an area of 3.19 million ha with production of 1.61 m tonnes and is grown in all crop seasons and suitable for all cropping systems due to its short duration and photo insensitive nature Katiyar *et al.* (2016). Pulses also render improvement in soil health by enriching its N status, long term fertility and sustainability of the cropping system. It meets up to 80 per cent of its N requirement by biological/ symbiotic nitrogen fixation from air and leaves behind substantial amount of residual N and organic matter for subsequent crops. Though black gram is being cultivated since long but its productivity has been low as compare to its potential yield. It is realized that lack of suitable high yielding varieties as well as poor knowledge of improved production technology along with complex disease – pest syndrome, races of key pests and pathogens are major impediments in realizing the full potentialities of black gram production Dhaka *et al.* (2016). Production of black gram per unit area and time can be increased by adopting feasible scientific and sustainable management practices with suitable varieties. In order to promote pulse cultivation, the Government of India has devised a programme in cluster mode under National Food Security Mission through KVKs. The main objective of CFLD is to demonstrate production technology and its management practices on farmer's field under different farming situations. These demonstrations are carried out under the supervision of agricultural scientists and feedbacks from the different farmers has to be generated on the demonstrated technology. Keeping the importance of CFLD the KVK, Samastipur conducted demonstrations on black gram at farmer's field. The present study has been undertaken to increase the per capita availability of oilseed and popularization of new production technology amongst the farming community by promoting black gram crop production employing improved practices.

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MATERIALS AND METHODS

The study was carried out in operational area of Krishi Vigyan Kendra, Samastipur during *kharif* 2018. The crop was sown in the plots after the harvest of wheat and selected from different villages/clusters (each of 0.4 ha) from the district (Table 1). The soil of the farmers field was sandy loam/loam in texture, slightly alkaline in reaction (pH 8.1) with good drainage. The soil was of low to medium fertility with medium in organic carbon (0.54%), available K (226 kg/ha) and available P (37 kg/ha) while low in available N (276 kg/ha). The total area of 10 ha has been allotted to KVK, Samastipur by ICAR-ATARI, Patna (Zone–IV). The critical inputs were supplied to the farmers by the KVK while other inputs like balanced fertilizers, additional agro-chemicals, herbicides, irrigation facility were managed by farmers himself as per recommendation of scientists of KVK. The black gram variety 'PU-31' was sown during second fortnight of July adopting line sowing method using seed drill. A spacing of 30 x 20 cm was maintained with a seed rate of 20 kg/ha. The full dose of NPK and sulphur fertilizer was applied as basal at the time of sowing. Recommended package of practices were followed for raising the crop along with need based weed control and plant protection measures. Earlier the farmers grow this crop by their own methods through seed broadcasting etc. kept as local which is considered as standard check during this trial. All the farmers were trained for improved package of practices before hand through training programme. Materials for the present study with respect to CFLD and farmers practices are presented in Table 2.

In case of local check plots, existing practices being used by farmers were followed. Regular visit by the KVK scientists to demonstration field were ensured to guide the farmers. These visits also helped to collect feedback from different farmers for further improvement in research and extension programme. Field days, awareness camp and group meeting were also organized at the demonstration plots to provide the opportunities for vicinity farmers to witness the benefits of these demonstrated technologies. The improved technology includes quality seed, seed treatment and maintenance of optimum plant population etc. Recommended weed control measure and irrigation were applied according to the requirement of the crop. The crop was harvested at perfect maturity stage with suitable method. Desired yield data were collected through field observations. Gross return was calculated by multiplying yield into prevalent local market price of the grain. For estimating input cost, the sum of expenditure on land preparation, planting method, fertilizer, insecticide, fungicide, herbicide, irrigation cost, labour wages, harvesting cost etc. were calculated from each demonstration. Further, net return and benefit-cost ratio were calculated from these data. To estimate the technology gap, extension gap and technology index formula devised by Samui *et al.* (2000) have been used as given below:

Table 1: Details of farmers and cluster in different blocks of Samastipur district under CFLD programme

Year	No. of farmers	Name of Blocks and Villages of Samastipur District			
		Mohaddinagar	Patori		
		Chapar	Darwa	Lodipur Narayan	Shahpur Undi
2018	25	12 (3)	06 (01)	05(01)	02 (01)

Parenthesis indicates number of cluster in each village

Table 2: Comparison of cultural practices adopted by farmers and CFLD

Cultural operations	Prevailing Practices	CFLD employing improved cultivation practices
Use of seed	Use of local seed	Pant Urad- 31
Seed quality	Small non-graded seed	Bold graded seed
Seed treatments	-	Treated with bavistin followed by chlorpyrifos
Method of sowing	Broadcasting	Line sowing by seed drill
Fertilizer application	-	100 kg DAP + 33 kg MOP + 125 kg Phospho-gypsum/ha
Control measures	Single spray of pesticide when severe problem occurs	Two spray of insecticides to control of insects and application of micronutrients for more branches and healthy plants as well as seeds

Technology gap = Potential yield - Demonstration yield

Extension gap = Demonstration yield - Farmers yield

Technology index = Technology gap/Potential yield x 100.

RESULTS AND DISCUSSION

The result of 25 demonstrations conducted during *kharif* 2018 at farmers' field in Samastipur district has been presented in Table 3 as per the prescribed proforma provided by ICAR-Agricultural Technology Application Research Institute (ATARI), Patna (Zone-IV). Farmers adopted the improved technological practices for the cultivation and the crop was supervised by the scientists of KVK, Samastipur as per the area allotted by ICAR-ATARI, Patna. The data revealed that the CFLD reflects good impact over the farming communities.

A comparison of productivity levels between local check and demonstrated variety and practices are shown in Table 3. The seed yield of black gram was 9.80 q/ha in demonstration field as compared to seed obtained from farmers field (6.10 q/ha). Demonstration plot resulted in 37.75 per cent higher seed yield from local check. Similar findings have also been observed by Jain (2016), Singh *et al.* (2018) and Ganga Devi *et al.* (2018) where results from demonstrations plots observed to be higher in black gram crop. The major differences were observed between demonstration package and farmers' practices are introduction of seed treatment, method and time of sowing, fertilizer doses and method of its application and plant protection measures. It is evident from the results that the yield of demonstration was found better than the local check (farmer's practice) under the similar environmental conditions. Farmers were motivated by results of demonstration and agro-technologies applied in the cluster front line demonstration and they would adopt all these new technologies in their fields. This finding are in corroboration with the finding of Ganga Devi *et al.* (2018) and Singh *et al.* (2018).

The technology gap is the gap between demonstration yield and potential yield and it was 2.20 q/ha. The observed technology gap as presented in Table 3 is due to various constraints such as soil fertility, availability of low soil moisture content, sowing time and climatic hazards etc. This indicates that a gap existed between technology evolved and technology adoption at farmer's field. Hence, to reduce the yield gap, location specific recommendations for varieties and timely sowing appears to be necessary. The 3.70 q/ha extension gap was recorded (Table 3). The extension gap should be assigned to adoption of improved dissemination process in recommended practices which out come in higher grain yield then the farmers practice. There is a need to decrease this wider extension gap through latest techniques. The findings are similar to the findings of Ganga Devi *et al.* (2018) and Singh *et al.* (2018). The technology index showed the feasibility of evolved technology at farmer's field. Lower technology values indicated that the feasibility of variety among the farmers is more. It is obviously due to uneven and erratic rainfall and Vageries of weather conditions during study period in the area. The technology index was 18.33 per cent. This finding is in corroboration with the findings of Dhaka *et al.* (2016) and Sandhu and Dhaliwal (2016).

The economics of black gram production under CFLD have been presented in Table 4. Economic analysis of the yield performance revealed that CFLD recorded

Table 3: Yield, technology gap, extension gap and technology index of black gram in Samastipur

Year	Name of variety	No. of demons-tration	Yield (q/ha)							Yield increase (%)	% increase over check	Tech-nology gap (q/ha)	Exten-sion gap (q/ha)	Techn-ology index (%)
			Poten-tial	Demonstration			Check							
				Max.	Min.	Av.	Max.	Min.	Av.					
2018	PU-31	25	12	10.20	9.40	9.80	6.7	5.5	6.10	37.75	60.65	2.20	3.70	18.33

Table 4: Gross cost, gross return, net return and B:C ratio of black gram cultivation in Samastipur

Year	Expenditure and return							
	Check plots				Demonstration plots			
	Gross cost (Rs/ha)	Gross Return (Rs/ha)	Net return (Rs/ha)	B:C ratio	Gross cost (Rs/ha)	Gross Return (Rs/ha)	Net return (Rs/ha)	B:C ratio
2018	16400	24400	8400	1.52	17600	39200	21600	2.22

Sale rate of black gram during 2018 : Rs. 4000/q

higher gross return (Rs 39200/ha) and net return (Rs. 21600/ha) with higher benefit-cost ratio 2.22 as compared to 1.52 in case of local check. The sale rate of black gram in local market during 2018 was Rs. 40/kg. The higher benefit cost ratio in demonstrated plot is due to of higher yield obtained under improved technologies as compared to farmer's practices during the experimental year. Similar results were corroborated with Kumar *et al.* (2018).

It is concluded from the study that under CFLD mode the recommendation of improved technologies has impact on yield of black gram to be increased to its potential yield in Samastipur district. This will substantially increase the income as well as livelihood of the farming communities.

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Situational Analysis of Guidance Needs of Adolescents Across Various Levels

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ABSTRACT

Adolescents are confronted with multiple stressors which leads to many mental health problems. To identify and compare adolescents' guidance needs, a sample of 200 adolescents (100 males and 100 females) aged between 16-18 were taken from Government Senior Secondary Schools. The Guidance Needs scale developed by Grewal (1997) was used to identify the guidance needs of students across various levels. Data was analyzed using Z test. Irrespective of locale among all guidance needs, the percentage of students falling at high level of guidance need was maximum in vocational guidance needs. No significant difference was found between males and fameless on overall guidance needs.

Keywords: Educational, Guidance, Physical, Psychological, Social, Vocational

INTRODUCTION

Contemporary world is an age of technological advancement and development which has given multiple opportunities and comfort to humankind. At the same time, it has changed lifestyle and remitted multiple stressors in human life. Thus, guidance and counseling have become high needs for the people in significant domains of life. Guidance is a broader term which includes counselling as one of its service. Guidance is regarded as conceptualized programme of activities that offers a gateway out to the existing problems in present era of complex scientific and technological developments (Okobiah and Okorodudu, 2004) and counseling is a learning directed procedure which usually takes place in an interactive relationship with the goal of supporting the person so that client can search different alternatives for problems and able to find better solution for him/ herself (Mutie and Ndambuki, 1999). Counseling aims to help in behavior change, improve relationship and assist to find human's potential (Fuster, 2002). Guidance and counselling receive recognition through their services rendered in escalating human happiness by being healthier, more productive, attain valuable lesson and also purged later stage problems. Killeen (2001) stated guidance and counselling as the process of helping individuals to learn to deal with complications and to think crucially about themselves and their future. On the other side Hattie (1999) reported that counselling and guidance services in high schools facilitates to build up personal discipline, appropriate management of time as well as self reliance.

Adolescence is generally considered as a chaotic age and is often depicted as a negative chapter of life- a part of storm and stress which is to be survived or endured (Arnett, 1999). Adolescence means 'to emerge' to attain 'identity' and this route of gaining identity has numerous challenges and changes as well. It is a significant period in connection to puberty and regarded as a drastic revolution of human's life which initiates with physiological changes and terminates in adjusting with those challenges in the society (Petersen, 1988). Adolescence is characterized by shifting from child to being adult (Lerner and Spanier, 1980). The frequency of innovation is more common in adolescence than in childhood because during childhood the child way of exploration is restricted according to parents or caregiver and children have fear of going far but during adolescence, teenagers find out superior freedom while exploring. The tendency to make innovative discoveries is more frequent in adolescence as compare to childhood because in childhood scope of activity is restricted as child has fear of guardians or afraid of going

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far whereas in adolescence they discover superior freedom where they make use of trial-and error approach.

Guidance and counselling services are an important domain for building up adolescent personality. It have an immense role in taking out the best in adolescence, and at present period teenagers need proper guidance to polish their personality and to orient them in physical, social, psychological, educational and vocational needs of the students who go a long way to remove obstacle of knowing right path. The chief goal of guidance and counseling services is to motivate students' academic, social, emotional and personal development which are an essential factor of education as well. The wrong education, desire to self-exhibition and inspired acts often provoke the adolescent towards unconstructive behavior (Chaube, 2002).

Guidance and counselling needs of adolescents are those needs that are important to come out with their problems which they deal with in day to day life, assist to get better in their personal development and encourage individual welfare. For being disciplined and able to cope with challenge and realities which they face in their academic, social and physical environment, guidance and counseling services are helpful to them (Collins, 2007).

Mishra and Sophia (2015) found that adolescents have poor knowledge of reproductive health irrespective of their age, gender and place of residence. Guidance and counseling could take seat to help teenagers in this regard. Vogel *et al.* (2007) in his studies revealed that students feel uneasy to take counselling. They have shy attitude towards taking additional information regarding counselling process. Social stigma, fear and decreased protherapy social rules related to women and men are the blockade for seeking help from professional counselors. Kaur (1992) stated that in many schools guidance and counselling were not essential attribute. There was no separate financial assistance for guidance and counselling programmes. The barrier which was created while implementing guidance program were schools lack full time counselor, Lack of awareness among parents. Guidance needs of respondents in all the domains were observed to be insignificantly related to their type of family. Among the five domains of guidance, respondents from nuclear and joint families depicted need for vocational guidance on top priority (Valentina and Singh, 2014). A study by Singh *et al.* (2018) revealed that students who were given intervention regarding selection of vocation had significant impact knowledge about the vocations and their choice of vocation according to their skills and interest.

MATERIALS AND METHODS

Sample selection: Sample of 200 adolescents aged between 16-18 years were taken from Government Senior Secondary schools

Selection of rural sample: The sample selection was made through multi-stage purposive cum random sampling technique. One block i.e. Ludhiana-I was purposely selected for the study keeping in view easy access to schools. From selected block two schools i.e. Govt. Senior Secondary School, Dhandra (25 females and 25 males), and Govt. Senior Secondary School, Thareeke (25 females and 25 males), were randomly selected to draw the rural sample.

Selection of urban sample: Municipal Corporation Ludhiana has divided the city into four zones i.e. Zone A, Zone B, Zone C and Zone D. One Zone i.e. Zone D was purposely selected for this study keeping in view easy access to schools. A complete list of all the Government Senior Secondary Schools falling in this zone was procured from the internet. From this list, 3 schools i.e. Govt. Girls Senior Secondary School, Jawahar Nagar (25 females), Govt. Senior Secondary School, Govind Nagar (25 females and 25 males) and Govt. Boys Senior Secondary School, Jawahar Nagar (25 males) were randomly selected to draw the urban sample.

Research instruments : Grewal guidance need inventory: The Guidance Needs scale developed by Grewal (1997) was used to identify the guidance needs of students. The inventory consists of 65 items and divided into 5 major areas namely physical guidance need, social guidance need, psychological guidance need, educational guidance need and vocational guidance need where 10 items measure the strength of physical guidance need. 15, 13,19 and 8 items measure the strength of social, psychological, educational guidance need respectively. The test retest reliability of the scale is 0.82.

RESULT AND DISCUSSION

Physical guidance needs: From overall population (200 respondents), 41 per cent of adolescents were accumulated at low level of physical guidance need followed by average level (39%) and 20 per cent adolescents were at high level of physical guidance needs. Physical guidance needs of rural population and urban population holds a non

significant difference at average level where rural sample population holded its maximum population (40%) whereas urban holded 38 per cent of the population. A significant difference was found in urban and rural adolescents at high level of physical guidance needs where rural adolescents were found more than urban adolescents, whereas, at low level urban adolescents (51%) were found more than rural adolescents (31%). Lack of knowledge, regarding physical fitness, high gym facilities in urban area, lack of yoga trainers can be the attributing factors for more proportion of rural adolescents in physical guidance needs (Table 1).

Social guidance needs: For social guidance need overall population lied more at average level (48.50%), 26 per cent population clustered at high level whereas one fourth of population (25%) were occupied at low level of social guidance need. Maximum proportion of rural sample and urban sample were at average level of social guidance needs (44% rural and 53% urban). At high level social guidance needs differ significantly where rural adolescents (35%) were found more than urban adolescents (18%) and 21 per cent of rural adolescents and 29% of urban adolescents fell at low level of social guidance needs. Hesitation to interact, low social contact, less expressive can be the attributes for more proportion of rural adolescents at high level of social guidance needs (Table 1).

Psychological guidance needs: Total sample population for psychological guidance need resulted more population at high level of psychological guidance need (48%) followed by average (40.50%) and low guidance need (11.50%). Rural population were found more at high level of psychological guidance need (56%) than urban

Table 1: Locale wise differences in distribution of respondents across various dimensions and levels of guidance needs

Dimension and levels	Rural (n_1 = 100)		Urban (n_2 = 100)		Z value	Overall (n=200)	
of guidance needs	Frequency	Percentage	Frequency	Percentage		Frequency	Percentage
Physical							
High	29	29.00	11	11.00	3.18***	40	20.00
Average	40	40.00	38	38.00	0.28^{NS}	78	39.00
Low	31	31.00	51	51.00	2.87***	82	41.00
Social							
High	35	35.00	18	18.00	2.72***	53	26.50
Average	44	44.00	53	53.00	1.27^{NS}	97	48.50
Low	21	21.00	29	29.00	1.30^{NS}	50	25.00
Psychological							
High	56	56.00	40	40.00	2.26**	96	48.00
Average	33	33.00	48	48.00	2.16**	81	40.50
Low	11	11.00	12	12.00	0.22^{NS}	23	11.50
Educational							
High	62	62.00	54	54.00	1.14^{NS}	116	58.00
Average	26	26.00	33	33.00	1.08^{NS}	59	29.50
Low	12	12.00	13	13.00	0.21^{NS}	25	12.50
Vocational							
High	74	74.00	65	65.00	1.38^{NS}	139	69.50
Average	22	22.00	28	28.00	0.97^{NS}	50	25.00
Low	4	4.00	7	7.00	0.93^{NS}	11	5.50
Overall							
High	32	32.00	22	22.00	1.59^{NS}	54	27.00
Average	61	61.00	62	62.00	0.14^{NS}	123	61.50
Low	7	7.00	16	16.00	1.99*	23	11.50

*$p \leq 0.10$; **$p \leq 0.05$; ***$p \leq 0.01$

population (40%) under significant difference (Z-2.26; $p \leq 0.05$), 33 per cent of rural and 48 per cent urban adolescents responded to be at average level with significant difference (Z =2.16; $p \leq 0.05$). Quiet similar results were seen in rural (11%) and urban locale (12%) at low level. Lack of resources to guide mental health problems, emotional disturbances, family conflicts, parental education, socioeconomic status could be the reason for more proportion of rural adolescents at high level of psychological guidance needs (Table 1).

Educational guidance needs: In educational guidance need maximum adolescents occupied (58%) at high level. 29.50 per cent and 12.50 per cent adolescents gathered at average and low level of educational guidance. Major population of rural respondents (62%) and more than half (54%) urban respondents were found at high level of educational guidance needs followed by average level where 26 per cent of rural and 33 per cent of urban adolescents were accumulated and only 12 per cent rural and 13 per cent urban adolescents were found at low level of psychological guidance needs. Lack of facilities in rural school, less approach to resources, lack of infrastructure (library) and teaching methodologies does not match to technological advancement. These could be the contributing factors for more proportion of rural adolescents at high level of educational guidance needs (Table 1).

Vocational guidance needs: In overall sample, more than half of the population (69.50%) were at high level, followed by average (25%) and low level (5.50%) of vocational guidance needs. Non significant locale difference was found where 74 per cent of rural and 65 per cent of urban were found at high level of vocational guidance needs, 22 and 28 per cent students of rural and urban adolescents fell at average vocational guidance needs whereas a less proportion of sample population occupied at low guidance needs (7% urban 4% rural respondents). Irrespective of locale among all guidance needs, the percentage of students falling at high level of guidance need was maximum in vocational guidance needs (Table 1). In line to this findings a study conducted by Agnihotri (2012) revealed among all guidance needs proportion of respondents were more at high level vocational guidance need. Thus it can be summarized as, area of vocation is undergoing rapid change and youngsters of today's generation are lacking in seeking help to take right decision in the field of selecting vocation.

Overall guidance needs: In overall guidance needs 61.50 per cent of the total sample population were found to be at average level, 27 per cent and 11.50 per cent were at high and low level of overall guidance needs. Most of the urban (62%) as well as rural population (61%) lied under average level. 32 per cent or rural and 22 per cent of urban adolescents were at high level which means more adolescents from rural area fall in high category than rural. Similar findings was found by the study conducted by Nivedita and Singh (2017) where the more number of rural secondary school fall under high level of guidance need than urban secondary school students. It could be concluded that rural adolescents were more as compared to urban at high level of physical, social, and psychological guidance need and urban adolescents were found more at average level of psychological guidance need whereas at low level urban adolescents were found more in physical and overall guidance need (Table 1).

Physical guidance needs: More proportion of females (42%) were found at average level of physical guidance need which was more than males (36%) at average level. At low level, 33 per cent females and 49 per cent males were found with significant difference. ($Z=2.30$; $p \leq 0.05$), whereas, at high level of physical guidance needs, females (25 %) were found more than males (15%) with significant difference. ($Z=1.76$; $p \leq 0.10$) (Table 2).

Social guidance needs: Half number of female respondents (50%) and 47 per cent of males clustered at average level of social guidance needs with non significant difference. At high level of social guidance need per cent was approximately similar for both the gender groups. (26% females and 27% males) whereas at low level 26 per cent males and 24 per cent females were found. Thus result revealed that for both the gender, social guidance need is same which further reveals that being social is not influenced by gender, moreover it depends personally how individual makes contact with society (Table 2).

Psychological guidance needs: Both the gender group showed equal proportion of respondents (48%) at high level of psychological guidance and at average level of psychological guidance needs 46 per cent females and 35 per cent males were found, whereas, at low level of psychological guidance, males (17%) were accumulated more than females (6%) with significant difference (Z-2.43; $p \leq 0.05$) (Table 2).

Educational guidance needs: Data resulted in non significant gender difference in all levels of educational

Table 2: Gender wise differences in distribution of respondents across various dimensions and levels of guidance needs (n=200)

Dimensions and levels of guidance need	Female (n_1 = 100)		Male (n_2 = 100)		Z value
	Frequency	Percentage	Frequency	Percentage	
Physical					
High	25	25.00	15	15.00	1.76*
Average	42	42.00	36	36.00	0.86^{NS}
Low	33	33.00	49	49.00	2.30**
Social					
High	26	26.00	27	27.00	0.65^{NS}
Average	50	50.00	47	47.00	0.42^{NS}
Low	24	24.00	26	26.00	0.32^{NS}
Psychological					
High	48	48.00	48	48.00	0.00^{NS}
Average	46	46.00	35	35.00	1.58^{NS}
Low	6	6.00	17	17.00	2.43**
Educational					
High	56	56.00	58	58.00	0.28^{NS}
Average	33	33.00	27	27.00	0.92^{NS}
Low	11	11.00	15	15.00	0.84^{NS}
Vocational					
High	74	74.00	65	65.00	1.38^{NS}
Average	25	25.00	25	25.00	0^{NS}
Low	1	1.00	10	10.00	2.79***
Overall					
High	32	32.00	22	22.00	1.59^{NS}
Average	59	59.00	64	64.00	0.72^{NS}
Low	9	9.00	14	14.00	1.10^{NS}

*$p \leq 0.10$; **$p \leq 0.05$; ***$p \leq 0.01$

guidance needs where 58 per cent of males and 56 per cent of females occupied high level of educational guidance needs whereas one fourth of the male sample population (27%) and 33 per cent of females were gathered at average level of educational guidance needs. As compare to other levels, less proportion of adolescents were found at low level of educational guidance needs (15% males and 11% females). Both the gender showed need for educational guidance which means they aspire for better opportunities in the field of education (Table 2).

Vocational guidance needs: Majority of females (74%) and 65 per cent males falls under high level of vocational guidance and equal proportion of respondents (25%) were found at average level of vocational guidance needs whereas only 1% of female and 10 per cent males resulted in low level with a significant difference ($Z=2.79$; $p \leq 0.05$).

Overall guidance needs: Overall guidance need displayed non significant gender difference in all the levels but females (32%) clustered more at high level than males (22%) whereas maximum population of females (59%) and males (64%) lies in average level. 9 and 14 per cent of females and males were in low level. Similar result was found by the study conducted by Nivedita and Singh (2017) which revealed that the guidance needs of female adolescents is more than male adolescents (Table 2). In comparison of all dimensions of guidance needs and overall guidance needs, it was observed that females guidance need were higher than opposite gender. Though the time has changed and lead to advancement in technology but still patriarchal system holds its power and females are the one who are neglected for their concerns. Less exposure to environment, hostile family condition, lack of accessibility of resources

can be the attributing factors for high guidance needs of females.

Physical guidance needs: In rural sample, females (36%) were found more at high level of physical guidance needs than males (29%) whereas females (24%) were less than males (19%) at low level of physical guidance needs with a significant difference. Equal proportion of respondents (40%) from both the gender groups were found at average level of physical guidance needs. On other side in urban sample, very few males (8 %) and females (14%) falls under high physical guidance needs with non significant difference whereas at low level males occupied more than half (60%) of the sample which was less than females (42%) with significant difference (Z-1.80; $p \leq 0.05$) (Table 3).

Social guidance needs: In rural sample, females (42%) falling at high level social guidance were more as compared to males (28%) with non significant difference whereas a different trend was seen in urban sample at high level of social guidance needs where males were more than double (26%) as compared to females (10%) with a significant difference (Z-2.08; $p \leq 0.05$). As regard with rural sample, females (36%) were less than and males (52%) who clustered at average level of social guidance needs (Z-1.61; $p \leq 0.05$). On the other side in urban sample, females (64%) were found more than males (42%) who were accumulated at average level of social guidance needs (Table 3).

Psychological guidance needs: In rural sample more females (64%) clustered at high level of psychological

Table 3: Locale wise gender distribution of respondents across various dimensions and levels of guidance needs (n=200)

Dimensions and levels of guidance needs	Rural (n_1 = 100)					Urban (n_2 = 100)				
	Female (n_1 = 50)		Male (n_2 = 50)		Z value	Female (n_3 = 50)		Male (n_4 = 50)		Z value
	F	%	F	%		F	%	F	%	
Physical										
High	18	36.00	11	22.00	1.54*	7	14.00	4	8.00	0.95^{NS}
Average	20	40.00	20	40.00	0.00^{NS}	22	22.00	16	32.00	1.23^{NS}
Low	12	24.00	19	38.00	1.51*	21	21.00	30	60.00	1.80**
Social										
High	21	42.00	14	28.00	1.46^{NS}	5	10.00	13	26.00	2.08**
Average	18	36.00	26	52.00	1.61*	32	64.00	21	42.00	2.20**
Low	11	22.00	10	20.00	0.24^{NS}	13	26.00	16	32.00	0.66^{NS}
Psychological										
High	32	64.00	24	48.00	1.61*	16	32.00	24	48.00	1.63*
Average	15	30.00	18	36.00	0.63^{NS}	31	62.00	17	34.00	2.80***
Low	3	6.00	8	16.00	1.59^{NS}	3	6.00	9	18.00	1.84*
Educational										
High	33	66.00	29	58.00	0.82^{NS}	23	46.00	29	58.00	1.20^{NS}
Average	12	24.00	14	28.00	0.45^{NS}	20	40.00	13	26.00	1.48^{NS}
Low	5	10.00	7	14.00	0.61^{NS}	7	14.00	8	16..00	0.28^{NS}
Vocational										
High	39	78.00	35	70.00	0.91^{NS}	35	70.00	30	60.00	1.04^{NS}
Average	10	20.00	12	24.00	0.48^{NS}	15	30.00	13	26.00	0.44^{NS}
Low	1	2.00	3	6.00	1.02^{NS}	0	0.00	7	14.00	2.74*
Overall										
High	25	50.00	7	14.00	3.85***	7	14.00	15	30.00	1.93*
Average	21	42.00	40	80.00	3.89***	38	76.00	24	48.00	2.88***
Low	4	8.00	3	6.00	0.39^{NS}	5	10.00	11	22.00	1.63*

*$p \leq 0.10$; **$p \leq 0.05$; ***$p \leq 0.01$; F = Frequency; % = Percentage

guidance than males (48%) with a significant difference (Z-1.61; p≤0.10) but within urban sample males (48%) were accumulated more at high level of psychological guidance need than females (32%) with a significant difference (Z-1.63; p≤0.10). 30 and 36 per cent females and males of rural area were under average level with non significant difference whereas in urban area, average level of psychological guidance needs holds 62 per cent of females and 34 per cent males with a significant difference (Z-2.80; p≤0.01) between them. At low level, 16 per cent males and 6 per cent females were found, whereas, in urban locale 6 per cent females and 18 per cent males were found which were proportionately less as compared to other levels (Table 3).

Educational guidance needs: In the locale of rural non significant difference was found in all the levels. More than half of the sample population of females (66%) and males (58%) gathered at high level of educational guidance needs. 24 and 28% of females and males were under average level. As compared to other levels a very less proportion (10% females and 14% males) of respondents were at low level of psychological guidance need (Table 3).

CONCLUSION

Adolescents requires an explicit attention to deal with their challenges and changes as it is stage of stress and storm. To resolve their problem in different dimensions like physical, social, psychological, educational and vocational, guidance services are must for the adolescent to shape their better future. Teenagers are the hope of nation and leaders of future, they must be assisted with proper guidance and counseling services so that they can resolve their problems. The findings can contribute towards improving the status of guidance and counselling needs among adolescents and also it would be a useful source for policy makers, social workers, government agencies, teachers, counsellors and NGO working in the field of guidance and counselling.

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Analysis of Marketing Efficiency of Prominent Vegetable Marketing Channels in Nadia District of West Bengal

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ABSTRACT

Vegetables play an essential role in the Indian diet because of its high nutritive value. It is a good source of dietary fiber, folic acid, vitamins, and minerals. Though India ranks second in the production of fruits and vegetables in the world, a considerable amount gets wasted in our country due to the highly perishable nature. The production also requires proper value chain management practices to minimize losses due to transportation and marketing. The present study is conducted in different villages under the Santipur Block and Krishanagar 1 Block of Nadia district in West Bengal during the year 2018-19. Quantitative data have been collected from forty vegetable growers randomly. Also, participatory interviews were conducted from twenty primary wholesalers, twelve secondary wholesalers, twenty-five retailers, and twenty consumers of Fulia, Majhdia, and Kolkata market. The marketing efficiency and producer share in consumers' rupees were found to be higher in the local marketing channels than the Kolkata marketing channels because of little interference from the middlemen. The vegetable growers of the district were found to face problems concerning marketing such as low prices offered by the traders, fluctuation in prices, lack of storage facilities, etc.

Keywords: Marketing channels, Marketing efficiency, Price spread, Value chain

INTRODUCTION

India is the second-largest country in the Asian continent and ranks seventh in world context with a large population density. The country is a house to 1369.59 million people, which covers 17.7 per cent of the total world population (Chandramouli and General, 2011). More than 60 per cent of this large population is entirely dependent on agriculture and allied sectors for their survival. Indian food and grocery market is the world's sixth-largest segment. While in the case of fruit and vegetable production, it is the second-largest producer in the world (Shanmugasundaram *et al.,* 2020). The area under vegetable cultivation increased from 6.74 million hectares (mha) in 2004-05 to 10.10 mha in 2018-19. Vegetable production increased from 101.25 mt in 2004-05 to 185.88 tonnes in 2018-19, with average productivity of 18.4 t/ha. The major vegetable crops are grown in India, which accounts for 11.2 per cent of global vegetable production are potato, tomato, onion, Brinjal, cabbage, cauliflower, peas and okra (APEDA, 2020).

According to the state-wise horticulture production data released by the Agriculture Ministry, West Bengal playsa leading role in vegetable production, followed by Uttar Pradesh. It produced 29.55 million tonnes (mt) of vegetables, which cover 15.9 per cent of total India's vegetable production. In the case of fruit production, West Bengal is ranked ninth preceded by Andhra Pradesh, Maharashtra, Uttar Pradesh, Gujarat, Madhya Pradesh, Tamil Nadu, Karnataka, and Bihar (Ministry of Agriculture & Farmers' Welfare, 2018).

Table 1 presents the production of fruits and vegetables in West Bengal is high and is comparable to other states of the country. However, there is a wide disparity in the socio-economic condition of the farmers in the state. A considerable number of farm families in our country are unprivileged and have managed to survive beyond the poverty line. Excessive interference of intermediaries in the marketing channel is one of the most importer reasons for the backwardness of Indian farmers.

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Table 1: State-wise vegetable crops production in India (2018-19)

Rank	State	Area ('000 ha)	Production (mt)	Productivity (t/ha)
1st	West Bengal	1490.39	29.55	19.82
2nd	Uttar Pradesh	1256.27	27.70	22.05
3rd	Madhya Pradesh	897.99	17.77	19.79
4th	Bihar	872.55	17.00	19.14
5th	Gujarat	626.26	12.55	20.04

Source: Ministry of Agriculture & Farmers' Welfare, 2018

Intermediaries are responsible for the deprivation of the farmers as well as consumers from gaining maximum profit (Rais and Sheoran, 2015). The study reveals that rising food prices are benefitting intermediaries rather than farmers and are also preventing a supply response (Isakson, 2014). One of the most significant constraints to the proper functioning of agricultural markets is the Agriculture Produce Marketing Committee (APMC) Act, which prevents farmers from selling their produce directly to retailers or the consumer. They can only trade in government-mandated markets (*mandis*) to licensed middlemen (Rao, 2018). Other problems like the highly perishable nature of fruits and vegetables make their marketing difficult. Also, seasonality, varied climatic conditions, diversified consumption patterns, high transportation costs, corruption, unstable marketing condition, etc. also lead to farmer's woes. To overcome these problems, an effective and efficient value chain management is essential (Kumar *et al.,* 2018).

The concept of Value Chain Management (VCM) in agriculture is relatively new and uprising. This concept is mainly used in the industrial sector. VCM includes all the stages which are directly or indirectly involved in the satisfaction of consumers need. It is a sequence of related business activities/functions, from the provision of specific inputs for a particular product to primary production, processing, sales, and distribution, to final consumption. From an institutional perspective, a value chain can be defined as the organizational arrangements linking and coordinating the producers, processors, traders, and distributors who perform these functions (Gattorna and Walters, 1996). A value chain is also synonymously referred to as a Supply chain or a market chain. Proper VCM is a crucial way to optimizing business operations and maximizing profit. Companies always try to maximize value for themselves, their vendors, and their end customers when they effectively manage the flow of production and sales from inbound logistics to operations, outbound logistics, marketing, and sales and service (Mukhamedjanova, 2018). According to (Bammann, 2019), "A value chain in agriculture identifies the set of actors and activities that bring a basic agricultural product from production in the field to final consumption, where at every stage value is added to the product". Communication network and expert system also play a vital role to maintain proper value chain of agricultural commodities. Input dealers were also playing a vital role in famers' support system (Rohit *et al.,* 2018).

Objectives of the study: The objectives of the study are to portrait the effective value chains of vegetables of Nadia district of West Bengal by calculating marketing margin, producer share in consumers' rupees, marketing efficiencies, etc. It also aims to identify the major problems and prospects of vegetable marketing in the Nadia district of West Bengal.

MATERIALS AND METHODS

The study was conducted in the year 2018-19 in Nadia district of West Bengal. Forty vegetable growers were randomly selected from Tarapur, Lalmath, Punglia, Malipota, Khamarpara, Chasicolony, Umapur, Kadampurvillages under Santipur Block; Nidhirpota, Bablabon, Chandannagar, Vimpur, Smuliavillages under Krishanagar 1 Block. Also, twenty primary wholesalers, twelve secondary wholesalers, twenty-five retailers including shopkeepers, vendors and hawkers, and twenty consumers were randomly selected from the Fulia market, Habibpur Market, Majhdia market, Kalyani market, and Kolkata market. Vegetable cultivators, traders (*aratdars*, wholesalers & retailers), and consumers were the major sources of primary information. The interview method with an open-ended questionnaire was used for the collection of primary data. Besides this, data was also obtained through observations, fields and market surveys, phone calls, and

video conferencing with farmers and traders, etc. The secondary data were collected from previous publications on related topics, government websites, etc. After collection of the necessary data like the cost of production, marketing, and maintenance cost, wholesale and retail prices, etc. are analyzed for calculating added value at each level, marketing margin, marketing efficiency, producer's share in consumer's rupee, etc. Marketing costs consist of packing, loading and unloading, storage and maintenance, and commissions, and taxes.

The difference between the price paid by consumers and the price received by the producers for an equivalent quantity of farm produce is called price spread.

Price spread (PS) = (Retail price - producer price)

Estimates of the marketing margins are the best tools to analyze the performance of the market. The marketing margin was calculated by taking the difference between production cost and retail prices.

Marketing margin (MM)= (Retail price- Production cost)

The producer's share in the Consumer's Rupees is the price received by the producer expressed as a percentage of the retail price. It is given by the following formula (Acharya, 2004).

$$Ps = FP/RP \times 100$$

Where Ps= Producer's share in consumer's rupee

FP= Producer's price, RP = Retail price

Marketing efficiency is used for comparing the efficacy of two marking channels. It is the most used measure of market performance. Improved marketing efficiency is a common goal of farmers, marketing organizations, consumers, and society. The formula for calculating Marketing Efficiency is given below:

$$ME = FP/(MC+MM)$$

Where, Marketing Efficiency (ME), Total Marketing Costs (MC), Net Marketing Margins (MM), Prices Received by the Farmers (FP).

Index is an indirect measure of a concept, whether it is unidimensional or multidimensional, which under a given set of circumstances, is not directly measurable (Sharma, 1974). Formula of measurement of Index Value by five-point scale presented below:

$$Index\ Value = (f\times5) + (f\times4) + (f\times3) + (f\times2) + (f\times1)/F$$

Where frequency according to score (f), Score value of five-point scale (5,4,3,2 and 1) (Ray and Mondal, 1999).

RESULT AND DISCUSSION

The study identifies various channels of fruit and vegetable marketing, cost of production, marketing cost, and value addition at a different level of marketing. Also, the middleman interference, price spread, marketing margin, producers share in consumer rupees, and the efficiency of various marketing channels are taken into account. Besides these, the study also touched on problems hindering efficient fruit and vegetable marketing along with the stakeholder's suggestion for solving these problems.

The prominent value chains of vegetable marketing in Nadia district of West Bengal were identified. The marketing channels are picturized below:

Local marketing channels of the Fulia vegetable market: The vegetable growers are coming from Malipota, Punglia, Lalmath, Tarapur, Chasicolony, Umapur, Kadampur, Khamarpara, etc. villages to Fulia vegetable market for selling their commodities to the wholesalers or directly to the retailers or ultimate consumers. Sometimes wholesalers or traders themselves come to the villages to buy farmers products directly from the field at low prices (Figure 1).

Local marketing channels of the Majhdia vegetable market: Farmers come from Nidhirpota, Bablabon, Chandannagar, Vimpur, Asannagar, Simulia, etc. villages to Majhdia vegetable market to sale their produce. They

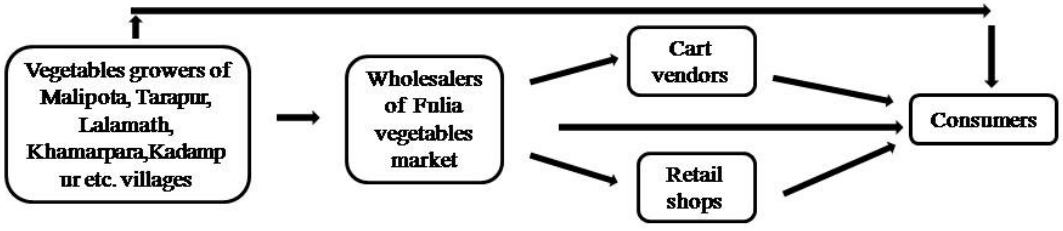

Figure 1: The functioning of local marketing channels of Fulia vegetable market

mainly sell their products to wholesalers. Sometime they may also sell directly to the retailer or ultimate consumers (Figure 2).

Fulia to Kolkata vegetable marketing channels: In these channels, primary wholesalers are collecting produce from the growers and transport the same to the Kolkata wholesale market to achieve more profit (Figure 3).

***Majhdia to Kolkata vegetable marketing channels*:** Primary wholesalers are purchasing commodities from the farmers and sell it to the Kolkata wholesale vegetable market (Figure 4).

The agro-climatic condition of Nadia district is highly suitable for vegetable production. Different varieties of vegetables are cultivated in Nadia. Among them, 12 major vegetables, namely cabbage, cauliflower, Brinjal, pointed gourd, tomato, pumpkin, ash gourd, spinach, cucumber, chili, onion, and Garlic are purposively chosen from Fullia and Majhdia vegetable markets for this study. Table 2 focuses on the production cost, marketing cost, and value distribution within the different levels of stakeholders like a producer, wholesaler, retailer, and ultimate consumers of the local value chains of vegetable marketing.

Table 3 depicts that, among the 12 crops, marketing cost is highest (Rs. 44.50/kg) in Garlic and lowest (Rs. 4.25/ kg) in Pointed gourd. The marketing margin was found to be the highest in Garlic at both minima (Rs. 126.00/kg) and maximum (Rs. 31.00/kg) level and lower in Pumpkin at both maximum (Rs. 23.50/kg) and minimum (Rs. 1.50/ kg) level. The price spread is also highest in Garlic marketing at both minimum (Rs. 40.00/kg) and maximum (Rs. 70.00/kg) level, and it is the lowest in the value chain of cabbage (Rs. 16.00/kg) and (Rs. 10.00/ kg). Producer share in consumer rupees is an essential attribute in value chain analysis. High producer share in consumer rupees indicates the high effectiveness of the marketing channel. In Brinjal

Figure 2: The functioning of local marketing channels of Majhdia vegetable market

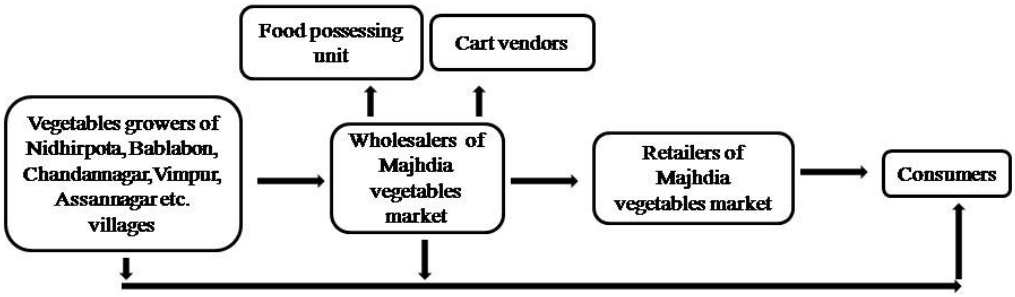

Figure 3: Functioning of Fulia to Kolkata vegetable marketing channels

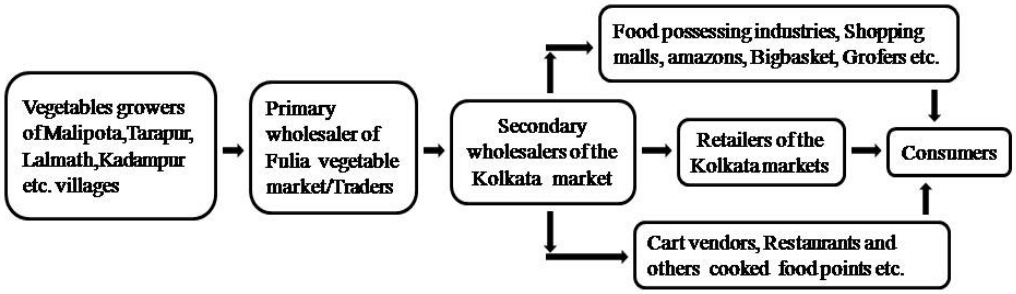

Figure 4: Functioning of Majhdia to Kolkata vegetable marketing channels

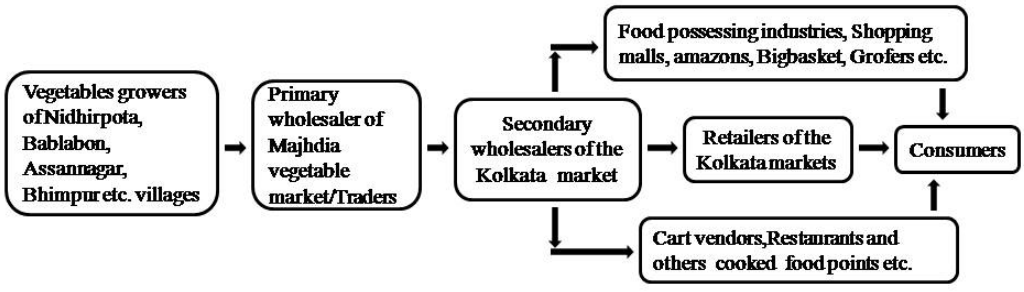

Table 2: Distribution of different costs and value within local market Stakeholders

Vegetables	PC	PP (Rs./kg)		MCW[1]	WPL (Rs./kg)		MCR[1]	RP[1] (Rs./kg)	
	(Rs./kg)	Max	Min	(Rs./kg)	Max	Min	(Rs./kg)	Max	Min
Cabbage	8.00	32	08	1.75	40	12	3.50	48	18
Cauliflower	10.00	40	05	2.50	50	10	5.00	70	20
Brinjal	12.50	38	14	1.50	44	18	3.00	55	27
Pointed Gourd	8.50	62	6.30	1.50	75	8.50	2.75	100	15
Tomato	11.00	60	12	3.00	68	16	7.25	120	28
Pumpkin	12.50	16	04	2.25	22	07	4.50	36	14
Ash gourd	10.00	35	08	1.75	40	12	3.75	52	20
Spinach	6.00	35	04	2.00	48	9	4.00	80	20
Cucumber	12.00	32	07	1.75	40	12	3.00	60	20
Chili	10.50	65	12	2.50	80	16	5.00	120	27
Onion	8.30	40	8	1.25	48	12	4.25	80	22
Garlic	24.00	80	18	9.25	110	28	25.25	150	55

PC = Production Cost, **PP** = Producer Price, **MCW[1]** = Marketing Cost of wholesaler (transportation cost, wastage losses, value addition cost, etc.), **WPL[1]** = Wholesale Price in the local market, **MCR[1]** = Marketing Cost of Retailer (transportation cost, wastage losses, value addition cost, etc.), **RP[1]** = Retail Price in the local market

Table 3: Estimation of TMC, MM, PS, Ps and ME of value chains of vegetables in local marketing condition

Vegetables	TMC	MM (Rs./kg)		PS (Rs./kg)		Ps		ME	
	(Rs./kg)	Max	Min	Max	Min	Max	Min	Max	Min
Cabbage	5.25	40.00	10.00	**16.00**	**10.00**	66.60	44.44	0.70	0.52
Cauliflower	7.50	60.00	10.00	30.00	15.00	57.14	25.00	0.59	0.29
Brinjal	4.50	42.50	14.50	17.00	13.00	**69.09**	**51.85**	**0.80**	**0.74**
Pointed Gourd	**4.25**	91.50	6.50	25.00	8.70	62.00	42.00	0.65	0.58
Tomato	10.25	109.00	17.00	60.00	16.00	50.00	42.85	0.50	0.44
Pumpkin	6.75	**23.50**	**1.50**	20.00	10.00	44.42	28.57	0.52	0.48
Ash gourd	5.50	42.00	10.00	17.00	12.00	67.30	40.00	0.74	0.52
Spinach	6.00	74.00	14.00	45.00	16.00	**43.75**	**20.00**	**0.43**	**0.20**
Cucumber	4.75	48.00	8.00	28.00	13.00	53.33	35.00	0.61	0.54
Chili	7.50	109.50	15.00	55.00	15.00	54.42	44.44	0.56	0.53
Onion	5.50	71.70	13.70	56.00	14.00	50.00	36.36	0.51	0.37
Garlic	**44.50**	**126.00**	**31**	**70.00**	**40.00**	53.30	27.20	0.46	0.24

TMC= Total Marketing cost, **MM =** Marketing Margin, **PS =** Price spread, **Ps =** Producer share in consumer rupees, **ME =** Marketing Efficiency

producer share in consumer, rupees are highest at both maximum (69.09) and minimum (51.85) level, and it lowest in the spinach value chain (43.75 in max) and (20.00 in min). Marketing efficiency is also highest in Brinjal at both maximum (0.80) and minimum (0.74) level and lowest in spinach at maximum (0.43) and minimum (0.20) both the level of marketing. Table 4 presents the distribution of added values among the stakeholders of Fulia to Kolkata and Majhdia to Kolkata's marketing channels of vegetables. There is a prominent role of middlemen in these channels. Besides the producer and consumer primary wholesalers/ traders, secondary wholesalers, retailers exist in these channels, and it increases the marketing cost and reduces the effectiveness of the channels.

Table 5 depicts that, in the case of Fulia to Kolkata and Majhdia to Kolkata, marketing cost is highest (Rs.

Table 4: Distribution of different costs and value within local to Kolkata market Stakeholders

Vegetables	PC	PP (Rs./kg)		MCW²	PWP (Rs./kg)		MCS	SWP (Rs./kg)		MCR²	RP² (Rs./kg)	
	(Rs./kg)	Max	Min	(Rs./kg)	Max	Min	(Rs./kg)	Max	Min	(Rs./kg)	Max	Min
Cabbage	8.00	32	08	2.00	42	12.25	3.25	52.25	20	6.50	80	35
Cauliflower	10.00	40	05	3.25	52	10	4.75	65	22	8.00	90	40
Brinjal	12.50	38	14	1.25	45	18.50	2.50	54.50	25	6.00	82	42
Pointed Gourd	8.50	75	6	1.50	82	9	2.50	92	14.50	4.75	180	25
Tomato	11.00	60	12	3.50	68.50	18	5.25	88	27	18.00	200	60
Pumpkin	12.50	16	04	2.75	23	07	3.25	34	16	11.50	65	38
Ash gourd	10.00	35	08	2.25	40	12	3.50	52	20	7.75	80	40
Spinach	6.00	35	04	2.50	42	7.25	4.00	60	16.50	10.00	120	42
Cucumber	12.00	32	07	2.00	40	12	3.50	49	18	9.00	85	35
Chili	10.50	65	12	2.70	80	16	3.00	90	22	18.00	170	45
Onion	8.30	24	8	3.00	32	12	5.25	44	25	17.50	120	42
Garlic	24.00	80	15	4.75	110	22	12.30	130	54	38.00	220	110

PC = Production Cost, **PP** = Producer Price, **MCW²** = Marketing cost of Primary Wholesaler (transportation cost, wastage losses, value addition cost, etc.), **PWP** = Primary Wholesale Price in Kolkata market, **MCS** = Marketing Cost of secondary wholesaler (transportation cost, wastage losses, value addition cost, etc.), **SWP** = Secondary Wholesale Price in Kolkata market, **MCR²** = Marketing cost of the Retailer in Kolkata (transportation cost, wastage losses, value addition cost, etc.) **RP²** = Retail Price in Kolkata market

Table 5: Estimation of TMC, MM, PS, Ps and ME of value chains of vegetables in local to Kolkata marketing condition

Vegetables	TMC	MM (Rs./kg)		PS (Rs./kg)		Ps		ME	
	(Rs./kg)	Max	Min	Max	Min	Max	Min	Max	Min
Cabbage	11.75	72	27	32	8	40.00	22.86	0.38	0.21
Cauliflower	16	80	30	40	5	44.44	12.50	0.42	**0.11**
Brinjal	9.75	69.5	29.5	38	14	**46.34**	**33.33**	**0.48**	**0.36**
Pointed Gourd	**8.75**	171.5	16.5	75	6	41.67	24.00	0.42	0.24
Tomato	26.75	189	**17**	60	12	30.00	20.00	0.28	0.16
Pumpkin	17.5	**52.5**	25.5	**16**	**4**	24.62	10.53	0.23	0.09
Ash gourd	13.5	70	30	35	8	43.75	20.00	0.42	0.18
Spinach	16.5	114	36	35	**4**	29.17	**9.52**	0.27	0.08
Cucumber	14.5	73	23	32	7	37.65	20.00	0.37	0.19
Chili	23.7	159.5	34.5	65	12	38.24	26.67	0.35	0.21
Onion	25.75	111.7	33.7	24	8	**20.00**	19.05	**0.17**	0.13
Garlic	**55.05**	**196**	**86**	**80**	**15**	36.36	13.64	0.32	0.11

TMC = Total Marketing cost, **MM =** Marketing Margin, **PS =** Price spread, **Ps =** Producer share in consumer rupees, **ME =** Marketing Efficiency

55.05/kg) in Garlic and lowest (Rs. 8.75/kg) in Pointed gourd. The marketing margin is also highest (Rs.196/kg) in Garlic for both maximum and the minimum level of marketing and lowest in pumpkin (Rs. 52.50/kg) and tomato (Rs. 17.00/kg) respectively at maximum and minimum level. In case of price spread through the value chain garlic ranking highest at both maximum (Rs. 80/kg) and minimum (Rs. 15/kg) level and the maximum level of marketing pumpkin ranking lowest (Rs. 16.00/kg) and the minimum level of marketing pumpkin and spinach both ranking lowest (Rs. 4.00/kg). Producer share in consumers' rupees is leading in Bringal at both maximum (46.34) and minimum (33.33) level of marketing and lowest in onion (20.00) at maximum level and spinach (9.52) at the minimum level. Marketing efficiency is highest in Brinjal at both maximum (0.48) and minimum (0.36) level

and lowest in onion (0.17) and cauliflower (0.11) respectively at maximum and the minimum level of marketing.

It is found from Table 6 that the producer share in consumers' rupees and marketing efficiency of each vegetable are higher in local marketing channels than the local to Kolkata marketing channels at both maximum and the minimum level of marketing. The marketing efficiency of the local vegetable marketing channels is approximately double of the local to Kolkata vegetables marketing channels. In the case of Brinjal, the marketing efficiency of the local marketing channels are 0.80 at the maximum level and 0.74 at the minimum level. But in local to Kolkata marketing channels marketing efficiency of Brinjal is 0.48 and 0.36 at the maximum and minimum level, respectively.

Problems and prospects of fruits and vegetable marketing of Nadia district of West Bengal: The marketing of perishable commodities faces difficulty because of poor marketing infrastructure, seasonality, high transportation costs, price fluctuation, and interferences from the middleman. Farmers are not able to sell their surplus produce with profits due to the lack of cold storage facilities, excessive wastage, and low marketing

Table 6: Comparison between marketing in two markets

Vegetables	Marketing in local market				Marketing in Kolkata market			
	Producer share in consumer rupees		Marketing efficiency		Producer share in consumer rupees		Marketing efficiency	
	Max	Min	Max	Min	Max	Min	Max	Min
Cabbage	66.60	44.44	0.70	0.52	40.00	22.86	0.38	0.21
Cauliflower	57.14	25.00	0.59	0.29	44.44	12.50	0.42	0.11
Brinjal	69.09	51.85	0.80	0.74	46.34	33.33	0.48	0.36
Pointed Gourd	62.00	42.00	0.65	0.58	41.67	24.00	0.42	0.24
Tomato	50.00	42.85	0.50	0.44	30.00	20.00	0.28	0.16
Pumpkin	44.42	28.57	0.52	0.48	24.62	10.53	0.23	0.09
Ash gourd	67.30	40.00	0.74	0.52	43.75	20.00	0.42	0.18
Spinach	43.75	20.00	0.43	0.20	29.17	9.52	0.27	0.08
Cucumber	53.33	35.00	0.61	0.54	37.65	20.00	0.37	0.19
Chili	54.42	44.44	0.56	0.53	38.24	26.67	0.35	0.21
Onion	50.00	36.36	0.51	0.37	20.00	19.05	0.17	0.13
Garlic	53.30	27.20	0.46	0.24	36.36	13.64	0.32	0.11

Table 7: Marketing problems faced by vegetable growers of Nadia district of West Bengal

S.No.	Problems	Score					Total	Index value	Rank
		5	4	3	2	1			
1.	Low price offered by the traders	32	8	0	0	0	40	4.80	I
2.	Price fluctuation	30	9	1	0	0	40	4.72	III
3.	Sales on credit	30	10	0	0	0	40	4.75	II
4.	High commission charged	29	8	3	0	0	40	4.65	IV
5.	Non availability of storage facilities	28	9	3	0	0	40	4.62	V
6.	High transport cost	26	12	2	0	0	40	4.60	VI
7.	Excessive wastage during low marketing demand	27	7	6	0	0	40	4.52	VII
8.	Non regular marketing	24	12	4	0	0	40	4.50	VIII
9.	High dominance of market intermediaries	24	10	4	2	0	40	4.40	IX
10.	Demand commodities beyond actual weight	21	9	7	3	0	40	4.20	X

Table 8: Suggestions for vegetable growers to solve their problems

S.No.	Suggestions	Score					Frequ-ency	Index value	Rank
		5	4	3	2	1			
1.	Provide them actual price of their produce	40	0	0	0	0	40	5.00	I
2.	Provide appropriate storage facilities	37	3	0	0	0	40	4.92	III
3.	Reduce commission charge and marketing cost	37	2	1	0	0	40	4.90	IV
4.	Prohibition of sale on credit	38	2	0	0	0	40	4.95	II
5.	Reduce transport cost	34	5	1	0	0	40	4.82	V
6.	Provide subsidy for the loss due to natural calamities	32	6	2	0	0	40	4.75	VI
7.	Provide available credit facilities	30	9	1	0	0	40	4.72	VII

demand, etc. (Sankar *et al.*, 2017). Fruits and vegetable markets of Nadia district also suffer from some structural weaknesses, according to the farmers' perception which is presented in Table 7.

Table 8 depicts the major marketing problems faced by the vegetable growers of Nadia district, and the issues have been ranked according to their magnitude. Out of ten items, the low price offered by the middleman occupies the highest rank, followed by price fluctuation, credit sale, a high commission charged for marketing, lack of storage facilities, high transportation cost, excessive wastage during low marketing demand, irregular marketing, the other influence of intermediaries, and the demand free commodities beyond the actual weight. To address the marketing-related problems faced by the vegetable growers of Nadia, they were asked to provide necessary suggestions to resolve their issues. It is found from the study that the prime focus of the respondents is to gain the best price for their produce. It is challenging to receive the best price because of excessive interferences from the middleman along with improper marketing infrastructure, storage facilities, the prohibition of credit sale, reduction of transport cost, and inadequate credit facilities, etc.

CONCLUSION

In the case of local marketing conditions, the producer share in consumers' rupees is comparable to the local vegetable marketing channels of Nadia district of West Bengal. The addition of the middleman in the Kolkata vegetable marketing channel leads to the reduction of the marketing efficiency of the channels. The study also implies that in the case of both marketing channels, the producer share in consumers' rupees and marketing efficiency is higher in case of brinjal, cabbage, cauliflower, pointed gourd, etc. while the same was lower in spinach, onion, garlic, chilli, and pumpkin. The summary of the marketing-related problems and suggestions of the vegetable growers to solve these problems according to the farmer's perception were mainly concerned with the excessive interferences of the middleman. Such a value system is inept since there is little trust among the stakeholders. In the value chain, farmers are the primary victim since they are always deprived of their actual rights and remain behind the real scene. Besides this, they also face the problems of price fluctuation, credit sale, high commission charge, lack of storage facilities, high transportation cost, excessive wastage during low marketing demand, etc. The concept of the modern supply chain can be developed with a view of the benefit of both farmers as well as ultimate consumers, and it also plays an essential role in increasing farmers income, generate employment opportunities for the local peoples, and improve the livelihood of the farmers which leads to the development of Indian economy as a whole (Negi and Anand, 2015)

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Nature, Extent and Determinants of Mortality of Buffalo Calves in Central Region of Uttar Pradesh

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ABSTRACT

Analysis of 775 dairy animal (buffalo) at 150 farmers' dairy units in Central Uttar Pradesh (India) reveals that the young stocks up to one year of age in an average dairy farm were 27.35 per cent of the total buffalo population (stock) and 75.99 per cent of the in-milk stock. The calf mortality including still births was 27.96 per cent on an average dairy farm, it ranged from 42.86 per cent for males to 20.74 per cent for female calves. The per farm male and female calf mortality was higher on large farms compared to small farms. The calf health management index was of average level, at 50 per cent of the recommended/optimal level. The status of calf health management practices like colostrums feeding at birth and the de-worming and parasite management was better (above 50%) compared to that of vaccination and disease management, calf starter feeding and the milk feeding. The main factor responsible for calf mortality was pneumonia and other respiratory problems (34.33%) followed by digestive/liver related ailments or enteritis (25.37%). The losses due to respiratory and digestive system diseases were higher on 0-3 age groups and its extent decreased with the increase in the age of the calf. A locally available herbal treatment promoted by KVK extension agency was found quite effective in controlling calf mortality (9.09%) compared to 18.18 per cent under chemical treatment and 31.82 per cent under no medical treatment under all farm categories. This treatment was also effective in reducing the incidence of other diseases as well as in improving the overall physical health of the calf. An effective health care and production management programme is called for to reduce the extent of calf mortality significantly. The locally available herbal product be exploited for commercial use by developing proper formulations of the product. The extension agencies need to encourage targeted extension programmes to educate the farmers in better controlling the calf mortality.

Keyword: Buffalo, Calves, Determinants, Extent, Mortality, Nature

INTRODUCTION

The estimates of the world population of buffaloes is approximately 207 million (in 2018) dispersed in 44 countries, more than 97 per cent of which are in Asia, and around 2 percent are in Africa, particularly Egypt (FAO, 2020). India, Pakistan, China, Egypt and Nepal are the main countries with large numbers of dairy or water buffaloes. India has approximately 55.2 per cent (114.2 million) of the total world buffalo population. The buffalo contributes immensely to the agricultural economy through milk, meat, hides and draught power (Kumar *et al.,* 2006). The share of buffalo milk occupies the highest position in Indian dairy industry, contributing about 49 per cent of total milk (187.7 MT) in India produced by varied buffalo population (57% of the cattle population) (GOI, 2019). The dairy industry in Uttar Pradesh which contributes about 16.26 per cent of national milk production, and its composition is just the opposite where the buffaloes are more than cattle, about 175.73 per cent of the cattle, and the share of buffalo milk production is 63.76 per cent of total milk production in the state.

Keeping in view the sustainable development goals, the emphasis on quality control in livestock production systems including milk production is to be ensured. This will be ensured by developing better animal health systems right from their births. The dairy young stock or the calves

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are the future herd or the replacement herd, and the efficient calf management plays an important role in the success of dairies units. Keeping the calves in fit and healthy conditions leads to the dairy farm's efficiency, productivity and profitability in the times to come. Despite this, the high buffalo calf mortality in dairy units is a cause of concern. High mortality rate up to 83.25 per cent in male calves and 79.47 per cent in female calves in south India has been reported (Sreedhar and Sreenivas, 2015). The mortality of calves in buffaloes within one month of birth was quite high earlier, 29.1 to 39.8 per cent (Afzal *et al.,* 1983) which now stands reduced but still high upto 19.5 per cent (Sreedhar *et al*., 2010). It calls for more rigorous efforts in managing calf mortality and for developing more effective, cheap and easily accessible management practices. Studies indicate that it is associated with the type of housing, feeding, management practices used, weather conditions, external and internal parasitic problems and bacterial infections especially those causing septicemia and enteritis (Blood *et al*., 1994). Poor and unscientific management in calf rearing practices have been reported as the main cause of calf mortality by number of studies. Earlier studies indicate that 20 per cent calf mortality in a livestock farm resulted in reduction of 38 per cent profit (Martin and Wiggins, 1973). Mortality in the calves renders not only economical losses but also contributes to the low production of the herd when taking futuristic terms for the farming

Knowledge of health management practices and disposal pattern of milch animals and their young stock from a herd is important because it aids in making more accurate planning and execution of programmes for genetic improvement, animal marketing, and viability of slaughter houses. Reports of health management and disposal pattern in cattle and buffaloes are also available but such information is limited to commercial farms. Such information is lacking for farmer producers. Regional variations do occur and some site specific peculiarities and the regional scenarios need to be analysed for better understanding of calf mortality. The present paper is an attempt to analyse the dairy farm size and the calf intensity. The paper also attempts to identify and summarize causes of mortality of buffalo calves and explore site-specific, traditional and low cost methods of calf mortality management in central region of Uttar Pradesh. The paper also attempts to analyse the effectiveness of cheap alternatives developed in the area for calf mortality management.

MATERIAL AND METHODS

The study of buffalo calf health and mortality management practices was conducted during the period from October 2018 to March, 2020 in central zone of Uttar Pradesh. The climate of the central Uttar Pradesh region is humid sub-tropical with cool, dry winters from mid-November to February and dry, hot summers with sunshine from March to mid-May. In winter the minimum temperature is in the 3°C (37°F) to 7°C (45°F) range, and it experiences colder winter spells than places like Shimla situated way high up in the Himalayas. Fog is quite common from mid-December to late January. Lucknow district representing central region of Uttar Pradesh and ten villages falling under the responsibility of KVK, Lucknow were randomly selected for detailed study. One hundred fifty (150) dairy farmers in proportion to their size of land holding in these villages were selected to carry out detailed observations on these farms. Accordingly, the study examines the calf health and mortality management practices on 112 small holders and 38 large holders reporting 279 calf births and 67 calf mortality on these farms.

The information on calf health management and mortality related other aspects was compiled by conducting number on intermittent meetings with the farmers and interviewing them on these aspects through well-structured questionnaires. For assessing the status of calf health management, six different calf health management categories were considered. The considered categories were: colostrum feeding at birth, milk feeding after 4 days of birth, calf starter mixture/quality fodder feeding, de-worming and parasite management, vaccination and disease management, and general hygiene maintenance. Out of these, the first two, colostrum feeding and milk feeding, were having two sub-categories each. In order to capture the differences on account of delayed placenta expulsion situations (Kunbhar *et al.,* 2011), the colostrum feeding category was considered as comprising two sub-categories as normal and delayed placenta expulsion situations. Similarly, for milk feeding category, two sub-categories; one representing the quantity of milk fed and the another highlighting the method of milk feeding were considered. For each category/sub-category, numbers of statements (Xn) varying from 3 to 20 were framed, based on a review of literature, to assess the status of vital dairy calf health management practices in the area. Each statement was assigned marks (Sn) in such a manner so that the statement representing the most ideal/recommended condition may

get the maximum marking. The marks assigned to each statement were then homogenized by dividing the marks with the highest marks allocated in that health management category/sub-category. An index value for health management category/sub-category under small as well as under large holdings was prepared for each calf as weighted mean of the score. The weights assigned to different health management categories/sub-categories were developed based on the information and opinion of 25 innovative farmers and 5 veterinarians and animal husbandry experts/officials working in the area.

To analyse the calf rearing scenario, their survival and the mortality rate, the information on age-wise, sex-wise and utility-wise composition of whole buffalo population and calf survival as well as mortality status was compiled and analysed. Information on buffalo dams and calves maintained at selected dairy farms was compiled from "dairy books" specially prepared and introduced prior to the study period. The farmers were provided on-farm training, one month prior to the start of the study, on how to prepare the information in these dairy books under the guidance of KVK, Lucknow. The farmers were trained to prepare information on the date of birth of a calf, sex, type of birth, season of birth, weight of calves at birth, dam's number of abnormal calving (stillbirths and abortions), cause of death of calf, age of the calf at death, age of dam at the time of parturition, the parity number of the dam, feeding schedule, etc. The dairy book records of selected farmers were reviewed on monthly intervals. Four types of age groups of calves (up to 3 months, 3-6 months, 6 to 9 months and 9-12 months) were considered to analyse the differences in calf mortality occurrences and determine the most critical stage where the mortality was higher.

For testing the efficacy of a locally available herbal product against parasites, in addition to recommended chemical treatment, was encouraged among the farming community for de-worming of buffalo calves, by way of its feeding to calves. Thirty-one buffalo calves (22 on small and 9 on large farms) were considered for such treatment with herbal product. Another batch of 31 buffalo calves was selected for providing chemical treatment. As a check, still another batch of 31 buffalo calves was also selected and not provided with any de-worming medicine. The data was analysed by following standard statistical procedures including means, variations, percentages, the tabular analysis.

RESULTS AND DISCUSSION

Buffalo dam and calf intensity: The dairy farms in central Uttar Pradesh are mostly of small size on all types of land holders. Analysis of 775 dairy animal (buffalo) rearing behaviour of 150 farmers reveals that an average dairy farm reared 5.17 buffaloes, 36 per cent of which were in-milk stock. The young stocks up to one year of age were 27.35 per cent of the total and 75.99 per cent of the in-milk stock. An average small holder reared 4.61 buffaloes (out of 6.42 bovines and 7.02 livestock population) on the farm. The large holders on an average

Table 1: Dairy animal and young stock population on an average dairy farm in Central Uttar Pradesh

Particulars	Small holders	Large holders	Overall
Total dairy owners selected	112	38	150
Total livestock on selected farms	786	419	1205
Total livestock on an average farm	7.02	11.03	8.03
Total bovines	6.42	9.21	7.13
Total cattle	1.99	2.37	2.09
Total buffaloes	4.61	6.82	5.17
Total female buffaloes	4.16	5.89	4.60
Total male buffaloes	0.45	0.31	0.76
In-milk buffaloes	1.69	2.37	1.86
in-milk as % of total buffaloes	36.63	34.75	36.00
in-milk as % of milch animals	82.89	66.67	76.86
Dry buffaloes*	0.35	1.18	0.56
Milching buffaloes	2.04	3.55	2.42
Breedable Female buffaloes	2.24	3.84	2.65
Breedable male buffaloes	0.09	0.32	0.15
Youngstock (upto 1 year of age)			
Male	0.29	0.66	0.39
Female	1.03	1.03	1.03
Total	1.32	1.68	1.41
Young stock as % to total buffaloes	28.68	24.71	27.35
Young stock as% of in-milk stock	78.31	71.11	75.99
Other stock including young stock of more than one year of age			
Male	0.06	0.26	0.18
Female	0.89	1.03	0.93
Total	0.96	1.29	1.11

Note: * dry at the time of initiation of study and not to be calved during next 6 months

reared 6.82 buffaloes out of 9.21 bovines and 11.03 livestock population (Table 1). The in-milk stock as percentage of total buffaloes was 36.63 per cent on small holdings and 34.75 per cent on large holdings. About 83 per cent of milch animal animals on small holdings and 67 per cent on large holdings were in-milk stock. The young stocks up to one year of age were 1.32 and 1.68 per farm on small and large holdings, respectively, constituting 28.68 per cent of the total buffaloes and 78.31 per cent of in-milk stock on small holdings, and comparatively less proportion of young stock population under these categories on large holdings. Around 21.47 per cent stock on the farms may be regarded as other stock comprising of non-breedable animals as well as young stock of more than one year of age.

Status of dairy animal health management practices and calf care: The calf health management index on an average farm was worked out as per methodology explained earlier. It was 0.5 highlighting that the status of recommended/desired level of practices for calf health management in central region of Uttar Pradesh was up to 50 per cent of the recommended level. Amongst different aspects/categories of calf health management practices, the status of colostrum feeding at birth was 0.747 followed by deworming and parasite management at 0.611 (Table 2). The indices for other practices were below 0.5. Vaccination to calves and calf starter feeding practices were at the lowest level. The health practices being followed were comparatively better for females than for male calves on small as well as large farms. The level of adoption of all the health practices was better on large farms compared to small farms except one practice of deworming and parasite management.

Nature, extent and determinants of calf mortality: The data of calves born from October 2018 to March 2020 showed that out of total 279 calf births, the proportion of male calves was 32.62 per cent while that of female calves was 67.38 per cent. The calf mortality

Table 3: Calf mortality scenario in an average dairy farm in central Uttar Pradesh

Particulars	Small holders	Large holders	Overall
Calf births			
Total	1.69 (189)	2.37 (90)	1.86 (279)
Males	0.48 (54)	0.97 (37)	0.61(91)
Females	1.21(135)	1.39 (53)	1.25(188)
Mortality % including stillbirths			
Total	25.93	32.22	27.96
Males	46.30	37.84	42.86
Females	17.78	28.30	20.74
Stillbirths % of parturitions			
Total	5.13	4.48	4.93
Males	10.81	7.41	9.38
Females	3.36	2.50	3.14
Extent of aborted cases	**0.06**	**0.08**	**0.07**
Abortion rate % of expected parturitions	3.57	3.23	3.46

Note: The study examines the survival behaviour of 279 births, 91 males and 188 females as indicated in parentheses above. each.

Table 2: Calf health management status on an average dairy farm in central Uttar Pradesh

Management practice	Stmt	wt	Indices based on the satisfactory level of management practices followed								
			Small holders			Large holders			Overall holders		
			M	F	T	M	F	T	M	F	T
Colustrum feeding at birth	27	0.25	0.678	0.717	0.710	0.725	0.853	0.841	0.731	0.754	0.747
Milk feeding after 4 days of birth	10	0.25	0.322	0.311	0.314	0.422	0.546	0.489	0.362	0.374	0.370
Calf starter mixture/quality fodder feeding	9	0.1	0.193	0.440	0.370	0.357	0.375	0.368	0.260	0.422	0.369
De-worming and parasite management	14	0.1	0.577	0.665	0.639	0.550	0.550	0.550	0.566	0.632	0.611
Vaccination and disease management	12	0.1	0.202	0.303	0.274	0.270	0.281	0.277	0.230	0.297	0.275
General hygiene maintenance	20	0.2	0.355	0.453	0.424	0.542	0.611	0.583	0.433	0.499	0.477
Overall index		1	0.418	0.489	0.469	0.513	0.593	0.569	0.466	0.517	0.500

Note: M, F, T, wt and stmt stands for males, females, total, weight given and statements, respectively. Statements/indices for management practices are based on recommended practices as per source: (Kochewad *et al.,* 2013; Kunbhar *et al.,* 2011).

including still births was 42.86 per cent for males and 20.74 per cent for female calves with overall 27.96 per cent on an average dairy farm (Table 3). Male calf mortality was higher on small farms (46.29%) while female calf mortality was found to be comparatively higher on large farms (28.30%). The comparatively lower female calf mortality on small farms may be due to farmers' tendency to increase the herd size on these farms as well as the existence of intermediary arrangements for transferring young stocks for rearing up to 3 to 4 years on 50:50 basis to landless people of schedule tribe caste (Sharma *et al*., 2008; Singh *et al*., 2018). The pattern of stillbirths was same as the overall pattern of calf mortality in respect of male and female calves. Significant difference between the sex based still births was observed and higher extent of stillbirths was observed in male calves (9.37%) compared to female calves (3.14%). On small farms, the extent of calf stillbirths was comparatively higher than that existing on large farms. It was higher for male calves too. On an average farm situation, the still births were to the extent of 4.93 per cent of total parturitions. The variation may be due to the age and body weight of the dam or the birth weight of the calf (Hearnshaw *et al.,*1984). The average abortion rate was to the extent of 3.46 per cent of the total expected parturitions.

Disease/disorder wise analysis (Table 4) revealed that the greatest losses to calves were caused due to pneumonia and other respiratory problems (34.33% cases) followed by digestive/liver related or enteritis (25.37% cases). The

Table 4: Nature, extent and determinants of buffalo calf mortality in an average dairy farm in central Uttar Pradesh

Disease/disorders causing mortality	Age groups (months)				
	0-3	3-6	6-9	9-12	Total (no of cases)
Percent share of disease causing mortality in different age groups					
Pneumonia and Respiratory problems	35.71	40.91	23.08	25	34.33
Digestive & liver related problems	28.57	18.18	30.77	25	25.37
Parasitic problems	14.29	18.18	23.08	25	17.91
General debility	14.29	13.64	7.69	25	13.43
Others	7.14	9.09	15.38	0	8.96
Overall (no of cases)	100 (28)	100 (22)	100 (13)	100 (4)	100 (67)
Per cent share of age group wise calf mortality due to a single disease					
Pneumonia and Respiratory problems	43.48	39.13	13.04	4.35	100.00 (23)
Digestive & liver related problems	47.06	23.53	23.53	5.88	100.00 (17)
Parasitic problems	33.33	33.33	25.00	8.33	100.00 (12)
General debility	44.44	33.33	11.11	11.11	100.00 (9)
Others	33.33	33.33	33.33	0.00	100.00 (6)
Over all	41.79	32.84	19.40	5.97	100.00 (67)
Seasonal impact					
October – March	38.64	31.82	20.45	9.09	100 (44)
April – September	47.83	34.78	17.39	0.00	100 (23)
Sex-wise status					
Males	45.45	33.33	18.18	3.03	100 (33)
Females	38.24	32.35	20.59	8.82	100 (34)
Holding size wise impact					
Small holders	41.46	34.15	17.07	7.32	100 (41)
Large holders	42.31	30.77	23.08	3.85	100 (26)

Note: The age-wise analysis has been presented for the overall average dairy farm situation only.

other important factors leading to calf mortality were found to be parasitic problems (17.91% cases) followed by general debility and other factors like poisonous plants/ accidents etc. amongst different age-groups, the losses due to respiratory and digestive system diseases were higher on 0-3 age groups and it decreased with the increase in the age of the calf. Calf age wise analysis reveals that around 41.79% calf deaths were up to 3 months of age and 32.84 per cent in 3 to 6 months of age group.

The season has also been considered as an important risk factor (Bebe *et al.,* 2001). Two seasons, i.e., winter season (October-March) and summer season (April-September) were considered and observations were made accordingly. During summer months, the mortality was found to be comparatively higher for calves up to 6 months of age. However, during winter months, the calf mortality was higher and for calves beyond 6 months of age when milk feeding is reduced or stopped altogether. Calf-sex wise analysis revealed that the extent of mortality (78.78%) was higher for male calves compared to 70.59 per cent for female calves upto 6 months of age. There was found to be no significant difference or no systematic trend of age related calf mortality with respect to holding size. However, the per farm male and female calf mortality was higher on large farms compared to small farms

Calf mortality management: As highlighted in Table 2, the calf health management status on dairy farms is not very encouraging. The status of general hygiene, disease management as well as calf starter use and the milk feeding was very poor. However, the status of de-worming and parasite management was comparatively better (at 61% level). Some farmers were found to use some innovative management practices for worm management which provided significant results for worm control and management. A locally available herbal product being used by a few farms was encouraged and promoted by KVK, Lucknow among the farming community for de-worming of buffalo calves, by way of its feeding to calves. The innovative herbal treatment consisted of a sweetener fortified with extract of two plant herbs, viz C*onvolvulus arvensis* (Hirakhuri) and *Achyranthesaspera* (Latzera) in the ratio of 2:1. This herbal mixture was provided @ 125 gms per dose to each calf per day. The effect of herbal treatment was observed with respect to 3 aspects: reduction in calf mortality, occurrence of other diseases and the general health status of the calf. The treatment managed calf mortality more efficiently even than by the chemical treatment. Under chemical treatment, anthelmintic (fenbendazole and piparazine citrate) were used for group II calves. Group III calves were not dewormed and no treatment was given to them for ascariasis and gastro intestinal nematodes during the period under observance. The calf mortality was observed to be 31.82, 18.18 and 9.09 per cent under herbal treatment, chemical treatment, and no treatment, respectively. The mortality rate under herbal treatment was comparatively lower on small farms compared to large farms. However, the mortality rate of male calves was still higher under herbal treatment too, it was quite less compared to that under chemical treatment.

The occurrence of other diseases/ailments in the calves under herbal treatment was 6.45 per cent (Table 5). It was higher on male calves at 12.50 per cent compared to female calves at 4.35 per cent. Under chemical treatment, the extent of other diseases reported was 16.13 per cent, its extent was comparatively higher on large farms. It was of higher extent on small holders compared to large holders. This was in sharp contrast to effect of herbal treatment since its occurrence was comparatively higher on small farms. The extent of weak status of calves was also found to be comparatively lower under herbal treatment. For male calves, the weak status was observed in 25 per cent calves under herbal treatment, 37.50 per cent under chemical treatment and 50 per cent under no medication situations. For female calves, it was 39.13 per cent under no medication, 17.39 per cent under chemical treatment and nil under herbal treatment. When no treatment was given, the extent of mortality was 35.48 per cent and the extent of other diseases reported and the calf weak status observed was 32.26 per cent and 41.94 per cent, respectively. It was higher for males compared to females under all three aspects. The mortality rate in male calves was up to 60 per cent on small farms (Table 5).

It was found that the chemical treatment was more popular on small farms compared to their large counterparts. The large farms could do better herbal treatment. The herbal management treatment for managing calf mortality was thus quite economical as it was developed from locally available sources. Farmers' perceptions were quite positive as 68 per cent of user farmers agreed with the effectiveness of use and the ease in preparing the herbal product.

Table 5: Performance of herbal vis-a-vis chemical treatment for de-worming of buffalo calves

Deworming treatment	Small holders			Large holders			Overall		
	Mortality (%)	Occurance of other diseases reported (%)	Weak status at 9 months (%)	Mortality (%)	Occurance of other diseases reported (%)	Weak status at 9 months (%)	Mortality (%)	Occurance of other diseases reported (%)	Weak status at 9 months (%)
Herbal treatment									
Total	9.09	9.09	4.55	11.11	0.00	11.11	9.68	6.45	6.45
Males	20.00	20.00	20.00	0.00	0.00	33.33	12.50	12.50	25.00
Females	5.88	5.88	0.00	16.67	0.00	0.00	8.70	4.35	0.00
Chemical treatment									
Total	18.18	18.18	22.73	11.11	11.11	22.22	16.13	16.13	22.58
Males	40.00	20.00	40.00	0.00	0.00	33.33	25.00	12.50	37.50
Females	11.76	17.65	17.65	16.67	16.67	16.67	13.04	17.39	17.39
No medicine/treatment									
Total	31.82	31.82	36.36	44.44	33.33	55.56	35.48	32.26	41.94
Males	60.00	40.00	40.00	66.67	33.33	66.67	62.50	37.50	50.00
Females	23.53	29.41	35.29	33.33	33.33	50.00	26.09	30.43	39.13

Note: The data in the table is based on the observations on a group of 31 calves under each treatment/group. On small holdings, 22 calves (5 males and 17 female calves) and on large holdings, 9 calves (3 males and 6 female calves) were selected for detailed observation under each treatment.

CONCLUSION

The study highlights that the young stock population up to one year of age in an average dairy farm is 27.35 per cent of the total buffalo population (stock) and 75.99 per cent of the in-milk stock. The calf mortality including still births was 27.96 per cent on an average dairy farm. It was higher amongst male calves compared to female calves. The overall calf mortality was also higher on large farms compared to small farms. In contrast, the male calf mortality was higher on small farms. The calf health management index was of average level, at 50 per cent of the recommended/optimal level. It was of poor status in comparison to that existing on large farms. Intensive health care and management for young male buffalo calves in the age group of 0-3 months is required to minimize mortality due to respiratory and digestive problems. Suitable training programmes for the farmers need to be executed in this regard at the extension agency level. The control of calf mortality is one of the most important factors for increasing profits from dairy farming. As the locally available herbal treatment promoted by KVK extension agency was found quite effective in controlling calf mortality, such local products/formulations need to be well documented and promoted by the concerned extension agency. These products need to be made an integral part of an effective health care and production management programme to reduce the extent of calf mortality significantly. The locally available herbal product be exploited for commercial use by getting into an agreement with the industry, farmers and the extension agency. The extension agencies need to be encouraged to run targeted extension programmes to educate the farmers in better controlling the calf mortality. The producers need to be educated and oriented to implement good calf health management practices to reduce the losses from diseases. The extension needs in managing calf mortality need to be revisited, and an effective herd-health and production management program including vaccination, proper hygiene programmes and nutrition management need to be developed with the active involvement of local extension agency.

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Contract Farming: Status and Effect on Socio-economic, Psychological and Social Characteristics of Farmers in Assam

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ABSTRACT

Globalization and commercialization has brought a better opportunity for farmers in rural areas in improving their livelihood by enhancing their economic growth. Contract farming is a system where supply of agricultural/horticultural/ livestock products under forward contracts between producers/ suppliers and buyers. It is a form of vertical integration within agricultural commodity chains so that the firm has greater control over the production process and final product. Contract farming has now become a dominant and growing mode of raw material production and procurement through a co-ordination between the processors, market and the exporters. The paper describes that various models of contract farming existed but in informal way. The paper focuses on the status of contract farming and its impact on farmers' socio-economic, psychological and social characteristics. The most prominent model of contract farming exist is intermediary model which account for 36.34 per cent of the respondents. Maximum of the enterprises involved in contract farming is poultry which account for 32 per cent of the respondents and very least is piggery which holds only 3 per cent of the respondents. Around 63.67 per cent of the respondents were in contract with private firm or company for the procurement of their product. The paper also examined that there is a significant association between the characteristic of the respondents like age, annual income, extension contact, information source utilization, economic motivation and scientific orientation with the practice of contract farming. Various researchers has observed that farmers and sponsors were highly benefited by involved in contract farming.

Keywords: Association, Contract farming, Enterprise, Impact, Models of contract farming, Psychology, Social, Socio-economic, Sponsors

INTRODUCTION

Farming is an age-old means of livelihood for millions of people in India. However, there have been few systems/ models in which farmers are assured of a market for their products. Farmers had to throw their produce away for want of buyers. This is one side of the coin. On the other side, is the Agri-based and food industry, which requires timely and adequate inputs of good quality agricultural products. An important concern in Indian agriculture is that while "front end" activities including wholesaling, processing, logistics, and retailing are rapidly expanding and consolidating, the "back end" activities of production agriculture have been continuously fragmenting (Gulati, 2008). The challenges lie in linking the two ends and ensuring viable business opportunities for both farmers and agri-businesses. This underlying paradox of the Indian agricultural scenario has given birth to the concept of Contract Farming, which provides a proper linkage between the farm and market. Contract farming also refers to the production and supply of agricultural produce under advance contracts, the essence of such contracts being a commitment to provide an agricultural commodity of a type, at a time and a price, and in the quantity required by a known buyer. It basically involves four things: pre-agreed price, quality, quantity or acreage (minimum/ maximum) and time. The contract could be of three types; (i) procurement contracts under which only sales and purchased conditions are specified; (ii) partial contracts wherein only some of the inputs are supplied by the contracting firm and produce is brought at pre-agreed price; and (iii) total contracts under which the contracting firm supplies and manage all the inputs and the farmer become just a supplier of land and labour. The relevance

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and importance of each type varies across products and over time, and these are not mutually exclusive (Key and Runsten, 1999). It has been found by many studies in India that most of the contracting firms work mostly with large and medium farmers (Bhalla and Singh, 1996; Singh 2002; Kumar, 2006; Khairnar and Yeleti, 2005; Singh, 2008) with the exception of firms in Karnataka, Tamil Nadu, and Andhra Pradesh which worked with small and marginal farmers due the nature of the crop/produce (cucumber/ gherkin, and broiler chicken). There are also many advantages of working with contract farmers like easy availability of family labour, better commitment levels, helping spread risk of default, giving corporate agency a social face, and lower cost of production due to lower mechanisation of smaller farms (Boselie *et al.,* 2003). Singh (2002), in his study on contract farming in Punjab observed that farmers practicing contract arming get more reliable income, improved market access, generated additional employment and provided new technologies and credit. Miyata *et al.* (2009) also found significant impact on family household labours, age, education, farm size and other characteristics in Shandong Province of China. Maratha *et al.* (2018) in their study of analysis on marketing behaviour of vegetable grower in Madhya Pradesh emphasis on linking agribusiness, large retailers and farmers through contract farming and group marketing. Sinha *et al.* (2018) in their study of socio-economic impact of baby corn cultivation in Haryana examine adoption of contract farming by farmers all over India for cultivation of baby corn on behalf of companies. Birthal *et al.* (2005) in his study found that gross margins for contract dairy farmers in India were almost double than those of independent dairy farmers which is mainly due to contract growers had lower production and marketing costs. They also found that vegetable contract farmers received prices that were eight per cent higher than those received by non-contract growers. Simmons *et al.* (2005) investigated the impact of contract farming in poultry, maize seed, and rice seed in Indonesia and found that contracts positively affect the welfare and reduced poverty. Ramaswami *et al.* (2006) has analyzed the benefits of contract farming in case of poultry production in the state of Andhra Pradesh. He observed that production under contract farming is more efficient than non-contract production. The reason behind this may be due to selection of farmers who have pre owned experience on poultry farming, skills, credit accessibility etc.

MATERIALS AND METHODS

The study was conducted in six districts of Assam from different Agro-climatic zones *viz* Tinsukia and Jorhat district (Upper Brahmaputra valley zone), Darrang district (North Bank plain zonse), Kamrup (Rural) and Dhubri (Lower Brahmaputra valley zone), Karbi-Anglong (Hills region). From each district, two villages were selected in consultation with Govt. officials or other NGO's and sponsors. A total of 50 respondents were selected from each district randomly (25 respondents from each village) *i.e.,* a total of 300 respondents, for collection of data who involved in any model of contract farming in the past or are practicing contract farming to some extent. Status was identified using simple frequency and percentage methods. Impact study was analysed by using statistical technique "paired t-test" which is mainly used to identify change in the behaviour, financial and social aspect of the farmers. The same methodology has been used by Geetha (2020) on impact of cluster promotion programme on socio-economic aspects on women sericulture farmers in Karnataka. The paper also examines the association between the personal, socio-economic and psychological characteristics of the respondents and practicing contract framing using statistical tools "*Chi-Square*" test. The data were collected using pre tested questionnaire.

RESULT AND DISCUSSION

It was observed from Table 1 and Table 2 that most of the respondents follow intermediary model (36.34%) followed by centralized model (35.67%) and informal model (16.66%). Only few per cent (11.33%) of respondents follow other *i.e.,* direct sale to specific individual. Intermediary model mainly found in the procurement of tea (7.00%), poultry (25.33%) and ginger cultivation (4.00%). Centralized model is mainly found in poultry (6.67%), potato (12.33%) and paddy (16.67%). Here, a large number of farmers were associated with a single firm where the firm provides the inputs like poultry chick, feeds and vaccines and finally procure the whole birds in bulk. It was also observed that 21 per cent of the poultry farmers were engaged with private firm and only 4.33 per cent of the poultry farmers were engaged with a particular individual. Informal model is mainly found in vegetables (8.33%) and jute (8.33%) where procurement is done on seasonal basis. Only few farmers engaged in other models i.e. vegetables (8.33%) and piggery (3.00%).

Table 1: Types of contract farming

Type	Enterprises	Frequency	Percentage	Stake holders
Centralized model	Poultry	20	6.67	Private firm
	Potato	37	12.33	Private firm
	Paddy	50	16.67	Private firm
Informal model	Vegetables	25	8.33	Individual
	Jute	25	8.33	Cooperative
Intermediary model	Tea	21	7.00	Private firm
	Poultry	63	21.00	Private firm
	Poultry	13	4.33	Individual
	Ginger	12	4.00	Individual
Others	Piggery	9	3.00	Individual
	Vegetables	25	8.33	Individual
Total		**300**		

Table 2: Distribution of respondents according to their contract farming model

Model of CF	Frequency	Percentage
Centralized model	107	35.67
Informal model	50	16.66
Intermediary model	109	36.34
Others	34	11.33

Table 3 describes the frequency of enterprises involved in contract farming. It was observed that 32 per cent of the respondents involved in poultry farming followed by paddy (16.67%), potato (12.33%), vegetables (16.67%), jute (8.33%), tea (7.00%), ginger (4.00%) and piggery (3.00). It is mainly due to profitability and consistency of poultry farm. Both paddy and potato farmers have contract with the sponsors for seed production. Vegetables were procured by the individuals for local market at seasonal basis.

Table 4 shows the frequency of respondents with whom they engaged in contract. It was observed that 63.67 per cent of farmers have contract with private small firms or company followed by individual (28.00%) and cooperative (8.33%). It is mainly due to the involvement of small private companies in contract farming. Individuals which are mainly involved as intermediary in the marketing channel with an informal verbal communication of agreement with the farmers.

Table 5 represents classification of respondents according to models of contract farming followed. It was observed that 90 per cent of the respondents following contract farming are marginal farmers followed by small farmers (9.33%) and medium farmers (0.66%). It is mainly due to less acquisition of landholdings of the farmers with less than one hectare (ha). Among marginal farmers, 32 per cent of respondents follow centralized model, 14.67 per cent followed informal model 32.67 per cent followed intermediary model and 10.66 followed other model of contract farming. 3.33 per cent each of small farmers followed centralized and intermediary model and very few

Table 3: Distribution of respondents according to enterprises of contract farming

Model of CF	Frequency	Percentage
Poultry	96	32.00
Paddy	50	16.67
Potato	37	12.33
Vegetables	50	16.67
Jute	25	8.33
Tea	21	7.00
Ginger	12	4.00
Piggery	9	3.00

Table 4: Distribution of respondents according to sponsors of contract farming

Model of CF	Frequency	Percentage
Private firm/Company	191	63.67
Individual	84	28.00
Cooperative	25	8.33

Table 5: Classification of respondents according to type of contract farming

Type	Marginal farmers	Small farmers	Medium farmers	Big farmers
Centralized model	96(32.00)	10(3.33)	1(0.33)	0(0.00)
Informal model	44(14.67)	6(2.00)	0(0.00)	0(0.00)
Intermediary model	98(32.67)	10(3.33)	1(0.33)	0(0.00)
Others	32(10.66)	2(0.66)	0(0.00)	0(0.00)
Total	**270(90.00)**	**28(9.33)**	**2(0.66)**	**0(0.00)**

respondents i.e., 2.00 per cent and 0.66 per cent followed informal and other respectively. Very few member of medium farmers i.e., 0.33 per cent followed centralized and intermediary model each. It was also observed that no respondents belong to big farmers practicing contract farming.

It was observed from Table 6 that there is a positive impact on psychological behaviour like motivation level, attitude of farmers, scientific orientation, risk taking ability and decision making ability of the respondents. Average mean of motivational level, attitude, scientific orientation, risk taking ability and decision making ability has been increased from 1.17 to 2.44, 1.25 to 2.45, 1.27 to 2.31, 1.22 to 2.48 and 1.32 to 2.50 respectively. Psychological classification of farmers before and after adopting contract farming model had been mentioned in Table 7. It also depicts that there is a positive impact on socio-economic factor like land holdings, area under contract farming and expenditure of the respondents. Average mean of land holdings, area under contract farming and expenditure has been increased from 4.36 to 4.81, 0 to 1.79 and Rs. 5085.67 to Rs 5636.00 respectively. It is mainly due to improvement in farm income of the farmers which increase the expenditure of the family. There is slight increase in the land holding of the farmers. It was also observed from Table 6 that there is a positive impact on social factors like contact with sponsors, animal husbandry officer, input dealers, participation in training programme, visit to exhibition, *krishi* mela, education tour and mass media participation of the respondents. Average mean of sponsors, animal husbandry officer, input dealers, training programme, exhibition, *krishi* mela, education tour and mass media participation has been increased from 1.00 to 2.45, 1.24 to 1.35, 1.26 to 1.52, 1.00 to 1.63, 1.22 to 1.58, 1.51 to 1.94, 1.00 to 1.31 and 1.67 to 2.00 respectively. It is mainly due to increase in motivation level of the farmers to encourage more and more on contract farming. Social impact of farmers before and after adopting the contract farming model had been mentioned in Table 7.

Table 6: Social, psychological and economic impact of Contract farming on farmers

	Average Mean		
	Before CF	**After CF**	**t-test**
Psychological Factor			
Motivational level	1.17	2.44	36.39*
Attitude of farmers	1.25	2.45	32.30*
Scientific orientation	1.27	2.31	30.32*
Risk taking ability	1.22	2.48	35.10*
Decision making ability	1.32	2.50	31.97*
Socio-economic factor			
Land holdings	4.36	4.81	6.46*
Area under Contract farming	0	1.79	24.36*
Expenditure	5085.67	5636	17.22*
Social factor			
Contract farming sponsors	1.00	2.45	50.31*
ADH/AHO	1.24	1.35	5.97*
Input dealers	1.26	1.52	10.25*
Training	1.00	1.63	22.40*
Exhibition	1.22	1.58	13.06*
Krishi mela	1.51	1.94	12.02*
Education tour	1.00	1.31	11.5*
Mass media participation	1.67	2.00	12.04*

*5 % level of significance (Critical value: 1.96)

It was observed from Table 7 that there was a significant impact of psychological and social factors on farmers. The psychological impact includes motivational level, attitude of farmers, scientific orientation, risk taking ability and decision making ability. Before practicing contract farming, around 80 per cent of the respondents had low level of motivational level. This was increased to around 40.67 per cent medium and 51.67 per cent high motivational level. Similarly, attitude of the farmers before was 75.33 per cent which was increased to 48 per cent

Table 7: Frequency distribution of social and psychological impact of farmers on Contract farming

	Before Contract farming			After Contract farming		
	Low	**Medium**	**High**	**Low**	**Medium**	**High**
Psychological Factor						
Motivational level	248(82.67)	52(17.33)	0(0.00)	23(7.67)	122(40.67)	155(51.67)
Attitude of farmers	226(75.33)	74(24.67)	0(0.00)	10(3.33)	144(48.00)	146(48.67)
Scientific orientation	230(76.67)	60(20.00)	10(3.33)	30(10.00)	148(49.33)	122(40.67)
Risk taking ability	235(78.33)	60(20.00)	10(3.33)	30(10.00)	148(49.33)	122(40.67)
Decision making ability	205(68.33)	95(31.67)	0(0.00)	14(4.67)	123(41.00)	163(54.33)
Social factor	**Regular**	**Occasional**	**Never**	**Regular**	**Occasional**	**Never**
Contract farming sponsors	0(0.00)	0(0.00)	300(100.00)	134(44.67)	166(55.33)	0(0.00)
ADH/AHO	0(0.00)	73(24.33)	227(75.67)	0(0.00)	105(35.00)	195(65.00)
Input dealers	0(0.00)	77(25.67)	223(74.33)	0(0.00)	155(51.67)	145(48.33)
Training	0(0.00)	0(0.00)	300(100.00)	0(0.00)	188(62.67)	112(37.33)
Exhibition	0(0.00)	63(21.00)	237(79.00)	0(0.00)	172(57.33)	128(42.67)
Krishi mela	0(0.00)	154(51.33)	146(48.67)	0(0.00)	281(93.67)	19(6.33)
Education tour	0(0.00)	0(0.00)	300(100.00)	0(0.00)	92(30.67)	208(69.33)
Mass media participation	0(0.00)	202(67.33)	98(32.67)	0(0.00)	300(100.00)	0(0.00)

medium and 48.67 per cent high. Scientific orientation of the farmers has increased from 76.67 per cent low to 90 per cent medium to high. Likewise risk taking ability of the farmers has been increased from 78.33 per cent low to 90 per cent medium to high. And decision making ability of the farmers has been increased from 68.33 per cent low to approximately 95 per cent medium to high level. This significant impact is due to higher financial benefit of the farmers which motivate them to practice more and more on contract farming.

It was observed from Table 8 that age of the respondents have significantly associated with the adoption behaviour of farmers on contract farming. It is because, most of the respondents are young to middle age group who were more dynamic, enthusiastic and curious enough to adopt and practice contract farming. But there is no significant association between education and adoption behaviour of respondents on contract farming as education was not a barrier for verbal communication which was a main method of communication in contract farming. Further, extension activities on contract farming are carried out by private firm which may not require formal education to develop favourable or unfavourable attitude towards contract farming. Similar kind of findings were also reported by Talukdar and Sontaki (2005) and Goswami *et al.* (2010). It was also found that operational land holding of the respondents did not have any significant relationship with the adoption behaviour of respondents on contract farming. Land is the basic requirement of the farming and if the farmers have good land holding he can take risk to adopt new farming techniques. But in case of contract farming this theory does not have significant

Table 8: Association between the personal, socio-economic and psychological characteristics of the farmers and practicing of contract farming

Variables	**Chi-square value**	**P-value**
Age	1.141	0.000*
Education	1.420	0.156NS
Operational Land holdings	4.412	0.914NS
Means of livelihood	50.161	0.181NS
Income	1.087	0.000*
Income from Contract farming	8.663	0.000*
Extension contact	2.709	0.000*
Information source utilization	3.918	0.000*
Economic motivation	2.380	0.090*
Scientific orientation	2.210	0.004 *
Risk orientation	1.739	0.777NS
Decision making ability	1.943	NS

*Significance at 5 % level; NS: Not significant

impact as farmers with less area can adopt contract farming by adopting firm like poultry, piggery and other livestock firm which does not require huge land holding of the farmers. This finding does not go in line with the findings of Goswami *et al.,* (2010). It was found that livelihood of the respondents do not have any significant association with the adoption behaviour of respondents on contract farming. Most of the respondents take farming as the secondary source of income and mainly engaged in business, private job, *kirana* shops, teachers etc. So livelihood does not have any effect on the adoption of contract farming. Annual income was found to have a significant association with the adoption behaviour of farmers on contract farming. Income from contract farming gives additional income to the farmers with respect to the primary income. Extension contact of the respondents was positively and significantly associated with the adoption behaviour of the respondents on contract farming. It indicates that, more is the extension contact more was the adoption behaviour. This may be due to the fact that more contacts with the extension personnel helped them in acquiring more information as well as material support, developing confidence in them and thereby increasing the credibility of the farming. The result of this study is supported by Tiwari *et al.* (2007). Information source utilisation was found to possess a positive and significant association with the adoption behaviour of the respondents on contract farming. This reveals that more is the information source utilisation by the respondents, the better is the adoption behaviour. It may be due to the fact that more a farmer uses different sources to access information on farming, the more he becomes aware, gathers knowledge, develops proper perception on the technologies, etc. and all these effects his adoption behaviour in a positive manner. This finding goes in line with the findings of Tiwari *et al.* (2007) and Manjula *et al.* (2007). Economic motivation of the respondents has significant association with the adoption behaviour of the respondents. All the farmers want to get more profit out of his holdings and contract farming gave them an assured income and market for the produce grown by the farmers, which was sometimes better than traditional crop. This made the farmers to develop favourable attitude towards contract farming. This findings were reported by Talukdar and Sontaki (2005) and Singha and Baruah (2011). Scientific orientation was found to have a positive and significant association with the adoption behaviour of the respondents. This indicates that the more the scientific orientation, the better is the adoption behaviour. This may be because, scientific orientation leads to increase in innovation proneness of a farmer, he readily accepts modern ways of farming, leaving the traditional ways, experiments with new ideas in farming and develops positive attitude towards contract farming. This made them to adopt the technology which was scientific and giving higher profit to the farmer. That was possible through contract farming. Similar kind of findings were also reported by Talukdar and Sontaki (2005) and Tiwari *et al.* (2007). It was found that the risk preference of the respondents did not have any significant association with the adoption behaviour. Most of the input resources were provided by the sponsors. More over any lose in the final product are borne by the sponsors. This reduces the risk of farmers on contract farming. Similar kind of finding was reported by Talukdar and Sontaki (2005). Decision making was found to have no association with the adoption behaviour. It is because all farm decisions on contract farming were taken by the sponsors and farmers have very small role in decision making process.

CONCLUSION

The study identified various models of contract farming in the region like centralized model in poultry, paddy and potato; informal model in vegetables and jute; intermediary model in tea, poultry and ginger and other model includes enterprises like piggery and vegetables. Most of the respondents practice poultry as contract farming followed by paddy (seed production), potato (seed production), vegetables, jute, tea, ginger and piggery. The study also identified the sponsors involved in contract farming where private firm occupy the maximum share followed by individual and cooperatives. Most of the respondents involved in contract farming are marginal farmers holding land area of less than one hectare followed by small and medium farmers. Involvement of contract farming improves the psychological behavior like motivational level, risk taking ability, attitude decision making ability and scientific orientation of the farmers. It also improves the expenditure ability of the respondents. Most importantly, contact farming has improved the social contact of the farmers. Respondents were in regularly contact with the sponsors and input dealers, engaged in technical training, exhibition, *krishi-mela* etc. It was also found that there is an association between age, annual income, extension contact, information source utilization, economic motivation and scientific orientation with the adoption of contract farming

model. So contract farming can play an important role in improving the social and economic condition by approaching a sustainable development and also improve the psychological behavior of farmers as well as sponsors.

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ICT Integration in Agriculture Education: A Perspective of College Principals

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ABSTRACT

Leadership plays a key role in ICT integration in education. Many teacher or student initiated ICT projects have failed to sustain owing to lack of support from leaders. For ICT integration programs to be effective and sustainable, administrators themselves must be competent in the use of the technology, and they must have a broad understanding of the technical, curricular, administrative, financial, and social dimensions of ICT use in education. The study involved the use of individual one to one semi structured interviews with a selection of 5 agricultural colleges' principals in the north east region. Following analysis of the interview data, a focus group interview with five principals was conducted to validate and explore the issues that emerged from the one to one interviews. Principals had welcomed the National ICT in agricultural colleges' initiative of ICAR however, they indicated that it had significantly added to their responsibilities. While the lack of up to date resources, poor levels of technical support and time were identified as the main impediments, a lack of familiarity of ways in which the technology could be integrated across the curriculum affected the quality of pedagogical leadership provided by them.

Keywords: Information and Communication Technology (ICT), Technology integration, Student administration, Technology leaders, Organizational change

INTRODUCTION

There are opposing views to the impact ICT has on the acquisition of learning by students. On one hand, ICT has been viewed as a tool for promoting quality learning. This is supported by studies from several parts of the globe such as Kundu (2021); Navani and Ansari (2020); Al-Samarraie (2019); Pandey *et al.* (2019); Serrano *et al.* (2019); Rakshit and Sharma (2019); Jääskelä *et al.* (2017); Sheikh (2017) and Murphy (2006). Despite the various arguments about ICT, there is no doubt that technology is invading all life aspects including education. Whether we opt for using it in formal education or not, it is evident that students are using it extensively throughout the day where they learn informally (Ghamrawi, 2011). The purpose of integrating ICT is "to improve and increase the quality, accessibility and cost-efficiency of the delivery of education, while taking advantage of the benefits of networking learning communities together to equip them to face the challenges of global competition". The term "ICT integration" connotes a range of learning environments from a stand-alone computer in a classroom to a situation where the teaching is done by the computer through pre-packaged "teacher-proof courseware" (Laferrière *et al.,* 1999).

A longitudinal study conducted by the British Educational Communications and Technology Agency concluded that the essential factor for effective ICT integration was school readiness, which, in turn, was described as comprising of resourcing, school leadership and general teaching. Leadership has been regarded as a critical component in the successful integration of ICT in Education (Van Wart *et al.,* 2017; McGarr and Kearney, 2009; Kirkland and Sutch, 2009). The importance of leadership in managing ICT integration has been revealed in many researches. In order to be effective, leaders have to deploy three comprehensive categories of leadership practices: setting direction, developing people and making the organization work (Leithwood and Jantzi, 2005). Another main factor which exercises great influence on

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the ability of leaders to influence ICT integration is policy and good practice. The position of school principals can create the conditions to develop a shared ICT policy. Fullan (2005) makes clear that for any initiative to become embedded in an educational institution, distributed leadership and shared responsibility is required. Research also supports the suggestion that distributed leadership throughout an educational institution or system enables successful ICT integration (Hayes, 2007). Leadership can take the form of pioneer teachers, everyone in the school, senior management (Lawson and Comber, 1999) mentors or supervisory teachers, ICT coordinators (Wong *et al.,* 2008), Principals (Schiller, 2002), and even network administrators (Hayes, 2007). At this point, it is important to shed light on the role played by school leadership in creating the culture and setting the vision conducive to the appropriate integration of ICT in education. The present study was conducted to understand the e-readiness of educational leaders, e-intensity in their institutions, e-impact and impeding factors of ICT integration in higher learning institutions of agricultural sciences in north eastern hill states in India.

MATERIALS AND METHODS

The present study was conducted during 2016-17. From six North-Eastern Hill States, one college each from Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Sikkim and two colleges from Tripura were selected for this study. The research entails both quantitative and qualitative approaches which includes interviews and surveys. Potential factors were derived through review of the literature and reviewed by teachers, ICT coordinators and researchers thereafter, responses were measured using 5 point Likert Scales (1-strongly disagree, 2-rather disagree, 3-neutral, 4-rather agree, and 5-strongly agree). Further, extent of improvement in learning and attainment among students and teachers adopting ICT was measured using 10 point rating scale viz. 1-10%, 2-20%, 3-30%.....9-90%. Out of six principals only five responded and actively participated in the survey. Data were analyzed using standard statistical tools *viz.,* frequency, percentage and mean.

RESULTS AND DISCUSSION

It is clear from the Table 1 that resources/ services e.g., use of digital report card, on line admission, biometrics for students and online payment of fee services based on ICT were unavailable by any colleges under the study. However, video-conferencing facility, student information system, biometrics for staff were found only in two (2) colleges. Further, it is noticed that every institute's website was updated on daily, weekly, fortnightly and monthly basis. The colleges have the facility of video conferencing which was used occasionally. All the colleges have computerized student's information system. Students and staff communication through email was also observed in all the colleges. Further, two (2) colleges had availability for biometrics for staff and one (1) college had provision to use email id domain as well.

Usage of ICT: Information administration was identified as one of the important functional area in higher education institutions. It is often mentioned in various studies as managerial. Usage of appropriate information technologies could improve the overall environment and

Table 1: Usage of ICT resources/services by the administrators/institution

ICT resources/services	*C1	C2	C3	C4	C5
Use of digital report card	X	X	X	X	X
Whether video-conference facility is available	X	√	√	X	X
Availability of online admission	X	X	X	X	X
Availability of student's information system	√	√	√	√	√
Use of Biometrics for staff	X	√	√	X	X
Use of Biometrics for students	X	X	X	X	X
On line payment of fees	X	X	X	X	X
Students and staff communication through email	√	√	√	√	√
	Daily	**Weekly**	**Fortnightly**	**Monthly**	**Occasionally**
Institute's website updation	X	√	√	√	√
Usage of video conference facility	X	X	X	X	√

*College

operational efficiency of higher education institution and it helps to improve the following functional areas and not limited to inventory control, allocation of resources, fiscal management, communications, pupil/personnel services, student records, employee productivity etc. (Roblyer *et al.*, 2005). In general, a good communication system should also be in place for the overall effectiveness of administration. ICT helps in providing a good communication system in higher education system (Magni, 2009). The usage of ICT by the college head in information administration is presented in Figure 1.

The Figure 1 clearly depicts that equal per cent (80%) of the administrators used ICT for communicating online (email, website announcements, etc.) with teachers and with educational authorities (at local, regional, or central level) respectively. Further, it could be seen that equal per cent (60%) of the administrators used ICT for institute management related tasks (budgeting, planning, time tabling etc.) and communicating online (email, website announcements, etc.) with parents respectively.

Extent of improvement: According to Zainally (2008), "Information and Communication technology provides several facilities and possibilities for educational administrators to do their tasks". There is a mention that communication and information systems have changed the very nature of higher education, allowing information to be transferred, stored, retrieved and processed by almost all who work, study or interact with a given institution. Improvement using ICT in their respective institutions as perceived by the principals are presented in Figure 2.

From Figure 2 it could be seen that the highest improvement (92%) took place in transparency and accountability in management of institution followed by academic development of the staff and students (84%) *viz.* high rated articles, information about awards, projects and overseas visits etc. by using ICT tools as rated by the administrators. Significant improvement was also observed in case of governance (78%), employability of students (72%) and in manpower productivity (70%) after using ICT as perceived the principals.

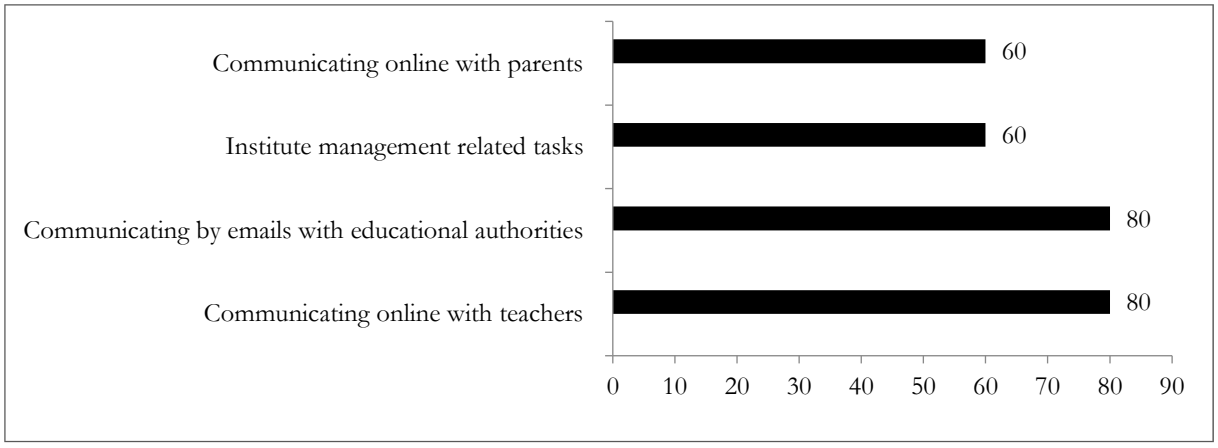


Figure 1: Usage of ICT resources/services by the administrators

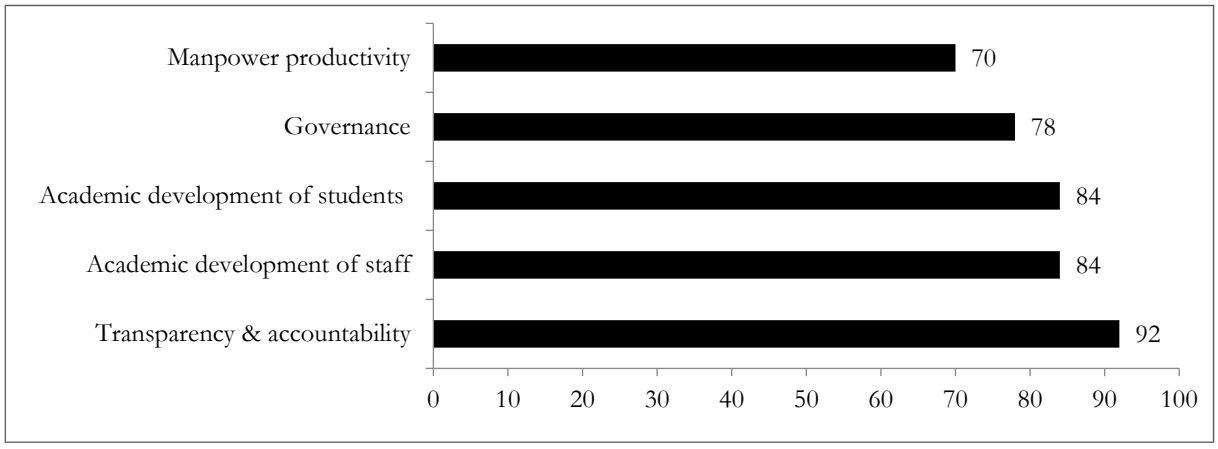
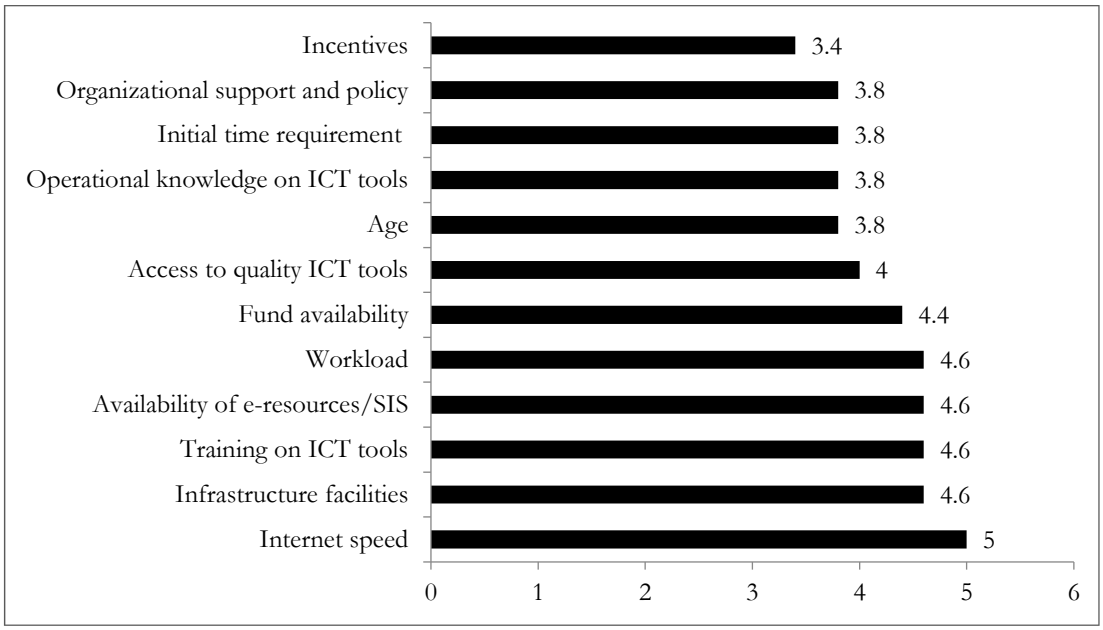


Figure 2: Extent of improvement after using ICT tools

Figure 3: Distribution of factors influencing the adoption of ICT



Factors influencing ICT integration: Inspite of knowing the benefits of ICTs in education, Principals are not able to integrate ICT in their institutions to the desired extent. The factors that influence the integration of ICTs are vital to understand the constraints and provide a convenient and favourable atmosphere for enhanced participation and improvement. From the Figure 3 it was observed that slow internet speed hitting ICT use in a big way specifically download and upload the educational contents. This was followed by poor ICT infrastructure at the institutions, training on ICT tools, availability of e-resources and workload reported as critical factors that hindered ICT integration in agriculture education. Limited fund availability with the institutions was another impeding factor for ICT integration. Principals indicated initial time requirement, age, operational knowledge of ICT and organizational support/policy as deterring factors in influencing adoption of ICT.

In fact the NEH region suffers from highly unstable tele-connectivity offered by the only optical fiber link, passing through Chicken's Neck (the Siliguri Corridor), to Kolkata. According to the Akamai Q1, 2017 State of the Internet Report, the average internet connection speed in India is 6.5 Mbps and the average peak connection speed is 41.4 Mbps. Globally, India was ranked 89th out of 149 countries/regions by average internet connection speed and 97th by average peak connection speed. A total of 42 per cent of internet users in India have an average internet connection speed of above 4 Mbps, 19 per cent have a speed of over 10 Mbps, and 10 per cent enjoy speeds over 15 Mbps. The average internet connection speed on mobile networks in India was 4.9 Mbps. Another concern for spread and development of ICT tools in the country is a steady telecommunication network in the country. However, there are a number of other site-specific reasons, beside the over-arching national lacuna that impedes optimization of ICT resources in Indian classrooms. As far as ICT resources are concerned, it is not always non-availability of hardware or software or proper e-content; it may also be poor organization of resources, sub-standard quality of hardware, inappropriate software or insufficient time and curricular scope to incorporate ICT in the knowledge-dissemination framework.

CONCLUSION

This study has identified a comprehensive set of functional areas of information administration in the agricultural colleges. Current level of usage indicates a clear integration of ICT for managerial or information-based administration in higher education institutions. Enhancing the usage of ICT on these functional areas and especially for general administration will improve administrative efficiency in agricultural colleges in north east India. This study could serve as a base for education planners to deploy technology led administration in higher education institutions. It is suggested that the heads/principals of colleges may take pro-active measures in enhancing technology integration in the pedagogical practices, involving all stake holders.

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Performance of French bean (*Phaseolus vulgaris* L) Variety Arka Anoop in the Sonitpur District of Assam

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ABSTRACT

The field study was undertaken to evaluate the yield performance of French bean variety namely Arka Anoop with a local non-descript variety in Amolapam and Punioni areas of Sonitpur, Assam during the *rabi* season of 2015-16. The study was based on field observations and farm level data and the results showed substantial differences among means of traits between the two varieties. Data recorded on growth and yield parameters revealed that green pod yield was more in Arka Anoop (158.4 q/ha) as compared to control (99.07 q/ha) due to their yield contributing traits namely number of primary branches per plant,7.65 and 7.25 and; total number of pods per plant, 30.57 and 22.39 and green pod length ,17.04 cm and 11.80 cm in Arka Anoop and control, respectively. The green pod yield was recorded more in Arka Anoop, along with higher net returns and B: C ratio compared to the control. Based on the results of the study, farmers realized that Arka Anoop was a better choice of variety in terms of yield and less incidence of diseases compared to the non-descript variety.

Keywords: Arka Anoop, Frenchbean, Performance

INTRODUCTION

Seed is the most critical and basic input in agriculture and all other inputs play a supporting role in obtaining higher crop production (Manjunatha *et al*., 2015). Food legumes plays a key role in Indian cropping systems eradicating *protein*-energy malnutrition to the vegetarian diet (Singh *et al*., 2018). French bean (*Phaseolus vulgaris* L.) belongs to family Fabaceae and locally known as Rajmash in India which occupies an important place among legumes in the world (Sharma *et al*., 1994). French bean is highly nutritious and supplies protein apart from being source of minerals like calcium, iron and phosphorous. It is cultivated for tender green pods which are consumed fresh as well as for dry seeds to be used as pulse. In India, it is mostly grown for tender green pods, while in countries like USA it is grown for processing in large quantities. This vegetable not only plays an important role in nourishment of human population but also improves soil fertility, being a highly nitrogen fixing crop. Seeds of french bean contains 21.1 per cent protein, 69.9 per cent carbohydrates, 1.7 per cent fat, 381 mg calcium, 425 mg phosphorous and 12.4 mg iron per 100 g of edible part (Ali and Kushwaha, 1987). With potential health benefits and antioxidant activity, french beans have medicinal values and are recommended in the treatment of dyspepsia, rheumatism, asthma and constipation. It is also an important source of diosgenin and cattle fodder. French bean consumption is associated with reduced risk of chronic diseases such as cardiovascular diseases, obesity, diabetes, and cancer which could be an exceptionally cost effectual approach for improving health (Hayat *et al*., 2014).

Himachal Pradesh, Uttar Pradesh, Bihar, Gujarat, Madhya Pradesh, Maharashtra, Karnataka, Andhra Pradesh and Tamil Nadu are the major states in India where french bean is cultivated. French bean can be grown under irrigated conditions almost throughout the year and fetches better price to the farmers compared to other vegetables in the market (Meena *et al*., 2017).

French bean is important and highly profitable vegetable crop of Assam due to its short duration and high production potential. However, its average yield is low in farmers field as compared to its potential yield. Variety is the most important input in any crop production program and response of all other technologies depends on it to a large extent (Goutam *et al*., 2001). Generally

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some farmers use under script seeds which are sold loose in the local haats or markets. Therefore, unless a good variety with high potential is used; other technologies will also not give good results.

Arka Anoop, a french bean variety released by Indian Institute of Horticultural Research, Bengaluru is reported to have resistance to both rust and bacterial blight apart from being a good yielder with long, flat and straight pods. The performance of french bean varieties varies under different agroclimatic conditions due to their specific climatic requirement. Hence this study was undertaken to assess the performance of Arka Anoop variety in comparison to non-descript seeds locally available in the market with the objective to carry out comparison of their performances in Sonitpur district in order to guide and educate the farmers of the area.

MATERIALS AND METHODS

The study was conducted using observational data and field data in the farmers' field under rainfed condition at Amolapam and Punioni areas of Sonitpur district of Assam during the cropping year 2015-16. The seeds of Arka Anoop released by Indian Institute of Horticultural Research (IIHR), Bengaluru was considered for comparison of performance with non-descript seeds locally available in the market. The distance between row to row and plant to plant were kept 45 cm and 30 cm respectively. The recommended seed rate of 50 kg/ha was adopted. All the other pre-sowing and post sowing cultural practices like manuring, weeding, earthing up etc were carried out as per package of practices. Need based plant protection measures were adopted to make the crop free from insects.

Regular monitoring and field visits were made by the team of KVK scientists. The biometrical observations were noted on plant height, number of primary branches per plant, number of green pods per plant, green pod length and green pod yield. Economics was also calculated and comparison was made with farmer's practice based on the information obtained from the farmers.

RESULTS AND DISCUSSION

The plant height was affected considerably by the treatments. The data (Table 1) showed that significantly higher plant height (45.33 cm) were recorded at harvest stage in Arka Anoop than Control (40.16 cm). The differential response of plant height might be due to their genetic character and adaptability to growing environment. These results are in conformity with the findings of Yadav (2015).

Primary branches per plant are more valuable trait which increase or decrease the yield of the crop. More number of primary branches produced more number of pods and vice versa. The data (Table 1) showed that significantly higher number of primary branches per plant (7.65) were recorded in Arka Anoop while in control, number of primary branches per plant were 7.25 which is directly related with pod yield. Branching is basically a genetic character but environmental conditions and farming practices also influence the number pf primary branches per plant. Singh (2014) reported similar findings for number of primary branches per plant.

Data (Table 1) showed that maximum number of green pods per plant (30.57) was recorded in Arka Anoop while in control, the number of green pods were observed to be (22.39). More number of pods may be attributed to more number of primary branches per plant and genetic makeup of the variety. Similar results were also reported by Yadav (2015).

Significantly higher length of green pod per plant (17.03 cm) was noticed in Arka Anoop while in control it was found to be 11.80 cm (Table 2). The variation of pod length in french bean varieties may be due to inherited traits and environmental factors. The variability in pod length in different varieties were also reported by Muthuramu *et al.* (2015).

Weight of pod varied substantially affected due to varieties (Table 2). Higher pod weight (7.02 g) was recorded

Table 1: Varietal effect on yield traits of the crop

Parameters	Plant height (cm)			No. of primary branches/plant			No. of green pods/plant		
	Farm 1	Farm 2	Average	Farm 1	Farm 2	Average	Farm 1	Farm 2	Average
Arka Anoop	44.25	46.41	**45.33**	8.17	7.13	**7.65**	32.99	28.15	**30.57**
Control	38.83	41.49	**40.16**	7.08	7.42	**7.25**	21.25	23.53	**22.39**
Average	41.54	43.85	42.74	7.62	7.27	7.45	27.12	25.84	26.48

Table 2: Varietal effect on yield traits of the crop

Parameters	Length of green pod (cm)			Weight of green pod (g)			Green pod yield (q/ha)		
	Farm 1	Farm 2	Average	Farm 1	Farm 2	Average	Farm 1	Farm 2	Average
Arka Anoop	17.85	16.21	**17.03**	7.13	6.91	**7.02**	160.37	156.43	**158.40**
Control	12.67	10.94	**11.80**	6.09	5.85	**5.97**	100.07	98.11	**99.07**
Average	15.26	13.57	14.41	6.61	6.38	6.49	130.22	127.27	128.73

Table 3: Economic parameters of the crop

Parameters	Gross return (Rs/ha)			Net Return (Rs/ha)			B:C ratio		
	Farm 1	Farm 2	Average	Farm 1	Farm 2	Average	Farm 1	Farm 2	Average
Arka Anoop	1,92,444	1,87,716	**1,90,080**	1,36,866	1,32,138	**1,34,502**	3.46	3.37	**3.42**
Control	1,20,084	1,17,732	**1,18,884**	70,755	68,403	**1,18,884**	2.43	2.38	**2.41**
Average	1,56,264	1,52,724	1,54,482	1,03,810	1,00,270	1,54,482	2.94	2.87	2.91

Cost of production of the crop were Rs 55,578/- and Rs 49,329/- for Arka Anoop and Control respectively
Sale price of French bean @ Rs 1200/q (According to 2015-16 prices)

in Arka Anoop while pod weight was less in control (5.97 g). This variation in pod weight might be due to variability of different genotypes. Yadav (2015) reported similar findings in french bean.

The yield parameters (Table 2) showed that significantly higher number of primary branches per plant, maximum number of green pods per plant and higher length of green pod per plant were recorded in Arka Anoop (158.4 q/ha) compared to control (99.07 q/ha). The results revealed that number of primary branches per plant, number of green pods per plant and length of green pod per plant were related to the yield mostly through their direct effects which was confirmed by many workers like by Muthuramu *et al.* (2015) in their study on french bean varieties.

The variation in cost of cultivation was due to different varieties. Although Arka Anoop recorded the maximum cost of cultivation, it reflected higher net returns than control (Table 3) due to higher green pod yield and less incidence of rust and bacterial blight. The economic analysis indicated higher B:C ratio (3.42) with Arka Anoop than control (2.41). Moreover incidence of diseases was observed to be less compared to control.

CONCLUSION

It can be concluded from the overall view of the results that cultivating Arka Anoop in Sonitpur district of Assam compared to non-descript seeds was more beneficial due to their yield contributing traits namely number of primary branches per plant, number of green pods per plant and green pod length which were recorded more as compared to farmer's locally available non-descript seeds. Farmers realized that Arka Anoop was a better choice in terms of yield and less incidence of diseases.

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Suggestions of the Faculties to Reduce the Gap Between the Prevailing and Expected Organizational Climate of Selected State Agricultural Universities in India

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ABSTRACT

Present study was conducted in four state agricultural universities of India viz. PAU, Punjab (North); ANGRAU, Andhra Pradesh (South); AAU, Assam (East) and MPAU, Rajasthan (West) to seek the suggestions provided by the faculties to minimize the gap between the existing and expected organizational climate. The data collected from the 216 faculty members on 13 dimensions viz. communication, management of rewards, interpersonal relationships, control and supervision, orientation, decision making, leadership, policies and rules, innovation, physical facilities, team work, monetary gains and accountability/ evaluation. Faculties suggested lots of suggestions on selected dimensions, specially suggested that improvement in communication as one of the important ways to improve organizational climate.

Keywords: Climate, Expected, Faculties, Organizational, Prevailing, Reduce

INTRODUCTION

Organizational climate addresses attitudes and concerns that help the organization to work with employees to instill positive changes including the increase in productivity. Climate surveys give employees a voice to assist in making desired transitions as smooth as possible. It also serves as a basis for quality improvements. By identifying areas of inefficiency and acting on performance barriers identified by employees of all levels, an organization gains a fresh and different perspective. It helps to identify areas of employee satisfaction and dissatisfaction to facilitate management in the creation of greater workplace harmony productivity. Mowday *et al.* (1974) and Reddy (1996) reported a positive relationship between employee's performance and organizational climate.

State Agricultural Universities are academic organization which contributes significantly to agricultural development. They operate on the concept of integration of three basic functions: Teaching; Research and Extension with a large number of specialized disciplines and departments. The technical expertise and commitment of scientist of various agricultural universities is of paramount importance which has a direct bearing on the generation and transfer of improved agricultural technology. The congenial organizational climate provides for efficient functioning of the scientists working in these organizations and ultimately helps in achieving the objectives of the organization. Any organization needs constant studies and evaluation with a view to ascertain the measures necessary to improve areas of deficiency, to attain a faster growth rate and development towards achieving its goals. The study of organizational climate is one of the most important academic and applied subjects of research, as it constitutes the core-of organizational effectiveness and socio-psychological adjustment of an individual worker.

In this context, the present study was designed to analyze the organizational climate in totality, by analyzing the suggestions provided by the employees regarding existing organizational climate of four SAU's representing north, south, east and west zone of the country.

The implementation of the results from the present study will enable SAUs to identify the critical dimensions of organizational climate and bridge gap between the existing and expected organizational climate to improve working environment and productivity. Keeping the above in sharp focus, the present investigation has been designed

with the objectives to seek suggestions of the faculty and administrators to reduce the gap between the prevailing and expected organizational climate of SAUs.

MATERIALS AND METHODS

The widely adaptable descriptive research design was used in the present study. The study was conducted in four State Agricultural Universities from Northern, Southern, Eastern, and Western zone of India viz. Punjab Agricultural University (PAU), Punjab (North); Acharya N. G Ranga Agriculture University (ANGRAU), Andhra Pradesh (South); Assam Agriculture University (AAU), Assam (East) and Maharana Pratap University of Agriculture and Technology, (MPAU), Rajasthan (West). Sample of 54 faculty members representing various levels in hierarchy and equal allocation to teaching, research and extension of each university were selected. Hence 216 faculty members were selected as the total sample for the study. Perception of organizational climate was considered as dependent variable. Organizational climate scale was developed by using Likert technique. It comprised of 13 dimensions viz. communication, management of rewards, interpersonal relationships, control and supervision, orientation, decision making, leadership, policies and rules, innovation, physical facilities, teamwork, monetary gains and accountability/ evaluation. Socio-personal characteristics were selected as independent variables. An interview schedule was developed for collection of data. Each respondent was contacted personally to explain the objectives of the study and record their suggestions on the selected dimensions. The data thus collected from the sample respondents through interview schedule were coded, tabulated and analyzed. Statistical techniques used for analyses of the data were frequency and percentage. The findings emerged out of the data were suitably interpreted and conclusions were drawn. Accordingly, the findings of the study were given below.

RESULTS AND DISCUSSION

1. Communication: It has been defined as the flow of information, both horizontal and vertical within the organizations. It will include its direction, flow, mode and the type of communication. Majority of the faculty (81.94%) suggested direct communication for timely and clear-cut conveying of messages and achievement of objectives followed by free flow of information within the organization (70.83%), reduced burden of repetitive paper work (68.98%) and more stress on e-communication at all levels (20.37%). For reducing the gap in prevailing and expected organizational climate faculty provided many suggestions related to communication which might be due to the fact that they perceived this dimension as the most important in organizational climate. Communication is an important component of desired behaviour, measured by the organization's communication patterns (Table 1). Acceptable behaviours are reflected in direct, constructive and timely feedback, open communication, mutual respect and use of conflict as an asset. Lack of acceptable behaviours such as blaming others, focusing on problems rather than solutions, allowing rumours, gossip and criticisms corrupts the organizational climate.

2. Managing rewards/Recognition: It refers to the management of the system of rewards, appreciation, acknowledgement and recognition both verbal and written on account of performance of duty (Table 1). More than half of the faculty suggested that personal relationships should not be the basis of managements of rewards. Recognition should be performances based some also suggested that the rewards must commensurate with contribution. Merit, hard work, sincerity and dedication according to 40.74 per cent of the faculty members should be recognized. It may be due to the fact the prevailing management of rewards was not satisfactory and not based on professional contribution. Rewards measure competencies in tangible ways. Reward systems characterized by a balance of task and behavioural competencies are powerful messages. Ongoing constructive feedback helps to show the seriousness in achieving results and the creation of values-driven organization (Oge, 2009). Pace and Faules (2005) also suggested that faculty get motivated if they believe that there is rewards, equity within the organization. Eliminating the appearance of favoritism and recognizing achievements that are not necessarily "high profile" go a long way in boosting the morale of workers.

3. Interpersonal relationship: It is operationally defined as the quality of warm, fruitful or apprehensive relationships between faculty members and members of administration of SAUs working in the work situation/ place in order to accomplish the same goals/objectives (Table 1). To reduce the gap in interpersonal relationship three fourth of the faculty suggested equal opportunities to every faculty for showing their capabilities (84.72%), authorities looking for fulfillment of organizational goals rather than their individual interest and vouched for sincere and dedicated faculty willing to extend helping hand to

each other. Lack of encouragement to groupism within the department/ colleges/university by the administrators was another suggestion made by half of the faculty.

4. Control and supervision: It has been operationally defined as the actions taken to regulate the day to day functioning within the university by the superiors to monitor the work/activities of the juniors and maintain orderliness (Table 1). To bring about improvement in control and supervision the faculty of SAUs suggested that the motivation should be provided by administration (79.63%), provision of stress free and conductive environment (48.61%), maintenance of administrative hierarchy (23.61%) and discouragement of fault finding behaviour (20.83%) where everyone is allowed to perform duties and responsibilities with dignity.

5. Orientation: The term orientation in the study is operationally defined as the ability of the university administration to enable the faculty to understand the mission, functioning, work profile, policies and rules, etc. pertaining to the university for the purpose of achieving excellence and achievement and the adhering to these by the faculty members (Table 1). Majority of the faculty members suggested regular and appropriate human resource development programmes to orient the faculty. Specially newly joined faculty member must get adequate orientation about organizational set up and future duties.

6. Decision making: It is operationally defined as the levels at which decisions are taken, their timeliness, extent and type of decisions and their appropriateness by those in authority and the process of making decisions (Table 1). More than half of the faculty suggested improvement in the decision-making dimension through participatory decision making. This might be due to the reason that presently the opinion of the faculty was either not sought or their suggestions not given any weightage in decision making. Mohan (2000) also reported lack of satisfaction due to these reasons. Nagananda (2005) also reported that providing opportunities for the subordinates to plan programme at grass root level and encouragement of subordinates by their superiors and considering subordinates suggestions helps in improving organizational climate.

7. Leadership: It has been defined as the ability of the authorities to influence the faculty of SAUs to achieve mutually agreed upon mission goals, provide able guidance in smooth functioning, future progress of the university beside the mutual trust in each other's abilities and capabilities (Table 1). To reduce the gap in leadership more than half of the faculty suggested, placing trust in faculty (64.81%), avoiding autocracy by administrators (34.72%) and authority striving for faculty development (33.79%). Leaders are people who are able to create a social context in which employees are guided towards a shared interpretation, understanding and perception of the organizational climate (Yukl 1989).

8. Policies and rules: The policies, rules and regulations are formulated and maintained for the benefits of faculty (Table 1). Some improvements in policies and rules of the organization suggested were implementation of appropriate transfer and promotional policies as per the laid rules (67.59%), substantial flexibility in rules/policies (42.59%) and freedom of the educational institutions from political interference (22.69%). Poor formalisation of policies and rules in organization create a weak organizational climate (Martins and Martins 2003); hence, faculty might be desiring changes.

9. Innovation: It refers to the administration's/superior's acceptance of new ideas with regard to the professional field, procedures and methods and to provision of facilities and opportunities for the faculty to perform creative work and grow professionally (Table 1). To reduce the gap in innovation one third of faculty suggested encouragement of innovative ideas both at creative and application level and exposure/ training on new technologies for developing creativity. Davidson (2003) also found that support of the organization is necessary for enhancing innovativeness.

10. Physical facilities: It refers to the facilities provides in the working environment for making it comfortable for facilitating work conditions (Table 1). Provisions of latest infrastructure, technical facilities, interiors and adequate and timely availability of transportation for official work were some of the suggestions made to improve physical facilities.

11. Teamwork: It refers to the work done by several associates with each doing a part but all subordinating personal prominence to the efficiency of the whole and being helpful in work relationships, encouraging each other at work and not allowing personal jealousies to hinder work performance (Table 1). To strengthen the team work in the organization faculty suggested, encouragement of team building only at professional level (13.89%), coordination of research, extension and teaching efforts

Table 1: Dimension wise suggestions of the faculty to reduce the gap between the prevailing and expected organizational climate of SAUs (n=216)

Suggestions	Frequency	Percentage
1. Communication		
Placing more stress on e-communication at all levels	44	20.37
Direct communication for timely and clear-cut conveying of messages and achievement of objectives	177	81.94
Reduced burden of repetitive paperwork	149	68.98
Encouragement of free flow of information within the organization	153	70.83
2. Managing rewards/Recognition		
Performances based recognition	144	66.67
Rewards must commensurate with contribution	90	41.67
Recognition of merit, hard work, sincerity and dedication	88	40.74
Personal relationships should not be the basis of rewards/ recognition	149	68.98
3. Interpersonal relationship		
Authority should look to the organizational need rather than individual interest	164	75.93
Encouragement of trust and faith within the organization	90	41.67
Equal opportunities should be given to every faculty for showing their capabilities	183	84.72
Sincere and dedicated faculty ready to extend helping hand to each other	162	75.00
Mistake should not be laughed at	90	41.67
Groupism should not be encourage within the department/ colleges/university	120	55.56
4. Control and supervision		
Everyone should be allowed to perform duties and responsibilities and dignity in well manner	21	9.72
Motivation should be provided by administration	172	79.63
Discouragement of fault finding	45	20.83
Provision of stress free and conductive environment	105	48.61
Official decorum should be maintained in all activities	21	9.72
Reducing inbreeding	12	5.55
Administrative hierarchy should be maintained in control and supervision	51	23.61
5. Orientation		
Newly joined faculty member must get adequate orientation about organizational set up and future duties	144	66.66
Orientation programmes for faculty members should be held time to time to motivate for work	162	75
Human resource development programmed should be organized regularly	185	85.65
Appropriate human resource development programmes should be organized to upgrade the knowledge and skill	164	75.93
6. Decision making		
Decision of the authority should be unbiased and clear cut	179	82.87
Clear direction should be provided	129	59.72
Involved faculty of all levels in decision making	170	78.70
Suggestions of each faculty members should be given weight age	118	54.63
7. Leadership		
Avoiding autocracy by administrators	75	34.72
Placing trust in faculty	140	64.81
Authority should strive for faculty development	73	33.79

Table 1 contd....

Suggestions	Frequency	Percentage
8. Policies and rules		
Implementation of appropriate transfer and promotional policies as per the laid rules	146	67.59
Substantial flexibility in rules/policies	92	42.59
Exiting rules and regulations should be strictly followed	49	22.69
Freedom of the educational institutions from political interference	49	22.69
9. Innovation		
Encourage of innovative ideas both at creative and application level	71	32.87
Innovative ideas should be encouraged by administration	64	29.63
Provide exposure/ training on new technologies to faculties for developing creativity and lead to many innovation	25	11.57
10. Physical facilities		
Provision of latest infrastructure and technical facilities	190	87.96
Adequate and timely availability of transportation for official work	118	54.63
Well maintained offices	146	67.59
11. Teamwork		
Research, extension and teaching effort needs to be coordinated	82	37.96
Encouragement of team building only at professional level	30	13.89
Encourage of intra and inter departmental action	49	22.69
Avoid leg pulling in teamwork	110	50.93
12. Monetary gains		
Availability of sufficient fund	183	84.72
Authority should provide an environment to maintain individual dignity	56	25.93
Timely payment of wages to research worker and labour	8	3.70
13. Accountability/ evaluation		
Performance of every faculty should be periodically monitoring	51	23.61
Authority much treats all faculty members in all aspect equally and in an unbiased manner	105	48.61
Regular monitoring and evaluation in teaching, research and extension for enhance accountability	10	4.63

(37.96%), encourage of intra and inter departmental action (22.69%) and avoidance of leg pulling in team work (50.93%).

12. Monetary gain: It is operationally defined as the degree to which the faculty members of SAUs feel the terms of organization facilitates for their economic development in terms of salary, traveling allowances, daily allowances, increments, housing etc. (Table 1). Availability of sufficient fund was the only important suggestion made to improve the dimension of monetary gains followed by the suggestion of authority should provide an environment to maintain individual dignity.

13. Accountability/ evaluation: It is operationally defined as actions taken by the management of the SAUs, which reasonably and constituency evaluates faculty member's performance for the purpose of improvement, fixing responsibility and making promotions (Table 1). Faculty suggested improvement in accountability / evaluation in the organization through unbiased evaluation and periodically monitoring. Faculty provided lots of suggestions to reduce the gap in prevailing and expected organizational climate. It may be due to the fact that they want to excel and achieve organizational objectives and have desired conductive organizational climate. The suggestions of the faculty can go a long way. These findings are in line with the findings reported by Jhansi (1985) and Mohan (2000).

Meyer *et al.* (2002) and Whitman *et al.* (2010) also pointed out that authority is interpretative filters, since they are the ones who implement the organizations goals and

policies and communicate the characteristics of the work processes on which to focus most. They have the power to create a context that leads to a shared interpretation/ understanding of the desired behaviours and attitudes, thereby influencing employees' perception.

According to Ren, Hauang and Zheng (2001), human resource management was one of the issues that faculty of any organizations were most concerned about. Whether these issues are recruitment, selection, training, salary or performance appraisal and benefits, they are all closely associated with the vital interests of faculty. Hence, university administrators should take into account the participation of employees in decision making process, keeping the communication channels open, strengthening communicational linkages for improving the organizational climate perceptions of the employees.

CONCLUSION

Faculties of four universities provided lots of suggestions with respect to different organizational climate dimensions to minimize the gap between existing and expected organizational climate. The few faculty in four SAUs attended trainings at international level and majority had gone for national level training. So, it is suggested that more opportunities should be provided to them to attend training at international level, which would help them to learn the organizational climate of other organizations globally and learn ways to improve their own organization. Communication and leadership were perceived as the most important dimensions of the organizational climate by the faculty. Hence, the faculty should strive to improve communication. Authority should lay special emphasis on developing leadership qualities and also provide visionary leadership rather than indulging in strict control and supervision, accountability and evaluation. Improvement in innovation and physical facilities were important to the faculty. Even through innovation, orientation and monetary gains are those dimensions point towards a need to take care of these aspects for creating more conductive organizational climate in these universities. Further it is also suggested to investigate the gap in each dimension and try to bridge it by the appropriate interventions based on the suggestions expressed by the faculty of selected SAUs. Superiors and the management authority should try to create friendly relations with their subordinates so as to motivate the performance of the employees. Organizational climate is the general perception of the working conditions of an organization. Organizational climate develops over many years and is affected by many factors, which cannot change by simply dusting off the top layer of discontent or vacuuming up the problems around the perimeter. While these tactics may remove the most obvious eye sores, but there is a need to consider the problems in depth through analysis of various dimensions of organizational climate.

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Parenting Practices as Predictors of Adolescents Externalizing and Internalizing Problems

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ABSTRACT

The present study aimed to determine the effects of parenting practices on adolescent externalizing and internalizing problems. The sample of the study comprised of 360 adolescents aged 13 to 17 years belonged to intact family drawn from urban and rural government and private schools. Self reported questionnaires *i.e.,* Strength and difficulties questionnaire and Alabama parenting questionnaire was used to assess adolescents' behavior problems and adolescents' perception on parenting practices, respectively. The results indicated that positive parenting was associated with pro social behavior and negative parenting (inconsistent discipline and poor monitoring) was associated with externalizing and internalizing problems. Further, except corporal punishment, all parenting practice components emerged as significant predictors of pro social behavior, externalizing and internalizing problems.

Keywords: Adolescents, Externalizing problems, Internalizing problems, Parenting practices, Pro-social behavior

INTRODUCTION

Evidence suggests that family environment constitute the basic ecology where children's behavior is manifested, learned, encouraged, and suppressed (Dishion and Patterson, 2006). Parents' roles in the family environment have primarily been to prepare children for adulthood through rules and discipline. During adolescence, however, the influence of peers also serves as an important socialization agent. Despite this new sphere of influence, research has clearly demonstrated that parenting accounts for more variance in externalizing behaviors in adolescence than any other one factor (Crosswhite and Kerpelman, 2009). The period of adolescence can be difficult for both parents and offspring; therefore, understanding the importance of maintaining high quality parenting is particularly essential. Specific attention was given to problem behaviors in adolescence, such as internalizing and externalizing behaviors because these are associated with long-term negative consequences across the life course. The term problem behavior refers to internalizing and externalizing behavior to describe adolescent outcomes. Researchers most commonly define externalizing behaviors as aggression, deviant behavior, drug use, underage drinking, deviant peer affiliation and opposition. Internalizing behaviors examined in past research include behaviors such as, depression, self-esteem, and fearfulness (Hoskins, 2014). However, in the present study, externalizing problems is confined to hyperactivity and conduct problems while internalizing problems includes emotional and peer problems.

Researchers examining the parameters of these malfunctioning behaviors emphasize the significance of interpersonal factors. Parental practices or behavior is, perhaps, the most influential factor in terms of the development of externalizing and internalizing behaviors of the child. The concept of parental importance has been well documented since Freud suggested that the infant's emotional tie to the mother provides the foundation for all other later relationships (Ireland and Power, 2004). For more than half a century, research has consistently supported the significance of parenting for child and adolescent psychopathology. As documented in several influential reviews (Georgiou, 2008), warm and accepting parenting styles are consistent predictors of favorable developmental outcomes in children, whereas hostility and rejection predict unfavorable outcomes. Although adolescence is marked by a burgeoning desire for independence, which results in increased time spent with

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the peer group, parenting practices nonetheless have a significant effect on adolescent functioning (Kerr *et al.*, 2012). Parenting practices has been highlighted as paramount with regard to adolescents' behavioural adjustment: poor supervision/monitoring, harsh discipline (e.g., corporal punishment) and inconsistent discipline (Gershoff, 2002). Extensive research emphasized these three parenting practices as risk factors for children's externalizing behaviors (Lahey and Waldman, 2008), but there is also growing support for an association with children's internalizing symptoms (Van der Sluis *et al.*, 2015). Given that there is an increase in negative parenting practices and a decrease in positive parenting during puberty, it is particularly important to understand how parenting practices affect adolescent developmental outcomes such as behaviors adjustment (*i.e.,* conduct, pro social behavior, hyperactivity, emotional and peer problems). Understanding how adolescents perceive key positive and negative parenting can help prevent adolescent adjustment behaviors problem and buttress other psychological health. Thus, the present study aimed to determine whether parenting practices would positively or negatively predict externalizing and internalizing problems of the adolescents.

MATERIALS AND METHODS

Locale of the study and Sampling: The sample selected for the study was the adolescents studying in 7th, 8th and 9th standards from government and private schools. The criteria for selection of the participants were adolescent boys and girls who belonged to intact family and in the age group of 13 to 17 years. The urban adolescents were drawn randomly from urban schools (two private and two government schools) and for rural adolescents were drawn from rural schools (two private and two government schools) in four villages of Dharwad taluk, Karnataka. A total of eight schools were selected randomly located in urban and rural areas. From each school, adolescents studying in 7th, 8th and 9th standards constitute the sample for the present study. In each school of each standard, nearly fifty per cent of the sample was drawn Out of the minimum strength. Around 15 to 20 adolescents belonging to intact family were drawn randomly; this makes a total of 45 adolescents drawn from three standards in each school. From all the eight schools, a total of 360 adolescents participated in the study.

Data collection: Prior to data collection, written permission was obtained from Block Education Officer (BEO) of urban and rural schools and the schools were selected randomly. Written permission was also sought from respective principals of each school. On meeting the concerned principal and teachers, brief introduction and purpose of the study was explained to seek their co-operation. At the same time ethical issues was discussed with the concerned authority of the respective schools like the purpose of data collection was only for academic purpose and the school's name, student's name, parent's name and teacher's name will not be disclosed in written materials or any publications. Further, required population and sample size of the study was discussed and suitable timing was fixed for further data collection. Reliability of each tool was pretested on a relevant sample (N=40). Prior to the distribution of the questionnaires, brief introduction and short explanation about the purpose of the study was explained to students. Oral consent from the students was obtained for their voluntary participation and confidentiality of information was assured. Clarifications on meaning and method of responding to items were explained to the students prior to data collection. Then, set of questionnaires about general information was given to each student and prompted them to feel free to discuss their doubts. Further, the strength and difficulties questionnaire (SDQ), a self-reported questionnaire was distributed to all the participants to assess own behavioral problems. The next questionnaire was distributed to the participants to assess own perception about their parents parenting practices by using Alabama Parenting Questionnaire.

Measures

Adolescent's behavioral problems: The Strength and difficulties questionnaire (SDQ) is a brief behavioral scale for 4-17 year olds developed by Goodman, 1997. The SDQ was used to study risk symptoms regarding the child's and adolescent's behaviour in the past six months. The scale consists of 25 items rated on 3- point scale ranging from 1 (not true) through 2 (sometimes true) to 3 (certainly true) except items 7, 11, 14, 21 and 25. These items are "reverse-scored". The scale consists of five subscales of five items each. These subscales viz., (i) hyperactivity (5 items: e.g., "restless, overactive, cannot stay still for long") (ii) emotional Symptoms (5 items: e.g., "many worries, often seems worried") (iii) conduct problems (5 items: e.g., "often fights with other children or bullies them") (iv) Peer problems (5 items e.g., "rather solitary, tends to play alone") and the pro-social scale (5 items e.g., "try to be nice to other people"). The externalizing scale was formed from items measuring hyperactivity and conduct problems and

internalizing scale was formed from items measuring emotional symptoms and peer problems. The resultant score ranges from 0 to 20. The Guttman split-half reliability for each subscale was calculated using pre-tested data (N=40) and the reliability indexes of externalizing (α = 0.84), internalizing (α=0.79) and pro social behavior (α = 0.78) were found respectively.

Parenting practices: The Alabama parenting questionnaire (APQ) developed by Frick, 1991 is a 42 items questionnaire which consists both child form and parent form for measuring five dimensions of parenting practices of parent of children aged 6 to 18 years. However, child-form questionnaire was used in the present study. The five dimensions consist of parental involvement, positive parenting, inconsistent discipline, poor monitoring, and corporal punishment. Items are rated on a 5-point Likert scale ranging from 1 (never) to 5 (always). No reverse coding is necessary. Sum of items for each dimension were obtained for a total score and the total score were subtracted by number of items in each dimension and were divided into four quartiles equally. Higher the score better is the parenting practices. A pilot study was conducted and the Guttman split-half reliability for each subscale was calculated using pre-tested data (N=40). The reliability indexes for involvement (α = 0.94), positive parenting (α=0.90), poor monitoring/supervision (α = 0.94), inconsistent discipline (α = 0.84), and corporal punishment (α = 0.88) were found.

Statistical Analysis: Bivariate correlation was employed to know the strength of relationships between parenting practices and adolescents' behaviors. Hierarchical regression analysis was used to determine whether components of parenting practices have any positive or negative contribution towards adolescents' behaviors. Parenting variables (*i.e.,* parental involvement, positive parenting, inconsistent discipline, poor monitoring and corporal punishment) as independent variables were regressed onto each subscales of strength and difficulties questionnaire (*i.e.,* pro social behavior, externalizing problem and internalizing problem).

RESULTS

Table 1 presented the correlation matrix among the variables of the study. The findings showed that inconsistent discipline was negatively correlated with parental involvement. Similarly, poor monitoring showed significant negative correlation with parental involvement and positive parenting and significant positive correlation with inconsistent discipline. Corporal punishment showed no trend of correlation with any dimensions of parenting practices. With regard to adolescents' behaviors, pro social behavior revealed a significant positive correlation with parental involvement and positive parenting and a significant negative correlation with inconsistent discipline and poor monitoring. Likewise, externalizing and internalizing problems showed a significant negative correlation with parental involvement, positive parenting and pro social behavior. On the other hand, a positive correlation was found with inconsistent discipline and poor monitoring. Table 1 also presented descriptive of the selected variables of the present study.

Table 2 described multiple regression analysis for components of parenting practices and their impact on pro social behavior, externalizing and internalizing

Table 1: Correlation matrix between components of parenting practices and adolescents' behavior

S.No.	Variables	1	2	3	4	5	6	7	8
1.	Parental Involvement	1							
2.	Positive Parenting	0.60**	1						
3.	Inconsistent Discipline	-0.43**	-0.44	1					
4.	Poor Monitoring	-0.38**	-0.41**	0.54**	1				
5.	Corporal Punishment	0.03	0.00	0.02	0.35	1			
6.	Pro social Behavior	0.23**	0.18**	-0.15**	-0.21**	-0.04	1		
7.	Externalizing Problem	-0.35**	-0.33**	0.27**	0.32**	0.04	-0.23**	1	
8.	Internalizing Problem	-0.40**	-0.33**	0.31**	0.32**	0.10	-0.19*	0.20**	1
	Mean	31.29	20.25	16.38	28.33	8.25	5.68	9.55	9.04
	SD	10.44	6.92	5.99	10.07	3.44	2.28	3.69	3.96

** Correlation is significant at the 0.01 level (2-tailed); * Correlation is significant at the 0.05 level (2-tailed)

Table 2: Multiple Linear Regression Analysis for parenting practices and adolescents' behaviors

Variables	R^2	Adjusted R^2	B	SE	β	t	P
Prosocial behavior							
Constant	.075	.062	5.53	.82			
Parental Involvement			.036	0.15	.163	2.45	.014
Positive Parenting			.008	.022	.025	.370	.712
Inconsistent Discipline			.003	.025	.008	.127	.899
Poor Monitoring			-.033	.014	-.147	-2.336	.020
Corporal Punishment			-.029	.034	-.044	-.856	.393
Externalizing problem							
Constant	.180	.168	10.32	1.26			
Parental Involvement			-.068	.022	-.193	-3.08	.002
Positive Parenting			-.065	.034	-.122	-1.92	.056
Inconsistent Discipline			.028	.037	.045	.739	.460
Poor Monitoring			.064	.022	.174	2.94	.003
Corporal Punishment			.050	.052	.047	.972	.332
Internalizing problem							
Constant	.209	.197	10.51	1.32			
Parental Involvement			-.103	.023	-.272	-4.426	.000
Positive Parenting			-.042	.036	-.073	-1.170	.243
Inconsistent Discipline			.063	.039	.096	1.605	.109
Poor Monitoring			.052	.023	.133	2.284	.023
Corporal Punishment			.009	.054	.008	.163	.871

problems. Multiple regression analysis for pro social behavior problems showed that parental involvement (β=.16, t=2.4, $p < .01$) and poor monitoring (β=.16, t=2.4, $p < .01$) emerged as the significant predictors. Likewise in the second model of multiple regression showed that parental involvement (β=.19, t=3.0, $p < .00$) and poor monitoring (β=.17, t=2.9, $p < .00$) appeared as the significant predictors of externalizing problems. Consistently in the third model, multiple regression analysis revealed that parental involvement (β=-.27, t=4.42, $p < .00$) and poor monitoring (β=.13, t=2.28, $p < .02$) emerged as the significant predictors of internalizing problems of adolescents.

DISCUSSION

The presents study was carried on with the assumptions that whether parenting practices components had any impact on adolescents' behaviors. Analysis of the five dimensions of parenting practices which included both positive (parental involvement and positive parenting) and negative (inconsistent discipline, poor monitoring and corporal punishment), the findings suggested that positive parenting practices yielded positive behaviors of adolescents while negative parenting practices revealed as a risk factors for adolescents' behavior problems. Several studies found that positive parenting practices such as involvement and positive reinforcement are related to more positive adolescent outcomes (*i.e.* less conduct problems, delinquency, aggression, risky behaviors, substance use, and depressive symptomology) while negative parenting practices such as poor monitoring and supervision, corporal punishment and inconsistent discipline are associated with more negative adolescent outcomes (*i.e.* more conduct problems, delinquency aggression, peer provocation, exposure to violence, risky behaviors, substance use, and depressive symptomology) (Barry *et al.*, 2007; Eckshtain *et al.*, 2010; Kamon *et al.*, 2005; Latzman *et al.*, 2009; Magoon and Ingersoll, 2006; Laird *et al.*, 2003). Previous literature has suggested that positive parenting is associated with reductions in externalizing behavior. Longitudinal evidence indicated that poor parental monitoring is a particularly robust predictor of

increases in conduct problems during adolescence Mahoney *et al.* (2000). The study provided a clear message that parenting practices associated with adolescence behavior. This might be the fact that adolescence needed parent guidance as much more than any other significant period of childhood. Adolescent's parents might not understand the important of this period or might be that parents were usually concentrate on their farm work to provide physical need rather than psychological, especially among farm women in rural area most of them are busy with household work as well farming where their time investing for their children is reduced (Sadhna *et al*., 2020; Sujay *et al*., 2020). Corporal punishment as one of the dimension of parenting practices, showed neither significant relationship nor emerging as a significant predictor of adolescents behavior problems. The possible explanation could be related to the fact that the age group of the sample in the study was the middle age adolescents, age ranges between 13 to 17 years, which is likely that the form of physical punishment is declining as children age increases. Likewise, Mahoney & his colleagues explained that as child age in years increased the prevalence and frequency of corporal punishment used by parents decreased substantially.

CONCLUSION

This investigation contributed to extant parenting research by examining parenting practices which include both positive (parental involvement, positive parenting) and negative (inconsistent discipline, poor monitoring, corporal punishment) components based on adolescents perception and its determinants over adolescents behaviors outcomes. Findings demonstrated convincingly that parenting practices are highly associated with the adolescents' pro social behavior and behavior problems, both externalizing and internalizing ones. Consequently, results reflecting that the quantity and quality of positive parenting in the adolescents' life, that is the perceptions that adolescents hold about their parents rearing practices, can serve as protective factors for behavior problems. On the other hand, negative parenting practices is associated or emerged as risk factors for externalizing and internalizing problems. Study highlighted the important one that should be considered while treating adolescents with behavioral problems. These findings are also important when planning behavioral parent training in treating adolescent's behavioral problems. Early identification of behavior problems of adolescents would help to educate the parents for prevention and cure these behavioral problems by changing and modifying their parenting style. Recognition of negative parenting practices facilitates the counselors and clinicians to educate parents about their parenting rearing practices.

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Impact Assessment of Front Line Demonstrations on Oilseed Rape (*Brassica napus* L.) in Sub-mountainous Region of Punjab

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ABSTRACT

The main objective of frontline demonstrations is to demonstrate newly released crop production and protection technologies and its management practices at the farmers' fields under different agro-climatic regions and farming situations. Realizing the importance of frontline demonstrations (FLDs) in transfer of Gobhi Sarson production technologies, Krishi Vigyan Kendra, Gurdaspur conducted FLDs at 26, 50 and 50 farmers' fields in the district during 2015-16, 2016-17 and 2017-18 on area of 10, 20 and 20 hectares (ha) respectively. The improved technologies were consisted of improved canola variety (GSC 7), balanced fertilizer application including use of sulphur, efficient weed and pest management. The results revealed that the demonstrations with recommended technology (FLDs) produced an average 17.6, 20.3 and 20.4 q/ha seed yields of Gobhi Sarson during 2015-16, 2016-17 and 2017-18 respectively which are 12.9, 12.0 and 16.3 per cent more than the existing farmers' practice (FP) yield during the three years of study. Execution of FLDs resulted in decrease of technology gap from 4.65 to 1.85 q/ha from the year 2015-16 to 2017-18. The increase in profitability of Gobhi Sarson in terms of average gross (Rs. 71924/ha) and net returns (Rs. 51793/ha) was also recorded in comparison to FP. Higher net returns with higher B:C ratio (3.58:1) obtained after conducting FLD shows positive impact of FLD on adoption of demonstrated technologies. Data also indicated that majority (91.3%) of the respondents had adopted canola varieties. The important package of practices where more increase in adoption was found were use of high yielding canola varieties (61.1%), use of recommended fertilizer dose (55.6%), timely irrigation (54.8%) and use of proper seed rate (26.2%). The study proved the positive impact of FLDs on adoption of improved production technologies and production potential of oilseed crops.

Keywords: Adoption, Extension gap, Front line demonstration, Gobhi Sarson, Impact, Technological gap, Technological index

INTRODUCTION

Oilseed occupies a significant place in India's agrarian economy, only next to food grains in terms of acreage, production and value. Globally, India holds a premier position in rapeseed-mustard economy of the world with a contribution of about 12.5 per cent in the total rapeseed-mustard production. It holds second rank in area (5.98 million hectares) and third rank in production (8.43 million tonnes) with productivity of 1.41 t/ha and per capita availability of 17.7 kg during 2017-18 (Anonymous, 2020). In India, this crop is the second most important edible oilseed crop after groundnut which shares 27.8 per cent in the India's oilseed economy. Oilseed production assumes great importance in India because of huge gap in demand and supply which has resulted in import of vegetables oil worth millions of rupees every year. Presently, the demand for vegetable oils is out pacing the supply with more than half of its annual requirements being met mainly through imports. India has the 5th largest vegetable oil economy in the world next to USA, China, Brazil and Argentina accounting for 7.4 per cent world oilseed output; 6.1 per cent of oil meal production; 3.9 per cent world oil meal export; 5.8 per cent vegetable oil production; 11.2 per cent of world oil import and 9.3 per cent of the world edible oil consumption (Ajrawat *et al.*, 2017). In India, oilseeds contribute 3 per cent and 10 per cent to gross national products and value of all agricultural products, respectively, with 14 and 1 million people involved in

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oilseed cultivation and processing, respectively. India is one of the biggest importers of vegetable oils. There is a spurt in the vegetable oil consumption in recent years, both for edible purposes as well as for industrial uses. This is further likely to go up in coming years with the change in consumption patterns as well as in rising living standards.

Gobhi Sarson (*Brassica napus* L.) is well adapted to our agro-ecological conditions and its cultivation can play a crucial role in crop diversification too. In Punjab, area, production and productivity of oilseed crops is 30.5 t/ha, 45.7 t/ha and 1.49 t/ha, respectively. In district Gurdaspur of Punjab, the area covered under rabi oilseed was 1.9 t/ha and 2.8 t/ha during the year 2017-18 (Anonymous, 2019). Moreover, the Indian cultivars, due to high content of erucic acid and glucosinolates, had limited preference in international market during previous years. Winter rape (*Brassica napus* L.) with Canola quality, i.e. low-glucosinolate, low-erucic acid varieties, represents one of the world's major sources of vegetable oil. Since early 1970s, the 'canola' quality oil has gained acceptance worldwide as a healthy edible oil cooking medium. It is the major edible oil in many countries like Australia, Japan and Canada. Though the nutritional advantages of rapeseed-mustard oil available in India be superior to many other edible oils (lowest amount of harmful saturated fatty acids, and contains two essential fatty acids – linoleic and linolenic), the presence of erucic acid and glucosinolates are considered to be undesirable. Erucic acid is feared to cause health problems and high glucosinolates in the oil cake are not desired for animal feed.

Generally oilseed crops are grown under irrigated and un-irrigated conditions with low productivity. The strategy is to enhance per capita availability is either to increase the land area under production or to increase productivity per unit area of available land (Aziz *et al.,* 2015). Many high yielding varieties have been released for cultivation, but their adoption by farmers is minimal. Farmers have to put so many efforts to fulfil the need of the country. For this, farmer should be aware of the right use of inputs like seed, fertilizer, insecticides etc. without any economic loss. With an objective to combat the causes of poor yield and lower economic returns, dissemination of recommended technology through front line demonstration was successfully attempted. The Front Line Demonstration (FLD) is an applied approach to accelerate the dissemination of proven technologies at farmers' fields in a participatory mode with an objective to explore the maximum available resources of crop production and also to bridge the productivity gaps by enhancing the production in national basket. In view of this, an attempt has been made to review the progress pertaining to the productivity potentials and profitability of the technologies that are recommended for oilseed production and existing extension gaps in adoption of these improved production technology under field conditions.

MATERIALS AND METHODS

Study area: The present study was conducted in Gurdaspur district located in the northern most part of the Punjab state (Figure 1). The district is bounded by the river Ravi and Beas. The district lies between 31° 36' to 32° 34' N, 74° 56' to 75° 24' E and shares common boundaries with Pathankot district in the north, Beas River in the north-east, Hoshiarpur district in the south-east, Kapurthala district in the south, Amritsar district in the south-west and internationally borders Pakistan in the north-west. The landscape of the district has varied topography comprising undulating plan, the flood plains of the Ravi and the Beas and the upland plain. Gurdaspur district is located in temperate climate and receive 905.3 mm average annual rainfall with altitude of 258 m and having varied soil types. About 70% of the rainfall occurs during July-August. However, the average rainfall of 105.9 mm and mean maximum and minimum temperatures 27°C and 10.5°C recorded respectively during the cropping season under three years of study (Figure 2). Rice, wheat and sugarcane are principal field crops grown in the district.

Experimental details: The present studies were carried out by conducting FLDs on oilseed crop Gobhi sarson during the year 2015-16, 2016-17 and 2017-18 to promote oilseed cultivation and crop diversification. The selection of the farmers was done randomly as per allotment of FLD to KVK, Gurdaspur by ICAR-ATARI, Zone I, Ludhiana, Punjab. Before organizing actual FLDs, baseline information has been collected from all blocks of the district. Twenty six FLDs were conducted on 10 hectares (ha) area in 6 blocks during the first year of study (2015-16) and 50 demonstrations were conducted on 20 ha during the each two next years of study (2016-17 & 2017-18) in 5 and 7 blocks of the district respectively. So, total of 126 FLDs were laid out on farmers' field according to the package of practices recommended by Punjab Agricultural

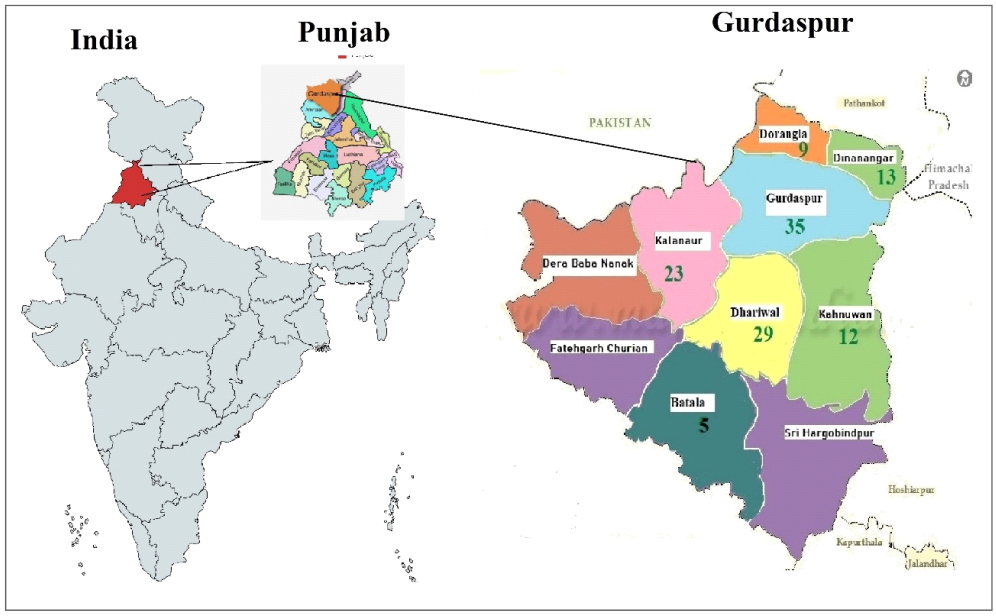

Figure 1: Map of study area showing total front line demonstrations (FLDs) conducted during 2015-2018

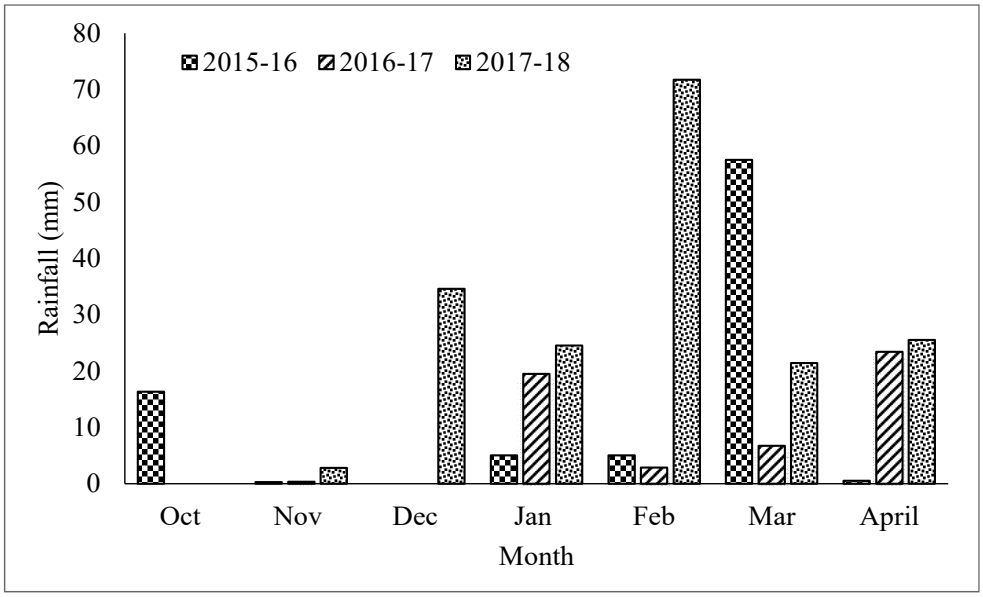

Figure 2: Rainfall trend in study area (Gurdaspur District) of Punjab in India during 2015–2018

University, Ludhiana (Table 1). The farmer's practice (FP) was considered as control plot/local check in the study. These control plots were maintained by the farmers according to their own traditional cultivation practices. Critical inputs such as seed, pesticides and implements were given to the farmers for demonstration plots. The demonstrations were laid out under the close supervision of KVK Scientists. Total 126 farmers were selected for conducting FLDs and treated as the samples for present investigation. Special emphasis was given on improved cultivar, nutrient and pest management which are major constraints in increasing area and production of oilseed crops.

Data collection and Interpretation: The yield data of demonstration plots as well as control plots/ farmers' practice plots were collected at the time of harvesting to assess the impact of FLDs intervention on the yield of gobhi sarson during the period under study. Before conducting the FLDs, the soil samples of selected fields were also tested and accordingly FLDs were laid out. Regular visits by KVK scientists to FLD plots were made so to ensure timely application of critical inputs and to solve other crop related problems. However, structured and pre-tested interview schedule was used to extract the information from beneficiaries about adoption, varietal performance and horizontal spread of oilseed crop

Table 1: Demonstrated package of practices and farmers' practice for gobhi sarson cultivation

Particulars/Practices	Farmers' practice	Demonstrated package
Variety	Local/ Unknown/ Hyola	GSC 7
Sowing time	Mid Oct.- End Nov.	10 Oct. - 30 Oct.
Seed rate	1.25 -2.5 kg/ha	3.75 kg/ha
Line sowing	Not Followed	Followed
Line Spacing	Broadcasting	45 cm
Thinning	Not Followed	Followed
Recommended fertilizer dose	115 kg N+57.5 kg P_2O_5(DAP)/ha	100 kg N+30 kg P_2O_5 (SSP)+15 kg K_2O/ha
Irrigation	3-4	3
Weed management	Un recommended weedicide	Isoproturon @ 750 g/ha
Pest & Disease Management	Un-recommended pesticide	Need based (Indofil M-45 @ 625 g/ha, Thiamethoxam 100 g/ha)

technologies in all blocks. The personal interviews were conducted with the addressee farmers. The extension activities like field days and kisan goshtis were also organized at the demonstration sites as to provide opportunities for other farmers of the area. To ensure the benefits of recommended technologies, feedbacks from the farmers were collected so that further research and extension activities were further improved. The impact of FLDs on the different parameters of gobhi sarson viz., yield increase in frontline demonstrations over farmers' practice (Choudhary *et al.*, 2009), extension gap, technology gap, technology index along with benefit cost ratio (Samui *et al.*, 2000) was studied by using the following formulae:

RESULTS AND DISCUSSION

Impact of demonstrated package on gobhi sarson yield: Data on grain yield of gobhi sarson are presented in Table 2 for all the three consecutive years. During 2015-16, the mean seed yields were 19.2, 17.7, 17.4, 12.8, 18.6 and 19.6 q/ha in Batala, Dhariwal, Dinanagar, Dorangala, Gurdaspur and Kahnuwan blocks respectively which were 14.7, 12.9, 11.5, 10.5, 14.5 and 12.3 percnt higher than the respective farmers' practice. On the other hand 21.1, 20.6, 20.3,19.3, 19.5 and 20.2 q/ha mean seed yields were obtained in Dhariwal, Dinanagar, Gurdaspur, Kahnuwan and Kalanaur block during 2016-17. The increase in mean seed yield was recorded to the tune of 11.6, 12.0, 10.3,

$$\% \text{ increase over farmer's practice} = \frac{\text{Demonstration yield(q/ha) - Farmer's practice yield (q/ha)}}{\text{Farmer's practice yield}} \times 100$$

$$\text{Technology gap (q/ha)} = \text{Potential yield (q/ha) - Demonstration yield (q/ha)}$$

$$\text{Extension gap(q/ha)} = \text{Demonstration yield (q/ha) - Farmer's practice yield (q/ha)}$$

$$\text{Technology index} = \frac{\text{Potential yield (q/ha) - Demonstration yield (q/ha)}}{\text{Potential yield (q/ha)}} \times 100$$

$$\text{Impact on adoption (\% change)} = \frac{\text{No. of adopters after demonstration (ha) - No. of adopters before demonstration (ha)}}{\text{No. of adopters before demonstration (ha)}} \times 100$$

13.4 and 12.8 percent against FP yield in the Dhariwal, Dinanagar, Gurdaspur, Kahnuwan and Kalanaur blocks respectively. Similarly, during the assessment year 2017-18, the mean seed yield recorded in FLD plots were 21.4, 20.1, 20.7, 20.5, 19.8, 19.9 and 20.5 q/ha in Batala, Dhariwal, Dinanagar, Dorangala, Gurdaspur and Kahnuwan blocks which were 18.2, 13.4, 19.6, 18.1, 17.5, 13.1, 14.1 percent more than the FP plots of the respective blocks. However, the demonstrations with recommended technologies (FLDs) produced on an average 17.6, 20.3 and 20.4 q/ha seed yields of gobhi sarson against 15.6, 18.2 and 17.6 q/ha in FP plots during 2015-16, 2016-17 and 2017-18 respectively (Table 2). This yield increase may be due to adoption of recommended technologies like seed rate, line sowing and use of Single Super phosphate in the FLDs (Sagar and Chandra 2004; Choudhary *et al.,* 2014). The improved practices followed in the FLD plots gave 12.9,12.0 and 16.3 per cent increase in yield over the plots sown with the existing technology generally followed by the farmers i.e. farmers' practice during the three consecutive years. This was mainly attributed to more seed yield obtained in the FLD plots.

Table 2: Average yield of farmer's practice and demonstrations during the year 2015-16, 2016-17 and 2017-18

Year/Block	No. of Farmers	Average Yield (q/ha)		
		FP	FLD	% increase
2015-16				
Batala	3	16.7	19.2	14.7
Dhariwal	4	15.7	17.7	12.9
Dinanagar	5	15.6	17.4	11.5
Dorangala	5	11.6	12.8	10.5
Gurdaspur	6	16.3	18.6	14.5
Kahnuwan	3	17.4	19.6	12.3
Mean		**15.6**	**17.6**	**12.9**
2016-17				
Dhariwal	10	18.9	21.1	11.6
Dinanagar	4	18.4	20.6	12.0
Gurdaspur	9	18.4	20.3	10.3
Kahnuwan	7	17.2	19.5	13.4
Kalanaur	20	17.9	20.2	12.8
Mean		**18.2**	**20.3**	**12.0**
2017-18				
Batala	2	18.1	21.4	18.2
Dhariwal	15	17.8	20.1	13.4
Dinanagar	4	17.3	20.7	19.6
Dorangala	4	17.36	20.5	18.1
Gurdaspur	20	16.8	19.8	17.5
Kahnuwan	2	17.6	19.9	13.1
Kalanaur	3	18.0	20.5	14.1
Mean		**17.6**	**20.4**	**16.3**

Economics of gobhi sarson cultivation: During the first year of study (2015-16), mean gross returns of different blocks ranged between Rs 47514/ha to Rs 72458 /ha with mean net returns ranged of Rs 29426/ha to Rs 54370/ha (Table 3). However, the average gross return obtained from all FLD plots were Rs 64968/ha with net return of Rs 46880/ha which is 12.9 and 40.3 percent higher than the FP plots. Whereas, the mean gross returns of FLDs conducted in various blocks varied between Rs 72150/ha to Rs 78070 /ha and arrested net returns varied from Rs 52625/ha to Rs 58545 /ha during 2016-17. The overall average gross return of Rs 75258/ha was recorded with overall net return of Rs 55733/ha in demonstrations which were 12 and 32.1 per cent more than the farmers' practice. Likewise, mean gross returns of FLDs conducted in various blocks varied between Rs 73172/ha to Rs 79180/ha during 2017-18 and seized net returns ranged between Rs 53070/ha to Rs 56400/ha. The overall average gross return of Rs 75547/ha was recorded with overall net return of Rs 52767/ha in demonstrations which were 16.3 and 34.9 percent more than the farmers' practice. These variations in the economic returns may be attributed to the performance of cultivar in terms of grain yield of FLDs conducted under different soil type and weather conditions. Better monetary returns in terms of gross and net returns through improved technologies have also been reported by various scientists (Vedna *et al*., 2007; Choudhary and Suri, 2014). Overall, economic analysis data showed that transfer of improved technology and its adoption in oilseeds may substantially enhance the oilseed productivity and farmers' profitability besides provide a better option of crop diversification under sub-mountainous conditions of Punjab.

Benfit cost ratio: The overall commutative mean benefit: cost ratio (B:C) ratio in front line demonstrations was recorded as 3.58 against 2.24 in farmers' practice (Figure 3). The improved technology in FLDs gave higher benefit cost ratio than FLD plots. Higher B:C ratio in FLDs proved

Table 3: Net returns of gobhi sarson demonstrations and farmer's practice in year 2015-16, 2016-17 and 2017-18

Year/ Block	No. of Farmers	Average Gross returns (Rs./ha)		Average Gross Cost of cultivation(Rs./ha)		Average Net Returns (Rs./ha)	
		FP	FLD	FP	FLD	FP	FLD
2015-16							
Batala	3	61852	70948	24150	18088	37702	52860
Dhariwal	4	58021	65490	24150	18088	33871	47402
Dinanagar	5	57813	64454	24150	18088	33663	46366
Dorangala	5	43013	47514	24150	18088	18863	29426
Gurdaspu	6	60218	68943	24150	18088	36068	50855
Kahnuwan	3	64503	72458	24150	18088	40353	54370
Mean		**57570**	**64968**	**24150**	**18088**	**33420**	**46880**
2016-17							
Dhariwal	10	69930	78070	24992	19525	44938	58545
Dinanagar	4	68080	76220	24992	19525	43088	56695
Gurdaspur	9	68080	75110	24992	19525	43088	55585
Kahnuwan	7	63640	72150	24992	19525	38648	52625
Kalanaur	20	66230	74740	24992	19525	41238	55215
Mean		**67192**	**75258**	**24992**	**19525**	**42200**	**55733**
2017-18							
Batala	2	67016	79180	25890	22780	41126	56400
Dhariwal	15	65681	74487	25890	22780	39791	51707
Dinanagar	4	64056	76613	25890	22780	38166	53833
Dorangala	4	64241	75850	25890	22780	38351	53070
Gurdaspur	20	62276	73172	25890	22780	36386	50392
Kahnuwan	2	65166	73676	25890	22780	39276	50896
Kalanaur	3	66446	75850	25890	22780	40556	53070
Mean		**64983**	**75547**	**25890**	**22780**	**39093**	**52767**

the overall superior performance of the recommended technology over the already existing technology being generally followed by the farmers. The results are corroborated with the findings of Saini *et al.* (2013) The factors responsible for low B:C ratio in farmers' practice was less adoption of all the recommended package of practices for gobhi sarson crop.

The extension gap ranging between 2.0 to 2.8 q/ha in terms of yield during the period under study emphasizes the need to educate the farmers through various means for the adoption of improved agricultural production techniques (Table 4). The technology gap varying between 1.85 to 4.65 q/ha during the period under study reflected the farmers' cooperation in carrying out such demonstrations with encouraging results in subsequent years. The technology gap observed may be attributed to the varied soil fertility status and weather conditions. These findings are in line with the study by Singh *et al.* (2016). The reduction in technology gap from 4.65 q/ha (2015-16) to 1.85 q/ha (2017-18) proved the effectiveness of the front line demonstrations and the changing mindset of the farmers towards the adoption of improved technologies. On an average technology index decreased from 20.9 to 8.31 per cent under FLD programme during 2015-16 to 2017-18, showed the efficacy of good performance of technological interventions. Lower technological index of the crop shows the more adoption of technological intervention and increased yield

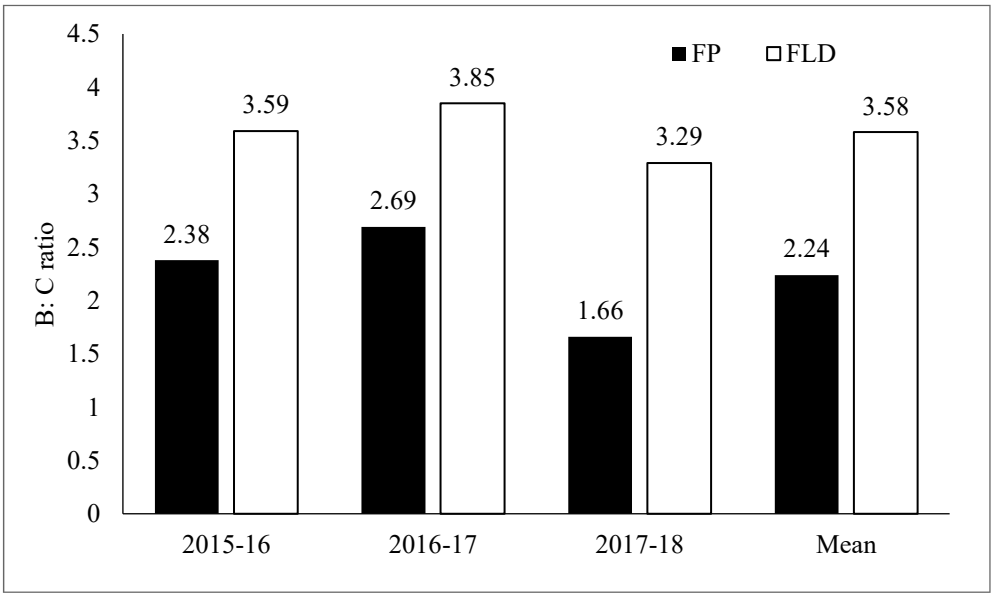

Figure 3. B:C ratio of the frontline demonstrations and farmers' practice during 2015-18 (Pooled data of three years)

performance of the crop. These findings are in line with the findings of Mitra & Tanmay (2010); Katare *et al.* (2011)

Impact of FLDs on adoption of recommended technologies: The results revealed that majority (91.3%) of the respondents had adopted Canola varieties (Table 5). The important package of practices where more increase in adoption was found were use of high yielding canola varieties (61.1%), use of recommended fertilizer dose (55.6%), timely irrigation (54.8%) and use of proper seed rate (26.2%). The increase in adoption showed the effectiveness and impact of FLD on adoption of gobhi sarson production technologies. It also indicated the keen interest took by the farmers in organizing such FLD programmes.

Impact of FLDs on horizontal spread of gobhi sarson: The study suggested that FLDs helped to increase the area under oilseed crops in the district. An increase in area from 1.9 to 3.5 thousand hectares was observed from the year 2015-16 to 2018-19. Therefore, it is evident from the study that frontline demonstrations made a significant impact on horizontal spread of Gobhi Sarson in the studied area.

Table 5: Technology gap, Extension gap, Technology index in study area of Punjab

Year	Technology gap	Extension gap	Technology index
2015-16	4.65	2.00	20.9
2016-17	1.95	2.10	8.76
2017-18	1.85	2.80	8.31

Table 6: Extent of adoption of recommended technologies of gobhi sarson crop before and after FLD (Pooled data of three years)

Package of practices	Adoption (Before FLD)		Adoption (After FLD)		Increase in Adoption	
	Number	Percent	Number	Percent	Number	Percent
Canola Variety	38	30.2	115	91.3	77	61.1
Sowing time	52	41.3	83	65.9	31	24.6
Use of Proper Seed rate	48	38.1	81	64.3	33	26.2
Line sowing and Spacing	15	11.9	40	31.7	25	19.8
Recommended fertilizer dose	33	26.2	103	81.7	70	55.6
Plant Protection measures	57	45.2	100	79.4	43	34.1
Timely Irrigation	39	31.0	108	85.7	69	54.8
Weed management	31	24.6	59	46.8	28	22.2

CONCLUSION

Frontline demonstrations are really helpful in creating awareness among the farmers and dissemination of improved technologies. The study emphasizes dissemination of improved farm technology imbedded with improved varieties and location specific crop management practices to improve oilseed productivity and profitability. Results indicated that improved practices followed in FLD plots gave 13.7 per cent higher yield with higher B:C ratio (3.58:1) over the plots sown with the existing technologies in farmers' practice. Most of the farmers became aware of the recommended production practices of gobhi sarson after conducting frontline demonstrations in the district particularly use of recommended fertilizers like use of single super phosphate instead of diammonium phosphate and canola variety. Higher yield and net returns obtained under FLD over existing practices of gobhi sarson cultivation created awareness and motivated the other farmers to follow. The economics of the frontline demonstration gives a first rate indication to further popularize the recommended package of practices among the farming community for large scale adoption. FLDs conducted at the farmers' field also ensured the horizontal spread of Gobhi Sarson crop. The area under oilseed crops increased from 1.9 to 3.5 thousand hectares in the district from 2015-16 to 2018-19. Therefore, it is concluded that FLDs are proven an effective intervention to demonstrate the production potential of oilseed crops. The technology transfer through FLDs either in terms of variety or other critical inputs may help to increase the oilseed crops productivity at micro and macro level situations.

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Effectiveness of Institutions in Promoting Pesticide Safety in Vegetable Crops: Development of Effectiveness Index and Measurement of Effectiveness

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ABSTRACT

The introduction of pesticides for agricultural pest management has become a paradoxical phenomenon, the question is whether it shouldmn, be lauded as a route in achieving food self sufficiency or reproved for ripping the ultimate balance of agro-ecosystem? At the core of this dispute, it is the use of these lethal chemical in cloying manner provoked public outcry. It is imperative to discern the role played by the change agents in ensuring pesticide safety in the fields. The present study made an attempt to measure effectiveness' of Government organization and input retail shop in promoting pesticide safety as a measure of farmers' perception using the composite effectiveness index developed for the study. The comparisons were made on individual dimensions (awareness, trust, appropriateness, timeliness and satisfaction) of the index and finally on the overall index score using Mann-Whitney U statistic. Results of critical comparison of government organization and input retail shop based on farmers' awareness of the pesticide safety services implied that farmers had a higher level of awareness about the services provided by the input retail shops than government institutions. On the trust dimension, government agents were one step ahead than the private service providers. Government agents were considered superior also on timeliness dimension by the farmers. Compared to private institution, highest relevance / appropriateness score was gained by government institutions. Level of satisfaction obtained on pesticide safety services from government institutions was highest than private institutions according to vegetables farmers. The highest score obtained by government agents on all the dimensions except on awareness, was subsequently reflected in overall effectiveness index score, on which the government institutions.

Keywords: Government organization, Input dealers, Institutions, Pesticide safety, Vegetables

INTRODUCTION

Role of vegetables is pivotal in achieving nutritional security of the nation and its consumption is vital for development of physically and mentally superior people. Regardless of this, the status of vegetable intake is well behind the recommended daily allowance owing to mounting concerns of consumers regarding elevated levels of pesticide residues in vegetables. Reported case series of rejection of Indian export consignments by European Union and other potential destinations also provided compelling evidence of pesticide residues above the Maximum Residue Limits permitted. Due to lack of awareness and presumption of getting high yield, the farmers are not following the recommended practices, which indeed drain their good health. Utmost violations are happening in field, where farmers neither care about their health nor the environmental as well as consumers'. The role of government agents and input dealers in selection of pesticides, the volume sprayed and frequency of sprays and in other agro-advisory services and diagnostic services are well pronounced in a number of studies. Mostly, the input dealers are the source of agro-chemicals and major source of information to the farming community (Al-Zaidi *et al.*, 2011; Ganiger, 2012; Etyang *et al.*, 2014; Saha *et al.*, 2015 and Devi *et al.*, 2017) who in turn are gaining knowledge about the technologies regularly from progressive farmers and fellow input dealers (Ganghas *et al.*, 2020). Hence these two groups are important link in ensuring and promoting pesticide safety.

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They are working at the grass-root level and they hold substantial credibility among the farmers. The present study made an attempt to investigate the effectiveness of these two types of institutions in promoting pesticide safety in the vegetable fields.

MATERIALS AND METHODS

An institution is any structure or mechanism of social order governing the behaviour of a set of individuals within a given community with purpose of meeting some basic human needs. Operationally institution can be defined as social and scientific organization working for enhancing the pesticide safety to ensure sustainability and facilitating local innovation. Institutions considered for this study were Government organizations like KVK and state department of agriculture; and pesticide retail shops. Role of institutions was studied through various dimensions reflecting institutional performance. The dimensions like awareness about institutional services, trust in the institution, timeliness and appropriateness of services, and level of satisfaction obtained from these services were studied by developing a composite effectiveness index.

Effectiveness is the extent to which an institution is successful in achieving the preset objectives and the targets. Five dimensions of institutional effectiveness had been identified after rigorous literature review, and discussions with expert from extension, entomology and vegetable science. The dimensions identified were awareness about institutional services, trust in the institution, timeliness, appropriateness of services, and level of satisfaction which represent performance variables. These dimensions were then given to 30 experts to give their weightage out of 10 based on their salience in measuring institutional effectiveness. The weightage obtained for awareness about institutional service was 7.5, for trust in the institution was 6.9, for timeliness was 7, for appropriateness of services was 6.8, and for level of satisfaction was 6.8. A total 30 items were identified under all the five dimensions following same procedure of literature review, expert opinion, and from researcher's insight. These items were then evaluated by experts for their relevancy on five point Likert scale. The relevancy score for each item was calculated by relevancy weight and mean relevancy score:

The statements with relevancy weight above 0.75 and mean relevancy score above one were selected. Thus, 23 statements were finally selected under all the dimensions. Based on five identified dimensions and corresponding items, effectiveness index was calculated by the following formula:

$$\text{Effectiveness Index} = \frac{E1\times WI+E2\times W2+E3\times W3+E4\times W4+E5\times W5}{W1+W2+W3+W4+W5}$$

E1: Mean score obtained on awareness about institutional services

E2: Mean score obtained on trust in the institution

E3: Mean score obtained on timeliness

E4: Mean score obtained on appropriateness of services

E5: Mean score obtained on level of satisfaction

W1: Weightage given by judges for awareness about institutional services

W2: Weightage given by judges for trust in the institution

W3: Weightage given by judges for timeliness

W4: Weightage given by judges for appropriateness of services

W5: Weightage given by judges for level of satisfaction

The index was administered to farmers of the study area in order to gauge effectiveness of institutions in promoting safe pest management interventions. Based on the mean score obtained in each category as per respondents rating and weightage given to each category by experts, the effectiveness index of government and private organizations was worked out and the values were compared using Man-Whitney U statistics.

$$\text{Relevancy weight (RW)} = \frac{\text{Number of most relevant response} * 5 + \text{Number of relevant responses} * 4}{\text{Maximum possible score}}$$

$$\text{Mean Relevancy Score (MRS)} = \frac{\text{Number of most relevant response} * 5 + \text{Number of relevant responses} * 4}{\text{Number of judges}}$$

The study was conducted in National Capital Region (NCR). The locale has been selected purposively since NCR has the largest consumer base (Census, 2011). From NCR two sub-regions, Uttar Pradesh (U.P.) and Haryana were selected purposively. The proposed research locale has been selected intentionally because pesticide consumption in vegetable crops is maximum in U.P. (Indiastat, 2012), while the highest number of vegetable samples exceeding Maximum Residue Levels (MRL) of pesticide has been reported from Haryana (DAC&FW, 2015).

The study followed stratified sampling procedure, the strata being vegetables growing districts. The study was conducted in four districts of Uttar Pradesh and Haryana. The districts were selected purposively, based on detailed analysis of their importance in vegetable cultivation, upon discussion with experts from ICAR-IARI and KVKs. The districts selected for the study were Faridabad (brinjal), Hapur (cabbage), Sonepat (cauliflower) and Ghaziabad (bitter gourd). A random sample comprising 50 farmers each from the districts were selected from the study area. Following an interview method, the effectiveness statements were administered on these farmers. The responses for each statement were recorded on five point agreement-disagreement continuum.

RESULTS AND DISCUSSION

Institutions intended to provide agro-advisory services in the study locale were studied to discover their role in promoting pesticide safety among the vegetable farming community. The major ones working in the locale were Government (mainly KVKs, and a few State department staff) and Input retail shops. Hence, these two were taken for further analysis based on farmers rating of their effectiveness. Five dimensions reflecting institutional performance were employed to study role of institutions. The dimensions, for instance, awareness about institutional services, trust in the institution, timeliness and appropriateness of services, and level of satisfaction obtained from the services of these institutions were studied by composite effectiveness index developed. The index comprised of total twenty three statements grouped in to five under the above mentioned dimensions (Table 1). Weightage obtained for awareness about institutional service was 7.5, for trust in the institution was 6.9, for timeliness was 7, for appropriateness of services was 6.8, and for level of satisfaction was 6.8. Responses were

Table 1: Composite index for institutional effectiveness

Dimensions with statements
Awareness (7.5)
Private institutions
1. The institutions recommend different/new types of pesticides for pest problem
2. They give guidelines on safe pesticide use
3. They suggest ways to protect oneself while handling pesticides
4. They sell improved pesticides/ botanicals and biocontrol agents
5. They sell personal protection equipments
Government institutions
1. They provide training classes on improved and safe pest management classes
2. They conduct on farm diagnosis and treatment of diseases
3. They provide SMS based information about pest management
4. They sell improved pesticides/ botanicals and biocontrol agents
5. They disseminate information on safe pesticide handling practices through newspaper/ T.V./Radio etc.
Trust (6.9)
1. I believe that recommendations on pesticide selection and use provided by staff of the institution can lead to pesticide safety in vegetables
2. I am sure about the truthfulness of their messages/inputs
3. I am sure that following the pesticide safety instructions provided by them will not compromise the production and income of the farm
4. I do not doubt the purity of their intentions as it is to promote human and environment health
5. It is sure that their instructions are good for the progress of the society
6. I do not believe them because practically they are poor
Timeliness (7)
1. The input services to enable safe handling practices are delivered on time
2. The advisory services on safety measures are timely disseminated
3. Diagnostic services to determine pest control schedules are offered when needed
Appropriateness (6.8)
1. Input services-like safe pesticides, botanicals and biocontrol agents are relevant
2. Advisory service on safety measures are appropriate
3. Diagnostic service to determine pest control schedules are relevant

Table 1 contd...

Satisfaction (6.8)	
1.	The recommendations provided by the institution on pest management are helpful
2.	The advisory services are reliable
3.	The cost of the safe pesticides /safety equipments is reasonable
4.	The services are always in reach
5.	The staff are easily approachable
6.	The staff are credible and competent to provide proper pesticide safety information

Maximum index value: 6.2; Minimum index value: 1
Numbers in parentheses: weightage given for the dimension

collected on five point scale for each statement with 5-score for most favourable response. The index value varies from a maximum of 6.2 to a minimum 1, where, 6.2 represent highly effective institution and as the value descends the effectiveness also.

Farmers were the respondents on whom the effectiveness index was administered, owing to the very fact that the beneficiaries/clients of a service are the best to evaluate it. Based on their response in the form of ratings of the statements, the effectiveness index for Government institutions as well as input retail shops was computed. The obtained indices were tested using Mann-Whitney U statistic to establish the significance of difference between the two groups. In addition, the respondents groups were compared on the individual dimensions of the index to track where they are equal and where they build difference.

Critical comparison of government organization and input retail shop based on farmers' awareness of the pesticide safety services was undertaken and the results are displayed in Table 2. It can be noted from the table that farmers had a higher level of awareness about the services provided by the input retail shops than government organization, since these kind of shops were present at village level, which can be attributed to local presence of these private institutions, facilitating easy access to farmers and the resulting frequency of contact the farmers made with the institution. Hence they were aware of the services provided by this institution. Farmers contact of input agencies more often than extension agents was claimed by other studies also (Rola and Pingali, 1993; Daku *et al.*, 2000; Rao *et al.*, 2009; Devi, 2010; Lekei *et al.*, 2014; Devi *et al.*, 2017; and Rijal *et al.*, 2018). The difference when tested for its significance with Mann-Whitney test was found to be highly significant (Table 3).

Table 2: Comparison of government and private organization on awareness dimension based on farmers response as per Mann-Whitney U test

Group	N	Mean rank
Government institution	200	45.29
Input retail shop	200	83.71

Table 3: Wilcoxon Mann-Whitney U test for awareness

	Test Statistics
Mann-Whitney U	818.5
Wilcoxon W	2898.5
Z	-6.036
P value	.000

The Table 4 portrays the analysis results of comparison of government and private organization on trust dimension based on farmers' response as per Mann-Whitney U test. It is loud and clear from the mean ranks that government organizations (mean rank = 96.5) succeeded in gaining the trust of farmers to a considerable extent than the trust gained by input shops (mean rank = 32.5). In support to this, higher credibility enjoyed by Government agents was published in many other studies (Holt, 1998; Daku *et al.*, 2000; Ibitayo, 2006 and Fan *et al.*, 2015). But, contradictory finding of private agents being considered more credible than their Government counterparts was brought out by Schwartz (1994). The observed difference was statistically significant (Table 5).

Table 4: Comparison of government and private organization on trust dimension based on farmers response as per Mann-Whitney U test

Group	N	Mean rank
Government institution	200	96.50
Input retail shop	200	32.50

Table 5: Wilcoxon Mann-Whitney U test for trust

	Test Statistics
Mann-Whitney U	.000
Wilcoxon W	2080
Z	-9.888
P value	.000

Institutional effectiveness was further compared on its third dimension; timeliness of the services provided. The farmers' response was such that government institution jumped over input retail shops in timely provision of pesticide safety related services. Since the pesticide safety information services provided by retail shops were relatively little (Fan *et al.*, 2015) most choice would go for Government. The results are depicted in Table 6 with its significance test in Table 7.

Table 6: Comparison of government and private organization on timeliness dimension based on farmers response as per Mann-Whitney U test

Group	N	Mean rank
Government institution	200	96.50
Input retail shop	200	32.50

Table 7: Wilcoxon Mann-Whitney U test for timeliness

	Test Statistics
Mann-Whitney U	.000
Wilcoxon W	2080
Z	-9.849
P value	.000

Two type of institutions; government and private, were compared for significance of their services as perceived by farmers' and it was observed that the farmers attached more significance to the services offered by government institutions and considered the offerings of input shops irrelevant and inappropriate in the context of safe pesticide practices. It is lucid from the significantly higher mean rank of 89 secured by government institution than the mean rank of 40 of private institutions. The test statistics and level of significance are given in Tables 8 and 9 respectively.

The Table 10 provides description of the level of satisfaction obtained to farmers from the services of government institutions and private input retail shops. The observation from the table is that farmers felt the services of government institutions (mean rank = 96.5) more

Table 8: Comparison of government and private organization on appropriateness dimension based on farmers response as per Mann-Whitney U test

Group	N	Mean rank
Government institution	200	89
Input retail shop	200	40

Table 9: Wilcoxon Mann-Whitney U test for appropriateness

	Test Statistics
Mann-Whitney U	.000
Wilcoxon W	2560
Z	-7.976
P value	.000

Table: 10 Comparison of government and private organization on satisfaction dimension based on farmers response as per Mann-Whitney U test

Group	N	Mean rank
Government institution	200	96.5
Input retail shop	200	32.5

Table 11: Wilcoxon Mann-Whitney U test for satisfaction

	Test Statistics
Mann-Whitney U	0.000
Wilcoxon W	2080
Z	-10.383
P value	.000

satisfying than that derived from input retail shops (mean rank = 32.5). Validity of the finding is established by Fan *et al.* (2015). The differences in satisfaction levels were tested for their significance using Mann-Whitney U test and found highly significant (Table 11).

Based on the mean score obtained on each dimensions according to farmers rating and the individual dimension weights given by expert team (awareness about institutional service = 7.5, for trust in the institution = 6.9, for timeliness = 7, for appropriateness of services = 6.8, and for level of satisfaction = 6.8) the overall mean score on composite effectiveness index was worked out for the two groups of institutions (Table 12). Government institutions had higher effectiveness index score (3.65) than input retail shops (2.66). Employing Mann-Whitney U statistic to test the hypothesis that both institutions have same effectiveness, it was found that there is significant difference between the two, necessitated the rejection of null hypothesis (Tables 13 and 14). The highest score obtained by Government agents on all the dimensions except on awareness, was subsequently reflected in overall effectiveness index score, on which the Government institutions top. But it must be said that this is not a reflection of success of Government in provision of safe

Table 12: Mean effectiveness index score (N=200)

Category	Mean index score
Government institution	3.65
Input retail shop	2.66

Table 13: Comparison of government and private organization on composite effectiveness index as per Mann-Whitney U test

Group	N	Mean rank
Government institution	200	96.5
Input retail shop	200	32.5

Table 14: Wilcoxon Mann-Whitney U test for composite effectiveness index

	Test Statistics
Mann-Whitney U	.000
Wilcoxon W	2080
Z	-9.760
P value	.000

pesticide promotion interventions, but the failure of private institutions in delivering at least a minimum. The insight from the field was that neither Government nor private institutions were rather effective in materializing pesticide safety at the vegetable fields. A huge gap is existent in farmers' awareness and practices from the recommended safety practices, which must be attended instantaneously to decimate the multiplicity effect of evils generated from mishandling of pesticides. A similar finding about the need for training of farmers and extension functionaries on use of environmentally safe cultivation practices was reported by Sarkar *et al.* (2019).

Farmers were categorized in to three categories; low, medium and high, based on tertiles and the percent distribution of farmers in these categories based on their perception of effectiveness of institutions in promoting pesticide safety was showed that 11 per cent of vegetable farmers considered government institution less effective, and ample per cent (51) held the opinion that they were of medium effectiveness. The government institutions were been regarded highly effective by 38 per cent of farmers.

Table 15: Categorization of farmers based on effectiveness index score given to government institutions and input retail shops

Category	Government institution (%)*	Private institution (%)*
Low (<2.67)	11	51
Medium (2.67-3.64)	51	47
High (>3.64)	38	2

***Percentage of farmers

On the contrary, large number of the vegetable farmers (more than 50%) had given less effective status for the private institutions. Whereas, private institutions were moderately effective according to 47 per cent of them. Only a meager number (2%) of farmers perceived that these institutions were highly effective (Table 15).

CONCLUSION

Agro-advisory services working at the grass-root level are central factors influencing information delivery to farmers' and further processing of information. The study focused on studying the effectiveness of these grass root agents, in this case, the Government organizations like KVK and state departments; and private organization mainly input dealers, in promoting pesticide safety by constructing an effectiveness index administered on vegetable farmers. Farmers responded to these statements based on their experience with government and private agents' activities. The results showed that government organizations were more effective on the overall effectiveness as well as on all individual dimensions except on awareness dimension than private institutions. There is an urging need for improving the effectiveness of input dealers, since they were frequently contacted by farmers and their presence has an indirect effect on farmers of safety behaviour.

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Awareness of Value-added Flour for Good Health of Farm Women in Udham Singh Nagar District, Uttarakhand

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ABSTRACT

Women plays an important role in maintaining good health of a family hence extension activities were carried out in selected villages of Udham Singh Nagar. The study focused on awareness generation towards effectiveness of a value-added flour through conducting on farm trials on value added flour. On farm trials were conducted to assess enhancement of health status of farm women through value added flour during *rabi*, 2015-16, *kharif*, 2016 and *kharif*, 2017 in selected villages viz., Anandkhera-1 (Gadarpur block), Khanpur-1 (Gadarpur block), Bannakhera Sani (Bajpur block), respectively. Five trials were conducted with different treatments (T1: Farmers practice, T2: Under-weight farm women (<18.4 BMI) with ingredient combination of flour prepared by wheat: chana: barley and T3: Normal weight farm women (18.5-24.9 BMI) with ingredient combination of flour prepared by wheat: chana: barley). The flour was prepared using ingredient combination of wheat: chana: barley in 7:2:1 ratio. Thirty farm women were selected for conducting T2 and T3 trials. There was increase in BMI, knowledge level, mid upper arm circumference (MUAC) and formulation of flour for the preparation of chappati/ paratha in case of farm women.

Keywords: Awareness, Farm Women, Flour, Good Health, Value-added

INTRODUCTION

In a world enjoying record wealth and food production, it is widely understood that improving food security and nutrition is about more than just increasing the quantity of energy intake – it is also about improving the quality of food in terms of dietary diversity, variety, nutrient content and safety (FAO, 2012). In other words, food security and nutrition are not only an issues of sufficient production, but rather a problem of continuous *access* to sufficient, safe, culturally acceptable and nutritious food; of health-nutrition relationships; of adequate water supply and sanitation; and of adequate knowledge and education about FSN – both in development, and in emergency and humanitarian settings. Food consumption is influenced by many factors such as socio-economic status, culture, religion, value, education, ignorance, food beliefs, preferences, choices and habits. Many problems of malnutrition, under nutrition or micronutrient deficiencies of iron, vitamin A, iodine, calcium etc. among various groups occur due to lack of knowledge among the people about the type of food and nutrition they should consume for their wellbeing. Hence, it is important to create awareness among the population in terms of nutrition, health and knowledge pertaining to preventive and curative measures. Lata *et al.* (2016) reported low per capita availability of cereals per day on 100 farm families (marginal and small farms) and availability and consumption level of pulses, vegetables and milk was also lower than the recommended quantities given by ICMR. The Mid upper arm circumference results that 3.4 to 22 per cent males and 4.8 to 22 per cent females were at risk category (less than 5 percentile). The result of Gomez classification for children upto 5 years revealed that 71.43 and 45.45 per cent children of marginal and small farms respectively suffers from various types of malnutrition.

India has achieved food security in terms of agricultural production but nutrition security is far-fetched goal because a large population is malnourished. The Rapid Survey on Children (RSOC) 2013–14 conducted by the Ministry of Women and Child Development and

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UNICEF shows considerable improvement in nutrition level of children under 5 years of age in comparison to 2005–06; but it still remains very high. The stunting has reduced from 48 per cent (2005–06) to 38.7 per cent (RSOC, 2013–14); underweight and wasting have reduced from 42.5 per cent to 29.4 per cent in 2005–06 and from 19.8 per cent to 15 per cent in 2013–14. Around 4.6 per cent of children in the age group 0–59 months were found to be severely wasted (National Plan of Action for Children, 2016). As per the information given in Table 1, India has a "serious" hunger problem with 15.2 per cent of its citizens undernourished and 38.7 per cent of under-five children stunted (Global Hunger Index Report, 2016, IFPRI). The prevalence of wasting and stunting in children under five years is 15.1 per cent and 38.7 per cent, respectively. The under-five mortality rate is 4.8 per cent (Global Hunger Index Report, 2016, IFPRI). According to the report's global rankings for 2016, India, ranked 97 among 118 developing nations.

The concept of adequate food has three components: food should be available in quantity and quality sufficient to satisfy the dietary needs of every individual, man, woman and child; and food should be acceptable within a given culture. Food security is measured by agricultural produce and population's access to it whereas nutrition security deals with the manner in which the agricultural produce (food) has been utilized (consumed quality and quantity against the requirement) by the biological system and given right parameters/ indicators for nutritional status. Uttarakhand which has around 10 lakh malnourished and around 2500 severely malnourished children has turned to local produce mandua flour (Finger millet flour) and kala bhat (Soybean) to boost nutrition among kids and pregnant women. In a study on 2500 malnourished children, 744 are in Haridwar, 394 in Udham Singh Nagar followed by Tehri- 183, Dehradun -172, and Nainital-186 (Times of India, 2016). The nutritional status of the family could be improved considerably, if farm women could be persuaded to feed the family with nutritionally rich, value-added flour for the preparation of chapatti. Nutrition-sensitive food systems, education, and awareness can give consumers better options, but ultimately, they choose what they eat from what is available and affordable to them. In turn, this influences their own nutritional status and sends signals back through the food system – to retailers, processors and producers – that shape both what is produced and how sustainably it is produced. Nutrition education is key to build a food secure world and foster sustainable development. It is defined as "any combination of educational strategies, accompanied by environmental supports, designed to facilitate voluntary adoption of food choices and other food and nutrition-related behaviours conducive to health and well-being" (Contento, 2007). Nutrition education is "delivered through multiple venues and involves activities at the individual, community, and policy levels" (Contento, 2007). Nutrition education empowers consumers to select, enables women to improve children nutrition, and improves children's educational achievements (children who are well-nourished learn better than those who are not). It gives people the needed knowledge about what they and their families should eat to be healthy, and helps them develop skills to make good food choices and prepare healthy meals. It can build people's confidence to discriminate between credible nutrition information and deceptive, misleading commercial food advertisements.

Tripathi and Selvan (2016) opined that capability building of home managers who are also the integral part of agricultural practices in western Uttar Pradesh need a call of attention. The different areas include design of high nutrient efficiency (HNE) diets, storage loss minimization techniques, income generation activities, location specific drudgery reduction technologies. These are the topics of utmost importance as per the preference of rural females.

Table 1: Proportion or prevalence of undernourished, wasting, stunting and under-five mortality rate

	Proportion of under-nourished in the population (%)		Prevalence of wasting in children under five years (%)		Prevalence of stunting under five years (%)		Under-five mortality rate (%)	
Year	**2007-2009**	**2014-2015**	**2006-2010**	**2011-2015**	**2006-2010**	**2011-2015**	**2008**	**2015**
	17.2	15.2	20.0	15.1	47.9	38.7	6.6	4.8

Source: GHIR, 2016, IFPRI

It is necessary to include all these topics in the training programmes to bridge the technological gap between existing and recommended home and farm managerial practices. Hence, how efficiently farm women fulfils her responsibilities of providing good health and nutrition to the family depends to a large extent on her knowledge and understanding of aspects of basic nutrition and health care. Keeping this in view attempts were made to generate awareness on nutrition and good health among farm women of U.S. Nagar district by conducting on-farm trials.

MATERIALS AND METHODS

The promotion of value-added flour for enhancement of nutritional security of farm women and family has been emphasised by the Krishi Vigyan Kendra, Kashipur. Efforts were made to enhance knowledge of farm women by conducting training, on farm trials, field visits and participation in kisan gosthi etc. On-farm trials were conducted to assess enhancement of health status of farm women through value added flour during *rabi*, 2015-16, *kharif*, 2016 and *kharif*, 2017 in selected villages such as Anandkhera-1 (Gadarpur block), Khanpur-1 (Gadarpur block), Bannakhera Sani (Bajpur block), respectively. Five trials were conducted for treatments (T1: Farmers practice-wheat flour, T2: Under-weight farm women (<18.4 BMI) with ingredient combination of flour prepared by wheat: chana: barley and T3: Normal weight farm women (18.5-24.9 BMI) with ingredient combination of flour prepared by wheat: chana: barley). The flour was prepared using ingredient combination of wheat: chana: barley in 7:2:1 ratio. Thirty farm women were selected for conducting T2 and T3 trials. Discussions were made and observations were recorded for data collection.

Participation in kisan gosthi and field visits: Farmers of the district were sensitized towards healthy eating practices, hygiene and sanitation and popularization of low-cost technology for nutrient rich food products.

Dissemination of relevant information through print media: For wider coverage of extension activities, information on health aspects, nutrition etc. has been extended through newspaper.

RESULTS AND DISCUSSION

Awareness generation among farm women/ farmers/ extension functionaries were conducted by the KVK through various extension methods on health and nutrition aspects. The outcome of the extension activities are observed as follows:

***Home visits, trainings and on farm trials*:** Home visits and trainings were conducted for capacity building and knowledge enhancement on thematic areas such as value addition, preservation and processing, hygiene and sanitation practices etc. to practicing farm women. Lata *et al.* (2016) assessed the food consumption pattern and nutritional status of 50 marginal and 50 small farm families in U.S. Nagar. The result indicated that per capita availability of cereals per day on marginal and small farms were 402.82 and 413.52 grams, respectively which were lower than the recommended quantity of cereals per day (420 g/day). The efforts of extension activities were made to enhance knowledge of farm women towards balance diet, food items required for maintenance of good health and ways to enhance nutritional value of food items. On farm trials were conducted on value added flour using ingredients as wheat, chana and barley. Based on field visits and experience sharing with farm women it was found that no awareness was there about value addition of flour before the conduct of trial but after the conduct of trials there was awareness among farm women regarding value addition of flour (Table 2). Average per cent (%) increase in knowledge was found for T2 and T3 as 71 and 73, respectively (Table 3). Our results are in agreement with those of Martolia *et al.* (2020). They concluded that farm women lack technical knowledge in adding value of farm produce at local or commercial level. They were of the opinion that women have a crucial role to reduce the wastage of agriculture produce. Health of farm women was assessed by body mass index (BMI). Average per cent (%) increase in BMI

Table 2: Awareness on value addition of flour

Technology	No. of trials	Awareness on value addition	
		Before	After
T1: Farmers practice	05	No	Yes
T2: Under-weight women (wheat: chana:barley)		No	Yes
T3: Normal weight women (wheat: chana: barley)		No	Yes

Table 3: Per cent increase in knowledge

Parameter	% increase in knowledge			Average
Season Village	***Rabi* 2015-16** **Anandkhera-1 (Gadarpur)**	***Kharif* 2016** **Khanpur-1 (Gadarpur)**	***Kharif* 2017** **Bannakhera Sani (Bajpur)**	
T1: Farmers practice	nil	nil	nil	nil
T2: Under-weight women (wheat: chana: barley)	68	70	75	71
T3: Normal weight women(wheat:chana: barley)	70	72	77	73

Table 4: Per cent increase in BMI

Parameter	% increase in BMI			Average
Season Village	***Rabi* 2015-16** **Anandkhera-1 (Gadarpur)**	***Kharif* 2016** **Khanpur-1 (Gadarpur)**	***Kharif* 2017** **Bannakhera Sani (Bajpur)**	
T1: Farmers practice	10	09	10	09.66
T2: Under-weight women (wheat: chana: barley)	21	20	16	19.00
T3: Normal weight women(wheat: chana: barley)	17	18	17	17.33

Table 5: Per cent increase in MUAC

Parameter	% increase in MUAC			Average
Season Village	***Rabi* 2015-16** **Anandkhera-1 (Gadarpur)**	***Kharif* 2016** **Khanpur-1 (Gadarpur)**	***Kharif* 2017** **Bannakhera Sani (Bajpur)**	
T1: Farmers practice	03	02	02	2.33
T2: Under-weight women (wheat: chana: barley)	12	13	11	12
T3: Normal weight women (wheat: chana: barley)	18	19	20	19

Table 6: Scores for acceptance of technology

Parameter	Scores for acceptance of technology		
Season Village	***Rabi* 2015-16** **Anandkhera-1 (Gadarpur)**	***Kharif* 2016** **Khanpur-1 (Gadarpur)**	***Kharif* 2017** **Bannakhera Sani (Bajpur)**
T1: Farmers practice	-	-	**-**
T2: Under-weight women (wheat: chana: barley)	3.8 (liked very much)	3.8 (liked very much)	3.8 (liked very much)
T3: Normal weight women (wheat: chana: barley)	4.3 (liked very much)	3.9 (liked very much)	3.9 (liked very much)

Score card: 1-2 disliked, 2-3 liked slightly, 3-4 liked very much, 4-5 liked extremely

was found in all the trials conducted as 9.66, 19.00 and 17.33 per cent for T1, T2 and T3 (Table 4). There was also increase in mid upper arm circumference (MUAC). Table 5 shows an increase in MUAC for T1, T2 and T3 as 2.33, 12 and 19 respectively. Acceptability scores of chappati/paratha were found using score card method. In all the trials conducted acceptability scores were found in the range 3-4 liked very much by farm women in trials conducted during *rabi*, 2015-16, *kharif*, 2016 and *kharif*, 2017 in selected villages viz., Anandkhera-1 (Gadarpur block), Khanpur-1 (Gadarpur block), Bannakhera Sani (Bajpur block), respectively (Table 6).

CONCLUSION

Awareness creation is understood to be a constructive and potentially catalytic force that ultimately leads to a positive change in actions and behaviours of the population. These changes may be sought by individuals, groups,

organizations, communities or societies. Various extension methods were used to enhance knowledge and awareness generation to improve health of the farm women and family. The study focused on awareness generation towards effectiveness of a value- added flour through conducting on farm trials on value added flour. There was increase in BMI, knowledge level, MUAC and formulation of flour for the preparation of chappati/ paratha was found acceptable by farm women.

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Practices Adopted by Vegetable Farmers to Minimize the Residual Effects of Pesticides

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ABSTRACT

Finding clearly indicate that overall awareness of vegetable farmers pertaining to aspects of minimization of pesticides' residual effects was moderate to high since approximately 86.00 per cent of farmers belonged to these categories. Cent percent farmers were found aware to use branded pesticides followed by pesticide residues remain in fruits and other food commodities, soil and underground water, proper identification/symptoms of insect pest, weed, fungi, nematodes attacks etc., no reuse of empty containers for drinking or eating purposes at field, single spray of different recommended pesticides with compatibility only to avoid repeated sprays, safe waiting period for harvesting and banned pesticides by university or other governing body were the other aspects on which majority of vegetable farmers possessed awareness while they were least aware of certain essential technical aspects such as dose of agrochemical on the basis expert's advice, pesticides should be applied at ETL level or beyond pest: defender ratio, no immediate marketing of fruits harvested after pesticide spray and alternatives of chemical pesticides for safe and healthy crops like botanical measures or biological measures, cow products etc. Regarding adoption of practices for minimization of residual effects, a vast majority did not grow vegetables in sewage water (mean score 4.00) followed by use of branded pesticides (green pesticides), consumed vegetables in the field after washing with clean water/peeling, pesticide measures after proper identification of insect pest, diseases, weeds, nematodes etc., no use of pesticides banned by university or government and no tank mixing of pesticides in one operation to avoid separate sprays of 2-3 kinds of pesticides were the regularly adopted practices by farmers whereas, rarely adopted or not adopted practices viz. insecticide dipping for shining product, immediate marketing of harvested vegetables after whitening with bleaching powder, after dye for colour enhancement, and use of chemical sweetener/aspartame to add sweetness in watermelon, muskmelon etc. (mean 1.00), followed by use of Oxytocin/growth hormone for increasing size of fruit (mean 1.07), use of pheromones traps or other hormones/ yellow sticky traps to save the crop, use botanical measures (Neem, Garlic, Dhatura, Oak, Tulsi, Tobacco etc.) or biological measures (*Trichoderma*, *Pseudomonas, Metarhizium* and growing organic vegetables, fruits and food grains, fodder for home use with weighted mean scores of 1.07, 1.23, 1.47, and 1.55 respectively.

Keywords: Adopted, Farmers, Pesticides, Practices, Residual, Vegetable

INTRODUCTION

Vegetables are important sources of macro- and micro-nutrients and phytochemicals necessary for boosting body immunity thus maintaining health and preventing diseases in human. It is in this context that nutrition guidelines contain a recommendation that a balanced diet should include vegetables. India is the second largest producer of vegetables in the world, next to China. The production of vegetables has increased from 58.5 million tonnes to 175 million tonnes since 1991-92 to 2016-17 (Anonymous, 2017). In India, vegetables are major constituents of diet as majority of Indians are vegetarian, with a per capita consumption of 135 g per day as against the recommended 300 g per day. Consumers generally demand for better quality vegetables. Quality vegetable to them means healthy, succulent and fresh looking vegetables with no visible rashes or holes caused by pests or diseases. To satisfy this demand, farmers have to tackle pest and disease problems by all means. The use of agrochemicals including pesticides has been found to be the immediate and cheaper way to produce unblemished vegetables and increased farm

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productivity. The usage of pesticide has increased manifold since 1960s worldwide. The occurrence of unacceptable levels of pesticide residues in horticultural produce has been a growing public health concern worldwide. High pest infestation forces farmers to apply pesticides intensively to rescue crop loss. It is reported that the crop loss due to pest infestation can be as high as 100 per cent if they are not controlled (Rajabu *et al.*, 2017). However, good pesticide application practices have to be observed to protect and promote public health. If not well controlled, pesticide use may result in unsafe pesticide residues in agricultural produce which in turn results in excessive pesticide exposure in human and animals. Consumption of pesticide containing food is the major route of chronic exposure to pesticides. It is estimated that dietary pesticide exposure is five times higher than exposure through other routes which include inhalation and contact (Bempah *et al.*, 2011; Fothergill and Abdelghani, 2013). Health risks associated with exposure to pesticide residues range from acute characterized with coughing, headache, nausea, stomachache, diarrhoea and vomiting to chronic in the form of endocrine disruption, reproduction and immune systems malfunctioning and development of some cancers (Thatheyus *et al.*, 2013; Toft *et al.*, 2004). Several initiatives have been taken to ensure pesticide safety of vegetables and other foods. Some of these include the establishment and enforcement of maximum residue levels (MRLs). Countries or the Codex Alimentarius Commission set MRLs based on reference limits such as acceptable daily intakes (ADI) and acute reference dose (ARfD) prescribed by The Joint Meeting of Food and Agriculture Organization (FAO) and World Health Organization (WHO) on Pesticide Residues (JMPR). MRLs are established based on data obtained from field supervised trials following good agricultural practices (GAP) whereas ADI and ARfD are established based on international dietary risk assessment data (WHO, 1997). The MRLs are set much higher above the ADI to ensure that, if the food produced under GAP is consumed in the entire lifetime of the consumer, the adverse health risks associated with the particular pesticide will not be manifested (Claeys *et al.,* 2008).

Vegetable farmers use a wide range of pesticides at different levels to reduce losses from pests and diseases. Majority of them seek advice from pesticide dealers at the time of purchasing pesticides. The pesticide dealers are more interested in earning their profit rather than guiding the farmers properly. Hence, the vegetable growers are making the excessive use of pesticides to keep the produce pest free and to force pests inside not to peep out which might reduce the market price. Most vegetable crops are harvested on daily basis and in many cases are sprayed daily. As aforestated, indiscriminate use of pesticides may result in excessive pesticide residues in food and the environment. Levels of pesticide residues in food may be altered during household operations or industrial processing. However, most of the studies reporting pesticide reduction in food were conducted under laboratory conditions (Keikotlhaile *et al.,* 2010). This implies that the alteration may not necessarily represent what happens in real life situations at household level. Beyond advocacy of vegetable consumption for general health promotion and prevention of diseases (WHO, 2003), dieticians prescribe higher amounts of vegetable and fruits consumption for people suffering from non-communicable diseases (NCDs). As a result, there is an increase in awareness about the health benefits of vegetables in human diets (FAO, 2015). The increased awareness of health benefits of vegetables and fruit has contributed to the increased consumption and demand of these products (HODECT. Tanzania development strategy 2012-2021). Since the risk of pesticide exposure is higher in populations consuming high levels of fruit and vegetables compared to those consuming moderate amounts (FAO/WHO, 2009), there is an urgent need to ensure the safe use of pesticides in fruit and vegetables. It is therefore imperative to gather, analyze and document farmers' and householders' practices that can influence presence and exposure of pesticides in developing countries. The information can be used by agricultural extension agents and food safety regulatory authorities to amend policies, regulations and codes of practices with a view to minimizing the problem of pesticide exposure in those countries.

MATERIAL AND METHODS

Empirical study was carried out following ex post facto research design to collect the primary data on "Practices adopted by vegetable farmers to minimize the residual effects of resticides" whereby the respondents were selected following multistage sampling method. Haryana state was selected purposively being in the vicinity of National Capital Region, Delhi as well with Asia's biggest vegetable market in Azadpur, New Delhi an accelerator for higher economic benefits of vegetable cultivation in the state. Further three districts namely Hisar, Yamunanagar

and Sirsa were selected randomly. Further the blocks viz. Hisar-1 and Hansi from Hisar, Sadhoura and Radaur from Yamunanagar, Sirsa and Rania from Sirsa district were selected randomly. Then vegetable growing villages viz. Sikarpur and Raipur from Hisar-1 block, Dhani Pirwali and Dhani Piran from Hansi and Suchan, Suchan Kotli and Kusumbhi from Sirsa, Ottu, Nanakpur and Abholi from Rania, Sadhora and Slempur from Sadhora, Fatehgarh and Rajheri from Radaur block were selected randomly. Finally, 8-10 vegetable growers were randomly selected from each village as per availability and a total of 120 vegetable growers were interviewed. The data were collected with the help of well-structured pre-tested interview schedule. The data were analyzed by applying the statistical techniques like frequency, percentage, weighted mean and rank order to draw meaningful inferences.

RESULTS AND DISCUSSION

Data of respondents profile presented in Table 1 depicts that approximately 50.00 per cent of respondents belonged to middle age category i.e. 38-55 years. The majority of respondents i.e. 50.00 per cent belonged to moderate experience category to grow vegetables followed by high experience category (38.33%) and low experience in vegetable cultivation i.e. 11.67 per cent only. In nut shell vast majority (88.33%) had wide experience of vegetable cultivation being their parental occupation. In case of educational qualification of respondents, about 45.00 percent had qualification up to higher secondary followed by graduation (28.33%) and up to primary only 27.50 per cent. The majority of respondents (54.17%) belonged to joint family and size of 4-6 family members.

The majority (63.33%) of respondents belonged to small and medium farmers' category after including the leased in land and only 16.67 per cent of farmers had more than 16 acres of land holding. Especially small and marginal vegetable growers were using rented farms for cultivation. Agriculture was main occupation of about 86.00 per cent respondents and rests of the farmers were doing subsidiary occupation like business and service.

Tube well was the main source of irrigation of about 53.00 per cent of farmers followed by both tube well and canal facility by 45.00 per cent. While, hardly 2.00 per cent had community tank/farm tank as irrigation facility. Only 40.00 per cent were having farm mechanization.

Only 10.00 per cent of vegetable growers had attended trainings on plant protection. The data pertaining

Table 1: Socio-economic attributes profile of vegetable farmers (n=120)

Category	Frequency	Percentage
Age		
Up to 37 years	34	28.33
38-55 years	57	47.50
Above 55 years	29	24.17
Experience		
Low (Up to 9 years)	14	11.67
Medium (10-21 years)	60	50.00
High (22-52 years)	46	38.33
Education		
Up to primary	33	27.50
Up to higher secondary	53	44.17
Graduation	34	28.33
Family type		
Nuclear	55	45.83
Joint	65	54.17
Family size		
Up to 3 members	02	1.66
4 to 6 members	60	50.00
7 to 9 members	26	21.67
More than 9 members	32	26.67
Land holding		
Landless	21	17.50
Less than 1.0 acre	21	17.50
Up to 5 acres	34	28.33
6 -10 acres	19	15.83
11-15 acres	05	4.17
16 and above	20	16.67
Occupation		
Agriculture	103	85.83
Agriculture + allied occupation	03	2.50
Agriculture + business	14	11.67
Source of irrigation		
Tube well	63	52.50
Both tube well & canal	55	45.83
Community tank	02	1.67
Farm mechanization		
No mechanization	72	60.00
Tractor, Harrow, Cultivator, Trolley & Thresher	20	16.67
Power sprayer	07	5.83
Straw reaper	03	2.50
Combine harvester	18	15.00

Table 1 contd...

Category	Frequency	Percentage
Trainings on plant protection		
Attended	12	10.00
Innovativeness		
Low	21	17.50
Medium	65	54.17
High	34	28.33
Information sources utilization		
Low (up to 3 score)	22	18.33
Medium (4-6 score)	62	51.67
High (7-17 score)	36	30.00

to innovativeness of farmers clearly indicated that majority (54.17%) of respondent farmers belonged to moderate innovativeness category followed by high innovativeness (28.33%) and only 17.50 per cent of them belonged to low innovativeness category. Similarly information source utilization pattern indicated that approximately 52.00 per cent made moderate use of information sources followed by 30.00 per cent to high use pattern. So it can be conclude that overall use of information sources was moderate to high since 82.00 per cent of farmers belonged to these categories.

Data pertaining to vegetable farmers' awareness on pesticide residue presented in Table 2 elicits that cent per

Table 2: Vegetable farmers' awareness on aspects of minimization of residual effects of pesticides (n=120)

S.No.	Statement	Frequency	Percentage
1.	Residues of pesticides remain in fruits, vegetables and other food commodities, soil and underground water	115	95.83
2.	Organic cultivation of vegetables, fruits and food grains for home	27	22.50
3.	Use of branded pesticides	120	100.00
4.	Proper identification/symptoms of insect pest, weeds, fungi, nematodes etc.	99	82.50
5.	The banned pesticides by University or other governing body.	62	51.66
6.	Safe waiting period for harvesting after application of pesticides.	70	58.33
7.	No immediate marketing of harvested vegetables after pesticide spray	29	24.16
8.	Proper washing/cleaning before taking to market	51	42.50
9.	Oxytocin/growth hormone use in vegetables for increasing size of fruit	29	24.16
10.	Better to stop application of insecticide/pesticide 7-10 days before harvesting	84	70.00
11.	Know the various categories of toxicity of pesticides and warning symbols given on packets.	46	38.33
12.	Single spray of different recommended pesticides with compatibility to avoid repeated sprays	96	80.00
13.	Determine the dose of agrochemical on the basis		
	a) packet/bottle label	41	34.16
	b) dealers prescription/advice	60	50.00
	c) expert's advice	05	4.16
	d) fellow farmers	05	4.16
	e) own experience	09	7.50
14.	Pesticides should be applied in the at ETL level or it is beyond pest: defender ratio	17	14.16
15.	Farmers' friendly insects or pest-defenders ratio	34	28.33
16.	Use of pheromones traps or other hormones to save the crop from insect pest.	46	38.33
17.	Alternatives of pesticides for safe and healthy crops like botanical measures or biological measures, cow products etc.	38	31.66
18.	No reuse of empty containers for drinking or eating purposes at field	98	81.66
19.	Destruction of empty containers of pesticides by underground burry or burning.	53	44.16

cent respondent farmers were aware for use of branded pesticides followed by pesticide residues remain in fruits, vegetables and other food commodities, soil and underground water (95.83%), proper identification/ symptoms of insect pest, weed, fungi, nematodes etc. (82.50%), no reuse of empty containers for drinking or eating purposes at field (81.66%), single spray of different recommended pesticides with compatibility to avoid repeated sprays (80.00%), better to stop application of insecticide/pesticide 7-10 days before harvesting (70.00%) whereas, they were less aware or not aware of aspects such as dose of agrochemical on the basis of expert's advice (4.16%), pesticide application at ETL level or it is beyond pest: defender ratio (14.16), no immediate marketing of fruits harvested after pesticide spray and proper washing/cleaning before taking to market (24.16%), farmers friendly insects/ pest-defenders ratio (28.33%) and alternatives of chemical pesticides (31.66%). Findings of the study are supported by findings of past study (Hossain *et al.,* 2018) who found that majority (96%) of the farmers were well aware of the harmful effect of pesticides but contrary to expectations, these do not significantly change their practices or attitude towards safe and healthy pesticide use.

Table 3: Overall awareness of vegetable farmers on aspects of minimization of pesticides residual effects (n=120)

Category	Score	Frequency	Percentage
Low	Up to 7	17	14.17
Medium	8-10	55	45.83
High	11-16	48	40.00

Mean score = 10.13; Standard deviation = 2.89

The overall awareness of vegetable farmers pertaining to pesticide residue was moderate to high since 85.83 per cent of farmers belonged to these categories. Only 14.17 per cent belonged to low awareness category.

Data pertaining to practices adopted by vegetable farmers for minimizing the residual effects presented in Table 4 clearly indicate that all respondent farmers did not grow vegetables in sewage water with top ranking and mean score of 4.00 followed by use of branded pesticides (mean score of 3.93) ranked 2nd, consume fruits/vegetables in the field after washing with clean water/ peeling ranked

Table 4: Practices adopted by vegetable farmers to minimize the residual effects of pesticides (n=120)

S. No.	Practices	Extent of Adoption				TWS	WMS	Rank
		Regularly (4)	Occasionally (3)	Rarely (2)	Not at all (1)			
1	Do not grow vegetables in sewage water	120	-	-	-	480	4.00	I
2	Consume fresh vegetables in the field after washing with clean water/ peeling	92	21	07	-	445	3.70	III
3	Grow organic vegetables for home use	19	5	-	96	187	1.55	XII
4	Always use branded pesticides	101	17	02	-	459	3.82	II
5	No use of pesticides banned by university or government.	72	34	14	-	418	3.48	V
6	Under take pesticide measures after proper identification of insect pest, diseases, weeds, etc.	91	17	12	-	439	3.65	IV
7	Follow safe waiting period for harvesting after application of pesticides	05	19	60	36	233	1.94	XI
8	Use of oxytocin/growth hormone for increasing size of fruit	03	-	-	117	129	1.07	XV
9	Marketing of harvested vegetables immediately after dye for colour enhancement	-	-	-	120	120	1.00	XVI
10	Take harvested vegetables to market immediately after whitening with bleaching powder	-	-	-	120	120	1.00	XVI
11	Use Malathion or any other insecticide dipping for shining product marketing	-	-	-	120	120	1.00	XVI
12	Use of chemical sweetner/aspartame to add sweetness in watermelon, muskmelon etc.	-	-	-	120	120	1.00	XVI

Table 4 contd..

S. No.	Practices	Extent of Adoption				TWS	WMS	Rank
		Regularly (4)	Occasionally (3)	Rarely (2)	Not at all (1)			
13	Always prefer to use green symbol pesticides for spray	26	48	12	34	306	2.55	IX
14	No tank mixing of pesticides in one operation to avoid separate sprays of 2-3 kinds of pesticides	63	29	17	11	384	3.20	VI
15	Use proper dose of agrochemical as per package of practices or prescribed by subject matter specialist along with proper quantity of water for spraying	09	70	32	09	319	2.65	VIII
16	Apply pesticides at ETL level or beyond pest: defender ratio	05	05	88	22	233	1.94	XI
17	Use of pheromones traps or other hormones/ yellow sticky traps to save the crop	02	10	02	106	148	1.23	XIV
18	Use botanical measures or biological measures cow products like dung, urine, butter milk etc., to avoid pesticide application	02	24	03	91	177	1.47	XIII
19	No reuse of empty containers for drinking or eating purposes at field	63	14	02	41	339	2.82	VII
20	Destruct empty containers of pesticides by underground burry or burning.	43	-	12	65	261	2.17	X

3rd with mean score of 3.70, pesticide measures after proper identification of insect pest, diseases, weeds, nematodes ranked 4th with mean score of 3.65, and no use of pesticides banned by university or government ranked 5th with mean score of 3.48 were regularly adopted by farmers while, rarely adopted or not adopted practices included marketing of harvested vegetables immediately after dye for colour enhancement, take harvested vegetables to market immediately after whitening with bleaching powder, aspartame to add sweetness in watermelon, muskmelon etc. and Malathion or any other insecticide dipping for shining product marketing (mean 1.00) ranked 16th followed by use of oxytocin/growth hormones in vegetables for increasing size of fruit, use of pheromones traps or other hormones/ yellow sticky traps to save the crop, use botanical measures (Neem, Garlic, Dhatura, Oak, Tulsi, Tobacco etc.) or biological measures (*Trichoderma, Pseudomonas, Metarhizium* and growing organic vegetables and fruits for home use with weighted mean scores of 1.07, 1.23, 1.47 and 1.55 with ranking of 15th, 14th, 13th and 12th respectively. Destruction of non metal/paper containers only. While, metallic containers were sold to kabaadi i.e. junk man by farmers. The findings get support from the past researches of Kiwango *et al.* (2018) who reported malpractices in use of pesticides in vegetables production. Though low adoption was found for use of insecticides dip and growth hormone but it was most used by rental farmers and marketers in sabji mandis (vegetable markets). Similarly low adoption of ETL/pest defender ratio by farmers get strength from the past study of Hossain *et al*. (2018) who reported majority (74%) of the interviewees applied the pesticide at low pest densities.

Table 5: Overall adoption of practices to minimize the pesticide residual effects by vegetable farmers (n=120)

Category	Score	Frequency	Percentage
Low	36-43	17	14.17
Medium	44-50	46	38.33
High	51-62	57	47.50

Mean score = 49.94; Standard deviation = 6.17

The overall adoption of practices to minimize residual effects by vegetable farmers was moderate to high since approximately 86.00 per cent of farmers belonged to these categories. Only 14.17 per cent of farmers belonged to low adoption category. In nut shell a vast majority (86.00%) had high to moderate adoption of practices to minimize pesticide residual effects. It was due to prevalence of green as well bio-pesticides in the market as well non adoption of hazardous practices like dyes, insecticide dips and other chemicals by vegetable farmers.

CONCLUSION

Finding highlight that overall awareness of vegetable farmers pertaining to pesticide residue was moderate since majority of farmers i.e. approximately 46.00 per cent of belonged to this category. Awareness was high on general aspects while it was low in case of technical aspects such as dose of agrochemical on the basis expert's advice, pesticides should be applied at ETL level or it is beyond pest: defender ratio and alternatives of chemical pesticides for safe and healthy crops like botanical measures or biological measures. Overall adoption of practices to minimize residual effects was high since around 48 per cent framers belonged to this category and it was found high in practices such as not growing vegetables in sewage water followed by use of branded pesticides, consume fresh vegetables in the field after washing with clean water/ peeling, pesticide measures after proper identification of insect pest, diseases, weeds, nematodes etc. which were regularly adopted practices to minimize residual effects by farmers whereas, rarely adopted or not adopted practices were such as insecticide dipping for shining product, immediate marketing of harvested fruits/ vegetables after whitening with chemical or dye for colour enhancement, and use of sweeteners in watermelon, muskmelon etc., use of chemical growth hormones/ Oxytocin for increasing size of fruit, use of pheromones traps or other hormones/ yellow sticky traps to save the crop and botanical measures or biological measures and growing vegetables organically for health and nutritional security of people as well sustainability of farming income. Awareness campaigns should be organized by field functionaries on health hazards of indiscriminate and injudicious use of insecticides, chemical growth hormones and non compliance of safe waiting period for health and nutritional security of vegetable farmers in particular and people of nation in general.

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Status of Urban Slum Households' Food Consumption Pattern and Suggestions to Improve their Food Consumption Pattern in the National Capital Region

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ABSTRACT

Worldwide, the population of slum dwellers in developing countries increased from 689 million in 1990 to 880 million in 2014. In India's 2011 census revealed that the slum population stands 65 million people. Around 5.41 per cent of Indian population lives in slums. These people don't access enough food, health and sanitation and infrastructural facilities. Further, in food and nutritional parameters, the slum and homeless residents have been facing huge food and nutritional insecurity issues due to their affordability, poor awareness about nutritionally rich low cost food items, lack of consumption of micronutrient rich food groups, etc. It leads high incidences of micronutrient deficiencies. Under this background, a study was conducted in the Delhi union territory, with the sample size of 120 respondents of slum households. This study assessed the slum households' awareness, knowledge level about the nutritionally rich food groups' consumption pattern, nutritional status of the households. More than 50 per cent of the slum households have consumed poor food consumption practices. The household sanitation and healthy food consumption practices also were very poor. Hence, the study suggested that, the promotion of awareness and knowledge creations related to nutritional food consumption patterns through low cost nutritionally rich food crops like drumsticks, guava, banana, millets and greens, tomato based consumption to promote balanced nitrous food habits in the urban poor's sustainable balanced diet with greater affordability and accessibility to improve the nutrient rich food consumption behaviour to the urban poor and easily address the Nutritional security of urban poor. Improvement of household sanitation and healthy food consumption practices also important to improve their nutritional security. Finally, food-specific policies are needed to improve the food systems to benefit the poor to solve the urban poor food and nutrition insecurity issues.

Keywords: Food consumption, Micronutrient deficiencies, Nutritional insecurity, Urban slum households

INTRODUCTION

Worldwide, fifty-four percent of the global population resides in the urban areas with less accessed basic necessities and food and nutritional requirements (UNO, 2019). Among the urban population, the slum dwellers in developing world challenges the UNO's Sustainable Development Goals (UNO-SDGs, 2019). According to the United Nations, slums are operationally defined as "groups of individuals living under the same roof in an urban area, lacking in one or more of the following five amenities of durable housing, sufficient living area, access to improved water, access to improved sanitation facilities and secure tenure (Nolan, 2015). Globally, the slum population increased from 689 million in 1990 to 880 million in 2014 (UN-Habitat 2016). In India, the slum population enhanced from 52 million in 2001 to 65 million in 2014 (5.41% of Indian population) lives in slums (Hank book of urban statistics, GOI, 2019). The poor population are really in need of hygienic food and quality nutrition, proper housing, transportation, health, education, sanitation & hygiene and livelihood opportunities (Barua *et al*., 2018). With respect to food and nutrition, the slums are facing huge food and nutritional insecurity issues due to poor awareness about nutritionally rich food items, lack of consumption of micronutrient rich food groups and its affordability (Laurencia Govender *et al.,* 2017). It leads in to high incidences of micronutrient deficiencies and nutritional problems such as protein energy malnutrition, iron

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deficiency, Vitamin - A deficiency, iodine deficiency disorders to threaten a large proportion of urban poor (Raghav *et al*., 2013). Under this background, a study was conducted in the Delhi union territory which was a representative unit of entire country's urban slum population (Olaf Muller, 2005). Further this study also focussed to enhance the food and nutritional consumption pattern through improving the nutritional consumption behaviour of slum people with locally grown, available and easily affordable nutrition rich food items based sustainable food consumption practices. It also, provides long term solutions to address the malnutrition and ensure the nutritional security

MATERIALS AND METHODS

The study was conducted in The Delhi union territory. Because, in Delhi and National Capital Region, around 1.8 million people are living in the slum settlements. Hence, it acts as a true representative of entire country's urban slum settlements. Further, the detailed study was conducted in the Delhi – North West district and data were collected by survey through using the semi structured interview schedule with 120 samples respondents of slum people during the year 2018 and 2019 under the ICAR-IARI Institutional Project of "Enhancing Nutrition Security and Gender Empowerment" to assess their awareness, knowledge about nutritionally rich food groups' consumption pattern, nutritional status of households and constraints with respect to food and nutritional security parameters and the data was analysed by suitable statistical tools to suggest strategies to enhance the food and nutritional consumption pattern to address the urban poor food and nutrition requirement for inclusive and sustainable development purposes.

RESULTS AND DISCUSSION

It is evident from the Table 1 (I) that (40 .00%) slum people migrated from the state of eastern Uttar Pradesh followed by 28.33 per cent who had migrated from the state of Bihar state and remaining 31.66 per cent of the slum dwellers migrated from various other states of the country. It shows that, the region where agrarian economy dependent low income region people were mostly migrated from their native regions to metro cities' slum regions for their life and livelihood purposes.

It was observed from the Table 1 (II) that, only 19.16 per cent of the slum families had small size families and rest of 80.84 per cent of the families were bigger and large size family size. It was due to the young age marriages of both men and women and poor awareness about the family planning and poor family management practices.

Table 1: Major profile characters of the slum respondents (n=120)

	Numbers	Per cent
I. Distribution of respondents based on the migration status		
Uttar Pradesh	48	40.00
Bihar	34	28.33
Other states	38	31.66
II. Distribution of respondents based on family size		
Less than four members	23	19.16
Five member's family	31	25.83
Six member's family	39	32.50
Above six member's family	27	22.50
III. Distribution of respondents based on Occupation status		
Construction works	43	35.83
Heavy labor works	36	30.00
Other works	41	34.16
IV. Distribution of respondents based on education		
Illiterates	23	19.16
Primary Education	44	36.66
Higher School Education	27	22.50
Higher secondary School Education	20	16.66
Graduation and above	6	5.00

The Table 1 (III) reported that, around 36.00 per cent of households were depended on construction works followed by 30.00 per cent people engaged in heavy labour works such as contact labour, machinery works, iron melting works, digging works, truck drivers, cycle rickshaw pullers, catering workers, market employs, factory works and other works like sanitation and cleaning works, security works, waste recycling works, auto drivers etc. The occupational status helps to decide the intensity and extent the household's purchasing power. Apart from the public distribution system services, the slum households spent more than 70 per cent of the income for food consumption only. Even though their purchasing power was very less only.

It could be observed from Table 1(IV) that 36.66 per cent of the households studied primary level education, followed by 22.50 per cent who had been educated up

to higher school level and 16.66 per cent were of higher secondary level. At the same time, illiterates and collegiate education were of 19.16 per cent and 5.00 per cent of the respondents respectively. Education increase the power of observation and decision-making ability. Educated households generally would like to have more exposure to information sources and more social participation. Thus, education helps households to broaden their outlook and expand their horizon of knowledge. Hence, educational status of an individual is considered as one of the influencing factors for knowledge and nutritional food habits to sustain nutritional security in the slum populations.

It could be observed from the Table 2 that among all 30 independent variable studied to assess the association and contribution of profile characteristics of slum people towards the nutritional food consumption behaviour. It shows that there were 8 profile characters had association with the nutritional food consumption behaviour and seven profile characters had contributed their nutritional food consumption behaviour. Among all associated profile characteristics of educational status, annual income, nutritional awareness, nutritional knowledge level had positive and significant relationship with the nutritional food consumption behaviour of slums respondents at one per cent level of probability. And the profile characteristics of household size, poverty level, inadequate housing infrastructure, unemployment level had negative and significant relationship with the nutritional food consumption behaviour of slums respondents at one per cent level of probability. Further, the findings of regression indicated that among all the associated variables acted as a cause to bring 73.80 per cent variation in the nutritional food consumption behaviour of slums respondents. It could be also observed that among the associated variables, educational status, annual income, nutritional awareness and nutritional knowledge level were found positively contributed significantly to the nutritional food consumption behaviour of slums respondents. Further, household size, poverty level and unemployment level were negatively contributed to the nutritional food consumption behaviour of slums respondents.

The Table 3 inferred that, more than 50 per cent of households were having Poor satisfactory level in their food consumption patterns in their regular diets, around 30 per cent of households replied medium satisfactory level about their food consumption patterns in their

Table 3: Monthly food consumption status in the selected Slums of Delhi (n=120)

Food Groups	Satisfactory level	Medium satisfactory level	Poor satisfactory level
Cereals (Wheat/ Rice)	21	27	52
Pulse	27	26	47
Edible oil	20	31	49
Vegetables	21	26	53
Fruits	5	13	82
Spices	28	38	34
Eggs	17	25	58
Chicken/other meat	16	22	62
Milk Products	19	15	66
Processed/Packed foods	15	34	51

Table 2: The association and contribution of profile characteristics of slum people towards the nutritional food consumption behaviour in Delhi slums

Profile characteristics	Slum people			
	Correlation r	Regression ('b' value) coefficient	SE of b	't' value
Educational status	0.521**	0.100	0.049	2.055*
Annual income	0.522**	0.127	0.038	3.730**
Household size	-0.416**	0.169	0.078	-1.776*
Poverty level	-0.579**	-0.236	0.067	-3.543**
Nutritional Awareness	0.621**	0.149	0.059	2.506**
Nutritional knowledge level	0.468**	-0.073	0.064	1.144**
Inadequate housing Infrastructure	-0.458**	0.079	0.077	1.026
Unemployment level	-0.282**	-0.147	0.104	-1.413*

$R^2 = 0.738$; F = 16.538; Constant = 2.452; *P < 0.05; **P < 0.01; NS–Non-signifiant; NA-Not applicable

regular diets and the remaining 20 per cent of households only having satisfactory food consumption patterns in their regular diets. Among all the food items, the slum households mostly depend upon the public distribution system based cereal consumption in their regular diets. They were deficient access of pulses, vegetables, fruits and milk products and it causes micro nutrient deficiency; because, the pulses, vegetables, fruits, eggs and other non-vegetarian food items are the major source of protein, minerals and vitamins consumption was in poor category. Further, the slum households were in semi-skilled and hardworking occupational category. Hence, the food consumption pattern didn't support their regular balanced diet and most of the people especially children and women were suffered by malnutrition and nutritional related disorders. It was due to insufficient food consumption, non-availability of low cost nutritional foods and insufficient food habits due to affordability. In this context, promotion of awareness and knowledge creation related to nutritional food consumption purposes to create natural demand of low cost nutritionally rich food crops like drumsticks, guava, banana, millets and greens, tomato in the market to enhance the consumption of the balanced nitrous food habits in the urban poor in one side and the demand also support further production of such crops to enhance the growth of agricultural growth and sustainable balance diet to their households with greater affordability and accessibility.

Table 4 reported that, the slum households were highly depended on public sector's nutrition related programmes for their food consumption pattern. Around 96 per cent of households were effectively utilized the public distribution systems followed by 83.33 percent of households utilized integrated child development scheme for children's nutrition security and 80.00 per cent of household's school going children consuming food under the mid-day meal programme. Hence, the public sector nutrition related schemes had supported well to the slum respondents. At the same time, the nutritional problems like anaemia, vitamin A deficiency and protein energy malnutrition (PEM) are common in large proportion of Indian children (Ghosh, 2004) due to poor consumption of nutri rich food consumption patterns. At the same time, the malpractices related issues in public distribution system practices of poor weighing and distribution practices also affects the household's utilization of PDS. Further, the problems like leakages, poor quality, non-availability of commodities in certain times, non-availability of ration cards, bogus cards, etc., also affect the efficiency of the system. The finding was related to the study (Nakkiran, 2004).

Table 4: Impact of the Nutrition programmes in the selected slums (n=120)

Statements	Numbers	Per cent
Usage of households in PDS	115	95.83
Usage of households in ICDS scheme and Anganwadies	100	83.33
Usage of households in mid-day meal programme	96	80.00

Table 5 suggested that, around one third of the respondents were didn't wash their hands before consumption of food followed by 68.33 per cent respondents were didn't use any washing power to wash the utensils and 84.44 per cent of the respondents didn't drink safe drinking water. But, 91.66 per cent of the respondents were washed their food grains, pulses and vegetables before cooking activities. This shows that, the slum households didn't practice safety and hygienic food consumption practices. Due to that, even the available food also affects the household's health through food borne diseases. Providing food safety related extension act as an important strategy to provide better nutritional and healthy life.

Table 6 suggested that, 26.66 per cent of respondents were didn't maintain cleanliness in their household premises. This survey revealed that 100.00 of the households were utilized community toilets and

Table 5: Safety and hygienic food consumption practices of the respondents in the selected slums

Statements	Numbers	Per cent
Households wash their hands before consumption of food	89	74.16
Households wash their food grains, pulses and vegetables before cooking	110	91.66
Households didn't use any washing power to wash utensils	82	68.33
Households didn't drink safe drinking water	100	84.44

Table 6: Cleanliness and sanitation practices of the respondents in the selected slums

Statements	Numbers	Per cent
Cleanliness in Household premises	32	26.66
Households using Community toilets	120	100.00
Cleanliness of community toilets and maintenance	18	15.00
Households having sanitary toilets in their home	0	0.00
Problems of mosquitoes	97	80.83

bathrooms only. In that, 85.00 per cent respondent replied that the community toilets and bathroom cleanliness maintenance was not satisfactory and none of the households were constructed sanitary toilets in their home. Hence, the unhygienic environment was a breeding ground for mosquitos and 80.83 percentage of respondents complained about the problems of mosquito bites related disease like dengue, etc. also affects their healthy living atmosphere.

Table 7 suggested that, majority of (87.50%) respondents were represented that they had good accessibility with primary health centers and charitable hospitals which were situated near to their residential area and they were well aware (66.66%) about the vaccination to their children (Polio, BCG, etc.) but, at the time of chronic health related issues, only (52.50%) of the household respondents only immediately accessed hospitals for recovery. It shows that, poor awareness and knowledge leads health related issues in region. Hence, proper health related awareness and knowledge delivery support to reduce the existing situations. Under the context, some of the recommendation suggested to improve food and nutritional consumption pattern of urban poor in India.

Recommendations to improve food and nutritional consumption pattern of urban poor in India

1. The nutritional status and diet of children residing in slums and homeless conditions were unsatisfactory. It was due to poor awareness and knowledge about the nutri-rich food habits, under-nutrition, high poverty, poor sanitation and social exclusion and lack of health facilities. Hence, conduction of nutritional, health and sanitation awareness related campaigns and educational programmes at school level to children may improve the nutri -rich food consumption behaviour
2. Majority of low-income urban slum residents depend on informal sector and casual labour works with less and irregular earnings. Hence, enhancement of minimum wage polices are important solutions to improve the standard of living and purchasing power of the urban poor
3. The slum households are spending their higher proportion of income to food purposes only. It affects their other basic needs of health, sanitation and others. Hence, installation of more mobile vegetables, fruit sale centres with affordable costs may improve their nutri-rich food consumption behaviour of the slum households.
4. The locally available fruits and vegetables such as the Moringa (Moringa Oleifera), guava, Banana, leafy vegetables, tomato, amla, sweet potato, eggs, etc. are having enormous source of available nutrition. The crops have a rich repository of proteins, vitamins and minerals including potassium, calcium, phosphorous, iron, folic acid as well as beta carotene. Hence, promotion and production enhancement of these low cost locally grown nutritionally rich underutilized food crops supports urban poors' nutritional food consumption pattern and also gives lot of employment to the farmers
5. Arrangement of adequate and accessible water and sanitation facilities also have a detrimental impact on health and nutrition.
6. The local governments have an important role to play in urban food systems. This includes the provision of reliable transport infrastructure to ensure that perishable foodstuffs reach markets quickly and storage facilities help reduce waste.

Table 7: Physical accessibility regarding Health facilities of the respondents in the selected slums

Statements	Numbers	Per cent
Primary health centers situated near to the households	105	87.50
Households follows vaccination to their children (Polio, BCG, etc)	80	66.66
Household's consults doctor for treatment of chronic health related issues	63	52.50

CONCLUSION

The Indian urban poor slum households were following poor nutritional food consumption behavior due to the poor awareness about nutritionally rich low cost food items, lack of consumption of micronutrient rich food groups and their affordability. It leads high incidences of micronutrient deficiencies in the slums. They were mostly construction workers and other heavy workers. Most of the people were less literates. More than 50 per cent of the slum people were consumed poor food consumption practices. The public sector nutrition related schemes had supported well to the slum respondents. But, the problems like leakages, poor quality, non-availability of commodities in certain times also affect the efficiency of the systems. The household sanitation and healthy food consumption practices were also very poor. To enhance, their food consumption pattern through promotion of awareness and knowledge creation related to nutritional food consumption patterns towards low cost nutritionally rich food crops like drumsticks, guava, banana, millets and greens, tomato to enhance their nutritional food consumption pattern with balanced nitrous food habits to the urban poor also support production of such crops to enhance the agricultural growth to the farmers too. Also, improvement of household sanitation and healthy food consumption practices also important to improve their healthy living atmosphere. Finally, food-specific policies are needed to improve the food systems to benefit the poor to solve the urban poor food and nutrition insecurity issues.

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Factors Affecting Entrepreneurial Success of Farm Entrepreneurs of Rural Delhi and Sonipat – Multivariate Analysis

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ABSTRACT

From a study conducted among the rural youth in Delhi and Sonipat region of National Capital Region, it has been found that the measure of entrepreneurial success among farm entrepreneurs was moderate. The entrepreneurial success index developed for the study included three profitability factors: amount of initial investment, total income earned, net profit gained, and four other factors: purposes of expenditure (productive or consumptive), knowledge and skills gained in marketing, level of satisfaction, and attempts made at expansion/diversification. The mean score of entrepreneurial success index was 75.55. About 45 per cent of respondents achieved high degree of success and another 40 per cent of rural youth have achieved very high degree of entrepreneurial success. Among the factors affecting entrepreneurial success of farm entrepreneurs the most significant variables were: length of experience, risk taking willingness, and marketing management, which were significant at 0.05 level of probability. Thus it can be concluded that the young farmers with little experience could succeed because of their willingness to take calculated moderate risks and managing well their marketing.

Keywords: Entrepreneurial, Factors affecting, Farm entrepreneurs, Multivariate, Rural

INTRODUCTION

Entrepreneurship is recognized as a prerequisite for sound and sustained economic development, especially the rural economy of a country (Bansal, 2012). The entrepreneurs are key persons of any country for promoting economic growth and technological change. The development of entrepreneurship is directly related to the socio-economic development of the society (Chaurasiya *et al.*, 2015). Becoming successful entrepreneurs has been seen as the most significant dream of achievement among the rural youth. Many strive to become farm entrepreneurs but get success in varying degrees. Measuring entrepreneurial success has been a topic of research by many researchers in the field of rural entrepreneurship.

Entrepreneurial Success: Several researchers, while giving an introductory remark on measurement of business success, stated that measurement of success, to a considerable extent, is neither a uni-dimensional concept, nor easily amenable to the various objective measures of success. Some economists use very complex objective measures like reinvestment of profit over the year; growth in fixed capital, period over which a business achieves break-even in terms of profit, internal rate of return, and.net worth of enterprise.

Measuring precisely the success of an enterprise, especially an agricultural rural enterprise is difficult and complex in the absence of a well-developed scale. Akhouri (1979) developed entrepreneurial economic success index (EESI) for assessing the success of an enterprise in industry. He has taken four economic indicators namely, extent of investment of his own capital to his own capacity to invest, his capabilities to borrowing or raising the capital, amount of profit per unit investment and promotion of total profit reinvested to develop a composite index. The use of this index warrants very precise economic facts that are difficult for the researcher to get from the rural people, as they do not maintain any records of their own. Moreover, the index suits well for industrial entrepreneur and not so much for rural entrepreneurs who are very diverse and complex in nature.

Sadangi (1991), while studying occupational diversification among self-employed rural youth, developed an index for measuring the success – failure of diversifying rural youth. Taking cues from Akhouri's (1979)

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entrepreneurial success index, Sadangi developed a success – failure index, which included eight indicators, *viz.,* growth, return per unit investment, net income, degree of satisfaction, employment level in diversified occupation, employment of the family labour, percentage reinvestment of profit, credit worthiness and occupational leadership. He developed the scale through rigorous procedure of collecting, selecting, and weightage giving by a panel of judges: teachers, researchers, and extension personnel. Thus the scale included social and psychological indicators in addition to economic indicators.

Entrepreneurial Success of Rural Youth: Generally, every entrepreneur claims success once he or she starts earning from the enterprise. Success in enterprise is an outcome of the efforts put in by the entrepreneur in terms of running the enterprise efficiently. It is an outcome of many factors and their interactions.

Since the study attempted to study the entrepreneurial success of agricultural entrepreneurs of NCR of Delhi, the success-failure index developed by Sadangi (1991) was adopted with necessary modifications. Since Sadangi studied occupational diversification of rural youth, three indicators viz., credit worthiness, employment level of diversified occupation and occupational leadership were appropriate for the study. But the present study, which aimed at the entrepreneurial success of the agricultural entrepreneurs, these three variables were considered inappropriate. Thus the entrepreneurial success index used for the study included five indicators *viz.,* a few outcomes like increased income, amount of money reinvested, net profit earned, level of expansion and diversification of enterprise, amount of marketing experience and skills gained, level of satisfaction/gratification derived. So these few indicators were selected to measure entrepreneurial success. Weighted scores were assigned to the indicators measured to get a composite index score of entrepreneurial success. These indicators are:

1. Amount of initial investment
2. Total income earned
3. Net profit gained
4. Purposes of expenditure (productive or consumptive)
5. Knowledge and skills gained in marketing
6. Level of satisfaction
7. Attempts made at expansion/diversification

Taking these seven indicators, an index was developed to get a composite score derived from scores of these seven indicators of entrepreneurial success. Entrepreneurial success was operationalized as the percentage of summated obtained scores over total obtainable scores on all the seven parameters. The scoring procedure is given below.

Entrepreneurial Success

1. Invested amount
2. Total Income

Net Profit	Score	Net Profit	Score
2000-2500	1	11001-11500	19
2501-3000	2	11501-12000	20
3001-3500	3	12001-12500	21
3501-4000	4	12501-13000	22
4001-4500	5	13001-13500	23
4501-5000	6	13501-14000	24
5001-5500	7	14001-14500	25
5501-6000	8	14501-15000	26
6001-6500	9	15001-15500	27
6501-7000	10	15501-16000	28
7001-7500	11	16001-16500	29
7501-8000	12	16501-17000	30
8001-8500	13	17001-17500	31
8501-9000	14	17501-18000	32
9001-9500	15	18001-18500	33
9501-10000	16	18501-19000	34
10001-10500	17	19001-19500	35
10501-11000	18	19501-20000	36

1. Purpose of expenditure
   - Consumptive expenditure 1
   - Partially saving + routine investment 2
   - Investing + buying assets 3
2. Knowledge and skills gained in marketing
   - No 0
   - Yes 1
3. Level of satisfaction
   - Not satisfied 0
   - Low 1
   - Medium 2

	High	3
	Very high	4
4.	Attempts made at expansion/diversification	
	Never thought of expansion	0
	Attempted once to expand	1
	Continuously expanding and improving	2

MATERIALS AND METHODS

The study was conducted among rural youth of Delhi-NCR and Sonipat. The sample of 35 successful entrepreneurs were selected from the villages of Alipur block of Delhi, Bahalgarh block of Sonipat district and Farukhnagar block of Gurgaon district of Haryana State. All the selected entrepreneurs who were running their enterprises have been interviewed for collecting data on their socio-personal and socio-economic characteristics and also on the dependent variable entrepreneurial success index.

RESULTS AND DISCUSSION

The frequency distribution of respondents on entrepreneurial success of successful rural entrepreneurs is presented here. An attempt was also made to identify the factors contributing to the entrepreneurial success through results obtained from regression analysis.

Entrepreneurial Success: Entrepreneurial success refers to success or failure that an entrepreneur achieves in his enterprise. The composite scores of entrepreneurial success were computed for each respondent by taking the percentage of summated obtained scores over the total obtainable scores of all seven indicators of success. Then the respondents were categorized into five groups based on their scores: very low, low, moderate, high and very high levels of entrepreneurial success. The mean, standard deviation & their frequency distribution are given in Table 1.

As can be seen from the results in the table, the mean entrepreneurial success index score of successful entrepreneurs was 75.55. The measure of standard deviation was higher (11.84) indicating very wide variation among the respondents on their levels of entrepreneurial success scores. Their scores of entrepreneurial success ranged from as low as 47.67 to as high as 94.62. A cursory look at the frequency distribution of respondents on their entrepreneurial success index scores revealed that they were highly skewed towards higher side of success. About 45.71 percent of respondents achieved high degree of success

Table 1: Distribution of respondents on their entrepreneurial success scores

Entrepreneurial Success Scores	Successful Entrepreneurs (n=35)	
Mean	75.55	
Standard Deviation (SD)	11.84	
Range	47.67 – 94.62	
Categories	**Frequency**	**Percentage**
Very Low (0-20)	0	0.00
Low (21-40)	0	0.00
Moderate (41-60)	5	14.28
High (61-80)	16	45.71
Very High (≥81)	14	40.00
Total	**35**	**100**

and another 40 percent of rural youth have achieved very high degree of entrepreneurial success. Thus it can be concluded that the sample of entrepreneurs had *higher* to *very higher* levels of entrepreneurial success in their farm enterprises.

Contributing Factors to Entrepreneurial Success: An attempt has been made to ascertain the factors contributing to the entrepreneurial success of the rural youth. To achieve this, regression analysis of entrepreneurial success scores was done with the independent variables. The results are presented in the Table 2. As can be seen from the results, about 78 per cent of variance in the entrepreneurial success of rural entrepreneurs was found to be explained by the independent variables included in the study. F ratio was also found to be statistically significant. Three variables were found to be significant at 0.05 level of probability.

Contributing Factors to prediction of Entrepreneurial Success: Among the independent variables, three variables were found to contribute to the entrepreneurial success of successful rural youth. An entrepreneur's length of experience (socio-personal variable) was found to be contributing to the success. The negative figures indicated that lesser length of experience actually resulted in more success. The rural youth succeeded in such new enterprises in which they had a personal interest and learnt from a formal source as well as other successful entrepreneurs. In such cases, the rural youth succeeded in their enterprises, which were new and had some technical aspects to learn. Thus it can be concluded that lesser experience in new enterprise had contributed to success. Among the socio-psychological variables, risk taking willingness found to

Table 2: Multiple Regression of Entrepreneurial success of rural entrepreneurs

Independent Variables	Partial 'b'	't' Value
Age	-0.20163	-0.439
Education	-4.71845	-1.089
Family Type	-11.56764	-0.921
Size of Family	11.95132	0.935
Exposure to Training	4.86069	0.223
Length of Experience	-5.90711	-2.528*
Achievement Motivation	0.88236	0.673
Knowledge of enterprise	0.12315	0.160
Risk taking willingness	4.21919	2.431*
Locus of control	1.14351	0.199
Market preference knowledge	4.48673	1.249
Marketing Management	6.29007	2.421*
Operations Management	11.51104	0.887
Decision making	13.75514	0.991
Planning & organizing	1.48833	1.127
Controlling	-0.52011	-0.438
Financial management	1.86040	1.124
Quality control	0.64360	0.537
Cash flow management	1.51126	0.989
Accounting & Book Keeping	-0.63844	-0.511

*Significant at 0.05 level pf probability
$R^2 = 0.78363$; F = 2.61175* at 20 and 14 degrees of freedom

be one factor contributing to the entrepreneurial success of rural entrepreneurs. The contribution of risk taking willingness to the prediction of entrepreneurial success of the successful rural youth. Was observed. Here the rural youth with moderately high risk taking willingness were found to be successful than others with lower risk taking willingness.

Among the other variables contributing to the entrepreneurial success or failure of rural entrepreneurs, marketing management has assumed greater significance as it contributed significantly to the prediction of entrepreneurial success of rural entrepreneurs. Indeed, marketing ability assumed great significance as it is one crucial function of entrepreneurs for achieving success in rural enterprises. Thus it can be concluded that three variables have significantly contributed to the prediction of entrepreneurial success of rural entrepreneurs. One' *locus of control* depicts individual's entrepreneurial orientation which shapes the entrepreneur's motivation. Having a *long experience* in running the rural enterprise will help develop one's aspirations. Both these variables were found to be contributing to their entrepreneurial success. This result finds resonance with the following finding by Singh *et al.* (2016), who reported *"Individual's motivation, aspirations and entrepreneurial competencies trigger agripreneurship development whereas adoption of best practices, dodging of inhibitive factors and facilitative socio economic factors play sequential role in reaching agripreneurial success.*

CONCLUSION

At the outset, it can be concluded that the rural youth were able to achieve considerable amount of success in their enterprises. Since the sample contained several people operating different types of rural enterprises on different scales of operation, the entrepreneurial success was found to be quite good and satisfactory. Three most important factors were contributing to the variation in entrepreneurial success of the successful entrepreneurs. Thus it can be concluded that the rural youths' low experience, their risk taking willingness and marketing management were the key factors to attain success.

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Promoting Summer Green Gram Cultivation for Sustainability and Enhancing Farmer's Income in Punjab

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ABSTRACT

The state of Punjab is known for its modern and mechanized agriculture in the country. Punjab's agriculture provides a lion's share in the national pool of paddy and wheat; at the same time, depleting ground water, crop residue burning, indiscriminate use of chemicals, etc. pose serious threats to its sustainability. In the wake of predominant cropping pattern in the state, irrigation facilities, remunerative pricing policy and availability of short duration varieties of summer green gram cultivation offers a balanced opportunity for increasing farmer's income while improving soil health and sustaining agricultural production. With the aim of promoting cultivation of summer green gram in Punjab, Krishi Vigyan Kendras have demonstrated latest production technologies in the farmer's field. The improved technologies involved latest varieties, seed treatment with biofertilizers, line sowing with machines, different intercropping systems, Integrated Pest Management, etc. Moreover, extension activities viz. method demonstrations, farmer-scientist interactions, field days, trainings, etc. were also organized. Efforts were simultaneously made to improve seed replacement rate by introducing latest varieties. Regular monitoring of sites was an integral part of the demonstrations. During summer 2017, 925 demonstrations were conducted in 406 ha in 16 districts and recorded 23.87 per cent higher yield as compared to that of local check. Similarly, 979 demonstrations in 420 ha during summer 2018 and 840 demonstrations in 337.2 ha during summer 2019 were organized, in which 24 percent and 20 per cent higher yields were recorded, respectively. Decline in the technology indices of both the varieties over the period indicate healthy trend in terms of the awareness about green gram production technologies and the impact of capacity building and extension activities organized along with demonstrations. Summer green gram has been found specifically effective in potato growing region due to opportune sowing time and available soil moisture and nutrients. The crop has also been found as an effective replacement for fodder maize in few areas. Farmers have also reported increase in consumption of green gram due to domestic availability.

Keywords: Demonstration, Extension gap, Green gram, Income, Punjab, Technology gap, Technology index

INTRODUCTION

The state of Punjab is significantly contributing in the growth of agriculture sector in the country. The area under paddy-wheat cropping system has increased manifolds in the post green revolution phase, thereby reducing area under pulses, oilseeds and other crops drastically. The gross cropped area under paddy-wheat increased to 80.77 per cent in 2012-13 from just 47 per cent in 1970-71. This monoculture has severely affected natural resources like water, soil, biodiversity, etc. Agriculture in Punjab accounts for 85 per cent of total water consumption as about 100 per cent of total cultivated area is irrigated (PAU, 2019). The cropping intensity in the state, due to input intensive agriculture, has reached 190 per cent in 2017-18 (all India percentage 138) which was only 126 per cent in 1960-61, affecting soil fertility (Anonymous, 2019). Presently, the soils are alkaline and low in macronutrients (NPK) and micronutrients (zinc, iron & manganese). Excessive applications of nitrogenous fertilizers have left shallow groundwater highly polluted (Khajuria *et al.,* 2013). Alongside, Punjab is the most mechanized state with farm power availability of 2.6 kW/ha. The state's average use of tractors per annum is only 450 hours as compared to the standard of minimum 1000 hours for productive use. This over capitalization in farm mechanization results in higher cost of production. Any further mechanization is considered economically unviable and environmentally unsustainable, as it leads to decreasing soil fertility and increasing soil erodability.

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In Punjab, the area under pulses was 9.03 lakh ha during 1960-61 with total production of 7.09 lakh tonnes, which after the advent of Green Revolution was reduced to just 4.14 lakh ha with production of 3.08 lakh tonnes in 1970-71. The area and production of pulses in the state continued to decline till 2007-08, the year of launch of National Food Security Mission (NFSM) on Pulses. Thereafter, although, there was a little improvement in pulses cultivation till 2010-11, it remained only 0.03 lakh ha during 2018-19 with a production of 0.03 lakh tonnes. This distancing from pulses cultivation must have led to some loss of indigenous technical knowledge, particularly with regard to pest and disease management. It can be considered an irreparable damage, as the indigenous knowledge can prove very effective if integrated with formal agricultural research (Sah *et al.,* 2019). The net return from cultivating total pulses in the state could not match the returns from paddy and wheat, which was the major reason behind limited success of National Food Security Mission (NFSM) Pulses (Grover *et al.,* 2015). Moreover, the procurement of pulses and associated risks with pulses yield and profitability were the other major issues.

Thus, reaching to the maximum of cropping intensity and irrigation potential, un-readiness of farmers to shift from paddy-wheat system and growth saturation in productivity, the growth of agriculture in Punjab has been affected. Therefore, the state's agriculture's share to Gross Value Added at constant prices has significantly declined. This decline signifies the structural transformation of the state's economy to other sectors from agriculture and allied sector. All the above factors point towards fewer opportunities in crop production for increasing farmers' income in a sustainable way. Moreover, for added production, profits and sustainability of paddy-wheat system, a paradigm shift would be necessary (Bhatt *et al.,* 2016). Enhancing total factor productivity of this cropping system requires incorporation of a legume crop with high yielding and short duration varieties without further degradations of natural resources (Kumar *et al.,* 2000). Therefore, considering existing irrigation facilities, remunerative pricing policy and availability of short duration varieties, summer green gram cultivation offers a balanced opportunity for increasing farmer's income while improving soil health and sustaining agricultural production. Many farmers prefer spring maize cultivation over summer green gram and end-up applying nearly 8650 m^3 water per hectare more than that of green gram (Manan *et al.,* 2019), which is 8.2 times more. The cost of irrigation is about 24.3 and 6 per cent of total cost of production in maize and green gram respectively. The study also revealed that the net returns obtained for sprint maize and summer green gram were respectively Rs. 49,421/ha and Rs. 54,600/ha.

Summer green gram, because of its short duration, can fit well into existing cropping systems like summer mungbean-maize/rice-mustard/wheat, summer mungbean - maize-potato, summer mungbean-rice-potato, summer mungbean /mustard/wheat, summer mungbean-kharif mungbean-mustard/wheat, etc. Summer green gram following potato is preferable being the lesser risky option than following wheat or kharif sowing (Grover *et al.,* 2004). Only limitation for cultivating green gram is that it acts as an alternate host for cotton white fly, thus it cannot be paired with cotton. Farmers must be trained on the aspects of appropriate time and dose of pesticide applications, which they generally lack (Kaur *et al.,* 2020). Green gram works well in sandy loam soils with good drainage. The selected variety should grow profusely in the first month to get itself established before the onset of flowering. Although, SML-668 has been very popular variety, new varieties like SML-832 and TMB-37 of PAU, Ludhiana also have promising yield potentials.

The crop is sown immediately after the harvest of preceding crop, as sowing after 10th of April may result in flower drop if flowering coincides with high temperature and winds. Similarly, early monsoon rains may also deteriorate grain quality. Sowing should preferably be done with zero till drill or happy seeder. Sowing is done on raised beds in medium to heavy textured soils, may be by using wheat bed planter. Nutrient application should be based on soil testing and if the crop is sown following potato, then the application of nitrogen should be skipped. Although flowering and early pod filling are the critical stages, first irrigation is provided after 25 of sowing and last irrigation is given before 55 days after sowing to obtain synchronous maturity. Whitefly, the prime vector for Yellow Mosaic Virus, should be managed if found necessary. When about 80 per cent of the pods mature, a defoliator may be sprayed and the crop is harvested using combined harvester.

MATERIAL AND METHODS

Agricultural Technology Application Research Institute (ICAR-ATARI), Ludhiana has been organizing demonstrations in Punjab through respective Krishi Vigyan

Kendras (KVKs). The objective of the demonstrations was to improve the productivity and profitability of summer green gram cultivation at the farmers' fields using latest improved production technologies. These demonstrations were organized in the cluster of villages to target specific area in a focused manner. Farmers were provided with basic inputs like seeds, biofertilizers, etc., avoiding the use of chemical fertilizers. Farmers were advised to follow recommended technological package only, as and when intimated by the KVK scientists. They also organized supporting extension activities like method demonstrations, farmer-scientist interfaces, *kisan goshthis*, trainings, field days, etc. to ensure participation of the farmers and local extension personnel in popularizing summer green gram cultivation. Regular monitoring was an integral part of the process to advise mid-term corrections, if any. Although, all the recommended production technologies were demonstrated in the farmers' fields, few specific technologies were emphasized such as seed treatment with bio-fertilizer rhizobium and rhizobacterium, line sowing in place of broadcasting, and intercropping with crops like sugarcane and poplar. These demonstrational packages of practices were selected based on the local agro-climatic conditions. For example, in Hoshiarpur and Gurdaspur districts i.e. the sub-mountain undulating zone of Punjab, where wheat, paddy and sugarcane are the major crops, intercropping of green gram with sugarcane was the special highlight. These agro-climatic zones of Punjab are PB-I (Sub-mountain undulating zone), PB-II (Undulating Plain Zone), PB-III (Central plain zone), PB-IV (Western plain zone), PB-V (Plain zone). The data regarding yield, farmers practices, cost of cultivation, net return and cost-benefit ratio were calculated.

The extension gap, technology gap and technology index were calculated as below (Kaur *et al.,* 2020; Katare *et al.,* 2011 and Samui *et al.,* 2000):

Technology gap = Potential yield – Demonstration yield

Extension gap = Demonstration yield – Farmers yield

Technology index= (Potential yield-Demonstration yield) X 100/ Potential yield

RESULTS AND DISCUSSION

Cultivating summer green gram can prove beneficial in improving soil health and promoting crop diversification, besides providing additional income to the farmers. Moreover, increased irrigation facilities, remunerative pricing policy and availability of short duration varieties provide all the motivation needed for cultivating summer green gram thereby increasing household income, combating protein malnutrition and sustaining agricultural production. Nevertheless, the yield potential of green gram in Punjab (8.33q/ha in 2014-15 and 8.68q/ha in 2015-16) is much higher than the Indian average (4.97q/ha in 2014-15 and 4.18q/ha in 2015-16).

Performance of Demonstrations: During summer 2017, an effort was made to replace more popular SML-668 variety with SML-832 in few of the districts, considering the availability of seed. Thus, FLDs were organized on cultivation of SML-668 in 276 ha and SML-832 in 130 ha (Table 1). FLDs on SML-668 reported a yield advantage of 2.03q/ha compared to that of the local check. These demonstrations obtained an increase of Rs.8595/ha in the net return in comparison to the check. Similarly, in case demonstrations on SML-832 in central and western plain zones, the demonstrations observed a yield gain of 1.35 q/ha and additional net income of Rs. 7293/ha, as compared to that of the local control. Thus, on an average, farmer's existing practices lag behind by 1.69q/ha in terms of yield and Rs. 7944 in terms of net return, when evaluated against the demonstrations.

The focus of popularizing SML-832 of green gram was shifted to other agro-climatic regions/districts during summer 2018. Thus, again due to paucity of the seed, the new variety was demonstrated in 70ha in few districts, along with SML-668 in other districts (Table 2). The FLDs on SML-668 recorded an average yield of 10.87q/ha, which was 8.82q/ha in local checks. Similarly, the net returns were Rs. 28831/ha and Rs. 19294/ha in case of the demonstrations and the farmers' practice respectively. In the same way for SML-832, the demonstrational yield was 10.58 q/ha with the net return of Rs.28523/ha; whereas, the yield of 8.47 q/ha and net return of Rs. 18604/ha was obtained by following the farmer's practices. The overall average suggests a yield increase of 2.08q/ha and net income gain of Rs.9728/ha in case of FLDs compared to cultivation by existing practices.

Looking at the seed production scenario, the KVKs were advised to grow their own seed for conducting demonstrations. Thus, in summer 2019, demonstrations on green gram variety SML-832 were organized in 337.2 ha area across the state (Table 3). These demonstrations reported an increase of 1.82 q/ha with an average of 10.72 q/ha against that of the local control. The net return

Table 1: Performance of FLDs on summer green gram in 2017

Agro-climatic zone	District	Area (ha)	FLDs (no.)	Yield (q/ha)		Yield increase (%)	Check		Demo	
				Check	Demo		Net return (Rs./ha)	B:C Ratio	Net return (Rs./ha)	B:C Ratio
Variety: SML-668										
PB I	Hoshiarpur	6.0	15	7.20	8.80	22.22	7322	1.2	14906	1.5
PB III	Ludhiana, Kapurthala, Jalandhar, Tarantaran	120.0	237	8.56	10.50	22.66	19262	1.3	27232	1.9
PB V	Bathinda, Mansa, Moga, Muktsar, Sangrur, Barnala	150.0	334	7.87	10.41	32.25	11236	1.1	21467	1.6
Total/Average (SML-668)		**276.0**	**586**	**7.88**	**9.90**	**25.72**	**12607**	**1.2**	**21202**	**1.7**
Variety: SML-832										
PB III	Amritsar, Patiala, Fatehgarh Sahib	60.0	161	8.98	10.33	15.11	19629	1.5	28079	2.0
PB IV	Faridkot, Ferozepur	70.0	178	7.98	9.33	16.93	20660	0.9	26795	1.0
Total/Average (SML-832)		**130.0**	**339**	**8.48**	**9.83**	**15.97**	**20144**	**1.2**	**27437**	**1.5**
TOTAL /AVERAGE		**406.0**	**925**	**8.18**	**9.87**	**20.67**	**16375**	**1.2**	**24319**	**1.6**

Table 2: Performance of FLDs on summer green gram in 2018

Agro-climatic zone	District	Area (ha)	FLDs (no.)	Yield (q/ha)		Yield increase (%)	Check		Demo	
				Check	Demo		Net return (Rs./ha)	B:C Ratio	Net return (Rs./ha)	B:C Ratio
Variety: SML-668										
PB II	Nawanshahar, Mohali	40	80	8.93	10.30	15.41	27538	2.6	34354	3.0
PB III	Amritsar, Patiala, Jalandhar, Kapurthala, Ludhiana, Taran	160	371	9.59	11.54	20.36	18847	1.8	28468	2.3
PB IV	Faridkot, Ferozpur	50	127	8.42	10.73	27.45	15402	1.6	25594	2.0
PB V	Muktsar, Barnala, Bathinda, Mansa	100	250	8.35	10.91	30.56	15390	1.8	26908	2.5
Total/Average (SML-668)		**350**	**828**	**8.82**	**10.87**	**23.21**	**19294**	**2.0**	**28831**	**2.4**
Variety: SML-832										
PB I	Hoshiarpur, Gurdaspur	20	49	8.05	9.67	20.14	14794	1.6	21852	1.9
PB III	Fatehgarh Sahib	20	31	7.20	8.45	17.36	13420	2.1	19610	2.6
PB V	Moga, Sangrur	30	71	10.18	13.63	33.91	27599	2.2	44108	2.9
Total/Average (SML-832)		**70**	**151**	**8.47**	**10.58**	**24.86**	**18604**	**2.0**	**28523**	**2.5**
TOTAL /AVERAGE		**420**	**979**	**8.65**	**10.72**	**24.02**	**18949**	**2.0**	**28677**	**2.5**

obtained was Rs. 32295/- in the demonstrations, which was only Rs. 22265/- in case of farmers' practice.

In toto, the demonstrational yields gaps of 1.4 q/ha in 2016, 1.69 q/ha in 2017, 2.8 q/ha in 2018 and 1.82q/ha in 2019 exhibit the potential that can still be achieved if scientific cultivation practices are followed by the farmers. Similarly, the net return advantages of Rs. 7944/ha (2017), Rs.9728/ha (2018) and Rs.10030/ha (2019) point towards the source of additional income for the farmers of Punjab.

Technology Gap Indicators: Three technology gap indicators were used to analyze the performances of demonstrations on summer green gram namely Technology gap, Extension gap and Technology index. Technology gap (yield gap I) measures the difference

Table 3: Performance of FLDs on summer green gram (SML-832) in 2019

Agro-climatic zone	District	Area (ha)	FLDs (no.)	Yield (q/ha)		Yield increase (%)	Check		Demo	
				Check	Demo		Net return (Rs./ha)	B:C Ratio	Net return (Rs./ha)	B:C Ratio
PB I	Hoshiarpur, Pathankot, Tarn taran	20	58	7.91	9.77	23.46	14515	0.6	22936	0.9
PB II	Nawanshahar, Ropar, Mohali	40	92	8.41	10.16	20.77	26344	1.4	37535	1.9
PB III	Amritsar, Fatehgarh Sahib, Jalandhar, Kapurthala, Patiala, Ludhiana	96.4	240	9.84	11.62	18.15	23130	1.1	33378	1.6
PB IV	Faridkot, Ferozepur	29.2	71	9.36	11.23	19.93	22120	0.9	30759	1.1
PB V	Bathinda, Mansa, Moga, Muktsar, Barnala	151.6	379	8.99	10.85	20.72	25213	1.1	36869	1.8
	TOTAL /AVERAGE	**337.2**	**840**	**8.90**	**10.72**	**20.48**	**22265**	**1.0**	**32295**	**1.5**

between the potential yield of a variety and its demonstrated yield, which should be as small as possible and should decrease over the years. Similarly, the extension gap (yield gap II) is the difference between demonstrated yield of a variety and its farmer's yield, which should also decrease over the years to indicate positive impact of demonstrations. Technology index is the difference between the potential yield of a variety and its demonstrated yield in comparison to the potential yield, which should be least possible and should decrease over the years.

Year	2017		2018		2019
Variety	SML-668	SML-832	SML-668	SML-832	SML-832
Technology gap (q/ha)	1.35	1.63	0.38	0.78	0.78
Extension gap (q/ha)	2.03	1.35	2.05	2.07	1.82
Technology index (%)	12.00	14.17	3.37	6.78	6.78

Comparing yield gap indicators across the period of study points toward positive trend of impact of frontline demonstrations on the farmer's field. The technology gap, for both SML-668 and SML-832 varieties, show that the demonstrations were organized under the close supervision of scientists of KVKs following all the recommended package of practices. Although, the extension gap had gone up in 2018 in comparison to 2017 for both the varieties, it can be attributed to bettering of demonstration yields in 2018 indicated by the improvement in the respective technology gaps and technology indices. However, the both Technology gaps I & II and Technology indices have decreased over the years indicating desirable change in technology use of demonstrating farmers and nearby farming community. It also shows the effectiveness of capacity building programs and extension activities organized to support the frontline demonstrations.

CONCLUSION

The demonstrations have clearly illustrated the prospects of growing summer green gram in the state of Punjab. Cultivation of summer green gram can be specifically advantageous for small and marginal farmers of the state. Although, summer green gram seems more fitting when cultivated after harvesting potato, it can also be well accommodated in the paddy-wheat cropping pattern using early maturing varieties of wheat. Farmers of the state reported certain technical constraints in cultivating summer green gram like paucity of technical knowledge on determining economic threshold levels of major pests, inaccessibility to quality seed leading to dependence on seeds retained from previous year harvest, yellow mosaic virus infestation, etc. (Singh *et al.,* 2019). Therefore, existing cultivation practices need to be amended as per the recommended technological packages so as to put minimum inputs to get optimum output thereby maximizing the profit in the farmers' pocket. Alongside, these recommended technologies would help improve the soil health and ensure agricultural sustainability. Information Communication Technologies (ICT) and social media platform can be effectively utilized to provide information about inputs, production technologies, marketing, etc. to the farmers (Sahar *et al.,* 2020). Farmers expect availability and accessibility to high yielding and pest-disease resistant varieties and assurance of minimum support prices from the government (Grover *et al.,* 2012). Moreover, assured procurement and insurance to cover losses due to weather

aberrations and severe pest-disease infestation can be really helpful. The results reveal that farmers can earn a handsome income by cultivating summer green gram. These profits can be further maximized through processing and value addition.

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Knowledge of Farming Families Regarding Air Pollution and its Mitigation

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ABSTRACT

Air pollution is one of the major health problems confronting humans today. It is the existence of pollutants in the form of solid, liquid or gas in atmosphere in such an amount that is injurious to human, plants and animals. Air pollution is caused by pollutants like CO, CH_4, NO_2, SO_2 that are emitted from burning crop, industries and vehicles. In Punjab, air pollution is high because of burning of crop residue. The present study entitled 'Knowledge level of farming families regarding air pollution and its application for mitigation' was conducted with the objectives to assess the knowledge level of respondents regarding causes, effects and mitigation practices for air pollution and to study the application of mitigation strategies by the respondents. Data was collected from five agro-climatic zones i.e. central plain zone, sub-mountain undulating zone, undulating plain zone, western plain zone and western zone of Punjab state. From each of the selected agro-climatic zone, fifteen farm families were selected randomly, the male and female heads of the family were chosen for responses, thus, in total 150 respondents were randomly selected. Data was collected using pre-tested structured interview schedule. A knowledge test was developed and pre tested for its reliability and validity. The data was analyzed using frequencies and percentile. The findings of the study revealed that majority of the respondents across all agro-climatic zones had high level of knowledge for causes, mitigation and medium level of knowledge for effects of air pollution. Overall, a large percentage of respondents had good amount of knowledge about mitigation of air pollution but very few mitigation strategies were applied for combating air pollution. It is suggested that extension trainings/ camps should be organized with more emphasis on mitigation strategies to combat air pollution and innovative behavior change communication strategies need to be applied to improve the practical application of knowledge gained.

Keyword: Agro-climatic zones, Air pollution, Farming families, Knowledge level, Mitigation

INTRODUCTION

Our planet has been witnessing the most profound changes in brief history of human species. These changes are manifested in terms of environment degradation, loss of biodiversity, climate change etc. thereby, threatening the very existence of this planet. Among these, environment degradation has attributed to the emissions arising from combustion of fossil fuels in thermal power plants, industries and transport sector and also from agriculture and biomass burning.

Air pollution is one of the major causes of environmental degradation. Air pollution is the existence of pollutants in the form of solid, liquid or gas in atmosphere in such an amount that is injurious to human, plants and animals. Obafemi *et al.* (2012) revealed that air pollution (72.4%) was observed higher than soil pollution (11.8%) and water pollution (9.2%) due to CO, CH_4, NO_2, SO_2 (pollutants) that are emitted from burning crop, industries and vehicles. In Punjab, air pollution is high because of burning of crop residue. Punjab every year produces 23 million tonnes of paddy straw and 17 million tonnes of wheat straw. From this residue, more than 80.0 per cent of paddy straw (18.4 million tonnes) and near about 50 per cent of wheat straw (8.5 million tonnes) is burnt in fields (Curtis *et al.,* 2006). This produces high level of pollutants like (NO_2, SO_2, N_2O, CH_4) etc. and affects health of the human and also decrease quality of soil. It is the major cause of health problems confronting humans today (Gawande and Kaware, 2015). The stubble burning

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has aggravated health problems in the form of watering of eyes, coughing, congestion in the chest, shortness of breath, respiratory allergies, asthma, bronchial problems, nose/throat irritation due to smoke etc. (ENVIS Center Punjab, 2017). Polluted air can also be the reason of discomfort, shortness of breath and a major cause of cancer (Yusuff and Sonibare, 2004). The Supreme Court on 25th November 2019 lashed out at the Punjab, Uttar Pradesh and Haryana governments for their inability to prevent pollution from stubble burning despite orders from the court, saying the smog from the fires had made Delhi a living hell (Anonymous, 2019b). Five worst hit districts of Punjab were Sangrurwith 6,662 stubble burning cases followed by Bathinda 5,798, Ferozpur 5,013, Patiala 3,983 and Muktsarwith 3,751 registered cases. (Ludhiana Times, 2019).

Air pollution has both direct and indirect impact on human body, animal life, plant kingdom, infrastructure, climate and entire ecosystem. These effects have both long-term and short-term implications, and influence the economy and welfares of the human-beings. Proper management of the environment is the only way to ensure continuous and sustained development of the society. There is a need to create an awakening on the problems arising due to faulty agricultural practices, related consequences and to suggest means to reduce the stress on environment in the rural areas (Roy *et al.,* 2018). Scientists are working on different mitigation strategies but its reach to the end users and its adoption by them needs immediate action. It is the need of the hour to make people aware of the causes, effects, mitigations and practices for air pollution on health and provide them solution to combat the ill effects of the same. The present study was conducted with the objectives to assess the knowledge level of respondents regarding causes, effects and mitigating practices for air pollution and to study the application of mitigation strategies by the respondents.

MATERIALS AND METHODS

The present study was conducted in all five agro-climatic zones of Punjab state with the purpose to have representative sample of all farming families of Punjab. The five agro-climatic zones of Punjab are central plain zone, sub-mountain undulating zone, undulating plain zone, western plain zone and western zone. From each of the selected agro-climatic zone, fifteen farm families were selected randomly, the male and female heads of the family were chosen for responses, thus, in total 150 respondents were randomly selected. Data was collected using pre-tested structured interview schedule. A knowledge test was also developed and pre tested for its reliability and validity. Knowledge level was studied with the help of self-developed and pre-tested knowledge test. Based on the scores gained by the respondents, the knowledge level was measured separately for knowledge of causes, effects and mitigation strategies of air pollution. Overall knowledge level of respondents was also calculated. The data was analyzed using Statistical Package for Social Sciences (SPSS) software.

RESULT AND DISCUSSION

Table 1 discusses the knowledge of respondents about causes of air pollution. The cent per cent respondents reported that the use of generators is one of the causes of air pollution. Almost all the respondents with the same percentage of 99.3 per cent from five agro-climatic zones of Punjab knew that air conditioners produce toxic gases and crackers used on festivals or occasions are the other causes of air pollution. Burning of stubble (98.6%) and garbage (97.3%), use of chullah (96.6%), dry waste burning (95.3%) also were the reasons of air pollution as perceived by the reasons. Most of the respondents also knew that deforestation (94.6%) and excessive use of fertilizers/ pesticides/ herbicides (92.0%) also cause air pollution. Most of the respondents knew that improper disposal of computers and laptops as e-waste (88.6%) and increase in Industries/ factories (84.0%) also cause air pollution. Most of the respondents (84.0%) also knew that at household level, storage of cloth with naphthalene balls also causes air pollution. Majority of the respondents from all five agro-climatic zones knew that increase in fast-food culture/ disposal packaging material (72.0%) open disposal of waste or garbage around house (70.6%), improper and long-term storage of fertilizer/pesticides (66.6%), use of synthetic paints for wall painting (65.3%) and microwave & oven cooking (64.0%) are also the reasons of air pollution. It can be concluded that most of the respondents had good amount of knowledge about causes of air pollution. The findings are in line with results reported by Obafemi *et al.* (2012) and Gadde *et al.* (2009).

Further, the knowledge level of the respondents from five agro-climatic zones of Punjab was measured for their knowledge about causes of air pollution. It was calculated by adding the respondents' knowledge scores about causes of air pollution which was further categorized as low, medium and high level. It can be stated from Table 4 that

Table 1: Knowledge of respondents regarding causes of air pollution (n=150)

Causes	Frequency	Percentage
Use of generators	150	100.0
Air conditioners produce toxic gases	149	99.3
Crackers used on festivals or occasion	149	99.3
Stubble burning	148	98.6
Garbage burning	146	97.3
Use of chullah	145	96.6
Dry waste burning	143	95.3
Deforestation (cutting of trees)	142	94.6
Excessive use of fertilizers/ pesticides / herbicides	138	92.0
Improper disposal of computers and laptops	133	88.6
Increase in Industries/ factories	126	84.0
Storage of clothes with naphthalene balls	126	84.0
Increase in fast-food culture/disposal packaging material	108	72.0
Open disposal of waste or garbage around house	106	70.6
Improper and long-term storage of fertilizer/pesticides	100	66.6
Use of synthetic paints for wall painting	98	65.3
Microwave and oven cooking	96	64.0

majority of the male (68.0%) and female (60.0%) respondents across five agro-climatic zones had comparatively high level of knowledge regarding causes of air pollution. Gender wise data further demonstrate that cent per cent male respondents from agro-climatic zone III (Central plain zone) followed by agro-climatic zone I and II (86.6%), 60.0 per cent from agro-climatic zone IV and only 6.6 per cent from agro-climatic zone V had higher level of knowledge about causes of air pollution. Most of the female respondents of agro-climatic zone I (Sub-mountain undulating zone) (80.0%) followed by agro-climatic zone III and IV (73.3%), agro-climatic zone II (46.6%) and agro-climatic zone V (26.6%) had high level of knowledge about causes of air pollution (Figure 1).

While comparing agro-climatic zones, it was observed that majority of the respondents of all agro-climatic zones had high level of knowledge except agro-climatic zone V (Western zone) where majority of the respondents (66.6%) had medium level of knowledge about causes of air pollution.

Data in Table 2 discuss the knowledge of respondents about effects of air pollution on environment and health of human being.

It is revealed that almost all the respondents (99.3%) from all five agro-climatic zones of Punjab knew that smoke caused by air pollution leads to accidental deaths followed

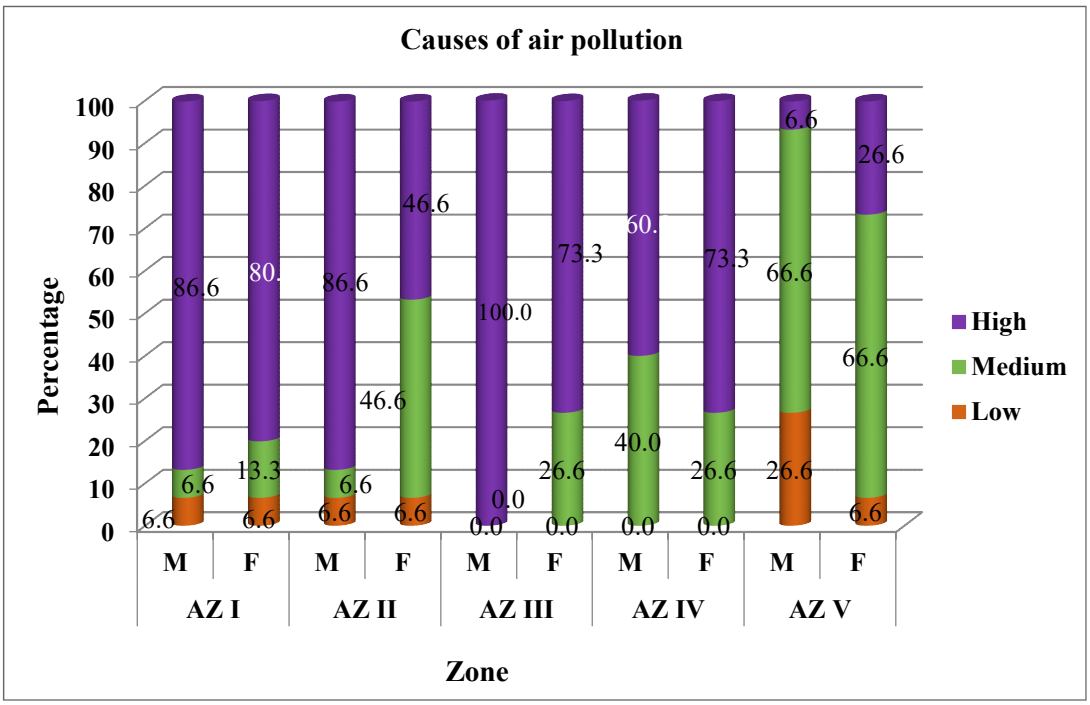

Figure 1: Graphical representation of the respondents on the basis of their knowledge level about causes of air pollution

Table 2: Knowledge of respondents regarding effects of air pollution (n=150)

Effects	Frequency	Percentage
Accidental deaths due to smoke	149	99.3
Increase in temprature	142	94.6
Occurance of smog	142	94.6
Shortness of breath	141	94.0
Nausea	132	88.0
Mental retardation	130	86.6
Skin rash	128	85.3
Headache	128	85.3
Bronchial infection	127	84.6
Irritation of eyes	126	84.0
Allergies	117	78.0
Infertility	90	60.0

by the same percentage of respondents i.e. 94.6 per cent knew that increase in temprature and occurance of smog are the other effects of air pollution on enviornment. The findings are in line with the results of Sharma *et al* (2018). Most of the respondents also had knowledge about effects of air polltion on human health such as shortness of breath (94.0%), nausea (88.0%), mental retardation (86.6%), skin rash and headache (85.35 each), bronchial infection (84.6%) and irritation of eyes (84.0%). Majority of the respondents knew that allergies (78.0%) and infertility (60.0%) are the other effects of air pollution. The findings are in line with the result of the study conducted by Gopal *et al.* (2014) and Jain *et al.* (2014). Further Figure 2 demonstrates the knowledge level of respondents about effects of air pollution that has been categorized into three distinct levels such as low, medium and high based upon the scores attained in knowledge test by respondents. It can be stated from Table 4 that majority of the male (62.6%) and female (72.0%) respondents across all agro-climatic zones had medium level of knowledge regarding effects of air pollution. Gender wise data further demonstrate that male respondents of agro-climatic zone IV (Western plain zone) i.e. 93.3 per cent followed by agro-climatic zone II and V (73.3%), agro-climatic zone I (40.0%) and least 20.0 per cent from agro-climatic zone III had medium level of knowledge regarding effects of air pollution (Figure 2).

Whereas female respondents of agro-climatic zone III i.e. 93.3 per cent followed by agro-climatic zone II and V (73.3%), agro-climatic zone IV (66.6%) and agro-climatic zone I (53.3%) had medium level of knowledge about effects of air pollution. While comparing all agro-climatic zones, it is observed that most of the male respondents of agro-climatic zone III (Central plain zone) (80.0%), agro-climatic zone I(Sub-mountain undulating zone) (60.0%) and nearly half of the female respondents of agro-climatic zone I (Sub-mountain undulating zone) (46.6%) had high level of knowledge regarding effects of air pollution.

Data presented in Table 3 shows the knowledge of respondents about mitigations strategies forair pollution. It was found that cent per cent of the respondents across

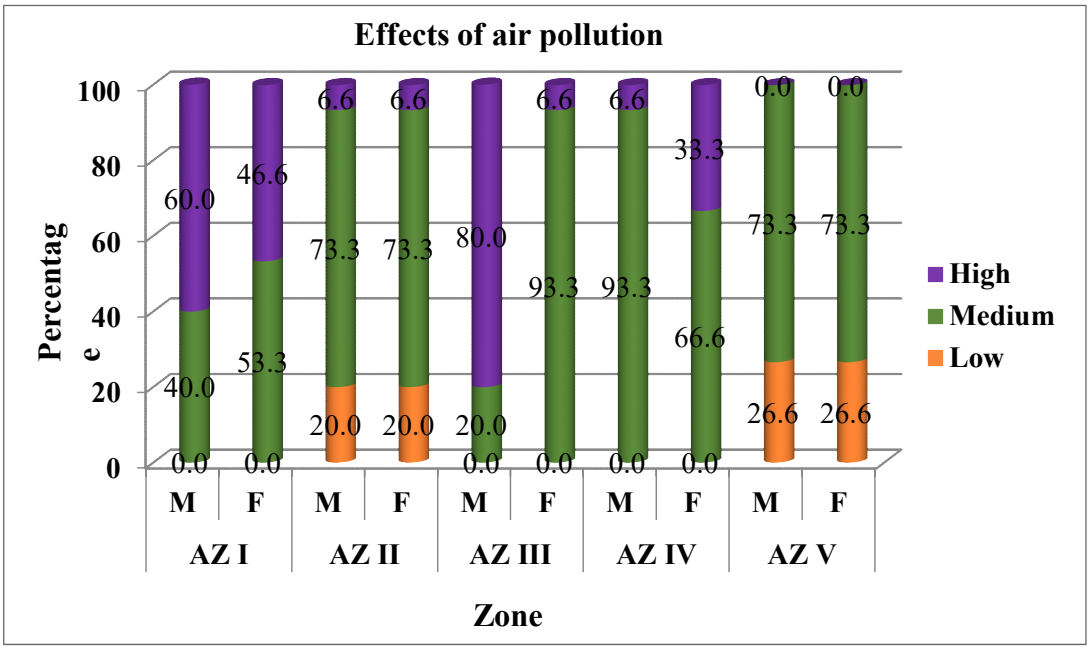

Figure 2: Graphical representation of the respondents on the basis of their knowledge level about effects of air pollution

Table 3: Knowledge of respondents regarding mitigation of air pollution (n=150)

Mitigation	Frequency	Percentage
Pooling of vehicles when going to same place	150	100.0
Use of gas Chullah (L.P.G.)	149	99.3
Gift plants to friends and relatives to increase green coverage	149	99.3
Growing of plants around house can reduce the air pollution	147	98.0
Use of biogas plant	147	98.0
Wearing of face mask during chemicals like pesticides spray	140	93.3
Use of solar devices	140	93.3
Storage with neem leaves	140	93.3
Wrapping of cloth with newspaper	139	92.6

all five agro-climatic zones knew that pooling of vehicles when going to same place can reduce air pollution.

Most of the respondents with the same percentage of 99.3 knew that use of gas chullah (L.P.G.) and gifting plants to friends and relatives can help in increasing the green coverage on earth. With the same percentage of 98.0 per cent respondents had knowledge that growing plants around house and use of biogas plant can help reducing air pollution. The same percentage of 93.3 per cent of respondents knew about wearing of face mask during chemicals like pesticides spray and use of solar devices are the other mitigation strategies to combat air pollution. Most of the respondents also knew that storage of clothes with neem leaves (93.3%) and wrapping of cloth with newspaper (92.6%) also are the practices to avoid air pollution. It can be concluded that most of the respondents had excellent knowledge about mitigation of air pollution. The findings are in line with Nhemachena and Hassan (2017), Sharma et al (2018) and Shobeiri *et al.* (2007).

Further the knowledge level of respondents about mitigation practices of air pollution was categorized as low, medium and high (Table 4). It can be stated that most of the male (82.6%) and female (85.3%) respondents had high level of knowledge about mitigation of air pollution across all agro-climatic zones. It was further demonstrated that cent per cent of male respondents of agro-climatic zone III (Central plain zone) followed by agro-climatic zone V (93.3%), agro-climatic zone I (86.6%), agro-climatic zone II (73.3%) and agro-climatic zone IV (60.0%) had high level of knowledge about mitigations of air pollution (Figure 3).

Similarly, cent per cent female respondents from agro-climatic zone III (Central plain zone) and V (Western zone) followed by 86.6 per cent from agro-climatic zone I, 80.0 per cent from agro-climatic zone II and 60.0 per cent from agro-climatic zone IV had high level of knowledge about mitigation of air pollution. While comparing agro-climatic zones, it was observed that a large proportion of respondents of agro-climatic zone IV (Western plain zone)

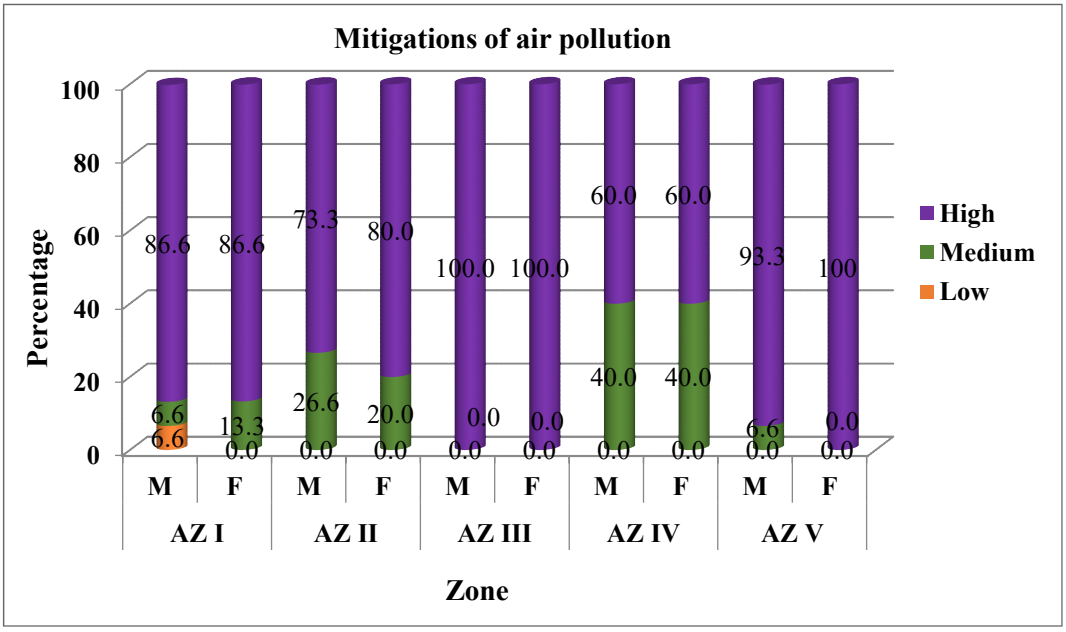

Figure 3: Graphical representation of the respondents on the basis of their knowledge level about mitigations of air pollution

(40.0%) had medium level of knowledge followed by nearly one-fourth of male (26.6%) and female (20.0%) respondents of agro-climatic zone II (Undulating plain zone).

It can be concluded from Table 4 that overall most of the respondents had high level of knowledge about mitigation strategies to combat air pollution. Although less than three fourth of the respondents had high level of knowledge about causes of air pollution but had medium level of knowledge about effects of air pollution. While comparing zone wise data, it is concluded that majority of the respondents of Zone V (Western zone) had comparatively medium level of knowledge about causes, nearly one fourth of the respondents of zone II (Undulating plain zone) and V (Western zone) had low level of knowledge about effects and nearly two fifth respondents of Zone IV (Western plain zone) had medium level of knowledge about mitigation strategies. These zones need to be given more attention while imparting knowledge about air pollution.

Table 5 highlights various mitigation strategies practiced by farm households to combat air pollution. Respondents were asked to tell which mitigation strategies they follow to combat air pollution. These are discussed as follows:

Use of gas Chullah (L.P.G.): All the households across five agro-climatic zones of Punjab used gas chullah (LPG) except 86.6 per cent households from agro-climatic zone I although traditional chullah for routine cooking was also in use. The findings are in line with the results of Roy *et al.* (2018). This is because LPG cylinders and cow dung cakes are easily available in Punjab.

Pooling of vehicles: All the households from agro-climatic zone III and V pooled vehicles when going to same place followed by 93.3 per cent households from agro-climatic zone I and 66.6 per cent from agro-climatic zone IV. It shows that respondents were serious about air pollution caused by vehicles.

Growing of plants around house: Cent per cent households from agro-climatic zone III (Central plain zone) followed by 86.6 per cent from agro-climatic zone II and 66.6 per cent from agro-climatic zone V grew plants around their houses. Very few households from agro-climatic zone IV (33.3%) and6.6 per cent from agro-climatic zone I practiced this strategy. It depicts that most of the respondents were aware about the importance of plants in reducing air pollution.

Gift plants to friends and relatives: Nearly half of the

Table 4: Knowledge level of respondents about causes, effects and mitigation of air pollution (n=150)

Knowledge		Causes			Effects			Mitigation strategies		
level		L	M	H	L	M	H	L	M	H
AZ I	M (n_1=15)	1(6.6)	1(6.6)	13(86.6)	0(0.0)	6 (40.0)	9(60.0)	1(6.6)	1(6.6)	13(86.6)
	F (n_2=15)	1(6.6)	2(13.3)	12(80.0)	0(0.0)	8(53.3)	7(46.6)	0(0.0)	2(13.3)	13(86.6)
AZ II	M (n_1=15)	1(6.6)	1(6.6)	13(86.6)	3(20.0)	11(73.3)	1(6.6)	0(0.0)	4(26.6)	11(73.3)
	F (n_2=15)	1(6.6)	7(46.6)	7(46.6)	3(20.0)	11(73.3)	1(6.6)	0(0.0)	3(20.0)	12(80.0)
AZ III	M (n_1=15)	0(0.0)	0(0.0)	15(100.0)	0(0.0)	3(20.0)	12(80.0)	0(0.0)	0(0.0)	15(100.0)
	F (n_2=15)	0(0.0)	4(26.6)	11(73.3)	0(0.0)	14(93.3)	1(6.6)	0(0.0)	0(0.0)	15(100.0)
AZ IV	M (n_1=15)	0(0.0)	6(40.0)	9(60.0)	0(0.0)	14(93.3)	1(6.6)	0(0.0)	6(40.0)	9(60.0)
	F (n_2=15)	0(0.0)	4(26.6)	11(73.3)	0(0.0)	10(66.6)	5(33.3)	0(0.0)	6(40.0)	9(60.0)
AZ V	M (n_1=15)	4(26.6)	10(66.6)	1(6.6)	4(26.6)	11(73.3)	0(0.0)	0(0.0)	1(6.6)	14(93.3)
	F (n_2=15)	1(6.6)	10(66.6)	4(26.6)	4(26.6)	11(73.3)	0(0.0)	0(0.0)	0(0.0)	15(100.0)
Overall	M (n_1=75)	6(8.0)	18(24.0)	51(68.0)	7(9.3)	45(62.6)	23(30.6)	1(1.3)	12(16.0)	62(82.6)
	F (n_2=75)	3(4.0)	27(36.0)	45(60.0)	7(9.3)	54(72.0)	14(18.6)	0(0.0)	11(14.6)	64(85.3)
	Total (n=150)	9(6.0)	45(30.0)	96(64.0)	14(9.3)	99(66.0)	37(24.6)	1(0.6)	23(15.3)	126(84.0)

Score range	Causes of air pollution	Effects of air pollution	Mitigation of air pollution
Low	9-12	6-8	4-5.6
Medium	12.1-15	8.1-11.2	5.7-7.3
High	15.1-18	11.3-13.3	7.4-9.0

Table 5: Application of mitigation strategies to combat air pollution by farm households

Air pollution mitigation strategies	AZ I (n = 15)		AZ II (n = 15)		AZ III (n = 15)		AZ IV (n = 15)		AZ V (n = 15)		Total (n=75)	
	F	%	F	%	F	%	F	%	F	%	F	%
Use of gas Chullah (L.P.G.)	13	86.6	15	100.0	15	100.0	15	100.0	15	100.0	73	97.3
Pooling of vehicles when going to same place	14	93.3	10	66.6	15	100.0	10	66.6	15	100.0	64	85.3
Growing of plants around house	1	6.6	13	86.6	15	100.0	5	33.3	10	66.6	44	58.7
Gift plants to friends and relatives to increase green coverage	8	53.3	8	53.3	0	0.0	8	53.3	8	53.3	32	42.7
Use of biogas plant	2	13.3	4	26.6	7	46.6	6	40.0	4	26.6	23	30.7
Wearing/instructing for wearing face mask during spray of chemicals	6	40.0	0	0.0	0	0.0	9	60.0	2	13.3	17	22.7
Use of solar devices	1	6.6	0	0.0	0	0.0	0	0.0	2	13.3	3	4.0

households (42.7%) across all five agro-climatic zones gift plants to friends and relatives so that to increase the green coverage on earth. None of the households of agro-climatic zone III followed this strategy.

Use of biogas plant: A large percentage of households from agro-climatic zone III (46.6%) followed by 40.0 per cent households of agro-climatic zone IV,26.6 per cent from agro-climatic zone II and V and least 13.3 per cent households from agro-climatic zone I had biogas plant installed in their houses. In total, nearly one third of the respondents (30.7%) used bio gas plant for their routine life. There is a need to popularize this technology as it not only provides fuel and manure but also helps in livestock waste management and ultimately helps in reducing air pollution.

Wearing/instructing for wearing face mask during spray of chemicals: Majority of the farm households of agro-climatic zone IV (Western plain zone) (60.0%) followed by agro-climatic zone I (40.0%) and 13.3per cent households from agro-climatic zone V wore facemasks during spray of chemical as it may spread in the air and can have hazardous effect on health. None of the farm households from agro-climatic zone II and III followed this strategy. Overall, nearly one fourth of the respondents (22.7%) followed this practice.

Use of solar devices: Use of solar devices was very rare in all zones of Punjab where only one household from agro-climatic zone I and two households from agro-climatic zone V used solar devices such as solar energy operated fan and tube light. There is a need to poularize these natural energy sources to reduce air pollution.

It can be concluded that although the knowledge level of respondents about mitigation of air pollution was reported to be high in all agro-climatic zones but very few households practiced mitigation strategies to combat air pollution. The reason for not following mitigation strategies may be due to comparatively less knowledge about effects of air pollution as well as lack of sensitivity towards its effects on environment and health. The data is concurrent with the study conducted by Kumara *et al.* (2014) and Kaur and Kaur (2016).

CONCLUSION

The paper concludes that majority of the respondents had high level of knowledge about causes of air pollution. They had medium level of knowledge regarding effects of air pollution. Knowledge level of respondents about mitigation of air pollution was reported to be high in all agro-climatic zone but very few households practiced mitigation strategies to combat air pollution. It is further concluded that majority of the respondents of Zone V (Western zone) had comparatively medium level of knowledge about causes, nearly one fourth of the respondents of zone II (Undulating plain zone) and V (Western zone) had low level of knowledge about effects and nearly two fifth respondents of Zone IV (Western plain zone) had medium level of knowledge about mitigation strategies. These zones need to be given more attention while imparting knowledge about air pollution. It is suggested that in extension trainings/ camps more emphasis should be given on information about effects of air pollution, so that people could be sensitized to take serious action to mitigate the effects of air pollution. Innovative behaviour change communication strategies

need to be applied to improve the practical application of knowledge gained. Based upon the findings of the present research, intervention for each agro-climatic zone of Punjab can be planned.

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Training Needs of Vegetable Growers in Sonipat District (Haryana)

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ABSTRACT

Vegetable crops are vulnerable to a number of insects, pests, diseases, disorders and weather events. Therefore, its production and productivity depend on adoption of various improved cultivation practices. Training plays an important role in acquisition of knowledge, skill and attitude and also a critical input for human resource development that adds to the ability of individuals to do the job differently. Effective training cannot be planned and executed without knowing profile, basic knowledge and training needs of the growers. Therefore, keeping in view of its importance in farmers' economy, it was decided to conduct a study with specific objective to ascertain the training needs of farmers for vegetable cultivation. The study was conducted in Sonipat and Rai blocks of the Sonipat district and the total sample size was 200 respondents for the purpose of investigation. The data were collected through pre-tested interview schedule. The data so collected were tabulated and analyzed to draw logical inferences. The study reveals that majority of carrot and okra growers required training on plant protection measures. Further, analysis of data obtained about the training needs of farmers on selected technological aspects for potato and tomato cultivation showed that the farmers needed maximum training about improved seeds. Whereas, weed management stood first on the radish grower farmers' priority.

Keywords: Vegetable growers, Sonepat, Training, Training needs

INTRODUCTION

India is the second largest producer of vegetables in the world accounting for about 13.38 per cent of the world production. Indian farmers grow a numbers of vegetables, but potato, tomato, onion, cabbage and cauliflower account for 60.00 per cent of the total production. Vegetables are cash crops and contributing significantly in farmers' income, ultimately improving the livelihood of farmers, particularly small and marginal farmers. But the productivity level of vegetables in India is low as compared to the other countries. A wide gap exists between average obtained yield and potential yield in the country. The various impact studies indicated that production and productivity can be enhanced by adoption of improved vegetable cultivation practices. Therefore, trainings can play an important role in building of farmers' behaviors towards adoption of improved cultivation practices, positive attitude and critical input for human resource development and also adds to the ability of individuals to do the job differently. Successful and result-oriented farming requires possession of adequate skills and knowledge by the farmers, which can only be attained through appropriate trainings. Realization of need shows that there is lack of something, which if present would make a better situation to individuals or group of individuals. The gap between how job is being performed currently and how it should be performed emphasizes the need for training. A situation of need is therefore established when training is required, it is difference between what is and what ought to be (Adesoji, 2006). However, the success of any agricultural extension system depends upon the competencies posses by their extension personnel, who keep up themselves with this change trough training and can plan training for the farmers (Sarkar *et al.,* 2019).

Ghaswa *et al.* (2017) observed that the cauliflower growers required more trainings in some of crucial areas *viz;* "knowledge about method of application of phosphatic fertilizers", "appropriate time of harvesting". The cauliflower growers perceived the least training requirement in "knowledge about use of trace /minor elements or bio-fertilizers" and "knowledge about depth

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of sowing" of improved cauliflower production technology.

The important first ten areas on which vegetable growers required trainings, most essentially were selection of seeds, recommended chemicals for weed control, identification of insects and insecticides, recommended doses of insecticides, knowledge on FYM and compost, proper time for use of fungicides, recommended fungicides and their quantity for seed treatment, identification of major diseases and method of seed treatment, recommended doses of fungicides for disease control, proper time for use of herbicides. However, the least important areas were proper time and method of irrigation, number of irrigation according to vegetables, selection of field and method of storage, ideal storage house and summer ploughing (Sharma, 2014).

Sahu *et al.* (2011) assessed that farm women needed training in areas like knowledge of improved varieties, disease and IPM, spacing, seed treatment, weed control, cropping system, marketing, package of practices, management of fertilizers, quality improvement and nursery raising. The study concluded that the practices like sowing time, harvesting, seed rate, intercultural operation, irrigation and use of organic manures in which farm women received training, contributed major role in reducing overall knowledge gap.

Bhise and Kale (2014) revealed that there are various practices of onion crop about them growers required training namely spraying of mallic hydrazide (100.00%), to identify major diseases of onion crop (97.00%), plant protection measures against onion diseases (96.00%), improved storage practices of onion (88.00%), important intercultural operation recommended (65.00%), different storage methods (63.00%), plant protection measures (50.00%), irrigation water management (49.00%) and identification of major pests of onion crop (47.00%).

In Haryana more than half of total cropped area is covered by cereals. Similarly, Sonipat district is not an exception in this case. The paddy and wheat are the two major crops occupying 75 per cent of the total cereal crops area. But due to the vicinity of National Capital Delhi, the district has immense opportunity for commercial vegetable cultivation and farmers are harnessing the potential of vegetable production in this area but facing many problems on production front. Effective training cannot be planned and executed without knowing profile and training needs of different vegetable growers in the district. Therefore, keeping in view of its importance in farmers' economy it was decided to conduct a study with specific objective to ascertain the training needs of farmers for vegetable cultivation in the district.

MATERIAL AND METHODS

The present study was carried out in Sonipat district of Haryana. The district has seven blocks, out of which two blocks namely Sonipat and Rai were selected purposively (more acreage under vegetable cultivation) and from each block 10 villages were selected on the basis of large area coverage under vegetable crops. From each selected village 10 farmers were selected as respondents on the basis of random sampling method. Thus, the total sample size was 200 respondents for the purpose of investigation. The data were collected through pre-tested interview schedule. The data so collected were tabulated and analyzed to draw logical inferences.

RESULTS AND DISCUSSION

It was found that majority of the respondents were in young and middle age group, possess primary to high school level of education, belongs to medium level of SES, medium family income, medium level of cosmopoliteness, medium level of mass media exposure, medium level of scientism and medium level of economic and risk orientation.

The data presented in Table 1 indicated increasing trend in area and productivity of different vegetable crops under investigation. It shows positive inclination of farmers towards vegetable cultivation, but productivity of these vegetable crops is still major concern of the farmers. Productivity of any crop depends upon adoption of improved cultivation practices, therefore, skill upgradation of farmers is needed in the district.

The data presented in Table 2 reveals that majority of carrot growers required training on plant protection measures followed by improved seeds. It can be further seen that weed management secured III rank with a total score of 373. However, the other aspects are in descending order *viz.* sowing method (IV), irrigation management (V), manures and fertilizer application (VI), land preparation (VII) and post harvest technologies (VIII). The three most rated training requirement areas

Table 1: Area, production and productivity of different vegetable crops in Sonepat district

Crop	Year 2016-17			Year 2017-18			Year 2018-19		
	Area	Production	Productivity	Area	Production	Productivity	Area	Production	Productivity
Carrot	2409	29922	12.42	3650	65500	17.95	3900	76500	19.62
Okra	2067	20873	10.10	3600	45300	12.58	3080	45600	14.81
Potato	2450	57128	23.32	3100	81560	26.31	3500	92050	26.30
Tomato	2186	50865	23.27	2340	63500	27.14	2420	57200	23.64
Radish	3448	55616	16.13	4350	76000	17.47	4550	86000	18.90
Cucumber	1950	24560	12.59	2270	35050	15.44	2220	30000	13.51
Cauliflower	4837	82345	17.02	6200	122800	19.81	6310	164500	26.07

Source: Department of Horticulture, Govt. of Haryana

Table 2: Farmers' training needs for carrot cultivation (N=200)

Technological aspects	Intensity of need			Total score	Rank order
	Most needed (3)	Somewhat Needed (2)	Least needed (1)		
Land preparation	38 (114)	42(84)	120 (120)	318	VII
Improved seed	58 (174)	111 (222)	31 (31)	427	II
Nursery raising	00	00	00	00	IX
Sowing/transplanting methods	42 (126)	84(168)	74 (74)	368	IV
Integrated nutrient management	9 (27)	108 (216)	83 (83)	326	VI
Irrigation management	43 (129)	80 (160)	77 (77)	366	V
Weed management	21 (63)	131 (262)	48(48)	373	III
Integrated plant protection	61(183)	122 (244)	17 (17)	444	I
Post harvest technologies	12 (36)	53(106)	135 (135)	277	VIII

were plant protection measures, improved seeds and weed management because disease, insect pests and seed adversely affect production and productivity of the crop and hence reduce profitability. However, carrot is a close spacing crop and weeds closely compete for nutrition and ultimately lower down the profit. The findings were supported by Sahu *et al.* (2011).

It can be observed from the data in Table 3 that the earlier trend of placing plant protection measures on the top priority for requirement of training still continued in okra growing farmers. It was due to the fact that vegetables are high value crops needed more attention on plant protection measures. Disease and insect-pest infestation directly affect the income of farmers. Further, investigation of data reveals that weed management secured II rank followed by improved seeds, sowing method, manures and fertilizer application, irrigation management and post harvest technologies. Land preparation techniques are assigned least importance. Jaisawal *et al.* (2013) observed the same results in their study in Madhya Pradesh.

Analysis of data obtained about the training needs of farmers on selected technological aspects for potato cultivation showed that the farmers needed maximum training about improved seeds followed by weed management (II), land preparation (III), plant protection measures (IV), sowing method (V), manures and fertilizer application (VI), Irrigation management (VII) and post harvest technologies (VIII). Improved seeds got top priority in their training requirement because it affects the crop establishment and hence the production and profit. It was surprising to see that the post harvest technologies got least importance because it plays a crucial role in profit maximization of potato growers (Table 4). Similar results were reported by Sonkar and Mishra (2015) and Raina, *et al.* (2014).

Table 3: Farmers' training needs for okra cultivation (N=200)

Technological aspects	Intensity of need			Total score	Rank order
	Most needed (3)	Somewhat Needed (2)	Least needed (1)		
Land preparation	16 (48)	3(6)	181 (181)	235	VIII
Improved seed	51 (153)	130 (260)	19(19)	432	III
Nursery raising	00	00	00	00	
Sowing/transplanting methods	44 (132)	88(176)	68 (68)	376	IV
Integrated nutrient management	39 (117)	78 (156)	83 (83)	356	V
Irrigation management	7 (21)	91 (182)	102 (102)	291	VI
Weed management	61 (183)	119 (238)	20 (20)	441	II
Integrated plant protection	68(204)	128 (256)	04(04)	464	I
Post harvest technologies	11 (33)	38(76)	151 (151)	238	VII

Table 4: Farmers' training needs for potato cultivation (N=200)

Technological aspects	Intensity of need			Total score	Rank order
	Most needed (3)	Somewhat Needed (2)	Least needed (1)		
Land preparation	81(243)	52 (104)	67 (67)	362	III
Improved seed	71(213)	120 (240)	9 (9)	462	I
Sowing/transplanting methods	39(117)	107 (214)	54(54)	385	V
Integrated nutrient management	37(111)	94 (188)	69(69)	368	VI
Irrigation management	28(84)	90 (180)	82(82)	346	VII
Weed management	75(225)	105 (210)	20 (20)	455	II
Integrated plant protection	46(138)	112 (224)	32(32)	394	IV
Post harvest technologies	17 (51)	45(90)	138 (151)	279	VIII

It can be seen from Table 5 that farmers indicated more need of training on the aspect of improved seeds and opined least need of training on land preparation for tomato cultivation. The practice of weed management, plant protection measures and irrigation management were given equal and high importance for training. However, farmers rated manures and fertilizer application, sowing method and post harvest technologies on the lower side of training requirement. This may be due to the direct effect of these technologies on production of crop and quality of produce which leads to economic losses. The similar findings were observed by Sonkar and Mishra (2015) and Pale *et al.* (2019).

It was apparent from the data in Table 6 that weed management stands first on the farmers' priority followed by improved seeds (II), plant protection measures (III), sowing method (IV), land preparation (V), Irrigation management (VI), manures and fertilizer application (VII) and post harvest technologies (VIII). Weed management and improved seed attained equal and high training score. Radish being a close spacing crop requires more attention on weed control and improved seed lead to better crop and more profit (Sonkar and Mishra, 2015).

The Table 7 shows that farmers needed highest training on improved seeds followed by weed management and plant protection measures. It is quite revealing that the earlier trend of placing improved seeds, weed management and plant protection measures on top continued in cucumber crop. However, training requirement on other technological aspects was found moderate. Kumar *et al.* (2018) found that farmers required more training on plant protection, input management and marketing intelligence in vegetable crop cultivation.

The Table 8 reveals that majority of the respondents showed their training need in major area of improved

Table 5: Farmers' training needs for tomato cultivation (N=200)

Technological aspects	Intensity of need			Total score	Rank order
	Most needed (3)	Somewhat Needed (2)	Least needed (1)		
Land preparation	1(3)	72 (144)	127 (127)	274	IX
Improved seed	61 (183)	129 (258)	10 (10)	451	I
Nursery raising	54 (162)	135 (270)	11(11)	443	II
Sowing/transplanting methods	13 (39)	91 (182)	96 (96)	317	VII
Integrated nutrient management	9 (27)	103 (206)	88 (88)	321	VI
Irrigation management	24 (72)	156 (312)	20 (20)	404	V
Weed management	55 (165)	107 (214)	38 (38)	417	III
Integrated plant protection	37 (111)	141 (282)	22 (22)	415	IV
Post harvest technologies	4 (12)	79 (158)	117 (117)	287	VIII

Table 6: Farmers' training needs for radish cultivation (N=200)

Technological aspects	Intensity of need			Total score	Rank order
	Most needed (3)	Somewhat Needed (2)	Least needed (1)		
Land preparation	42 (126)	63 (126)	95 (95)	347	V
Improved seed	61 (183)	106 (212)	33 (33)	428	II
Sowing/transplanting methods	16 (48)	118 (236)	66 (66)	350	IV
Integrated nutrient management	4 (12)	101 (202)	95 (95)	309	VII
Irrigation management	39 (117)	58 (116)	103 (103)	336	VI
Weed management	59(177)	111(222)	30(30)	429	I
Integrated plant protection	22 (66)	131 (262)	47 (47)	375	III
Post harvest technologies	00	31(62)	169 (169)	231	VIII

Table 7: Farmers' training needs for cucumber cultivation (N=200)

Technological aspects	Intensity of need			Total score	Rank order
	Most needed (3)	Somewhat Needed (2)	Least needed (1)		
Land preparation	31(93)	91(182)	78 (78)	353	IV
Improved seed	73 (219)	119 (238)	8 (8)	465	I
Sowing/transplanting methods	11(33)	78 (156)	111 (111)	300	V
Integrated nutrient management	0	52 (104)	148(148)	252	VII
Irrigation management	7 (21)	61(122)	132 (132)	275	VI
Weed management	66 (198)	112 (224)	22 (22)	444	II
Integrated plant protection	57 (171)	106 (212)	37(37)	420	III
Post harvest technologies	0	28 (56)	172 (172)	228	VII

Table 8: Farmers' training needs for cauliflower cultivation (N=200)

Technological aspects	Intensity of need			Total score	Rank order
	Most needed (3)	Somewhat Needed (2)	Least needed (1)		
Land preparation	4 (12)	115 (230)	81 (81)	223	VII
Improved seed	90 (270)	98 (196)	12 (12)	478	I
Nursery raising	91 (273)	94 (188)	15 (15)	476	II
Integrated nutrient management	7 (21)	118 (236)	75 (75)	332	VI
Irrigation management	13 (39)	124 (248)	63 (63)	350	V
Weed management	59 (177)	63 (126)	78(78)	381	IV
Integrated plant protection	78 (234)	99 (198)	23 (23)	455	III
Post harvest technologies	0	103 (206)	97 (97)	303	VIII

Table 9: Correlation and regression coefficient between respondents' personal and socio-psychological variables and their training needs for diversification in farming

Variables	Correlation coefficient ('r' values)	Regression coefficients (Partial 'b' values)	't' values for partial 'b' values
Age	0.0674	0.1304	0.8569
Education	-0.3058*	3.0353	1.5886
Socio-economic status	-0.8439*	-2.2648	-3.7621*
Land holding	-0.7572*	-5.0718	-2.3775*
Income of family	-0.8849*	-0.0717	-5.3508*
Cosmopoliteness-localiteness	-0.4898*	-2.5653	-2.3057*
Mass media exposure	-0.4596*	0.6613	1.0395
Extension contact	-0.8371*	-0.0754	-0.0761
Extension participation	-0.8439*	-1.6293	-3.6912*
Economic orientation	-0.7388*	1.0477	1.7953*
Risk orientation	-0.8306*	0.3463	0.5934
Scienticism	-0.6113*	-1.0970	-2.3396*

R^2 = 0.8706; F value = 149.75; * Significant at 0.05 level of probability

seeds. However, the respondents given equal and high importance to nursery raising and plant protection measures. Training requirement on other technological aspects was found moderate. Sonkar and Mishra (2015) observed similar results in their study.

Data presented in Table 9 indicated farmers' traits such as respondents' education (-0.3058), SES (-0.8439), land holding (-0.7572), income of family (-0.8849), cosmopoliteness – localitenesess (-0.4898), mass media exposure (-0.4596), extension contact (-0.8371), extension participation (-0.8439), economic orientation (-0.7388), risk orientation (-0.8306) and scienticism (-0.6113) were significant and negatively correlated with the training needs of vegetable growers. While age (0.0674) was non-significant and positively correlated with the training needs of vegetable growers. Multiple regression analysis revealed that economic orientation (1.0477), SES (-2.2648), land holding (-5.0718), income of family (-0.0717), cosmopliteness (-2.5653), extension participation (-1.6293) and scienticism (-1.0970) were found contributing significantly. All the independent variables were found contributing to the extent of 87.06 per cent (R^2=0.8706) to the training need of vegetable growers.

Among the independent variables contribution to training need of vegetable growers, the increase in each unit was highest for education and economic orientation

followed by mass media exposure and risk-orientation in positive direction and in negative direction it was land holding, cosmopoliteness, SES, extension participation and scienticism.

CONCLUSION

The findings indicated that farmers had given equal and high importance for training on improved seeds, integrated plant protection measures and weed management. Highest need of training on plant protection measures was observed by carrot and okra growers. However, potato, tomato, cucumber and cauliflower growers gave top priority to training on selection, availability and use of improved seeds. Similarly, radish growing farmers emphasized main need of training on weed management. This may be due the factors like improved seeds, integrated plant protection measures and weed management are directly related to crop establishment, production, productivity and profit. Surprisingly, farmers had given least importance to post harvest technologies, land preparation and sowing techniques. The present study can provide insight and be useful for researchers, extension workers and KVK scientists in planning and execution of effective training programmes.

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Socio-economic and Communicational Profile of Member and Non-member Farmers of FPOs in Uttar Pradesh

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ABSTRACT

The FPOs in current scenario are playing paramount roles in strengthening markets for commodities produced, bought and sold by smallholders thereby reducing transaction costs; managing risk; building social capital; enabling collective action; and redressing missing markets. The study was conducted in purposively selected Central Zone of Uttar Pradesh as this Zone gives the universal representativeness in the state of Uttar Pradesh with reference to the FPOs. There are 14 districts in Central Zone and the researcher has purposively selected only two districts namely Kanpur Dehat and Kannauj on the basis of maximum number of FPOs working in these districts. Every three out of four FPOs were selected from each sampled district by simple random sampling technique. Thus, total 3 FPOs from Kannauj District and 4 FPOs from Kanpur Dehat District were selected. Further, 20 member farmers and 40 non-member farmers from the operational area of each FPOs were sampled to compare their selected profile. In this way, total 420 respondents were selected from 7 FPOs for the study. The variables included for comparison were from broad areas of socio personal viz, age, education, caste and family size; socio-economic namely, land holding, annual income & occupation; and communicational variables like, social participation, mass media contact & extension agency contact and the affected data were subjected for tabular analysis and Z test and Mann-Whitney U test to see the significance of difference if any. The socio-economic profile was compared between member farmers and non-members, the results showed that there is highly significant difference between two groups in age and social participation, mass media contact, extension agency contact and annual income traits ($P<0.01$).

Keywords: Communication profile, FPOs, Mann-Whitney test, Socio-personal traits and Socio-economic traits

INTRODUCTION

More than two-thirds of the three billion people comprising the developing world's rural population live on small farms of two hectares or less (Hazell *et al.,* 2010). Small Holder Farmers (SHF) constitute more than half of the world's undernourished people and the majority of people living in absolute poverty (IFPRI, 2005). Due to high transaction costs, immediate cash needs, lack of access to financial services, and inaccessibility of more remunerative markets, SHF traditionally have sold their crops to intermediaries at the farm gate after harvest (Fafchamps and Vargas Hill, 2005). Selling at harvest when prices are low for lack of liquidity, then buying when prices are high for lack of household stock (Stephens and Barrett, 2011), the majority of SHF participate in markets as net buyers of the very food they produce (Barrett, 2008). Agriculture, with its allied sectors, is unquestionably the largest livelihood provider in India, more so in the vast rural areas. It also contributes a significant share to the Gross Domestic Product (GDP) of country. Small and marginal farmers constitute the largest group of cultivators in Indian agriculture. About 85 per cent of operational holdings are smaller than or about two hectares and amongst these holdings, 66 per cent are less than one hectare (Singh, 2012). Average size of land holding has declined from 2.28 hectares to 1.16 ha. The small holding character of Indian agriculture is much more prominent today than even before. The average landholding size of an household has shrunk marginally to 1.1 ha in 2015-16 from 1.16 ha three years ago and nearly one-thirds of farmers have land

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parcels smaller than 1 ha (NABARD, 2015). While 37 per cent of farm households owned land parcels of smaller than 0.4 ha, another 30 per cent had holdings which fall between 0.41 and 1.0 ha. Only 13 per cent agricultural households owned landholdings bigger than 2 ha (Agriculture Census 2015-16). The total number of operational holdings in the country has increased from 138.35 million in 2010-11 to 146.45 million in 2015-16 showing an increase of 5.86 per cent (Agriculture Census 2015-16).

Farmer Producer Organisations (FPOs) is well known as an innovative co-operatives society in which farmers who are the primary producers who join together voluntarily to form the company based on the principle of free membership and have a common interest of their members specifically developing technical and economic activities. The concept of Producer Company evolved recently in India in 2002 under the chairmanship of an economist (Alagh, 2007) by introducing a new part IX A in to the Companies Act, 1956. Later the Indian Government took a necessary step to establishment of FPOs during 2011-2012 to overcome the associated problems in partnership with the state government, which was implemented through Small Farmers' Agri-Business Consortium. Farmer Producer Organisations (FPOs) are found to be an effective institutional mechanism for linking small farmers to the external world as it helps farmers to reap many tangible and intangible benefits including improved market access, reduced transaction costs, achieving economies of scale, better quality and price realization for the produce and reduce risk (Nikam *et al.* 2019).

Farmer Producer Company is performing different type of activities like agro-processing, involved in government procurement scheme, dairy production, organic farming, seed production and marketing, fishery and other allied activities. The major reason for formation of FPOs is getting better price for the produce by eliminating middleman through direct sale of produce (Jose *et al.,* 2019). The study therefore, attempts to compare the profile of member and non-member farmers to the selected seven FPO's in the state of Uttar Pradesh. The study will be helpful for the development agencies for the effective formulation of strategy for initiation and up-scaling of Farmer Producer Organizations in other areas.

MTERIALS AND METHODS

An ex- post facto research design was adopted for the present study. According to Kerlinger (1964) an ex-post facto research is a systematic empirical enquiry in which the researcher does not have direct control over the variables because their manifestations have already occurred or because they are inherently not manipulable.

The study was conducted in purposively selected Central Zone of Uttar Pradesh as this Zone gives the universal representativeness in the state of Uttar Pradesh with reference to the FPOs. There are 14 districts in Central Zone and the researcher has purposely selected only two districts namely Kanpur Dehat and Kannauj on the basis of maximum number of FPOs working in these districts. Every three out of four FPOs were selected from each sampled district by simple random sampling technique. Thus, total 3 FPOs from Kannauj District namely, AKPCL, GDPCL, and HAPCL and 4 FPOs from Kanpur Dehat District namely, BFPCL, KBMPCL, PFPCL and VKPCL were selected thus, total 7 FPOs were selected for the study. The researcher selected 20 member farmers and 40 non-member farmers from the operational area of each FPOs to compare the socio economic characteristics and their occupation was only agriculture and their land holdings between 0.5 acre to 2 acre. Thus, total 420 respondents were selected from 7 FPOs. The data was collected through personal interview with the respondents. Structured and

Table 1: Number of holdings and average size of holdings in India from 1970-71 to 2015-16

Size Groups	Number of Holdings (in '000)									
	1070-71	1976-77	1980-81	1985-86	1990-91	1995-96	2000-01	2005-06	2010-11	2015-16
Marginal	36200	44523	50122	56147	63389	71179	75408	83694	92826	100251
Small	13432	14728	16072	17922	20092	21643	22695	23930	24779	25809
Semi-Medium	10681	11666	12455	13252	13923	14261	14021	14127	13896	13993
Medium	7932	8212	8068	7916	7580	7092	6577	6375	5875	5561
Large	2766	2440	2166	1918	1654	1404	1230	1096	973	838
All Sizes	71011	81569	88883	97155	106637	115580	119931	129222	138348	146454

semi-structured interview schedules were constructed for the study. The variables included for comparison were from broad areas of socio personal viz, age, education, caste and family size, socio-economic namely land holding, annual income and occupation and communicational variables like social participation, mass media contact and extension agency contact and the affected data were subjected for tabular analysis and Z test and Mann-Whitney U test to see the significance of difference if any.

RESULT AND DISCUSSION

Socio-personal characteristics: A comparison of farmer members with non-member farmers (control group) was done in the study by applying Mann-Whitney Utest and Z test.

The data presented in Table 2 reflects that majority of the members of FPOs i.e. 51.42 per cent and Non-member 63.21 per cent were middle-aged between the age group of 39-54 years and the over-all mean was 46.09 and 49.29 for member and non-members respectively, similar finding was done by (Gill *et al.,* 2018). In case of all 7 FPOs the age of member farmers and non-member farmers was found highly significant as the selection of the control group was done with due care from the same locality and considering the similarity of the respondents along with across two FPOs namely, AKPCL and GDPCL the age was found significant ($P<0.05$) whereas in case of KBMPCL the age was found highly significant ($P<0.01$), the involvement of youths was least. The reason may be that rural youths are less attracted to farming and many of those who are employed in this sector are also dissatisfied, and if given a chance, they would like to quit farming (GOI, 2005). Regarding the literacy it was found that majority of the farmer members were middle school i.e. 22.85 per cent and non-member were high school i.e. 25 per cent. The same findings were reported by (Singh *et al.,* 2015). A further perusal of Table 2 depicts that about 36.42 per cent of the member belonged to general category and 45 per cent of the non-member belong to the other backward caste, reason may be that most of the land holdings are owned by the farmers by general and OBC category and they were also more aware about the government schemes.

An analysis of family characteristic reveals that most of the respondents belong to medium family size (6-7 member) i.e. 47.85 per cent & non-members 55.35 per cent and the over-all mean was found 6.14 and 6.01 for member and non-members, only in one FPO (HAPCL), the family size was found to be significant ($P<0.05$). the Mann Whitney U value of all FPO member and non-member was found 19164.5.

Socio economic characteristics: A perusal of Table 3 unfolds that a majority of member farmers i.e. 50 per cent and non-member 50 per cent belongs to 1 to 1.5 acre land holding followed by below 1 acre and above 1.5 acre 25 per cent respectively. The over-all mean was found 1.13 and 1.13 for members and non-members. And the Mann Whitney U value of all FPO members and non-members is 19600. Further, Table 3 revealed that a majority of member farmers were in high category of annual income 50 per cent and non-member farmers were in low category of annual income 40.71 per cent followed by low and medium category 25 per cent for member farmers and 34.28 per cent and 40.71 for medium and low category of annual income for non-member farmers. The over-all mean was 10592.14 for member farmers and 74925 for non-member farmers. The Mann Whitney U value of all FPO member and non-member is 27803. It is clearly stated from the table 3 that all FPOs annual income was found to be highly significant ($P<0.01$).

Communication characteristics: As far as communication is concerned, majority of the FPO members 62.85 per cent had medium level of social participation and 72.5 per cent non-member had low level of social participation and the over-all mean was 0.323 and 0.133 for member and non-member. The result of Table 4 revealed that there is a highly significant difference ($P<0.01$) between member farmers and non-member farmers of all FPOs and the value of Mann Whitney test was 5873 for all FPO.

Mass media contact exposure, majority of the FPO members 67.14 per cent had medium level of mass media contact index and 60.35 per cent non-member had low level of mass media contact. and the over-all mean was 0.718 and 0.665 for member and non-member. The result revealed that there is a highly significant difference ($P<0.01$) between member farmers and non-member farmers of all FPOs and the value of Mann Whitney test was 15141 for all FPO along with across two FPOs namely GDPCL and KBMPCL mass media contact was found highly significant ($P<0.01$), and one FPO BFPCL mass media contact was found significant ($P<0.05$). While for extension

Table 2: Socio personal traits of the respondents.

Category	AKPCL		GDPCL		HAPCL		BFPCL		KBMPCL		PFPCL		VKPCL		Over all	
	M (20)	NM (40)	M (20)	NM (40)	M (20)	NM (40)	M (20)	NM (40)	M (20)	NM (40)	M (20)	NM(40)	M (20)	NM(40)	M (140)	NM (280)
1. Age																
Young (upto 38)	2	2	5	1	8	12	2	2	10	4	7	1	5	8	39 (27.85)	30 (10.71)
Middle (39 to 54)	11	24	12	31	10	19	13	30	7	20	9	29	10	24	72 (51.42)	177 (63.21)
Old (55 and above)	7	14	3	8	2	9	5	8	3	16	4	10	5	8	29(20.71)	73(26.07)
Mean	46.55	51.12	44.70	49.30	43.80	47.35	49.55	49.55	43.35	51.55	45.55	49.65	48.90	49.75	46.09	49.28
SD	7.99	8.59	7.58	6.42	8.49	9.10	8.4	6.7	9.44	8.32	9.43	7.33	8.47	7.43	8.917	8.142
Range	33-61	34-67	34-68	32-64	34-62	33-63	29-61	38-64	35-67	34-65	31-64	34-65	29-67	38-64	29-67	31-67
Z value	-2.038		-2.327		-1.364		-1.016		-3.294		-1.619		-0.370		3.555	
Mann-Whitney U	338 [0.042*]		245 [0.020*]		328.5 [0.173]		327 [0.309]		381.5 [0.001**]		328.5 [0.106]		339 [0.712]		15444 [0.000*]	
2. Education																
Illiterate	2	3	3	4	2	3	6	3	1	3	2	3	1	3	17 (12.14)	22(7.85)
Primary school	2	4	3	6	5	6	1	10	2	4	2	5	3	5	18(12.85)	40(14.28)
Middle school	7	5	4	10	7	14	2	6	5	10	3	13	4	8	32(22.85)	66(23.57)
High school	2	13	4	10	3	5	3	7	6	13	4	10	5	12	27(19.28)	70(25)
Intermediate	4	14	5	7	2	10	5	8	3	8	7	8	5	8	31(22.14)	63(22.5)
Graduate	3	1	1	3	1	2	3	6	3	2	2	1	2	4	15(10.71)	19(6.78)
Post graduate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3. Caste																
General caste	7	14	6	10	6	4	8	18	12	18	6	15	6	10	51(36.42)	89(31.78)
OBC	8	17	7	18	6	24	8	17	5	15	6	16	6	19	46(32.85)	126(45)
Scheduled caste	5	9	7	12	8	12	4	5	3	7	8	9	8	11	43(30.71)	65(23.21)
4. Family Size																
Small (upto 5 members)	7	7	6	17	7	20	12	14	8	15	5	10	5	11	50(35.71)	94(33.57)
Medium (6-7)	12	27	12	21	8	16	5	23	8	18	12	24	10	26	67(47.85)	155(55.35)
Large (8 and above)	1	6	2	2	5	4	3	3	4	7	3	6	5	3	23(16.42)	31(11.07)
Mean	6.0	6.4	6.05	5.70	6.45	5.62	5.50	5.90	6.15	6.12	6.35	6.25	6.45	6.10	6.14	6.01
SD	1.02	1.10	1.14	1.13	1.39	1.27	1.66	1.17	1.56	1.36	1.13	1.23	1.39	1.15	1.355	1.224
Range	4-8	3-9	4-8	4-8	4-9	4-9	3-9	4-8	4-9	4-9	3-9	4-9	4-9	4-8	4-9	
Z value	-1.38		1.118		2.222		-0.840		0.061		0.312		0.970		--0.946	
Mann-Whitney U	319.5 [0.165]		332.5 [0.263]		266.5 [0.026*]		300.5 [0.401]		382.5 [0.951]		394.5 [0.755]		361 [0.332]		19164.5[0.344]	

Figure in [ ] indicate P value

Table 3: Socio economic traits of the respondents

Category	AKPCL		GDPCL		HAPCL		BFPCL		KBMPCL		PFPCL		VKPCL		Over all	
	M (20)	NM (40)	M (20)	NM (40)	M (20)	NM (40)	M (20)	NM (40)	M (20)	NM (40)	M (20)	NM (40)	M (20)	NM (40)	M (140)	NM 280 (%)
1. Land Holding																
Below 1 acre	5	10	5	10	5	10	5	10	5	10	5	10	5	10	35(25)	70(25)
From 1 to 1.5 acre	10	20	10	20	10	20	10	20	10	20	10	20	10	20	70(50)	140(50)
Above 1.5 acre	5	10	5	10	5	10	5	10	5	10	5	10	5	10	35(25)	70(25)
Mean	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13
SD	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.723	0.722
Range	0.05-2	0.05-2	0.05-2	0.05-2	0.05-2	0.05-2	0.05-2	0.05-2	0.05-2	0.05-2	0.05-2	0.05-2	0.05-2	0.05-2	0.05-2.0	
Z value	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.000	
Mann-Whitney U	400 [1.00]		400 [1.00]		400 [1.00]		400 [1.00]		400 [1.00]		400 [1.00]		400 [1.00]		19600 [1.000]	
2. Annual Income																
Low (32000- to 60000)	5	14	5	14	5	14	5	18	5	18	5	18	5	18	35 (25)	114 (40.71)
Medium (60,001 – 1,00,000)	5	16	5	16	5	16	5	12	5	12	5	12	5	12	35(25)	96 (34.28)
High (1,0,001 and above)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	70(50)	70 (25)
Mean	106335	76325	106335	76325	106335	76325	105560	73875	105560	73875	105560	73875	105560	73875	105892.14	74925
SD	45357.53	35430.42	45357.53	35430.42	45357.53	35430.42	45130.64	34628.75	45130.64	34628.75	45130.64	34628.75	45130.64	34628.75	44242.78	34617.77
Range	44500-166000	29000-126000	44500-166000	29000-126000	44500-166000	29000-126000	44000-164500	27000-121000	44000-164500	27000-121000	44000-164500	27000-121000	44000-164500	27000-166000	44000 - 138700	27000 - 126000
Z value	2.590		2.590		2.590		2.760		2.760		2.760		2.760		7.247	
Mann-Whitney U	551 [0.010*]		551 [0.010*]		551 [0.010*]		578 [0.006*]		578 [0.006*]		578 [0.006*]		578 [0.006*]		27803 [<0.0001*]	

Figure in [ ] indicate P value

Table 4: Communication traits of the respondents.

Category	AKPCL		GDPCL		HAPCL		BFPCL		KBMPCL		PFPCL		VKPCL		Over all	
	M (20)	NM (40)	M (20)	NM (40)	M (20)	NM (40)	M (20)	NM (40)	M (20)	NM (40)	M (20)	NM (40)	M (20)	NM (40)	M (140)	NM 280
1. Social Participation Index																
Low (0-0.22)	3	31	1	31	4	27	5	27	5	26	6	29	4	32	28(20)	203(72.5)
Medium (0.23-0.43)	16	9	15	9	9	11	13	13	12	14	11	11	12	8	88(62.85)	75(26.78)
High (0.44 and above)	1	0	4	0	7	0	2	0	3	0	3	0	4	0	24(17.14)	2(0.71)
Mean	0.329	0.121	0.383	0.119	0.35	0.14	0.28	0.13	0.308	0.154	0.279	0.140	0.329	0.121	0.323	0.133
SD	0.11	0.10	0.109	0.122	0.15	0.11	0.11	0.11	0.14	0.113	0.101	0.124	0.134	0.102	0.125	0.124
Range	0.08-0.50	0.00-0.33	0.16 - 0.58	0.00-0.41	0.08-0.58	0.00-0.33	0.16-0.50	0.00-0.41	0.16-0.50	0.00-0.41	0.08-0.50	0.00-0.41	0.08 - 0.583	0.00-0.33	0.083-0.583	0.00 - 0.583
Z value	7.068		8.48		5.386		4.647		4.462		3.796		6.137		-14.177	
Mann-Whitney U	78 [<0.0001*]		56.5 [<0.0001*]		122.5 [<0.0001*]		162 [<0.0001*]		164 [<0.0001*]		178 [<0.0001*]		90.5 [<0.0001*]		5873 [<0.0001*]	
2. Mass Media Contact Index																
Low (0-0.58)	6	14	1	11	5	11	3	16	1	15	7	16	6	14	29(20.71)	97(34.64)
Medium (0.59-0.83)	11	24	16	29	12	26	16	22	17	25	10	21	12	22	94(67.14)	169(60.35)
High (0.84 and above)	3	2	3	0	3	3	1	2	2	0	3	3	2	4	17(12.14)	14(5)
Mean	0.70	0.67	0.733	0.646	0.721	0.685	0.721	0.656	0.733	0.648	0.693	0.650	0.713	0.696	0.718	0.665
SD	0.16	0.14	0.100	0.137	0.165	0.119	0.139	0.136	0.10	0.13	0.167	0.150	0.142	0.139	0.140	0.136
Range	0.41-0.91	0.33-0.91	0.50-0.91	0.33-0.83	0.33-0.91	0.50-0.91	0.41-0.91	0.33-0.91	0.50-0.91	0.33-0.83	0.41-0.91	0.33-0.91	0.41-0.91	0.41-0.91	0.333-0.917	0.333-0.917
Z value	0.629		2.814		0.855		1.711		2.762		1.215		0.432		-3.686	
Mann-Whitney U	354 [0.529]		267 [0.005**]		319 [0.392]		276.5 [0.087]		250 [0.006]		317.5 [0.224]		369.5 [0.666]		15141 [0.000**]	
3. Extension agency contact Index																
Low (0-.21)	6	23	3	18	4	13	2	20	3	21	3	14	2	24	23(16.42)	133(47.5)
Medium (0.24-0.36)	10	14	13	19	11	24	17	16	13	16	11	22	14	14	89(63.57)	125(44.64)
High (0.37 and above)	4	3	4	3	5	3	1	4	4	3	6	4	4	2	28(20)	22(7.85)
Mean	0.293	0.225	0.313	0.236	0.310	0.255	0.298	0.238	0.315	0.229	0.313	0.254	0.328	0.218	0.30	0.23
SD	0.08	0.07	0.08	0.07	0.088	0.071	0.066	0.075	0.067	0.072	0.079	0.067	0.087	0.065	0.570	0.389
Range	0.20-0.45	0.15-0.40	0.20 - 0.15	0.50-0.40	0.15-0.45	0.15-0.40	0.15-0.45	0.15-0.40	0.20-0.40	0.15-0.40	0.15 - 0.40	0.15-0.40	0.15 - 0.50	0.15 - 0.40	0.0 - 2.0	0.0 - 0.1
Z value	3.069		3.450		3.426		3.176		4.592		2.841		5.026		-10.032	
Mann-Whitney U	215 [<0.002**]		203 [<0.001**]		249.5 [<0.015*]		207.5 [<0.001**]		154 [<0.0001**]		231.5 [<0.004**]		125 [<0.0001**]		9738 [<0.0001**]	

Figure in [ ] indicate P value

agency contact FPO members 63.57 per cent had medium level of extension agency contact and 47.5 per cent non-member had low level of extension agency contact. and the over-all mean was 0.30 and 0.23 for member and non-member. The result revealed that there is a highly significant difference (P<0.01) between member farmers and non-member farmers of all FPOs and the value of Mann Whitney test was 9738 for all FPO.

CONCLUSION

Based on the above findings, it is concluded that the variables like, age, annual income, social participation, mass media contact and extension agency contact were found to be highly significant (P<0.01). Hence, there is a highly significant difference between member farmers and non-members. The FPOs are a platform where farmers get strengthening and reduce all cultivation and production costs faced by farmers and to enable them for enhance their income by selling their production in market after eliminating the role of middleman. The socio-personal, socio-economic and communicational traits of farmers should be considered very important by member farmers of FPOs in promoting their programmes as they will give an insight and help to select appropriate action which can have an impact. The support of institutions like, Farmer Producer Organisations will play prominent role in empowering the small producers to make their agricultural enterprise more viable and profitable for betterment of their socio-economic status.

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Willingness to Buy Agricultural Insurance by Progressive Farmers in Punjab State of India

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ABSTRACT

Agricultural insurance is considered as an important mechanism to effectively address the risk to output and income resulting from various natural and manmade events. Weather risk is a major cause of income fluctuations for rural households in developing countries. Weather based micro insurance is a powerful solution to weather related risks, but it is not widespread in use in the developing world. This paper attempts to determine the willingness to buy WBCIS & PMFBY among the progressive farmers of Punjab. The opinion of the farmers referred to the degree of acceptance of the new agricultural insurance scheme PMFBY and WBCIS and the degree of willingness to buy the insurance product by the progressive farmers of Punjab. The Average Mean Score (AMS) of all the factors was found to be 2.24 and mean score for coverage of crops and farmers was 2.31 which was little more than the AMS of 2.24 thus, this factor determined more willingness of the farmers to buy the product. The Average Mean Score (AMS) of all the factors in WBCIS was found to be 2.27. This revealed that the restructured WBCIS has comparatively preferred more over PMFBY. The degree of acceptance and willingness to buy the WBCIS is found to be more as compared to PMFBY by the farmers. After the appropriating of WBCIS for Punjab state it can be recommended into the agricultural policy, which can also be on adaptation strategy for the changing climate.

Keywords: Agricultural insurance, Degree of acceptance, Willingness to buy, PMFBY, WBCIS

INTRODUCTION

Agriculture insurance is an institutional response to risks faced by the farmers. The basic principle of agricultural insurance is that the loss incurred by the few farmers is shared by many in an area and losses incurred in bad years are compensated from resources accumulated in good years. Weather risk is a major cause of income fluctuations for rural households in developing countries. Weather-based crop insurance aims at mitigating the hardship of the insured farmers against the likelihood of financial loss on account of anticipated crop loss resulting from incidence of adverse conditions of weather parameters like rainfall, temperature, frost, humidity, etc. Pradhan Mantri Fasal Bima Yojana launched in 2016-17 by GOI aims at supporting sustainable production in agriculture sector by way of providing financial support to farmers suffering crop loss/damage arising out of unforeseen events. The state of Punjab's agriculture is at low risk hence requires many strategies which would move the state's growth from a plateau phase to again an ever growing phase. Some of the strategies being eyed by the policy makers are diversification from the wheat-paddy rotation, reduction of the non-institutional loan, adoption of improved cultivation and increased production of oilseeds, pulses and other risky crops. Under the situation of risks and uncertainties in agriculture, a farmer hesitates to take decisions related to adoption of new technologies, cultural practices and use of adequate quantities of various costly inputs (Birari *et al.,* 2002). Hence, there is a need to stabilize and protect the farm economy through the adoption of various appropriate measures. One of the mechanisms that could alleviate their lot is the agricultural insurance. Thus agricultural insurance can be used as an important instrument of social and economic policy to be pursued by the state for the protection of farmers against unforeseen losses, to adapt to the effects of climate change and support the diversification of agriculture by encouraging the growing of more risky crops. In developing crop insurance markets, one of the main problems to be solved is the setting of appropriate

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premium and subsidy levels for crop insurance schemes in order to fulfill the policymakers' objectives of a high participation rate among farmers.

MATERIALS AND METHODS

Consumers' willingness-to-pay (WTP) and willingness-to-buy (WTB) studies are often used in determining the market potentials (Govindasamy *et al.,* 2015; Govindasamy *et al.,* 2014; Surendran and Sekar, 2010; Xia and Zeng, 2008). Since both the schemes are not implemented in Punjab; the opinions of the farmers have been studied regarding both Weather Based Crop Insurance Scheme (WBCIS) & Pradhan Mantri Fasal Bima Yojana (PMFBY). The progressive farmers were selected as respondents for the study since adoption of the new product will be first among them among the social structure. There are four farmers association of Punjab Agricultural University, Ludhiana *viz.* Progressive Beekeeper Association, Tree grower Association and PAU Kisan Club and Nursery Growers Association. From each association 15 farmers were selected randomly thus, making a total sample of 60 progressive farmers for the study. An interview schedule was constructed for gathering information from the farmers which contained the items regarding the socio-economic characteristics of the farmer. It assessed the opinion of progressive farmers on various factors related to purchase decision of PMFBY and WBCIS such as the premium amount, subsidization, claim process, risks covered, crops covered, etc. The interview schedule so prepared was pre-tested with a sample of twenty respondents' non-sampled area. On the basis of information obtained through pretesting, necessary modifications were made in the schedule so as to make easy for recording data. After finalizing the research instrument, the data was collected personally from the farmers. Proper precautions were taken to ensure unbiased response of the respondents by providing them necessary instructions after explaining the objectives of the study. In addition, discussions were also held with the progressive farmers respectively for in-depth probing and understanding the various aspects under of WBCIS and PMFBY Schemes.

RESULTS AND DISCUSSION

The information regarding socio-personal profile of the progressive farmers which included age, education, operational land holding, crops grown, etc. is presented in Table 1. The variation of the age was between 18-66 years. Almost half of the farmers belonged to the age group of 34-50 years i.e. 45 per cent while 31.67 per cent of them aged between 18-34 years. About 23.33 per cent of them aged 50-60 years. It is clear from Table 1 that majority of the respondents have passed class 12th while 18.33 per cent of them were graduates. Only 16.67 per cent of the respondents were educated up to matric and the education level of the progressive farmers is quite good, where a considerable per cent (15%) of them were post graduates. About 11.67 per cent of them were diploma holders. Operational land holding of the respondents was classified into categories on the basis of Statistical Abstracts of Punjab 2016. The data in Table 1 revealed that 31.67 per cent of the farmers were operational on 10-25 acres whereas 30% of them were operating on (5-10 acres) (Figure 1).

As many as 16.67 per cent of the farmers were operating on more than 25 acres of land and an equal percentage operated on (2.5-5) acres of land. A meagre of 5 per cent of the farmers were operating on below 2.5 acres of operational land holding (Figure 2).

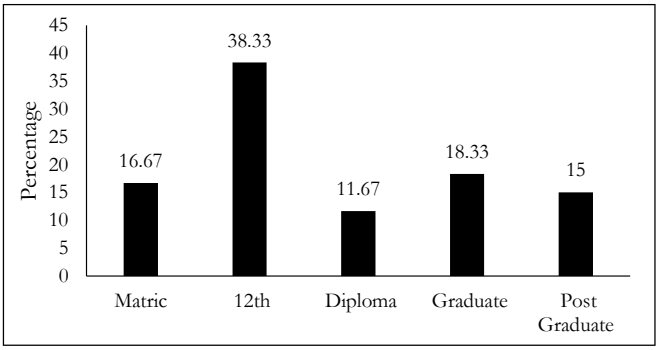

Figure 1: Distribution of farmers on the basis of education

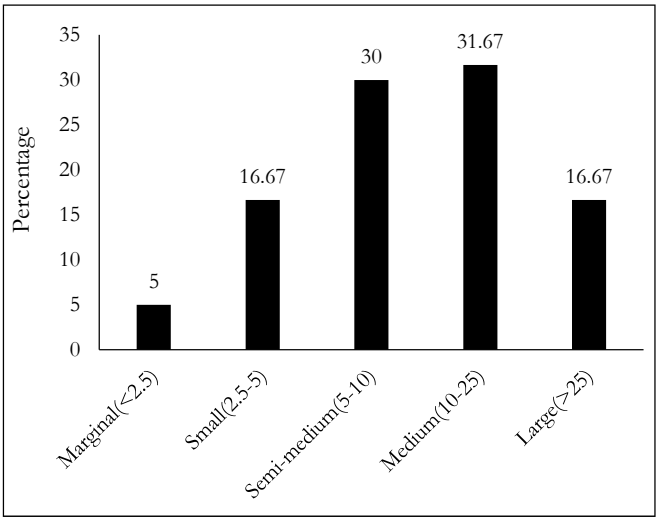

Figure 2: Distribution of farmers on the basis of operational land holding

It is pertinent from Table 1 that the progressive farmers were not only involved in paddy wheat rotation but also were cultivating fodder, oilseed, maize and potato. During *kharif* season almost 88.33 per cent of the farmers were growing paddy whereas 18.33 per cent were cultivating sugarcane, both of them being considered as water guzzling crops. For the *rabi* season, it can be well observed that the farmers were diversified in cultivating various crops like wheat, mustard, maize and potato. They were also growing berseem as a fodder crop for the animals reared by them. The crops growing by the selected progressive farmers were comparatively involving low production risk, but maize and potato are vulnerable to the market or price risk (Mohapatra *et al.,* 2016).

About 51.67 per cent of the selected farmers reared cows whereas almost equal percentages (48.33%) were rearing buffaloes. About 65 per cent of the farmers owned tractor and only 35 per cent of them owned tiller. The study findings revealed that 45 per cent of the respondent

Table 1: Distribution of farmers according to their socio-personal characteristics (n=60)

Category	Frequency	Percentage
Age (years)		
18-34	19	31.67
34-50	27	45
50-66	14	23.33
Education		
Matric	10	16.67
12th	23	38.33
Diploma	7	11.67
Graduate	11	18.33
Post Graduate	9	15
Operational Land Holding (acres)		
Marginal (<2.5)	3	5
Small (2.5-5)	10	16.67
Semi-medium (5-10)	18	30
Medium (10-25)	19	31.67
Large (>25)	10	16.67
Crops grown		
Paddy	53	88.33
Sugarcane	11	18.33
Wheat	56	93.33
Mustard	1	1.67
Berseem	7	11.67
Maize	9	15
Potato	9	15
Livestock reared		
Buffaloes	29	48.33
Cows	31	51.67
Possession of farm implements		
Tractor	39	65
Tiller	21	35
Level of social participation		
Agricultural		
Low (3-5)	9	15
Medium (5-7)	24	40
High (7-9)	27	45
Non-Agricultural		
Low (5-9)	26	43.33
Medium (9-13)	16	26.67
High (13-17)	18	30
Participation in extension activities		
Farmers meeting in the village	47	78.33
Field visit	46	76.67
Kisan Mela	57	95
Demonstration	48	80
Training camp	44	73.33
Campaign	34	56.67
Front line demonstration (FLDs)	22	36.67
Adaptive Research Trials (ARTs)	26	43.33
Level of extension contacts		
Low (3-5)	8	13.33
Medium (5-7)	14	23.33
High (7-9)	38	63.33
Level of mass media exposure		
Print media		
Low (3-5)	14	23.33
Medium (5-7)	27	45
High (7-9)	19	31.67
Electronic media		
Low (6-8)	16	26.67
Medium (8-10)	28	46.67
High (10-12)	16	26.67

Table 1 contd....

farmers had high social participation in agriculture related institution existing in their village society set up. And almost equal percentage of respondents were having medium social participation group.

The data in Table 1 also reveals that among the non-agricultural institutions *viz;* panchayat, social committees, the level of social participation is low with 43.33 per cent of respondent farmers belonging to this group. Where as 26.67 per cent and 30 per cent of them had medium and high level of social participation respectively. Participation in extension activities refers to the respondent farmer's participation for seeking the information regarding agricultural operations, inputs, latest technological interventions (Figure 3).

Majority of the respondents (95%) participated in *Kisan Mela* conducted by Punjab Agricultural University (PAU), Ludhiana. While about 78.33 per cent involved in group meeting of farmers conducted at village level. There was considerable percentage of farmers (80 per cent) who involved themselves in these demonstrations. Only 36.67 per cent of them participated in front line demonstration, whereas 43.33 per cent of respondent farmers had also laid down Adaptive Research Trials (ARTs). Extension contacts play a significant role in the adoption of an innovation. Data presented in Table 1 shows that majority of the progressive farmers (63.33%) had a high level of extension contacts while about 23.33 per cent of them had a medium level of extension contact and only 13.33 per cent of the progressive farmers had a low level of extension contacts (Figure 4).

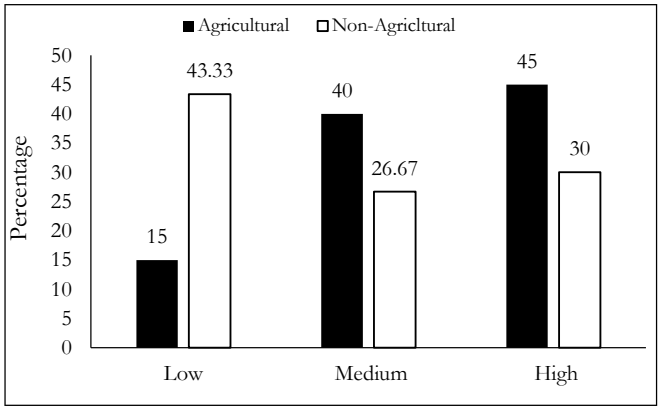

Figure 3: Distribution of farmers on the basis of level of social participation

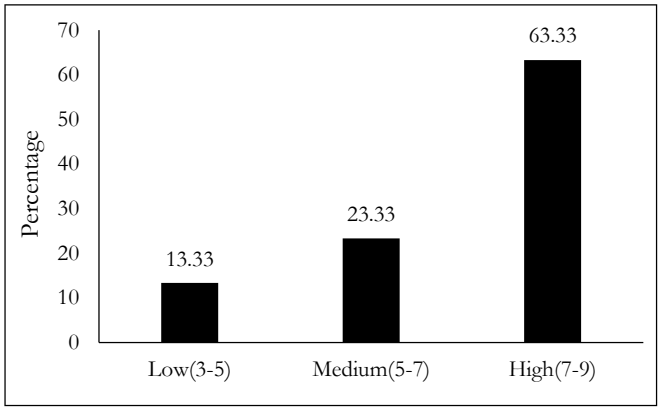

Figure 4: Distribution of farmers on the basis of level of extension contacts

The print media included the newspaper and magazine whereas the electronic media included exposure to television, radio, internet and mobile apps. The data given in Table 1 revealed that 45 per cent of the progressive farmers had a medium mass media exposure while about 31.67 per cent of them had a high mass media exposure. Only 23.33 per cent of the progressive farmers were found to have a low mass media exposure. The level of mass media exposure for electronic media was found to be medium while little more than one fourth (26.67%) of them had high mass media exposure and an equal per cent of the progressive farmers, were placed in low mass media exposure group (Figure 5).

The insurance scheme, PMFBY being a policy intervention for the risk management in agriculture has been studied in terms of its conditional acceptance by the farmers of the state. The progressive farmers being considered to have more of awareness were the sample of the study. The degree of acceptance of it has been determined on a three point scale measuring their state of liking or not liking of the different aspect of the insurance policy related to the crops, farmers and risk coverage, the

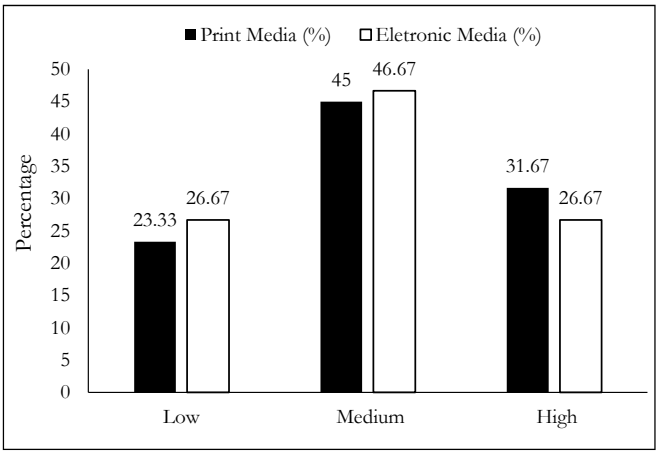

Figure 5: Distribution of the farmers on the basis of their mass media exposure

sum insured, the premium amount to be paid by them, the exclusions of risk coverage, the notification area, claim assessment and the procedure for implementation of the scheme. The results have been presented in Table 2 which reveals that the Average Mean Score (AMS) for all the aspects is 2.38. Further the data put forth in the table also reveal the mean score for the different aspects of the insurance scheme and every aspects being rated as less acceptable, more acceptable and undecided basing on AMS.

The scrutiny of the Table 2 clearly reveals that the farmer's degree of acceptance for the criteria of coverage of farmers was less with MS of 2.13 since they considered this aspect to be an optional factor. The availing of the scheme can be considered to be optional rather than compulsory coverage of all farmers. Moreover, there were further suggestions that the basis of consideration of insurance for crops should be on individual farmer, based on the operational land holding and the crops grown. The second aspect related to the coverage of crops was more acceptable to the farmers with mean score of 2.48, 2.43 and 2.52 for food crops, oilseeds and horticultural crops respectively.

The insurance scheme PMFBY, has covered the food and cash crops under its ambit so, this feature was more acceptable to the farmers. But in context of diversification where the present scenario demands a shift to farming system approach for cultivation of crops, the coverage of vegetable crops, cotton have not specified in particular. Sidhu and Vatta (2012) have also argued that there is very little risk in the production of food crops and other major crops of the state, but it is relatively higher for cotton crops. The crops which are more prone to risk are horticultural crops such as fruits and vegetable (Mohapatra *et al.,* 2016) whereas the schemes guidelines do not clarify the coverage scope of horticultural crops.

Further, it can be observed from data put forth in Table 2 of less acceptability for the risk coverage of due to less rainfall, adverse seasonal condition, drought, dry spells and pest and diseases with mean score of 2.32, 2.28, 2.37, 2.35 and 2.27 respectively, whereas the risk coverage of losses to standing crops due to lightening/ fire and storm/hailstorm were more acceptable by the farmers with mean score of 2.42 and were undecided regarding flood incidence on standing crop. It is interesting to discuss that, Mohapatra *et al.* (2016) studied the risk prevalence in cultivation of paddy as perceived by the insured farmers was production risk which occurred more due to the deficit of rainfall during the transplantation of paddy. These contrasting finding may be backed by the sample of farmers being selected for both studies, where the progressiveness of farmer is also an indicator for having more mechanisms for coping up of with risk. The data presented in the Table 2 concerning the degree of acceptance related to coverage of localized risk, incidence of hailstorm have more acceptability with MS of 2.43 whereas hailstorm and floods were less acceptable with mean score of 2.35. The less acceptability can be reasoned out due to their fewer incidences. The aspects related to post-harvest losses i.e. coverage up to two weeks from harvest and dry in cut and spread condition were more acceptable with mean score of 2.42. Any loss to the crop after harvest due to unseasonal rain was also more since the post-harvest is an important stage of crops where various weather variations can cause considerable loss to the farmers and its coverage under insurance is acceptable with mean score of 2.43. The unit of assessment of damage due to localized risks or post-harvest losses individual farm basis is more acceptable to the farmers with mean score of 2.47 since this is considered to be more acceptable unit whereas the notification of the insurance unit to be considered as village panchayat was less acceptable with mean score of 2.35. The possible reason for less acceptability of this aspect is the justification of village panchayat to be bigger unit, since the weather fluctuation, causing damage to the standing crop or sowing of it is localized. The exclusions of the scheme i.e. the losses arising out of war and nuclear risk, malicious damage was also more acceptable with mean score of 2.45.

The aspects related to sum insured i.e. its distribution among the critical phases of the crop and it is equal to the scale of finance as decided by District Level Technical Committee is more acceptable to the farmers with mean score of 2.40 and 2.68 respectively. The premium rate decided for *kharif* and *rabi* crops at 2 per cent and 1 per cent of sum insured for food grains and oilseeds was less acceptable with mean score of 2.25 since it was considered to be higher. Similar trend was also observed for the horticultural crops with mean score of 2.28. Regarding the premium subsidy, two factors such as the premium subsidy shall be shared equally by centre and states MS 2.30 and additional subsidy shall be entirely borne by the state 2.32 had low acceptance. The claims processing payment to be done within 45 days from the end of risk period is more acceptable to the farmers with mean score

Table 2: Distribution of farmers according to their degree of acceptance of various aspect of PMFBY (n=60)

S. No.	Aspects	Farmers (MS)	Degree of Acceptance (AMS = 2.38)
1.	**Coverage of farmers:** All farmers including sharecroppers and tenant farmers.	2.13	LA
2.	**Coverage of crops**		
a.	Food crops (Cereals, Millets and Pulses)	2.48	MA
b.	Oilseeds	2.43	MA
c.	Commercial / Horticultural Crops	2.52	MA
2.	**Risk coverage:**		
I.	**Delayed Sowing / Planting Risk:**		
a.	Deficit rainfall	2.32	LA
b.	Adverse seasonal conditions	2.28	LA
II.	**Standing Crops:**		
a.	Drought	2.37	LA
b.	Dry spells	2.35	LA
c.	Flood	2.38	U
d.	Pests & Diseases	2.27	LA
e.	Fire/ Lightening	2.42	MA
f.	Storm/ Hailstorm	2.42	MA
III.	**Localized Calamities:**		
a.	Hailstorm	2.43	MA
b.	Landslide	2.35	LA
c.	Floods	2.35	LA
4.	**Post-harvest losses:** Two weeks from harvest	2.42	MA
5.	**Exclusion unit:** Losses arising out of war and nuclear risks, malicious damage and other preventable risks.	2.45	MA
6.	**Insurance unit:** Village Panchayat or the major growing crop unit.	2.35	LA
7.	**Assessment of crop damage:** due to post-harvest losses and localized risks will be made be on individual farm basis.	2.47	MA
8.	**Sum insured (SI):**		
i.	Sum insured is same for loanee and non-loanee farmers	2.28	LA
ii.	The SI will be equal to the scale of finance as decided by District Level Technical Committee (DLTC)	2.68	MA
iii.	Sum insured is distributed among the critical phases of the crop.	2.40	MA
9.	**Premium rate:**		
a.	***Kharif*** – All food grains and Oilseeds crop – 2.0% of Sum Insured or Actuarial rate, whichever is less.	2.25	LA
b.	***Rabi*** – All food grains and Oilseeds crop – 1.5% of Sum Insured or Actuarial rate, whichever is less.	2.25	LA
c.	***Kharif* and *Rabi*** – Annual Commercial / Annual Horticultural crops – 5% of Sum Insured or Actuarial rate, whichever is less.	2.28	LA
10.	**Premium subsidy:**		
i.	The premium subsidy shall be shared equally by center and states.	2.30	LA
ii.	Additional subsidy shall be entirely borne by the state.	2.32	LA
11.	The claims will be processed and paid within 45 days from the end of risk period.	2.40	MA
12.	Crop loans through KCC are covered under compulsory coverage	2.37	MA
13.	The sowing certificate for the crop insured is issued by agriculture officer of the block.	2.42	MA
14.	Mobile App are used for reporting incidents of localized risks.	2.47	MA

MS=Mean Score, AMS=Average Mean Score, MA=More Acceptable, LA=Less Acceptable, U=Undecided, (1- I do not like it, 2- Undecided, 3- I like it)

of 2.40 and mobile app can be used for reporting incidents of localized risks is more acceptable to the farmers with mean score of 2.47 respectively.

The insurance scheme, WBCIS being a policy intervention for the risk management in agricultural has been studied in terms of its conditional acceptance by the farmers of the state. The results have been presented in Table 3 which reveals that the Average Mean Score (AMS) for all the aspects is 2.32. Further the table also reveals the mean score for the different aspects of the insurance scheme and every aspects being rated as less acceptable, more acceptable and undecided basing on AMS.

The scrutiny of the Table 3 clearly reveals that the farmers' degree of acceptance for the criteria of coverage of farmers was less since with MS of 2.13 they considered this aspect to be an optional factor. The availing of the scheme can be considered to be optional rather than compulsory coverage of all farmers. Moreover there were further suggestions that the basis of consideration of insurance for crops should be on individual farmer, based on the operational land holding and the crops grown. The second aspect related to the coverage of crops was more acceptable to the farmers with mean score of 2.48, 2.43 and 2.52 for food crops, oilseeds and horticultural crops respectively. The insurance scheme WBCIS, has covered the food and cash crops under its ambit so, this feature was more acceptable to the farmers.

Further, it can be observed from data put forth in Table 3 that more acceptability of the weather perils covered, temperature and add on index plus of due to more, deficit, excess, unseasonal, dry spell, dry days, high, low hail storms and the ideal risk period is from sowing to maturity of crop with mean score of 2.47, 2.47, 2.50, 2.35, 2.43, 2.37, 2.38, 2.35 and 2.40 respectively. Whereas the weather perils covered of losses to add on index plus due to cloud bursts were less acceptable by the farmers with mean score of 2.28. It is interesting to discuss that, Mohapatra *et al.* (2016) studied the risk prevalence in cultivation of paddy as perceived by the insured farmers was production risk which occurred more due to the deficit of rainfall during the transplantation of paddy. This contrasting finding may be backed by the sample of farmers being selected for both studies, where the progressiveness of farmer is also an indicator for having more mechanisms for coping up of with risk.

The data presented in the Table 3 concerning the degree of acceptance related to notification of the scheme, incidence of the issuance is one month prior to commencement of crop season or risk period having more acceptability with MS of 2.43. The aspects related to details contained on notification i.e. crop & reference unit areas (RUA), sum insured (SI), premium rate, subsidy and weather station for each (RUA) were more acceptable to the farmers with mean score of 2.47, 2.43, 2.37, 2.42 and 2.42 respectively. The aspects related to sum insured i.e. its distribution among the critical phases of the crop and it is equal to the scale of finance as decided by District Level Technical Committee is more acceptable to the farmers with mean score of 2.40 and 2.68 respectively. The premium rate decided for *kharif* and *rabi* crops at 2 per cent and 1 per cent of sum insured for food grains and oilseeds was less acceptable with mean score of 2.25 since it was considered to be higher. The same trend was also observed for the horticultural crops with mean score of 2.28. Regarding the premium subsidy, two factors such as the premium subsidy shall be shared equally by centre and states is less acceptable to the farmers with MS 2.30 and additional subsidy shall be entirely borne by the state remains undecided with mean score 2.32. Claims shall be assessed on the basis of weather data recorded by reference weather station is less acceptable to the farmers with mean score of 2.28 and the claims processing payment to be done within 45 days from the end of risk period is more acceptable to the farmers with mean score of 2.40 respectively.

The crop or weather insurance has been launched to provide support to the farmers in case of failure of the notified crop due to natural calamities, pests and disease which consequently stabilizes the income of the farmers. The upscaling of agricultural insurance may facilitate the adoption of innovative agricultural practices which involves risk. But since the risk involved is systemic and covariant, the lack of historical yield date, small sized farm holdings, low value crops and relatively high cost of insurance have made it difficult for the designing of a workable crop insurance scheme (Rao, 2010).

The restructured Weather Based Crop Insurance Scheme and Pradhan Mantri Fasal Bima Yojana (PMFBY) was launched was in 2016 by the GOI country wide. But the state of Punjab did not participate in any of these schemes. So, the degree of willingness to buy these two insurance products by the progressive farmers have been investigated on basis of the various features of the scheme adjuging whether they will buy, or not sure of it or will not buy it and have been weighed as 3, 2, 1 respectively.

Table 3: Distribution of famers according to their degree of acceptance of various aspects of WBCIS (n=60)

S. No.	Aspects	Farmers (MS)	Degree of Acceptance (AMS=2.32)
1.	**Coverage of farmers:** All farmers including sharecroppers and tenant farmers.	2.13	LA
2.	**Coverage of crops:**		
a.	Food crops (Cereals, Millets and Pulses)	2.48	MA
b.	Oilseeds	2.43	MA
c.	Commercial / Horticultural Crops	2.52	MA
3.	**Weather perils covered:**		
I.	**Normal coverage.**		
a.	**Rainfall:**		
i.	Deficit	2.47	MA
ii.	Excess	2.47	MA
iii.	Unseasonal	2.50	MA
vi.	Dry spell	2.35	MA
v.	Dry days	2.43	MA
b.	**Temperature**		
i.	High	2.37	MA
ii.	Low	2.38	MA
II.	**Add on index plus**		
i.	Hail storms	2.35	MA
ii.	Cloud bursts	2.28	LA
4.	Risk period is from sowing to maturity of crop	2.40	MA
5.	**Notification of the scheme:** The issuance is one month prior to commencement of crop season or risk period.	2.43	MA
b.	**The notification contain the following details:**		
i.	Crops & Reference Unit Areas (RUA)	2.47	MA
ii.	Sum Insured (SI)	2.43	MA
iii.	Premium rate	2.37	MA
iv.	Subsidy	2.42	MA
v.	Reference Weather Station	2.42	MA
6.	**Sum insured (SI):**		
i.	Sum insured is same for loanee and non-loanee farmers	2.28	LA
ii.	The SI will be equal to the scale of finance as decided by District Level Technical Committee (DLTC)	2.68	MA
iii.	Sum insured is distributed among the critical phases of the crop.	2.40	MA
7.	**Premium rate:**		
a.	***Kharif*** – All food grains and Oilseeds crop – 2.0% of Sum Insured or Actuarial rate, whichever is less.	2.25	LA
b.	***Rabi*** – All food grains and Oilseeds crop – 1.5% of Sum Insured or Actuarial rate, whichever is less.	2.25	LA
c.	***Kharif* and *Rabi*** – Annual Commercial / Annual Horticultural crops – 5% of Sum Insured or Actuarial rate, whichever is less.	2.28	LA
8.	**Premium subsidy:**		
i.	The premium subsidy shall be shared equally by center and states.	2.30	LA
ii.	Additional subsidy shall be entirely borne by the state.	2.32	U
9.	Claims shall be assessed on the basis of weather data recorded by Reference Weather Station.	2.28	LA
10.	The claims will be processed and paid within 45 days from the end of risk period.	2.40	MA

MS=Mean Score, AMS=Average Mean Score, MA=More Acceptable, LA=Less Acceptable, U=Undecided, (1- I do not like it, 2- Undecided, 3- I like it)

Table 5: Distribution of famers according to the factors determining their degree of willingness to buy PMFBY (n=60)

S. No.	Aspect	MS (AMS= 2.24)
1.	Coverage of crops and types of farmers	2.31
2.	Risks coverage	2.25
3.	Coverage of Post-harvest losses	2.20
4.	**Exclusions:** losses arising out of war and nuclear risks, malicious damage and other preventable risks shall be excluded.	2.17
5.	**Insurance unit:** Village Panchayat or the major growing crop unit.	2.25
6.	**Assessment of crop damage:** due to post-harvest losses and localized risks will be made be on individual farm basis	2.15
7.	Sum insured (SI)	2.26
8.	Premium rate	2.14
9.	Premium subsidy	2.31

AMS: Average Mean Score, MS: Mean Score

The data input forth in Table 4 reveals the various factor or the scheme features which determine the degree of willingness of progressive farmers to buy Pradhan Mantri Fasal Bima Yojana (PMFBY). The Average Mean Score (AMS) of all the factors is 2.24 and mean score for coverage of crops and farmers is 2.31 which is little more than the AMS of 2.24 thus, this factor determines comparatively more willingness of the farmers.

The mean score of feature related to coverage of risk is 2.25 and that of post-harvest losses is 2.20. While those exclusions of losses arising out of war and nuclear risks, malicious damage with mean score of 2.17 of to be less than the AMS. Also that village panchayat is notified as an insurance unit or the major growing crop unit is with mean score of 2.25 of to be more willingness of the farmer and that assessment of crop damage due to post-harvest losses and localized risks will be made on individual farm basis is 2.15 which is less than the AMS of the willingness to buy of the farmer. And mean score for the sum insured is 2.26 which is little more willingness of the farmers. The mean score related to premium rate is 2.14 was also less and that of premium subsidy is 2.31 which is more than the willingness to buy of the farmers.

The PMFBY though being revamped by taking care of various basis risk viz. the coverage of post-harvest losses and the unit of homogeneous area being reduced from block level to panchayat level, the degree willingness to buy is comparatively low. This may be accrued to the interest of farmers at farm level or individual basis for assessment of loss.

The data input forth in Table 5 reveals the various factor or the scheme factures which determine the degree of willingness of progressive farmers to buy Weather Based Crop Insurance Scheme (WBCIS). The Average Mean Score (AMS) of all the factors is 2.27 and mean score for coverage of crops and farmers is 2.31 which is little more than the AMS of 2.27 thus, this factor is determines comparatively more willingness of the farmers. The factor related to weather perils covered 2.27 were equal and that of notification of the scheme 2.24 was less willingness of the farmers.

Table 5: Distribution of famers according to the factors determining their Willingness to buy WBCIS (n=60)

S. No.	Aspect	MS (AMS= 2.27)
1.	Coverage of crops and types of farmers	2.31
2.	Weather perils covered	2.27
3.	Notification of the scheme	2.24
4.	Sum insured (SI)	2.26
5.	Premium rate	2.14
6.	Premium subsidy	2.31

AMS: Average Mean Score, MS: Mean Score

While mean score for the sum insured is 2.26 which is little more willingness of the farmers. The mean score related to premium rate is 2.14 was less and that of premium subsidy is 2.31 which are more than the AMS of willingness to buy the farmers. The restructured WBCIS was comparatively preferred more over PMFBY. The degree of willingness to buy it is more since the basic risk is weather index.

CONCLUSION

The designing of an agricultural insurance is largely dependent on the "index" which designates the actual farm level losses. In the current study, both the insurance scheme; PMFBY and WBCIS are based on two different types of index *viz.* yield index and weather index. The focus of appropriating the index is to minimize the basis risk i.e. for PMFBY the insurance unit is affixed as the village panchayat, coverage of post-harvest losses and trigger

yield. Whereas for the WBCIS it is the density of weather station, coverage of parametric weather exigencies and correlation between weather index and yield of the crop. The Average Mean Score (AMS) of all the factors was found to be 2.24 and mean score for coverage of crops and farmers was 2.31 which was little more than the AMS of 2.24 thus, this factor determined more willingness of the farmers to buy the product. The Average Mean Score (AMS) of all the factors in WBCIS was found to be 2.27. This revealed that the restructured WBCIS has comparatively preferred more over PMFBY. The degree of willingness to buy it is more since the basic risk is weather index. The degree of acceptance and willingness to buy the WBCIS is found to be more as compared to PMFBY by the farmers. The need appraisal of farmers for crop insurance is required, so that they can decide how to manage their production as well as price risk in a better way. The insurance product planned for Punjab state needs to be designed based on strong agronomic principles. The quantification of level of basis risk needs to be relooked for WBCIS and reframed accordingly. After the appropriating of WBCIS for Punjab state it can be recommended into the agricultural policy, which can also be on adaptation strategy for the changing climate.

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Marital Quality of Living Apart Together Couples and Proximal Couples: Differences and Similarities

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ABSTRACT

In the recent years, concept of marriage has changed drastically because of the revolution in society's economic, political, social and cultural spheres. Relationships in which intimate partners do not share a household (living apart together) are on high rise which makes it imperative to study differences in marital quality of living apart together or proximal couples. Seven Dimensions of Exceptional Relationships tool was administered on 75 living apart together couples and proximal couples each, drawn through snowball sampling from Distt. U.S. Nagar of Uttarakhand. Both, husband and wife's responses were recorded on structured tools to define their marital quality. Mixed methods of data collection were used in the present study namely mail questionnaire, face to face and telephonic interviews. Spouses' revelation depicted that commitment, passion and team work were significantly higher among living apart together couples than proximal couples. However, intimacy, individuality, communication, growth and spirituality were seen to be statistically similar between living apart together couples and proximal couples. Hence, married couple can live apart or together under the same roof and maintain a healthy relationship. This depends upon the couple.

Keywords: Communication, Geographically distant couple, Intimacy, Individuality, Passion

INTRODUCTION

Marriage is celebrated as an auspicious and sacred event marking the union of not only two individuals but their families, cultures, rituals and value system. It is a state of being united to a person of the opposite sex as a husband or wife in a consensual and contractual relationship recognized by law. In India, traditionally, marriage meant one of the spouses moving in to the other one's residence for establishing a single family unit. They are referred to as proximal couple families. However, modernizing forces have altered the socio-cultural fabric of India, influencing the structure, functioning and role expectations of familial and marital relationships (Sharangpani, 2010).

With the progressive mindset, society is now accepting and acknowledging marital associations where couples maintain two residences due to many reasons. Few dual earner couples stay apart as workplace of either partner is too far off for managing a daily commute; few single earner couples reside far off as workplace of working partner is remotely located and has not good options for bringing up his/her family, few partner(s) are enrolled for studies with no in campus residential provision for their family. Thus, some married couples are compelled to live in geographically distant places due to work or study. These couples are called "Living apart together couples". The label LAT (living apart together) is used to describe those who seek the intimacy of being in a committed relationship but, at the same time, sustain some autonomy (Strohm Charles *et al.,* 2009). Often such associations are called "non-residential alliances" (Castro-Martín *et al.,* 2008). In general, these couples consider their home as a primary and the other one as a satellite home. The partner living in the satellite commutes between the two homes on a daily basis, and this situation is known as a "commuter marriage" (Gerstel and Harriet, 1984 and Winfield Fairless, 1985).

It is important for individuals to have satisfying marriage in terms of maintaining a happy life (Anar, 2011). Marital quality is comparable to marital satisfaction or relationship satisfaction. Based on a study of married couples in an Indian village, marital quality is conceptualized as an overarching ideal of the life partner consisting of dimensions such as love, peace, understanding,

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communication, trust and balance (Allendorf and Ghimire, 2013). By and large, the concept of marital quality includes "satisfaction, happiness, adjustment, and other related dimensions and evaluations of the marital relationship" (Thomas *et al.,* 1984). Individuals in LAT unions consider the relationship with their spouse as valuable and understand that they are part of a marriage, even though their spouses live in geographically distant locations. LATC setup is interpreted as an attempt by the partners to "maintain the union alive while not allowing it to stand in the way of personal goals" (Adams, 2004).

Findings of studies comparing relationship quality of couples in LATC and PC setup have been inconsistent and often contradictory. Living separately from partners and interpersonal issues often become supporting factors for a marriage breakdown (Gravningen *et al.,* 2017). LDM (Long distance marriages) requires a good pattern and quality of communication to reduce loneliness (Favotto *et al.,* 2019). Effective communication is critical for a healthy marital relationship. Assessment of barriers in adoption and use of Information and Communication Technology (ICT) among rural women revealed that the technological barriers (mean rank = 297.34) found to be the most important factor which act as barrier in using ICT by rural women followed by cultural barrier (mean rank =285.54) followed by infrastructural barrier (mean rank =256.51) and personal barrier (122.59) (Verma *et al.,* 2018). Marital quality of couples also affects young adolescents to a large extent. Adolescence is a critical link between childhood and adulthood, characterized by significant physical, psychological, and social transitions. These transitions carry new risks but also present opportunities to positively influence the immediate and future health of young people. Significant age and gender differences were found in the mean scores of self concept and emotional stability in rural adolescents (Caur and Riar, 2013).

The decision to work far from home is usually made because of several reasons, but it is necessary to get support from the partner (Stoilkovska *et al.,* 2018). Some studies suggest that long distances are associated with decreased spousal involvement in family responsibilities and emotional support in everyday life (Magnuson and Norem, 1999). Wives and husbands in commuter marriages tend to feel degradation in the quality of their relationships. However, other studies have counter argued that in such living arrangements, spouses can balance individual preferences and aspirations with family interests and legitimate partnership (Marjolijn and Clara, 2008), thereby fostering relatively high levels of satisfaction. Rise in the LATC setup in recent years has sparked academic interest in understanding how couples in this marital arrangement maintain the quality of their relationships as opposed to the spouses in PC setup. Thus, present study was undertaken with following objectives:

1. To assess and compare differences in marital quality of living apart together and proximal couples
2. To explore and compare similarities in marital quality of living apart together and proximal couples.

MATERIALS AND METHODS

Participants and Procedure

The one hundred fifty couples meeting the eligibility criteria for inclusion under present study were identified using snowball sampling technique from Distt. Udham Singh Nagar. Out of the 150 participating couples, 75 were from living apart together setup and 75 from proximal setup. Sample selection for present study is represented diagrammatically in Figure 1. It can be clearly seen that both, husband and wife's responses were recorded on structured tools to define their marital quality. Mixed methods of data collection were used in the present study namely mail questionnaire, face to face and telephonic interviews. Respondents responded on a seven point Likert scale ranging from 1 (Not at all) to 7 (Very much) to express their marital quality. The data was then classified and tabulated per the objectives to arrive at meaningful and relevant inferences. The data were analyzed using statistical techniques like mean and independent sample t-test.

Measures

Marital quality of couples from living apart together and proximal couples were assessed using the Seven Dimensions of Exceptional Relationships Scale by Szekely (1980). Seven Dimensions of Exceptional Relationships Scale is a 21 item standard version questionnaire that focuses on the seven dimensions of successful relationship. Each dimension is further broken down into three sub categories, described in terms of their ideal scenario which are as follows: Commitment: (Priority, Security, Intention), Intimacy: (Affection, Attunement ,Emotional transparency), Individuality: (Personal satisfaction, Emotional regulation, Responsibility), Communication: (Sharing, Conflict resolution, Heartfelt conversation), Passion: (Sensuality,

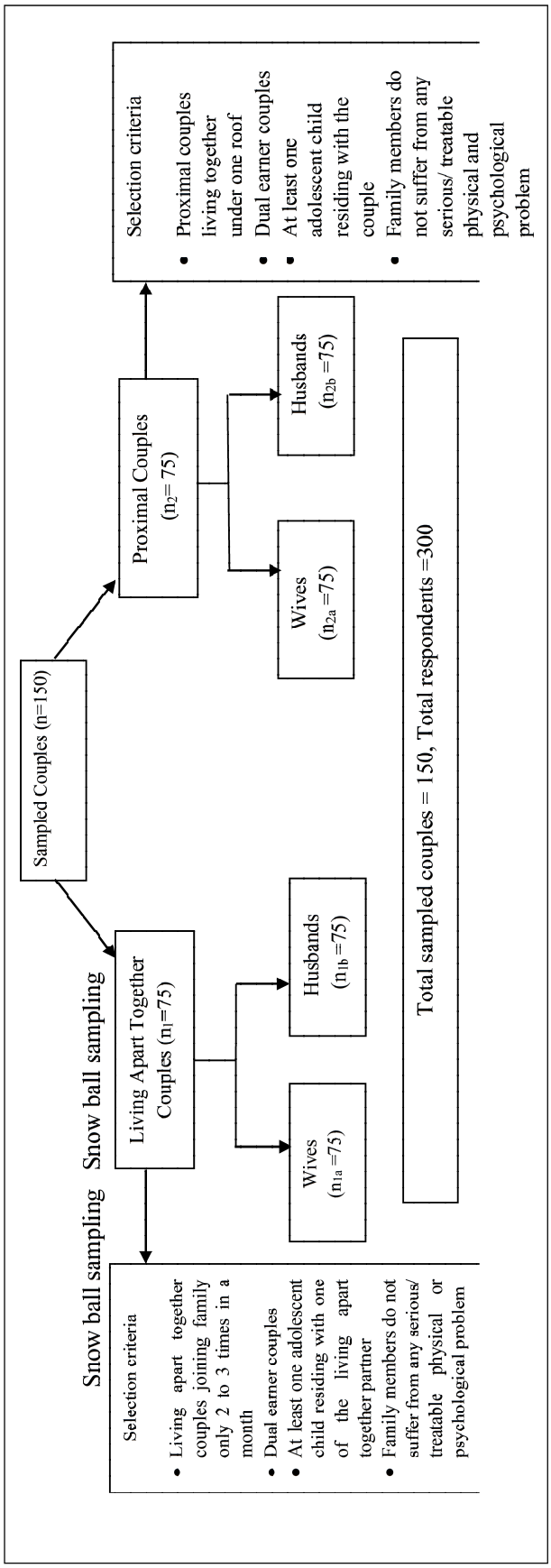


Figure 1: Diagrammatic representation of sample selection for the present study

Variety, Desire), Teamwork: (Service, Roles, Flexibility), Growth & spirituality: (Best self, Vision and purpose, Mystery). Minimum score for the scale is 7 and maximum is 21. These scores are further interpreted as 18-21 – Very high, 14-17 – High, 10-13 – Moderate, 6-9 – Low, 5 or lower – Very low.

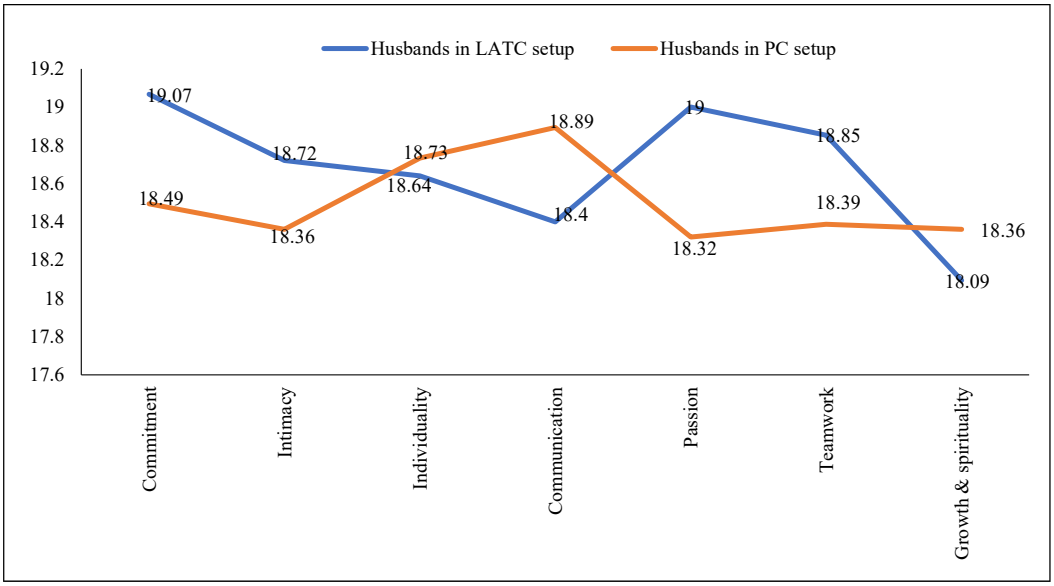
RESULTS AND DISCUSSION

It can be easily seen from Figure 2 and Table 1 that husbands who live apart from their partner have statistically higher mean scores on commitment, passion and team work domain of marital quality in comparison to those who live with their partner. Findings of a study suggests that major factor in all the egalitarian living apart together couple families is that they operate from the family philosophy that both partners have equal rights and responsibilities toward their employment careers and family care (Lindemann, 2017). The results are also supported by a study that reported that spouses living apart tend to reflect and give importance to their spousal autonomy and think of themselves as closely connected to their partners, despite their geographic separation (Lau *et al.,* 2012). Indeed, through communication technologies, they feel connected in many ways, even when physically they are not. Couples are intentionally engaged in activities and interactions that display love, trust and appreciation for each other when they are together (Farris, 1978). Contrary to the possible negative implications of living separately, a commuting lifestyle can bolster the confidence and trust between a wife and a husband, contributing to a positive couple identity.

Table 1 reveals that that intimacy, individuality, communication and growth are statistically similar in husbands from living apart together setup and proximal setup. As we know India is a relatively developing country of advanced public transit, many living apart together spouses can frequently visit their families who reside in the primary home. Moreover, due to the wire- to wire expansion of Internet systems and facility of cell phones, couples can get in touch with one another anywhere and anytime. Owing to all these advantages, living apart spouses in India are seemingly successful in overcoming the marital challenges and difficulties resulting from living separately.

The new family trends and patterns also lead to changes in gender roles, especially alteration from women's typical conventional roles to an economic provider for the family, and lately also the transformation of men's role with more

Figure 2: Mean scores of husbands from living apart together couples and proximal couples on marital quality



extensive involvement in family responsibilities. This positive shift in relationship dynamics is likely to have a positive effect on relationship quality of the couples. It helps foster individuality by giving partners an opportunity to venture freely into their personal passions and not necessarily overburden them with responsibilities. It helps focus on things that are going to last such as true love even when the going gets rough. This adds a spiritual dimension to the relationship and helps partners connect to their true self. It helps develop in us wisdom to use relationship as a path and partner as a conduit for furthering inner development.

A cursory look at Figure 3 reveals and Table 2 that like husbands from LATC setup, wives who live apart from their partner have higher mean scores on commitment, passion and teamwork in comparison to wives from PC setup. The results are in line with a study which reported that commuter couples would be alike on sharing of family chores (Kim, 2001). However, he found that in commuter couples compartmentalization of work and home lives prevailed and was recognized by the spouses as a benefit of their lifestyle.

The results of the present study undermine the argument that regional separation obstructs the maintenance and enhancement of marital quality. Couples living separately value the limited time they have together while simultaneously giving space for the chances to pursue individual freedom and aspiration and bolstering the trust between the partners. Charting out priorities and scheduling a framework that reduces the possibilities of misunderstandings, the space for disappointments, as well as the scope of negative interactions can actually enhance relationship quality.

Some wives and husbands in commuter marriages confess that they enjoy their time alone because they can spend it as they wish and do what they want (Jackson, 2000). Some couples in commuter marriages report that the limited opportunities to get together actually increase the purposefulness and meaningfulness of the time they spend with each other (Bunker, 1992). Some empirical comparisons based on some convenience samples revealed that women and men in commuter marriages do not actually differ in any relational satisfaction measurements (Hardill, 2004).

Figure 3 and Table 2 elicits that intimacy; individuality, communication and growth are statistically similar in wives from living apart together setup and proximal setup. In LATC setup, couples return to the primary home often and they can share their daily lives and emotional states with their spouses more frequently, and they can be more involved in the dynamics of family life (Judy and Seward, 2013; Gerstel and Harriet, 1984). Some qualitative research has indicated that a commuting lifestyle tends to reinforce traditional distributions of gender roles (Jesmin and Seward, 2011; Wismanto, 2017).

To them, this living arrangement is seen as a form of an egalitarian partnership where individual rights and preferences are secured. Spouses who live apart may tend to coordinate their work schedules in order to spend more leisure time together. Similar results have been reported in

Table 1: Statistical differences in mean scores of husbands from living apart together couples and proximal couples on marital quality

		Levene's test for equality of variances		t-test for equality of means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	95% confidence interval of the difference	
									Lower	Upper
Commitment	Equal variances assumed	6.7	.01	2.07	148	.04	.57	.28	.03	1.12
	Equal variances not assumed			2.07	143.89	.04	.57	.28	.03	1.12
Intimacy	Equal variances assumed	22.86	.00	1.19	148	.24	.36	.30	-.24	.96
	Equal variances not assumed			1.19	118.22	.24	.36	.30	-.24	.96
Individuality	Equal variances assumed	2.54	.11	-.34	148	.73	-.09	.27	-.64	.45
	Equal variances not assumed			-.34	141.63	.73	-.09	.27	-.64	.45
Communication	Equal variances assumed	11.73	.00	-1.74	148	.08	-.49	.28	-1.05	.07
	Equal variances not assumed			-1.74	127.19	.09	-.49	.28	-1.06	.07
Passion	Equal variances assumed	8.37	.00	2.66	148	.01	.68	.26	.18	1.18
	Equal variances not assumed			2.66	144.75	.01	.68	.26	.18	1.19
Teamwork	Equal variances assumed	4.01	.047	2.14	148	.03	.47	.22	.04	.90
	Equal variances not assumed			2.14	146.55	.03	.47	.22	.04	.90
Growth & spirituality	Equal variances assumed	2.82	.095	-.90	148	.37	-.27	.30	-.86	.32
	Equal variances not assumed			-.90	145.61	.37	-.27	.30	-.86	.32

Table 2: Statistical differences in mean scores of wives from living apart together couples and proximal couples on marital

		Levene's test for equality of variances		t-test for equality of means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	95% confidence interval of the difference	
									Lower	Upper
Commitment	Equal variances assumed	17.30	.00	2.30	148	.02	.65	.28	.09	1.21
	Equal variances not assumed			2.30	127.12	.02	.65	.28	.09	1.21
Intimacy	Equal variances assumed	3.96	.05	-.14	148	.89	-.04	.30	-.62	.54
	Equal variances not assumed			-.14	144.80	.89	-.04	.30	-.62	.54
Individuality	Equal variances assumed	.92	.34	.91	148	.36	.39	.42	-.45	1.23
	Equal variances not assumed			.91	141.42	.36	.39	.42	-.45	1.23
Communication	Equal variances assumed	37.63	.00	-.05	148	.96	-.01	.29	-.59	.56
	Equal variances not assumed			-.05	91.53	.96	-.01	.29	-.59	.56
Passion	Equal variances assumed	7.05	.01	2.05	148	.04	.53	.26	.02	1.04
	Equal variances not assumed			2.05	133.96	.042	.53	.26	.02	1.04
Teamwork	Equal variances assumed	.14	.71	2.07	148	.04	.53	.26	.02	1.04
	Equal variances not assumed			2.07	140.05	.04	.53	.26	.024	1.04
Growth & spirituality	Equal variances assumed	1.36	.25	-.63	148	.53	-.19	.30	-.78	.40
	Equal variances not assumed			-.63	147.02	.53	-.19	.30	-.78	.40

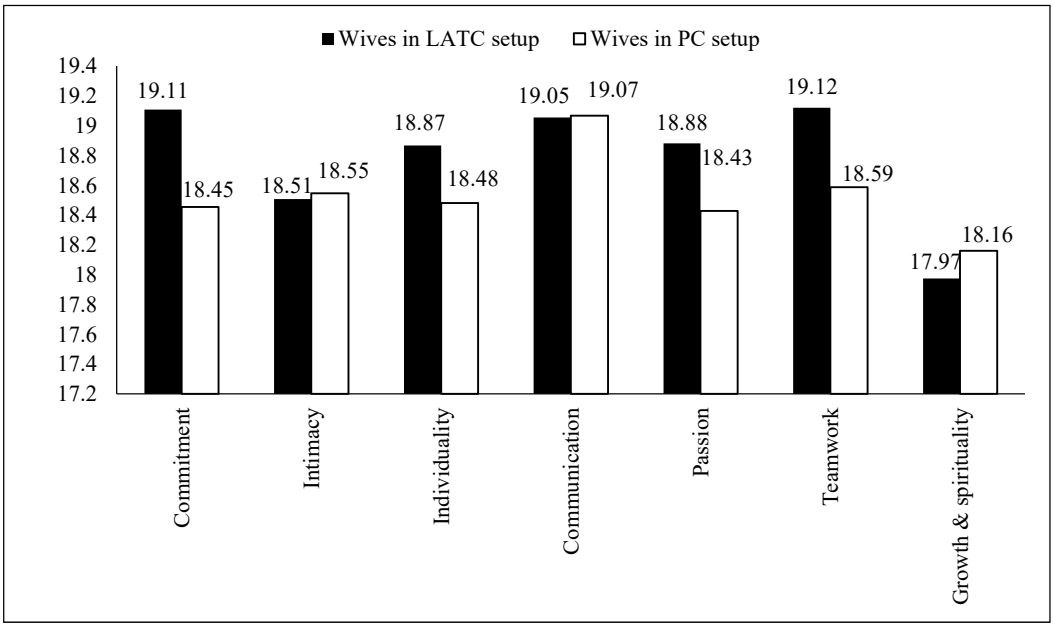


Figure 3: Mean scores of wives from living apart together couples and proximal couples on marital quality

a study which reported that the marital relationship among couples who lived remotely would make their spousal relationship increasingly more strong, there is equal participation, commitment and mutual trust rather than couples who do not have a remote relationship. After the start of a new living arrangement, many commuter couples try their best to enhance the quality of their relationship.

CONCLUSION

Being distant from one's partner may be extremely challenging as it affects every aspect of an individual's life. Hence, long distance relationships are indeed very tricky to navigate through. However, long periods of time apart don't necessarily spell doom in the marriage. Couples in both LATC and PC setup have their unique set of challenges and opportunities. However, internal and external stressors affecting the dynamics of the relationship might vary. A strong relationship requires the investment of genuine feelings, time and efforts, whether a couple lives in the same home together or is separated by geographical barriers.

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Growth and Performance of Agro-processing Industries in India

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ABSTRACT

The present study is an attempt to 1) to find out the share of states in all India manufacturing and growth of all India manufacturing, and 2) to examine the growth and performance of agro-processing industries in India. The study is exclusively based on secondary data collected from various issues of Annual Survey of Industries (ASI) for the period from 1981-82 to 2016-17. The study revealed that the states Tamil Nadu, Andhra Pradesh, Gujarat and Maharashtra have dominated the industrial scenario in the country. Herfindal index calculated indicates that concentration of industries is almost same over the years. Sector-wise share of agro-processing units indicate that share of food products & beverages in terms of number of factories was highest followed by manufacturing of textiles, paper and paper products, wearing apparel, tobacco products. In terms of other variables also the share of food products & beverages was highest followed by manufacturing of textiles. Sector-wise growth of agro-processing units indicate that growth in number of factories was highest in case of wearing apparel followed by paper and paper products, food products and beverages, textiles, wood and products of wood and cork, except furniture. In case of fixed capital, crop and animal production, hunting and related service activities recorded highest growth followed by wearing apparel, wood and products of wood and cork, except furniture, food products & beverages, leather and related products, etc. The growth was negative in case of tobacco products and manufacture of furniture. On the whole the growth in terms of persons engaged was moderate. In case of total input, total output and net value added, the growth was fairly good except manufacture of furniture. Efforts should be made to open new agro-processing units near the source of supply of raw material. It will not only help to solve the problem of marketing of agricultural products but also it will create more employment opportunities in rural areas particularly for landless & marginal farmers.

Keywords: Agro-processing, Manufacturing, Growth, Herfindahl index

INTRODUCTION

Agro industry has historically been given high priority in Indian Policy of development programmes. The focus on agro-industry as an agent of rural development and employment generation was present in Mahatma Gandhi's emphasis on village-based agro-industry during India's independence movement and is today a central component of the national development plan. India is an agrarian economy, therefore, setting up agro-industries that make use of agricultural raw material directly and indirectly is of paramount importance for sustained inclusive economic development. Agro-processing not only stimulates value addition but also generates employment particularly in rural areas to absorb the surplus work force.

According to FAO (1997), "Agro-processing industry is a subset of manufacturing that processes raw materials and intermediate products derived from the agricultural sector. Agro-processing thus means transforming products that originate from agriculture, forestry and fisheries." The Standard Industrial Classification categorizes the eleven divisions under the agro-processing industry: food, beverages, paper and paper products, wood and wood products, textiles, wearing apparel, furniture, tobacco, rubber products, footwear and leather and leather products.

Agro-processing has strong backward and forward linkages with the industries. On the demand side, through backward linkages it plays a crucial role for the process of industrial development by supplying crucial agricultural inputs to agricultural sector whereas on the demand side, agricultural sector serves as a provider of resources to the industrial sector which is known as forward linkages of the agricultural sector. Thus, agro-industrial sector through

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strong backward and forward linkages and potential to generate employment opportunities play a key role for the economic development of a country. Economists are of the view that the dependence of industry on agriculture and services is getting more pronounced than it used to be in 1970s and 1980s (Sastry *et al.,* 2003). But the level of food processing industry is still miserable as it processes only about 8 percent of the total food production. India with 2.3 per cent of global area and 18 per cent of world population produces 12.3 per cent of world wheat, 21.4 per cent of world paddy, 18.2 percent of oilseeds, 13.7 per cent of rapeseed, 11.3 per cent of potato, 17.4 percent of onion, 19.60 per cent of sugarcane, 11.68 of tobacco, 54.7 per cent of jute and 25.5 per cent of pulses, 21 percent of tea and 17 per cent of milk produced globally. In case of horticultural products, India contributes 11.6 and 9.6 percent to the global production of fruits and vegetables, respectively. However, the level of processing is only about 2 percent and 30 percent of total production go waste due to lack of storage and processing facilities (Arunajatesan and Balaji, 2004). Value addition to food products is only 10 percent which is expected to reach to 30 percent by 2025. Agro-processing industries have, thus, vast potential in India.

MATERIALS AND METHODS

The study is exclusively based on secondary data collected from various issues of Annual Survey of Industries (ASI) published by the Central Statistical Organisation, Ministry of Planning, Department of Statistics, Government of India for the period from 1981-82 to 2016-17.

To examine the performance of agro-processing industries, share of agro-processing group in all India manufacturing and growth of agro-processing industries were calculated. The share of different states and share of agro-processing industries in total manufacturing was assessed in terms of number of factories, fixed capital, total persons engaged, value of output, total inputs and net value added at different points of time.

RESULTS AND DISCUSSION

Share of different states in terms of important indicators i.e. number of factories, fixed capital, total persons engaged, value of output, total inputs and net value added in all India manufacturing are shown in Table 1. As far as numbers of factories are concerned, factories are concentrated in Tamil Nadu, Andhra Pradesh, Gujarat and Maharashtra as about 50 percent of the factories operated in these states during the year 2001-02. In case of the other variables also these states have dominated the industrial scenario in the country. Uttar Pradesh, Karnataka and Punjab have also fared well in this respect. The states like Bihar, Madhya Pradesh and Orissa which are rich in mineral resources but are poor in industrial sector.

Similarly, of the total persons engaged, about 50 per cent persons are engaged in factories operating in Tamil Nadu, Andhra Pradesh, Gujarat and Maharashtra states. The figure on net value added also accounts for about 50 per cent. Almost the same position is experienced in the year 2011-12 and 2016-17 except one difference that the relative position of Andhra Pradesh declined as new state Telangana was portioned from Andhra Pradesh. The share of Andhra Pradesh in terms of number of factories, fixed capital, total persons engaged, value of output, total inputs and net value added was 12.74, 13.03, 10.15, 6.49, 6.80 and 8.26 per cent in the year 2011-12 which reduced to 6.92, 5.84, 3.78, 3.91, 3.66 and 2.28 per cent in the year 2016-17, respectively. The decline in share of Andhra Pradesh is due to emergence of new state Telangana which contributed 6.40, 2.17, 4.86, 2.74, 2.81 and 3.10 per cent in terms of number of factories, fixed capital, total persons engaged, value of output, total inputs and net value added, respectively.

Herfindal index calculated indicates that concentration of industries is almost same over the years. It also indicates that we have failed to bring about industrial balance in India. The policy of developing the port cities like Mumbai, Madras, Calcutta, etc. is still continuing because these capital cities are located amongst the dominating states of India. On account of economic reform it was expected that the incoming of multinational companies will create conditions for industrial parity through out the economy. But it is no denying fact that the direct foreign investment or foreign companies, largely hovered around the states of Tamil Nadu, Andhra Pradesh, Gujarat and Maharashtra.

The growth of industries in terms of number of factories, fixed capital, total persons engaged, value of output, total inputs and net value added for the three periods i.e. during 1980s, 1990s and 2001-02 to 2016-17 are presented in Table 2. The number of factories grew at the compound growth rate of 1.14 per cent per annum during 1980s, the growth increased to 1.69 per cent in 1990s and substantially to 5.14 per cent during 2001-02 to 2016-17. Fixed capital, value of output and value of input grew at compound growth rate of about 15 per cent each

Table 1: Share of different states in terms of important indicators of industries (Percent)

States	2001-02						2011-12						2016-17					
	No. of factories	Fixed capital	Total persons engaged	Total input	Total output	Net value added	No. of factories	Fixed capital	Total persons engaged	Total input	Total output	Net value added	No. of factories	Fixed capital	Total persons engaged	Total input	Total output	Net value added
Andhra Pradesh	11.08	6.96	11.58	6.55	6.64	7.16	12.74	13.03	10.15	6.49	6.80	8.26	6.92	5.84	3.78	3.91	3.66	2.28
Assam	1.11	0.83	1.43	0.87	0.83	0.67	1.39	0.78	1.34	0.94	0.92	0.78	1.77	0.88	1.46	0.82	0.87	1.12
Bihar	1.15	0.44	0.81	0.76	0.70	0.44	1.49	0.39	0.94	1.12	1.04	0.67	1.50	0.57	0.78	0.70	0.66	0.47
Chhattisgarh	0.99	2.75	1.21	1.23	1.31	1.64	1.14	2.60	1.38	0.14	1.61	1.51	1.32	3.92	1.26	1.55	1.50	0.99
Delhi	2.66	0.52	1.53	1.68	1.62	1.48	1.77	0.46	0.87	0.81	0.78	0.73	1.49	0.19	0.75	1.02	0.92	0.54
Gujarat	10.85	20.16	9.20	15.78	15.33	11.70	10.21	16.04	10.30	18.50	17.28	10.51	11.06	19.84	10.96	17.35	16.82	14.44
Haryana	3.45	3.33	3.71	4.79	4.73	4.51	2.82	2.76	4.34	4.34	4.22	3.57	3.62	3.65	5.55	7.15	6.89	5.84
Himachal Pradesh	0.39	0.95	0.47	0.57	0.63	0.89	1.14	2.23	1.22	1.17	1.40	2.58	1.16	1.35	1.33	1.30	1.49	2.47
Jammu & Kashmir	0.27	0.08	0.32	0.17	0.16	0.11	0.40	0.23	0.47	0.38	0.39	0.48	0.43	0.31	0.51	0.38	0.42	0.61
Jharkhand	1.11	3.70	2.02	1.83	1.96	2.26	1.17	3.46	1.47	1.73	1.78	2.01	1.22	3.24	1.27	1.63	1.70	1.85
Karnataka	5.44	7.32	6.29	5.50	5.73	6.77	5.27	6.77	6.75	5.88	6.83	12.34	5.68	5.68	7.14	6.86	6.90	7.22
Kerala	3.74	1.69	3.94	2.56	2.49	2.35	3.23	0.79	2.93	2.10	1.93	1.11	3.28	1.43	2.14	2.05	1.97	1.74
Madhya Pradesh	2.35	3.09	2.70	3.96	3.97	4.13	1.97	2.56	2.34	2.79	2.72	2.32	1.91	4.68	2.50	2.80	2.82	2.66
Maharashtra	13.89	15.97	15.00	18.62	18.83	20.37	12.97	13.39	14.00	17.12	17.40	18.51	11.50	10.59	12.92	14.12	14.80	18.22
Odisha	1.33	2.73	1.49	1.36	1.40	1.35	1.23	8.25	2.12	1.90	2.00	2.18	1.30	10.59	1.83	2.04	2.08	1.61
Punjab	5.64	1.95	4.50	4.06	3.95	3.76	5.79	1.92	4.47	2.96	3.08	3.94	5.32	1.29	4.40	2.71	2.60	2.17
Rajasthan	4.11	3.29	2.99	3.22	3.24	3.34	3.88	2.72	3.54	3.05	3.30	4.70	3.84	3.16	3.57	3.74	3.72	3.64
Tamil Nadu	14.71	8.31	14.14	9.78	9.80	10.13	17.01	8.28	14.45	10.79	10.54	9.11	15.85	8.85	16.15	10.56	10.54	10.29
Telangana													6.40	2.17	4.86	2.74	2.81	3.10
Uttar Pradesh	7.12	6.99	6.62	6.97	6.97	6.93	6.48	4.65	6.44	6.00	5.76	4.44	6.51	4.16	6.79	6.69	6.82	7.90
Uttarakhand	0.54	0.46	0.53	0.54	0.54	0.57	1.31	2.60	2.55	2.30	2.54	4.01	1.27	1.84	2.85	2.64	2.89	4.32
West Bengal	4.82	5.77	7.04	4.60	4.56	4.34	3.86	3.68	4.87	4.32	4.04	2.44	4.08	3.57	4.30	4.26	3.66	2.28
Other states	3.25	2.71	2.48	4.60	4.61	5.10	2.73	2.41	3.06	5.17	3.64	3.80	2.57	2.19	2.91	3.00	3.97	2.53
India	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Herfindahl index	0.18	0.21	0.18	0.24	0.24	0.24	0.18	0.18	0.16	0.20	0.19	0.18	0.17	0.20	0.18	0.20	0.19	0.21

Table 2: Growth of industries in terms of important indicator

Particulars	Compound Growth Rate (%)		
	1981-82 to 1990-91	1991-92 to 2000-01 to	2001-02 to 2016-17
Number of Factories	1.14	1.69	5.14
Fixed Capital	15.00	11.51	16.20
Total Person Engaged	0.23	-0.43	4.87
Value of Output	15.11	13.57	15.61
Net Value Added	14.08	11.53	15.07
Total Inputs	15.24	14.06	15.89

during 1980s. The growth of industries in terms of fixed capital, value of output, net value added and total inputs plummeted in 1990s compared to 1980s. However, the growth of these parameters increased during 2001-02 to 2016-17 surpassing growth of even 1981-82. The growth of total persons engaged remained almost stagnant during 1980s but became negative during 1990s. However, during 2001-02 to 2016-17, the total persons engaged increased at compound growth rate of 4.87 per cent per annum. During the post reform period i.e. 2001-02 to 2016-17, there was surge in growth in all the parameters even surpassed the growth rate observed during 1980s. For example, net value added indicated growth of 14 % in 1980s but during post reform period, growth increased to 15 per cent per annum. Hence, it is found that the growth of industries in terms of parameters included in the study declined in 1990s but increased during 2001-02 to 2016-17 (post reform periods).

The share of agro-processing industries in total manufacturing is presented in Table 3. It is evident from the table that in terms of variables considered for the study i.e. number of factories, fixed capital, total persons engaged, value of output, total inputs and net value added, the share of agro-processing industries has witnessed downward swing from 2005-06 to 2010-11 and further during 2014-15 in case of fixed capital. The deceleration in the share of agro-processing industries may be due to increase in non-agro industries and tertiary sectors. About 44 percent of the total industries were Agro-processing industries in 2005-06 which decreased to about 41 per cent in 2011-12 and remained almost same in 2016-17. The share of agro-processing industries in terms of total persons engaged was about 49 per cent in 2005-06 which decreased to about 41 per cent in 2011-12 and 2016-17. The share of agro-processing industries in terms of total inputs was 27.48 per cent in 2005-06 then declined to 25.27 per cent in 2011-12 which increased to 28.55 per cent in 2016-17. In terms of total output, the share was 26.27 per cent in 2005-06 which declined to 24.28 per cent in 2011-12 then increased to 27.14 per cent in 2016-17. However, agro-industrial sector contributed 20.67 per cent of the manufacturing value added which remained almost same over the years. The table further shows that only 22 percent of the total industrial fixed capital was in agro-industry in 2005-06 which slightly reduced to 19 percent in 2010-11 and further decreased to 16.25 in 2016-17. Thus agro-industry continues to be labour intensive and capital saving.

Sector-wise share of agro-processing units indicate that share of food products and beverages in terms of number of factories was highest (18.35%) followed by manufacturing of textiles (9.85%), paper and paper products (2.67%), wearing apparel (2.60%), tobacco products (2.39%) during the year 2005-06. In terms of other variables also the share of food products & beverages was highest followed by manufacturing of textiles. The relative position of different sectors remained almost same over the years. However, the share differed. For example, the share of food products and beverages in terms of number of factories was 18.35 per cent in 2005-06 which decreased to 16.93 per cent in 2011-12 and remained almost same in 2016-17. The share of manufacturing of tobacco products which was 2.39 per cent in 2005-06 decreased to 1.65 per cent in 2010-11 and further to 1.57 per cent in 2016-17.

The growth of agro-processing industries in terms of number of factories, fixed capital, total persons engaged, value of output, total inputs and net value added are presented in Table 4. The growth of agro-processing industries in terms of number of industries and persons engaged increased at the compound growth rate of 4.20 per cent and 2.82 per cent per annum during the period

Table 3: Share of different agro-processing industries in India in terms of important indicators (Percent)

States	2001-02						2011-12						2016-17					
	No. of factories	Fixed capital	Total persons engaged	Total input	Total output	Net value added	No. of factories	Fixed capital	Total persons engaged	Total input	Total output	Net value added	No. of factories	Fixed capital	Total persons engaged	Total input	Total output	Net value added
Agriculture, hunting and related service activities	2.04	0.12	1.20	0.80	0.68	0.21	2.05	0.26	0.94	1.43	1.27	0.56	1.50	0.16	0.50	1.18	1.02	0.34
Manufacture of food products and beverages	18.35	7.47	15.27	13.01	11.97	7.52	16.93	7.51	13.09	13.44	12.45	7.84	16.92	7.09	12.43	16.51	15.08	8.94
Manufacture of tobacco products	2.39	0.29	5.20	0.51	0.70	1.73	1.65	0.16	3.25	0.45	0.57	1.27	1.57	0.23	3.14	0.46	0.61	1.42
Manufacture of textiles	9.85	9.20	14.67	6.79	6.74	5.90	8.78	6.76	11.43	5.81	5.82	5.39	7.54	4.88	10.46	5.54	5.41	4.57
Manufacture of wearing apparel; dressing and dyeing of fur	2.60	1.02	5.95	1.42	1.46	1.70	4.36	1.07	6.88	1.59	1.64	1.95	4.28	0.88	7.63	1.65	1.77	2.51
Tanning and dressing of leather; manufacture of luggage, etc.	1.74	0.45	1.91	0.84	0.80	0.64	1.92	0.39	2.31	0.68	0.67	0.65	1.93	0.36	2.63	0.78	0.79	0.89
Manufacture of wood and products and cork	2.16	0.19	0.62	0.26	0.26	0.24	1.95	0.28	0.64	0.37	0.34	0.16	1.95	0.20	0.62	0.32	0.32	0.35
Manufacture of paper and paper product	2.67	2.46	1.95	1.26	1.30	1.38	2.89	2.20	1.96	1.25	1.27	1.23	2.94	1.81	1.70	1.38	1.35	1.10
Manufacture of furniture	1.83	0.71	2.08	2.60	2.35	1.34	0.67	0.16	0.45	0.24	0.25	0.34	1.92	0.49	1.08	0.47	0.54	0.84
Total agro-processing	43.65	21.91	48.85	27.48	26.27	20.67	41.20	18.79	40.94	25.27	24.28	19.39	41.28	16.25	40.67	28.55	27.14	21.20
Other industries	56.35	78.09	51.15	72.52	73.73	79.33	58.80	81.21	59.06	74.73	75.72	80.61	58.72	83.75	59.33	71.45	72.86	78.80

Table 4: Growth of agro-processing industries in India in terms of selected indicators: 2001-02 to 2016-17 (Percent)

Particulars	No of factories	Fixed capital	Total persons engaged	Total input	Total output	Net value added
Crop & Animal Production, Hunting & Related Service Activities	1.91	22.39	-1.74	21.06	21.41	26.60
Food Products & Beverages	4.29	15.25	2.61	11.22	8.65	14.32
Tobacco Products	1.30	9.98	-0.93	10.75	10.31	9.92
Textiles	3.70	12.71	2.23	13.94	13.54	12.64
Wearing Apparel	10.37	16.77	9.08	16.90	17.04	17.81
Leather and Related Products	5.76	13.79	7.60	13.47	13.94	16.44
Wood and Products of Wood and Cork, Except Furniture	3.38	16.86	4.48	16.36	16.72	19.11
Paper and Paper Products	5.99	12.40	3.09	14.37	13.79	11.01
Manufacture of Furniture	-3.72	0.77	-8.29	-6.09	-5.37	-1.71
Agro Processing Industries in Total	4.20	13.12	2.82	14.13	13.83	10.53
Other Industries	5.82	16.93	6.57	16.47	16.14	13.54

2001-02 to 2016-17, respectively. Fixed capital, total input, total output and net value added recorded growth of 13.12, 14.13, 13.83 and 10.53 per cent per annum, respectively.

Sector-wise growth of agro-processing units indicate that growth in number of factories was as high as 10.37 % in case of wearing apparel followed by paper and paper products (5.99%), food products & beverages (4.29%), textiles (3.70%), wood and products of wood and cork, except furniture (3.38%). In case of fixed capital, crop and animal production, hunting and related service activities recorded highest growth i.e. 22.39 per cent per annum followed by wood and products of wood and cork, except furniture (16.86%), wearing apparel (16.77%), food products and beverages (15.25%), leather and related products (13.79%), etc. As far as employment is concerned i.e. total persons engaged, the growth was highest in wearing apparel (9.08%) followed by leather and related products (7.60%), wood and products of wood and cork, except furniture (4.48%), paper and paper products (3.09%). The growth was negative in case of Crop and Animal Production, Hunting & Related Service Activities, tobacco products and manufacture of furniture. On the whole the growth in terms of persons engaged was moderate. In case of total input, total output and net value added, the growth was fairly good except manufacture of furniture. This sector i.e. manufacture of furniture witnessed negative growth in terms of all the parameters except manufacture of furniture under study.

CONCLUSION

The states Tamil Nadu, Andhra Pradesh, Gujarat and Maharashtra have dominated the industrial scenario in the country. The states like Bihar, Madhya Pradesh and Orissa which are rich in mineral resources but are poor in industrial sector. Herfindal index calculated indicates that concentration of industries is almost same over the years. It also indicates that we have failed to bring about industrial balance in India. The policy of developing the port cities like Mumbai, Madras, Calcutta, etc. is still continuing because these capital cities are located amongst the dominating states of India. The growth of industries in terms of parameters included in the study declined in 1990s but increased during 2001-02 to 2016-17 (post reform periods). Sector-wise share of agro-processing units indicate that share of food products and beverages in terms of number of factories was highest followed by manufacturing of textiles, paper and paper products, wearing apparel, tobacco products. In terms of other variables also the share of food products & beverages was highest followed by manufacturing of textiles. The relative position of different sectors remained almost same over the years. However, the share differed.

The growth of agro-processing industries in terms of number of industries and persons engaged increased at the compound growth rate of 4.20 per cent and 2.82 per cent per annum during the period 2001-02 to 2016-17, respectively. Fixed capital, total input, total output and net value added recorded growth of 13.12, 14.13, 13.83

and 10.53 per cent per annum, respectively. Sector-wise growth of agro-processing units indicate that growth in number of factories was highest in case of wearing apparel followed by paper and paper products, food products & beverages, textiles, wood and products of wood and cork, except furniture. In case of fixed capital, crop & animal production, hunting & related service activities recorded highest growth followed by wearing apparel, wood and products of wood and cork, except furniture, food products and beverages, leather and related products, etc. As far as employment is concerned i.e. total persons engaged, the growth was highest in wearing apparel followed by leather and related products, wood and products of wood and cork, except furniture, paper and paper products. The growth was negative in case of tobacco products and manufacture of furniture. On the whole the growth in terms of persons engaged was moderate. In case of total input, total output and net value added, the growth was fairly good except manufacture of furniture. To encourage entrepreneurship into agro-processing industries certain incentive like sales tax exemption, exemption from octoroi etc. should be given to agro-processing units. The existing units which are using obsolete and outdated technology and machineries should be encouraged to use modernize and latest technology and machineries. For updating technology / machineries, they should be provided concessional loans and subsidies. Efforts should be made to open new agro-processing units near the source of supply of raw material. It will not only help to solve the problem of marketing of agricultural products but also it will create more employment opportunities in rural areas particularly for landless and marginal farmers. Also it will help checking the migration of people from rural to urban areas.

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A Study on Housing Management Strategies Adopted by Livestock-rearers in Flood-prone Districts of Odisha

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ABSTRACT

Livestock-rearing plays a prominent role in strengthening India's rural economy. It has the potential to act as an instrument to bring about socio-economic transformation, but of late, flood as a result of climate variability seem to affect livestock-rearing; and thereby it became a serious issue and has been considered as one of the most serious challenges faced by livestock-rearers; and hence in this context it was felt important to know about the housing management strategies followed by the livestock-rearers in combating the flood vagaries. The present study was conducted in purposively selected flood-prone districts of Odisha, with 120 livestock-rearers selected as the respondent of this study, which revealed that majority (55.38%) of the respondents were constructing their animal sheds slightly above the ground level. 'Making the animal sheds slightly above from the ground level' was the most preferred strategy, followed to cope up with impact of flood. It was also found that majority (38.33%) of the respondent had high level of adoption in housing management practices. Accordingly, it is suggested that documentation and validation of such practices and techniques should be done for the purpose of further capacity building programmes.

Keywords: Flood, Housing Management, Livestock-rearers, Odisha

INTRODUCTION

Effects of 'Climate change' have been usually seen in various regions of the world (Al Mamun and Al Pavel, 2014). Frequency and severity of climatic extreme events like cyclones and floods have already increased and are expected to enhance in the future due to climate change (Goswami *et al.*, 2006). Variability in climate can threaten the sustainability of development processes and poverty reduction (Few *et al.,* 2006; Milli and Acharjee, 2013). Flood is the most predominant and costliest catastrophic event, one which demolishes both life and economy to an enormous degree. Flooding negatively affects crops, local livelihoods, and infrastructure (Lebel *et al.,* 2009; Kranz *et al.*, 2010; Bastakoti *et al.*, 2014). It was also found that the monetary losses related to these extreme climatic events have also gone up over the years (Medury, 2001; Botzen and van den Bergh, 2009). Floods have had been a regular phenomenon in India; as India is the worst flood-affected country in the world, after Bangladesh; and accounts for twenty per cent of the global death count occurring on account of floods (Padli *et al.,* 2013; Mane *et al.,* 2017).

The various roles that livestock contribute in developing countries mean that they have value beyond the direct value of their food or earning potential. Their contribution to the country's development through nutrition, improved agricultural output, financial and social functions is huge. These indirect values are frequently under-recognised and underestimated, when attempts are made to understand the impact of disasters (Campbell and Knowles, 2011). During the period of 2006-2016, Odisha was affected by the flood every year; whereas in the years 2006 and 2011 is happened to be severe ones, as 27 districts out of 30 districts were affected by floods in 2011 while causing havoc in the entire state (Anonymous, 2018). Flood affects in same way to both humans as well as animal's life. The intensity of flood damages the shelters of the livestock. Animals, those who survived from these floods are threatened by the non-availability of feed and shelter. Animals, which are continuously standing in contaminated floodwater for longer periods are susceptible to various type infections in their hooves and skin. The cuts, caused by disaster debris make animals more vulnerable to tetanus

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and toxins contained in the floodwater (Mishra, 2017). These feed-deprived and shelter less animals are stressed and immune-suppressed, thus become susceptible to contagious diseases. Outbreaks of fatal diseases such as *Hemorrhagic Septicemia (HS), Black Quarter (BQ)* can occur, which will further aggravate the death toll of livestock. (Anonymous, 2013). Ultimately, this creates a disaster, and affects the livelihood of the people of Odisha.

It is necessary to enable the developing countries to adapt to the effects of climate change. (Al Mamun and Al Pavel, 2014). Government and development organisations' supports/initiatives to cope with floods have been mostly relief-oriented, and short-term. People, who are living in the area have integrated floods into their lifestyles like *jal ka keeda* and have developed ways and adaptation strategies to get over their flood-related problems. (Wajih, 2008 and Bastakoti *et al*., 2014). Therefore, these adaptation strategies are required to be documented. Keeping this in view, a comprehensive study was conceptualized to determine the housing management strategy, followed by the livestock-rearers of flood-prone districts of Odisha for skilful implementation of policy to improve the socio-economic status and overall livelihood of farmers.

MATERIALS AND METHODS

Sampling plan: Present study was purposively conducted in Odisha state. Two districts (Dhenkanal from Minor flood-Prone districts and Balasore from Major flood-prone districts) were randomly selected and two blocks from each district were selected randomly for the study. Moreover four villages from each block were considered as the basic unit of this study. Total 120 respondents (15 livestock-rearers from each village) were sampled for accomplishment of this study through personal interview method at the door step of the livestock-rearers with the help of pre-listed structured interview schedule

Differential level of adoption of housing management strategies among the sampled households: A list of 'Housing Management strategy' was prepared with the help of review of literature, pilot study and consultation with the experts. Livestock-rearers were requested to put their response on a three-point continuum viz. continued the adoption, discontinued the adoption and never adopted with the score of 2, 1, and 0 on the pre-listed strategies. All the identified strategies were used for final index development for all the studied districts. Therefore, in order to quantify the strategies and the differential level of adoption of strategies, a "Flood Adaptation Index" was developed underlying the principle of Maiti *et al.* (2014) with some modification by using the following formula:

$$\text{Flood Adaptation Index (FAI)} = \frac{\text{Obtained Score}}{\text{Maximum obtainable score}}$$

The entire sampled households was categorized (Using Cumulative Square Root Frequency Method) into three differential levels of adoption of housing management strategy on the basis of obtained adaption score by the respective households.

RESULT AND DISCUSSION

Data portrayed in Table 1 indicated that many of the respondents of the minor flood-prone district (Dhenkanal) and major flood-prone district (Balasore) adopted making a *pucca* shed for livestock (45.00% and 51.67%, respectively) for their livestock as an adaptation strategy. Majority of the respondents (70.00%) of major flood-prone district and around 42 per cent of the respondents of the minor flood-prone district had built their shed slightly above from the ground level to prevent their shed to be damaged from flood water. It was found that during flood time, flood water entered the low land/low lying area easily in the studied area. So, high places near the river-bed or highland were preferable for livestock-rearers to arrange temporary shed and shifting their livestock to protect them from flood water. This strategy was followed by the 36.67 per cent of respondents of the major flood-prone district, while 40.00 per cent of the respondents from minor flood-prone district adopted it initially but discontinued this strategy, later on, because intensity and frequency of the flood were not severe in case of the minor flood-prone district. Around 40.00 per cent of the respondents of the minor flood-prone district were using Govt. building, as a temporary place for their livestock to protect them, whereas respondents (41.61%) from major flood-prone district did not adopt this strategy for their livestock. Some of the livestock-rearers (26.67% and 20.0% of the major flood-prone district and minor flood-prone district, respectively) were sharing the animal shed with their fellow friends/ relatives, those who were residing in comparatively higher places.

Similarly, the same Table 1 revealed that around 48.33 per cent of the respondents of the overall study area had adopted and continued the adoption of adaptation

Table 1: Distribution of respondents (reflected in percentage) on the basis of adoption of housing management strategy (n=120)

S. No.	Housing management strategies	Minor Flood-prone District (Dhenkanal; n_1=60)			Major Flood-prone District (Balasore; n_2=60)			Overall (Odisha; n=120)		
		AC	AD	NA	AC	AD	NA	AC	AD	NA
1.	Making a *pucca* shed for livestock	45.00	30.00	25.00	51.67	31.67	16.67	48.33	30.84	20.83
2.	Making the animal sheds slightly above from the ground level in order to avoid damage from the flood	41.67	23.33	35.00	70.00	16.67	13.33	55.83	20.00	24.17
3.	Shifting of livestock to highland /temporary sheds for their safety	21.67	40.00	38.33	36.67	33.33	30.00	29.18	36.64	34.18
4.	Using Govt. building as temporary places for the livestock to be kept during the flood period	16.67	41.67	41.67	40.00	31.67	28.33	28.33	36.67	35.00
5.	Sharing of animal shed with friends/relatives residing in upland during the flood period	20.00	26.67	53.33	26.67	50.00	23.33	23.33	38.33	40.84

AC: Adoption Continued; AD: Adoption Discontinued; NA: Never Adopted

strategies i.e. making a *pucca* shed for livestock. Majority (55.383%) of the respondents were constructing their animal's sheds slightly above the ground level. Only a few (29.18%) of the respondents of the study area were shifting their livestock to highland, unless a high intensity of flood came, because they had increased their adaptive capacity by building their houses slightly above the ground. Approximately i.e. 28 per cent of the respondents were using Govt. buildings during flood period for their livestock. A few (23.33%) respondents of the study area were sharing animal sheds with relatives and fellow farmers.

Most of the livestock-rearers of the studied area had made a *pucca* shed for their livestock so that it will not break down easily by the flood water and sanitation can be maintained properly as compared to *kutcha* shed. Some of the respondents were residing in the low-lying area of the studied districts. In this condition, flood water can easily enter their house. So, they had made their houses, along with their cow-shed, slightly above from the ground level in order to avoid damage from flood water. Alam and Collins, (2010); Sheheli and Khan (2015) found out that women increased the base level of households and elevated the level of cow sheds. If the flood intensity was high, some of the respondents shift their animals to higher places/ temporary sheds along the river bed or roadsides during the flood period. After the flood period, they came back to their habitat. Being a flood-prone area, Govt. had made cyclone/flood shelter near the village. Some respondents of the studied districts were keeping their animals under the roof of these shelter for protection from flood. Khendker (2007) reported that people were using government buildings as a temporary place for the animals during flood time and build their houses at a high level. It was also found that during the flood period, some respondents were also sharing their animals with their fellow farmer and/or fellow relatives, who were residing in higher places.

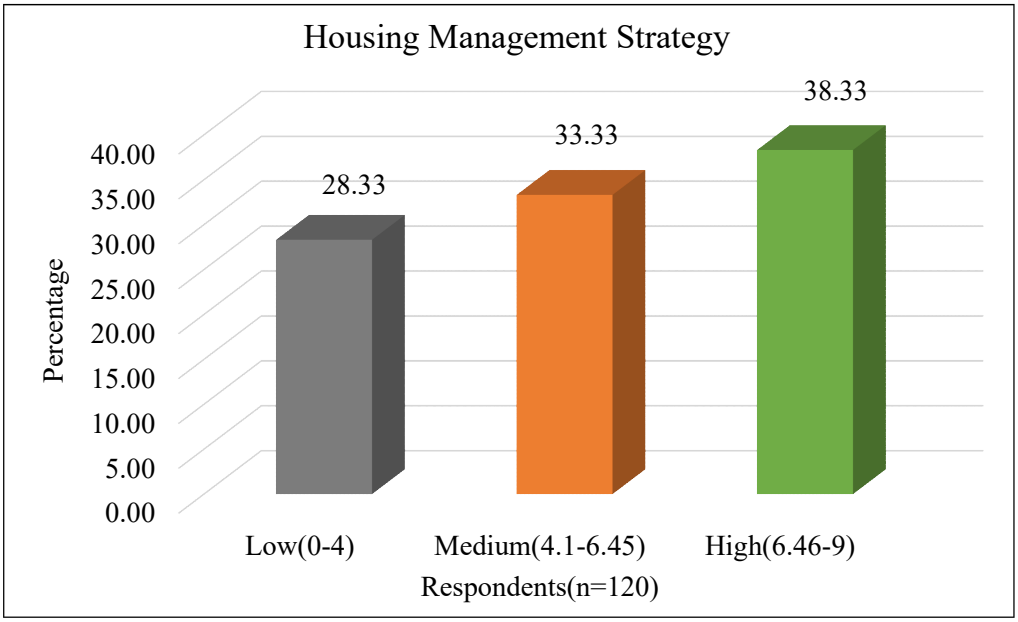
Table 2 indicated that there were five (5) adaptation strategies being adopted under the main heading of "Housing management strategy" among the respondents of the studied districts. These five (5) different adaptation strategies had been ranked on the basis of the score for each district and on overall basis, separately. It was found that most important strategy adopted by livestock-rearers of the major flood-prone district (Balasore) was "making the animal shed slightly above from the ground level", while the same strategy was second most important

Table 2: Index score and ranking of use of housing management strategy followed by livestock-rearers of the study area (n=120)

S. No.	Housing management strategy	Minor Flood-prone District (Dhenkanal; n_1=60)	Major Flood-prone District (Balasore; n_2=60)	Overall (Odisha; n=120)
1.	Making a *pucca* shed for livestock	0.60(i)	0.68(ii)	0.64(ii)
2.	Making the animal sheds slightly above from the ground level in order to avoid damage from the flood	0.53(ii)	0.78(i)	0.66(i)
3.	Shifting of livestock to highland/temporary sheds for their safety	0.42(iii)	0.53 (iv)	0.48(iii)
4.	Using Govt. building as temporary places for the livestock to be kept during the flood period	0.38 (iv)	0.56 (iii)	0.47(iv)
5.	Sharing of animal shed with friends/relatives residing in upland during the flood period	0.33(v)	0.52 (v)	0.43(v)

Note: Values in parentheses indicate the order of merit of preferences by the livestock-rearers

Figure 1: Distribution of the respondents (reflected in percentage) as per their adoption of housing management strategy (n=120)



adaptation strategy for livestock-rearers of the minor flood-prone district (Dhenkanal). Strategy "making a pucca shed for their livestock" was most important for the livestock-rearers of the minor flood-prone district, whereas this strategy was the second most important as adopted by major-flood prone district. Livestock-rearers of the major flood-prone district adopted "using Govt. buildings as temporary places for livestock", as the third important preference, which was the fourth important strategy among the respondents of the minor flood-prone district. Similarly, the fourth important strategy for the major flood-prone district was "shifting of livestock to highland/temporary shed", which was the third most important strategy for the minor flood-prone district. Result also indicated that the livestock-rearers of both the districts had equal importance (5th) for the strategy "sharing of animal sheds with friends and relatives".

Similarly the result portrayed in Table 2 indicated that among the respondents of the overall study area, 'Making the animal sheds slightly above from the ground level', 'making *pucca* shed for livestock', and 'Shifting of livestock to highland /temporary shed' were the first, second and third most preferred strategy, respectively for housing management to cope up with impact of flood.

Figure 1 showed the categorization of the respondents of the study area according to their adoption of housing management strategy. It was found that 38.33 per cent of

the respondents were having high level of adoption of housing management strategy, followed by 33.33 per cent of respondents, who were having medium level of adoption of housing management strategy, and 28.33 per cent of respondents, who were having a low level of adoption of strategy towards housing management, respectively.

CONCLUSION

Over centuries, farmers have traditionally adapted to the impact of the flood by building on their in-depth knowledge of climate variability. Adaptation strategies of livestock-rearers to the various effect of floods vary from household to household and region to region based on existing supporting system and their indigenous knowledge. Farmer's perception and local traditional knowledge help them in evolving measures and techniques to deal with unforeseen situations arising due to floodsA total of 5 strategies were adopted by the livestock-rearers to cope with the impact of flood, "Making the animal sheds slightly above from the ground level' was the most preferred adaptation strategy, followed to cope up with impact of flood. It was found that majority (38.33%) of the respondent had high level of adoption in housing management practices. These measures and techniques are locale-specific, and are inherently scientific. Documentation of such practices and techniques; farmer to farmer dissemination and sharing such innovative approaches at large platforms will help in influencing the research agenda of academic institutions, and setting the priorities for making the socioeconomic status of the livestock-rearers of the flood-prone region a sustainable one.

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Assessing Psychological Distress of Women during Covid-19

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ABSTRACT

The present study aims at assessing the psychological distress of women specifically during the Covid time. The study results found that majority of the respondents belong to age group 20-30 yrs and were doctorates and employed in government service. The majority of respondents' family size of was 3-4 with one child and with regard to psychological distress, emotional stability, personal growth, overall adjustment and security insecurity were average whereas, self acceptance was high. The psychological distress found to be high in majority respondents and the women using approaching type of coping strategies, like the logical analysis, positive appraisal and problem solving were able to deal with distress.

Keywords: Psychological Distress, Women, Covid-19

INTRODUCTION

Psychological distress covers a wide spectrum, ranging from normal feelings of vulnerability, sadness, and fears to problems that can become disabling, such as depression, anxiety, extensive worries, negative thoughts, or social isolation. According to the cognitive model, negatively biased cognition is a core process in psychological distress (Barlow and Durand, 1999). This process reflected when distressed patients typically have a negative view of themselves, their environment and the future (Weinrach, 1988). They view themselves as worthless, inadequate, unlovable and deficient. According to cognitive theorists, people's excessive affect and dysfunctional behaviour is due to inappropriate ways of interpreting their experiences. The essence of the model is that emotional difficulties begin when the way we see events gets exaggerated beyond the available evidence, this manner of seeing things tend to have a negative influence on feelings and behaviour in a vicious cycle.

Women are epicentres of home and naturally take the responsibility of family welfare. During the lockdown period with no external support system, women are stuck up with household chores and taking care of children and family along with office work if she is a working women. Infectious diseases outbreak have been the toughest challenge that human being has faced, the covid 19 pandemic brought havoc into the lives and livelihood of women counterparts living in the rural areas who were primarily depending upon agriculture and livestock sector. Women migrant workers residing in cities depend on daily wage earning are also affected due to long running lockdowns (Kumar *et al.*, 2020). Hence, the present study was taken up to assess the mental health of women during covid pandemic with an objective to assess Psychological distress of women during the lockdown period due to Covid-19.

MATERIALS AND METHODS

In this present study online survey research was adopted. In this procedure, survey researchers collected quantitative, numbered data using questionnaire. A sample of 200 literate women, in age group of above 30 years, who had access to technology either mobile or laptop/desktop) were selected. Questionnaire was developed for measuring the psychological distress. The scale divided into two parts, first part covering psychological distress which includes emotional stability, personal growth, overall adjustments, security-insecurity and self acceptance and second part consists of coping strategies of approaching and avoiding. The psychological terms used in this study are being defined in the following way:

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***Psychological distress*:** It describes unpleasant feelings or emotions that impact your level of functioning.

***Emotional stability*:** Emotional stability refers to a person's ability to remain stable and balanced.

***Personal growth*:** Process of understanding and developing oneself in order to achieve one's fullest potential.

***Overall adjustment*:** Refers to the behavioural process of balancing conflicting needs, or needs challenged by obstacles in the environment.

***Security-insecurity*:** Insecurity refers to feeling of rejected and isolated person, anxious and hostile; is generally pessimistic and unhappy; shows signs of tension and conflict tends to turn inward; is troubled by guilt-feelings. Feeling of Security is a state of mind in which one is willing to accept the consequences of one's behaviours.

***Self acceptance*:** is an individual's satisfaction or happiness with *oneself*.

Coping Strategy: refer to the specific efforts, both behavioural and psychological, that people employ to master, tolerate, reduce or minimize stressful events.

***Approaching coping strategy*:** includes behaviours that attempt to reduce stress by alleviating the problem directly.

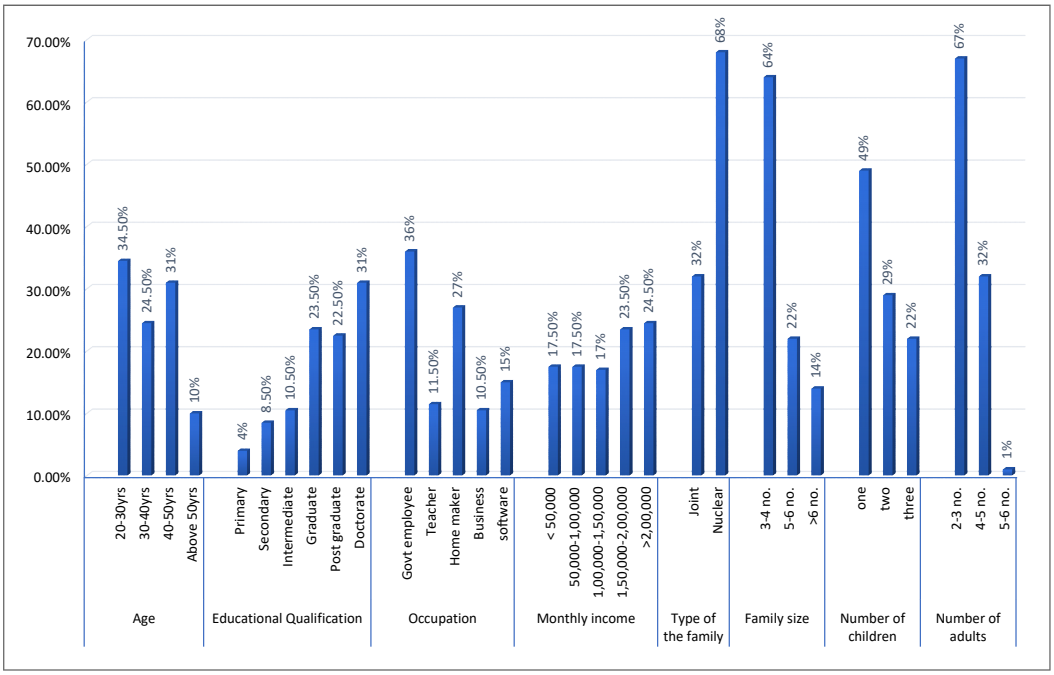
***Avoiding coping strategy*:** includes behaviours that reduce stress by distancing oneself from the problem.

RESULTS AND DISCUSSION

The data on psychological distress was collected through online survey method. The google form was created and posted to all the respondents. Filled up forms in excel sheets were used for further analysis of the data. The information relating to demographic profile (Figure 1) of the respondents are being described below.

With regard to age 34.5 per cent were in age group of 20-30 yrs, 31 per cent in age group 40-50 yrs, 24.5 per cent were in age group 30-40 yrs while only 10 per cent were above 50 yrs. With regard to educational qualification, 31 per cent were doctorate, 23.5 per cent graduates, 22.5 per cent postgraduates, 10.5 per cent studied upto intermediate, 8.5 per cent secondary educated while 4 per cent primary educated. With regard to occupational status, 36 per cent were government employee, 27 per cent of them were homemaker, 15 per cent were software professionals, while 11.5 per cent were teachers and 10.5 per cent business. With regard to the monthly income, 24.5 per cent had monthly income of above 2 lakh rupees while 23.5 per cent monthly income was between one lakh fifty thousand and two lakhs. The study found that monthly family income of 17.5 per cent was less than fifty thousand. With regard to type of family, 68 per cent were from nuclear families while 32 per cent from joint family. Family size of 64 per cent respondents was 3-4 members, 22 per cent respondents family size was 5-6 members while family size of 14.5 per cent was more than 6 members. With

Figure 1: Demographic profile of the respondents



regard to number of children 49 per cent had one child, 29 per cent two children and 22.5 per cent had three children, respectively. Number of adults in the family indicated that 67 per cent family had 2-3 adults, 32 per cent 4-5 while 1 per cent had more than 5 adults in the family.

The Table 1 and Figure 2 provides information about the psychological distress dimension. Emotional stability found to be average in 65 per cent of the respondents, high in 30 per cent and low in 5 per cent of the population. With regard to personal growth, high in 52.5 per cent of respondents and only 5 per cent were low in personal growth. Overall adjustment was found to be average in majority (48%) of the respondents, high in 43.5 per cent and low in 8.5 per cent of the respondents. Security-insecurity was found to be average in 43 per cent, high in 33.5 per cent and low in 23.5 per cent of the sample. Self acceptance found to be high in 58 per cent of the sample followed by 35 per cent average and low in 37 per cent of the respondents. With regard to total psychological distress 29.5 per cent of respondents had scored more and they had lower levels of distress, 31.5 per cent average and 39 per cent high distress. Many studies conducted on stress of women showed that the women experience moderate to high level of overall stress (Vimala and Madhavi, 2009; Harilal and Santhosh, 2017). Kermane (2016) studied on Stress among employed women and housewives and its management through Progressive Muscular Relaxation Technique (PMRT) and Mindfulness Breathing and the results revealed that the stress level was high among the employed women in comparison to housewives. The study was supported by Singh *et al.* (2020) who found that majority of respondents (53.5%) have developed fear factor for losing savings and basic services during covid-19.

From the Table 2 and Figure 3 it could be inferred that in approaching coping strategy, with regard to logical analysis, 49 per cent showed high, 38 per cent average and

Table 1: Distribution of Respondents on different dimensions of Psychological distress (N=200)

Dimensions	High	Average	Low
Emotional Stability	60(30%)	130(65%)	10(5%)
Personal growth	105(52.5%)	85(44.5%)	10(5%)
Overall adjustment	87(43.5%)	96(48%)	17(8.5%)
Security-Insecurity	67(33.5%)	86(43%)	47(23.5%)
Self acceptance	116(58%)	70(35%)	74(37%)
Total psychological distress*	59(29.5%)	63(31.5%)	78(39%)

*high score refers to low distress

Figure 2: Distribution of Respondents on different dimensions of Psychological distress

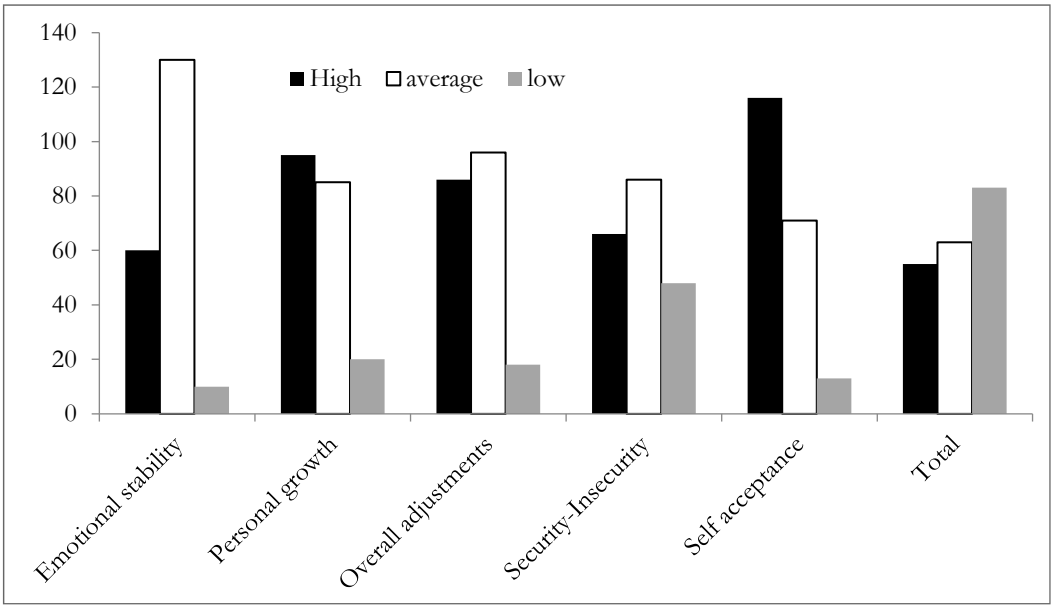
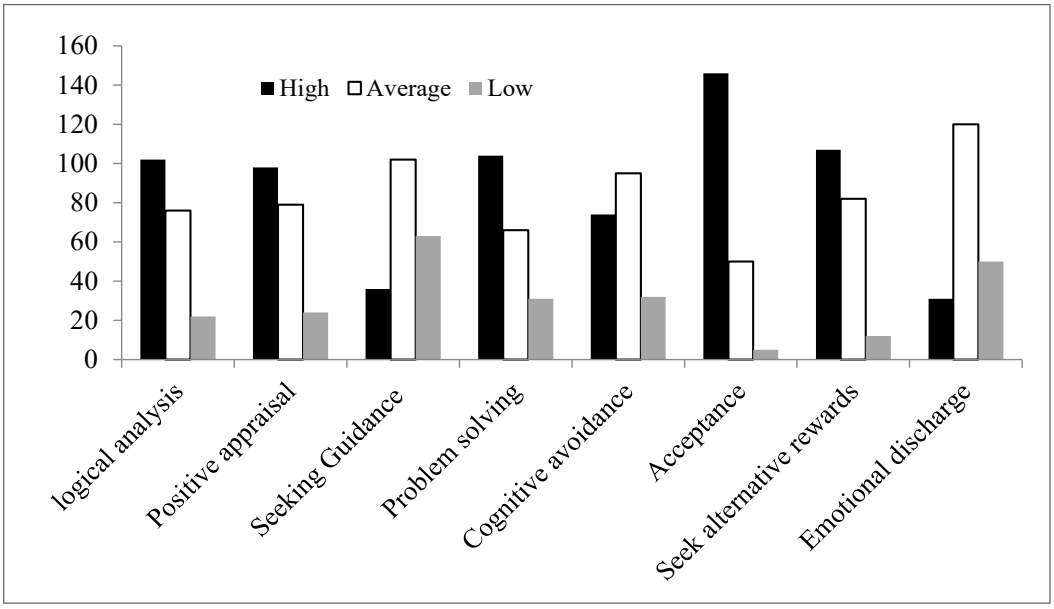


Table 2: Distribution of Respondents on different dimensions of coping strategies

Dimensions	High	Average	Low
Approaching coping strategy			
Logical analysis	98(49%)	76 (38%)	26(13%)
Positive appraisal	98(49%)	76(38%)	26(13%
Seeking Guidance	40(20%)	102(51%)	58(29%)
Problem solving	104(52%)	66(33%)	27(13.5%)
Avoiding coping strategy			
Cognitive avoidance	74(37%)	95(47.5%)	31(15.5%)
Acceptance	146(73%)	50(25%)	4(2%)
Seek alternative rewards	107(53.5%)	82(41%)	11(5.5%)
Emotional discharge	31(15.5%)	120(60%)	49(24.5%)

Figure 3: Distribution of Respondents on different dimensions of Coping strategies



13 per cent low logical analysis of coping. With regard to positive appraisal the respondents, 49 per cent exhibited high, 38 per cent average and 13 per cent showed low positive appraisal. In seeking guidance and support majority (51%) of them were under average category followed by 20 per cent high and 29 per cent under lower category of seeking guidance. In problem solving dimension of approaching coping strategy 52 per cent were under high category, 33 per cent under average and 13.5 per cent were under low problem solving coping strategy.

With regard to avoidance type coping strategy, 47.5 per cent showed average cognitive avoidance, 37 per cent high and 15.5 per cent low. Under acceptance dimension 73 per cent had high, 25 per cent average and 2 per cent had low acceptance type of coping strategy. With regard to seeking alternative rewards dimension, 53.5 per cent had high, 41 per cent average and 5.5 per cent had low level of coping strategy. In emotional discharge category, majority (60%) showed average levels, 24.5 per cent low and 15.5 per cent showed high emotional discharge. In a similar study Deepti and Gaukaran (2015) observed that women used technique of self distraction, instrumental support, behavioural disengagement, venting and positive reframing coping strategies for stress management. Also a study conducted by Singh *et al.* highlighted that safety needs must be followed to overcome psychological stress due to pandemic giving family and health issues as topmost priority.

CONCLUSION

Covid pandemic made a standstill for the whole world but only women at home were on their toes catering to

the needs of family without any kind of external support. With no domestic help, no food supply from outlets left women in major work. There is no denial that covid pandemic subjected woman to great stress. The study also found majority of women have psychological distress**.** The study concludes that psychological distress is high among women specifically during this covid-19. It is interesting to note that the women who are using approaching type of coping strategies, like the logical analysis, positive appraisal and problem solving were able to deal with distress but the women with avoidance coping strategy like cognitive avoidance, alternative rewards and emotional discharge were not able to deal with distress effectively.

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Development and Standardization of Perception Scales for Farmers and Extensionists Regarding Impact of Climate Change on Nutrition

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ABSTRACT

While climate change is ravaging our planet, its nutritional health which is going to be hit even harder. Food is going to be more expensive, less nutritious and scarcer. The reduced nutritional quality of important crops could mark the beginning of a looming nutritional health crisis. Climate change is not only reducing yields, but also sapping nutrients from our meals. If climate change is predicted to cut access to nutrients then food and nutritional security is growing concern and we need to understand perceptions and implications of this burning issue for stakeholders especially farmers and extensions. The objective of the study was to develop and validate scales to study these perceptions of farmers and Extensionists regarding impact of climate change on nutrition. The locale selected for the study was from States of Uttar Pradesh (UP) and Odisha due to their nutritional vulnerability status. The sample size constituted of 100 farmers from these villages and extensionists from Krishi Vigyan Kendras and line departments of the state who were selected by random sampling technique. A total of 69 items were selected from review of literature. These were further reduced to 43 based on expert's judgments. The items were finally reduced to 16 items for farmers and 24 items for extensionists by statistical analysis using Mokken's Scaling Analysis. Loevinger's coefficient was calculated for item H (Hi); item pair H (Hij) and for the overall scale (Hs). By this means, and based on the mean scores on items by individuals, a set of items were selected. Items which had Hs>0.4 were selected. These scales can be used by various stakeholders for designing interventions for climate and nutrition smart agriculture. There is a need for agri-nutri education for consumers and farmers, especially the women in India which has a triple burden of malnutrition. Synergies of the climate and nutrition agendas need to be built for human and planet health. The implications are huge. Climate change and agriculture needs to be seen through a nutrition and gender lens for convergence to ensure food and nutritional security.

Keywords: Climate change, Food systems, Nutrition, Nutritional security, Perception, Extensionists, Farmers and Mokken scale analysis

INTRODUCTION

Climate change is hitting us where it counts the most: the stomach and hunger. While climate change is ravaging out planet, it's our nutritional health which is going to be hit even harder. Food is going to be more expensive, less nutritious and scarcer. A number of recent studies point out that climate change will reduce nutrients in many crops. There is strong evidence that climate change will affect food quality (diversity, nutrient density and safety) and food prices (Global Panel on Agriculture and Food Systems for Nutrition, 2015; Vermeulen *et al.,* 2012).

Climate, agriculture, nutrition and gender are intrinsically linked, Climate change impacts are already being felt which is supported by a strong research base. There is a growing area of research, painting a rather grim and alarming picture, where climate change is severely going

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to impact nutrition of crops, which in turn is going to affect the most vulnerable - the poor, the women and children. There is certainly a need to develop better understanding of the pathways linking climate change to agriculture, nutrition outcomes and women for developing strategies for climate smart, nutrition smart and gender sensitive food system.

The reduced nutritional quality of important crops could mark the beginning of a looming nutritional health crisis. Serious questions are being raised over the future of nutritional security since studies are revealing how climate change is not only reducing yields but also what is again a serious issue, is that it is also sucking nutrients from our meals. These studies are eye-openers for us to realize that we need to bridge this gap to ensure sufficient nutrition and safe food till the end of this century.

Myers *et al.* (2016) reported that wheat grown in high CO_2 levels had 9 per cent less zinc and 5 per cent less iron, as well as 6 per cent less protein, while rice had 3 per cent less iron, 5 percent less iron and 8 per cent less protein. Maize saw similar falls while soybeans lost similar levels of zinc and iron. By 2050, the Vitamin B content of rice is expected to drop 17 to 30 per cent upping the risk of deficiencies in folate (B_9), thiamine (B_1) and riboflavin (B_2) for tens of millions of people, especially in regions dependent on rice. All these vitamins are crucial for normal and healthy development. According to Smith and Myers (2018), Atmospheric CO_2 is on pace to surpass 550 ppm in the next 30-80 years. Many food crops grown under 550 ppm have protein, iron and zinc contents that are reduced by 3-17 per cent compared with current conditions. They analyzed the impact of elevated CO_2 concentrations on the sufficiency of dietary intake of iron, zinc and protein for the populations of 151 countries using a model of per capita food availability stratified by age and sex, assuming constant diets and excluding other climate impacts on food production. They estimated that elevated CO_2 could cause an additional 175 million people to be zinc deficient and an additional 122 million people to be protein deficient. For iron, 1.4 billion women of child bearing age and children under 5 are in countries with greater than 20 per cent anemia prevalence and would lose more than 4 per cent of dietary iron. Regions at highest risk-South and South East Asia, Africa and the Middle East- require extra precautions to sustain an already tenuous advance towards improved public health. Ebi's research (2018) focused on health risks associated with climate variability and change. The results showed that rice grown at the concentrations of atmospheric carbon dioxide scientists expect the world to reach by 2100, has lower levels of four key vitamins. Higher carbon concentrations in plants reduce nitrogen amounts in plant tissue, which is critical to the formation of B vitamins. Vitamins B are required for regulatory key functions in the body. Folate, B vitamin, reduces the risk of birth defects consumed by pregnant women. By 2050, levels of protein available per head could fall by 19.5 per cent and of iron and zinc by 14.4 per cent and 14.6 per cent respectively. That is a fall of - for all three vital elements of survival, almost one fifth (Cole & Desphande-Lancet Planetary Health, 2019). Besides the impact of climate change on the levels of zinc, iron and vitamins in crops, a recent study has projected that as a result of climate change 66 per cent of croplands will lose 8.7 per cent of their selenium. Selenium boosts immune systems and prevents cognitive decline. It is also known to inhibit proper growth of bones in children.

Dietary intake is the number one source of zinc, whose deficiency can lead to diarrhea, poor vision, mouth and stomach ulcers, and even psychological and cognitive disorders. The most common iron deficiency can result in fatigue, hair loss and weakened immune function. In general people in low- and middle-income countries receive a larger portion of their nutrients from plant-based sources, which tend to have lower bioavailability than animal based sources. Nutritional deficiencies and malnutrition continue to take a heavy toll. The impact on individual crops can have disproportionate effects on diets and health. Significant nutrient losses in wheat and rice have especially widespread implications since majority of our population depends on these affordable cereals. Whitmee *et al.* (2015) reports that the hardest hit areas would be India, whereby 2050 the less nutritious food could lead to 50 million more people zinc deficient, 38 million more protein deficient and 502 million women and children facing iron deficiency. The Earth has already reached the point of diminishing returns. Millions could be added to the billions of people who do not get enough nutrition.

Little is known about farmer's perception on climate change impacts on nutrition and their effects on adaptation decisions. This information is a pre-requisite for adaptation strategies. It is crucial to understand their views and perceptions while formulating adaptation plans and policies, Understanding farmers including women farmers perceptions on climate change and nutrition are essential

for designing and implementing extension strategies for climate and nutrition smart agriculture.

Hence, there is a need to study the perceptions of farmers and extensionists regarding the impact of climate change on nutrition. The objective of the study was to develop and standardize a scale to study these perceptions by designing, testing and refining a set of items to assess perceptions in relation to impact of climate change on nutrition in crops. These scales need to be used to generate data for designing development communication strategies and interventions. This will also be helpful for Extension in the face of climate change challenges.

MATERIALS AND METHODS

As science advances and novel research questions arise it becomes essential to develop new scales. Scales are a manifestation of latent constructs used to capture an attitude, perception or behavior which cannot be accessed and encapsulated directly in a single variable or item. The development and validation of scales is of paramount importance in behavioral issues and outcomes. However this is not a straight forward endeavor since it involves a number of stages and steps.

The locale selected for the study was from States of Uttar Pradesh (UP) and Odisha due to their nutritional vulnerability status. The sample size constituted of 100 farmers from these villages and extensionists from Krishi Vigyan Kendras and line departments of the state who were selected by random sampling technique.

Mokken Scale Analysis was employed to reduce the number of items (Shenkin *et al.*, 2014; Van Der Ark, 2007). This a non-parametric approach. The main purpose of the Mokken scale is to validate an ordinal measure of a latest variable (Hemker *et al.,* 1997; Sijitsma and Molenaar, 2002).

The principle preferred standpoint of Mokken scale analysis as compared to factor analysis is that it can deal with less number of data and it does not require prior assumptions of the data generating process. Mokken scaling works by seeking unidimensional sets of items on the basis of Loevinger's coefficient (H) which is based on the extent to which pairs of items, as scored by respondents, conform to Guttmann criteria. In a Guttmann scale which is deterministic in nature any pair of items should be scored relative to one another consistently; in other words, of two items item i and item j, if item j represents more of the latent trait then item i (i.e. it is more 'difficult' in psychometric terms) then item i should always be more readily endorsed than item j. Where item pairs are not endorsed in the expected direction (i.e. where an individual endorses item j more readily than item i) then that is a Guttmann error. In this sense, 'difficulty' means the ease with which an item is endorsed or agreed with by respondents and is indicated by the mean score of the item: more 'difficult' items have lower mean scores. In addition, the present study employed Genetic Algorithm Approach to estimate the Loevinger's coefficient (H). The 'Mokken' package in R was used for the analysis.

We adopted the following steps under the three Stages based on Boateng *et al.* (2018).

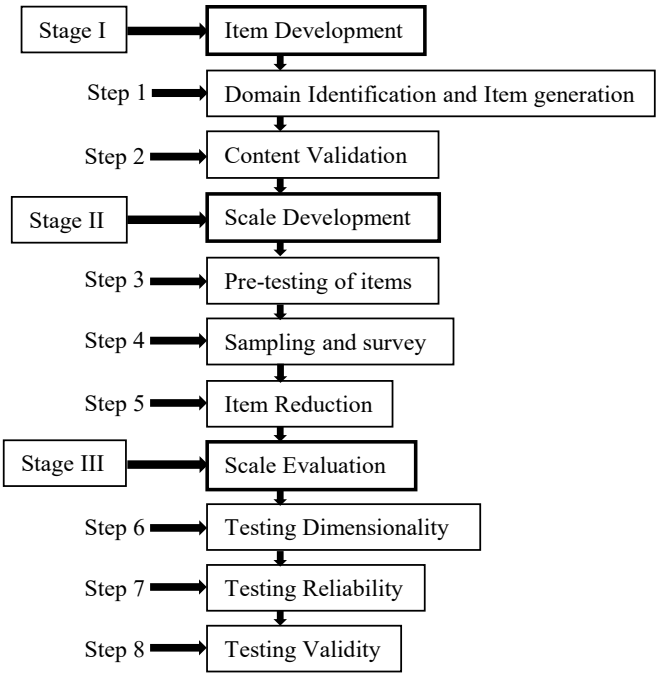

Figure 1: Stages and steps for development and validation of perception scale

Stage I: Item Development (2 steps)

Step 1: Domain Identification and Item generation:

Here the purpose is to first of all identify the domain and identify and generate appropriate items to fit the domain. The domain identified was perceptions of farmers and extensionists regarding the impact of climate change on nutrition. The dictionary meaning of 'perception' is a particular way of looking at or understanding something, an opinion. Cambridge dictionary defines it as a belief or opinion often held by many people and based on how

things seem. It is the way something is regarded, understood or interpreted on insight. They may include appreciations and apprehensions, assimilations, comprehensions. In psychology it is seen as the process of recognizing and interpreting sensory stimuli a process of acquiring and processing of information. Perception is very important in understanding human behavior because every person perceives the world and approaches life problems in a different manner. People behave and take action on the basis of their perceptions.

Understanding public perceptions of climate change impacts is critical for developing and implementing effective strategies for mitigation and adaptation and reduce human vulnerability to these impacts especially in terms of nutrition. In this study we aim to develop perception scales which can be used to address the questions of whether farmers and extensionists have the capacity to perceive links between climate change and nutrition in crops that indicates sensitivity to climatic conditions and nutritional security. This will enable researchers to collect data and policy makers to understand farmers and extensionists perceptions and behavior and make evidence based decisions on what issues to focus on and how do this effectively when communicating with farmers.

Through review of literature it was revealed that there is no such existing instrument on this emerging area of importance. Hence fresh items were generated. Deductive and inductive methods were used for item generation. Since no scale was found in this domain the research studies on impact of climate change were reviewed to frame the items. This deductive approach provided the theoretical basis for defining the domain. Focus group discussions and interviews with farmers (men and women) and extensionists in ICAR institutes and Krishi Vigyan Kendras were used as the inductive methods to make pragmatic decisions about the domain and move from an abstract point to its manifest form.

Step 2: Content validation

Content validity is vital to ensure that items measure what they are presumed to measure. The purpose here is to validate each item constituting the domain for the relevance, adequacy representativeness and technical quality of content by experts. Here 30 experts were chosen from the field. Formalised scaling and statistical procedures were followed. For content validation the authors consulted experts in the field of agriculture, climate change, and nutrition and extension education. The items were then subjected to content analysis using expert judges to select items that were accurate, relevant and interpretable. Items were then accepted, rejected or modified based on majority opinion. Cognitive interviewing entails the administration of draft questions to target populations and then asking the respondents to verbalize the mental process entailed in providing such answers (Beatly *et al.*, 2007). Cognitive interviews allowed for items to be modified, clarified, or augmented to fit the objective of our study. This helped to ensure that farmers and extensionists (our respondents) understood items as we intended and they were able to respond in a manner which reflects their experience. This was done on a sample outside of study population. Cohen's kappa measures agreement between two raters only. For a similar measure of agreement Fleiss' kappa is used since there are more than two raters, (Fleiss, 1981). Hence as we had 30 experts, Fleiss' kappa was utilized to check the validity. The Fleiss' Kappa value for m raters was 0.8995 and z= 16.5 while p value=0. The interpretation of the magnitude of Fleiss kappa is like that of the classical Cohen's kappa (Fleiss, 2003). For most purposes, values greater than 0.75 or so may be taken to represent excellent agreement beyond chance, Values below 0.40 or so may be taken to represent poor agreement beyond chance, and values between 0.40 and 0.75 may be taken to represent fair to good agreement beyond chance.

The initial bank contained 69 items we developed since we agreed with Kline (1993) and Schinka *et al.* (2012) that the number of items should be at least twice as long as the desired scale. The statements were kept simple, straight forward and followed contentions of normal conversation as suggested by Krosnik (2018). We developed items afresh and tested their clarity in rounds of qualitative interviews and focus group discussion. The 43 items selected from the 69 items after content validation are presented in Table 1.

Stage II: Scale Development

Step 3: Pre-testing of items to ensure meaningfulness of questions and answers.

The purpose in this step was assessment of the extent to which our domain was reflected by the questions and that valid measurements were produced by the answers. This was done by means of cognitive interviews wherein draft questions were administered to 30 interviewees in three rounds. This allowed the respondents to verbalise the mental process entailed in providing answers.

Table 1: Items selected after content validity screening on perceptions of farmers and extensionists on impact of climate change on nutrition

S.No.	Statements
1.	Climate Change strips nutrients from food crops (vegetables, legumes, peanuts, cereals etc.)
2.	Environmental changes (such as water scarcity, increase in temperatures and greater concentration of carbon dioxide could impact nutritional quality of crops vital to our everyday nutrition)
3.	Climate change is sucking the nutrients from our vegetables
4.	Climate change is sucking the nutrients from our legumes
5.	Climate change is affecting nutritious foods that are more important to a healthy diet.
6.	Farmers, especially women in rural areas, will be most affected by climate change effect on nutrition
7.	Important micro nutrients for our health (eg. Iron) will be reduced in bones due to climate change
8.	Anti-nutritional compounds (phytic acid and lead) will be increased due to climate change
9.	Climate change variability and extremes are the key force behind rise in hunger and malnutrition.
10.	Climate change stresses will most heavily impact the most nutritional vulnerable/insecure people
11.	Climate change will lead to lower levels of essential nutrients such as protein, iron and zinc in our diets
12.	Loss of dietary nutrients in foods will aggravate nutritional deficiencies/malnutrition
13.	Climate change will make rice less nutritious
14.	Some vitamins (eg. Vitamin E) may increase in rice due to climate change effects (eg. rising CO_2)
15.	A drop in nutritiousness of rice as result of climate change could have profound health effects
16.	Potatoes may be impacted by climate change in terms of nutritional quality
17.	Climate change will impact nutrition through decreased food quantity and access
18.	Climate change will impact nutrition through decreased dietary diversity
19.	Climate change will result in decreased food nutritional content
20.	'Double duty' actions that address climate adaptation and nutrition are required
21.	Climate change is reducing yields and impacting food security
22.	Global warming may cause our crops to be less nutritious
23.	Farmers especially women in rural areas will be most affected by climate change effect on nutrition
24.	It is troubling to see climate change impacting nutritional content of our crops
25.	Rising temperatures may actually improve nutrition but decrease yields (eg. In soybean)
26.	Crop yields may increase at the cost of nutrition due to climate change
27.	Bio availability of micro nutrients (esp. iron & zinc) may be impacted by climate change (increasing CO_2)
28.	Climate change can potentially intensify the problem of malnutrition
29.	Effects of climate change may be positive or negative on nutrition and health.
30.	Climate change in future will translate into increasing prevalence of malnutrition
31.	Climate change will reduce the nutritional quality of diets.
32.	Climate change will result in more human and animal diseases
33.	Unless food is stored properly it can increase risk of spoilage and contamination and result in more food-borne diseases especially in extreme weather conditions
34.	Heat wave will make livestock less fertile and more vulnerable to diseases
35.	Climate change will impact meat production and nutrition
36.	Livestock farmers may use more chemicals and medicines which might enter food chain
37.	Milk production could decline due to climate change affecting dairy cows
38.	Climate change will enable more weeds, pests and fungi to survive and result in more unsafe and injudicious use of pesticides
39.	A warmer and more acidic ocean will affect seafood impacted by climate change.
40.	Climate change may lead to increased food prices making food more expensive and scarce.
41.	Climate change has implications for food safety and quality
42.	Levels of vitamins (eg. B, B2, B5 and B9) may drop in rice due to climate change effects (eg. rising CO_2)
43.	Rising temperature may safeguard crop nutrition as climate changes

Step 4: Administration of survey and sampling in order to get sufficient data from the right people

The purpose here is ensuring enough data availability with minimum measurement errors for scale development and validation. The potential scale items were administered on a recommended sample size of 100 farmers and extensionists each. The respondents were farmers (men and women) drawn by simple random sampling technique from the purposively selected states (UP and Odhisa) and districts due to their nutritional vulnerability. The extensionists were selected by simple random sampling technique from the Krishi Vigyan Kendras and Agriculture Department of the two states. Personal interviews were conducted for data collection.

Step 5: Item reduction for ensuring that the scale is parsimonious (optimum)

The purpose of this step is to determine the probability of a particular respondent correctly answering a given item (Item Response Theory) According to Thurstone (1947) in scale development item reduction analysis is conducted to ensure that only parsimonious, functional and internally consistent items are ultimately included. Items which are not or are the least related to the domain under study are identified for deletion of modification. These items are correlated with each other, discriminate between individual cases, underscore single or multi-dimensional domain and contribute significantly to the construct (Boateng *et al.*, 2018). As per Fan (1998) two theories, Classical Test Theory (CTT) and the Item Response Theory (IRT) underpin scale development. Between the two, the IRT approach to scale development has the advantage of allowing the researcher to determine the effect of adding or deleting a given item or set of items by examining the item information and standard error functions for the item pool (Harvey and Hammer, 1999).

To determine the correlations between scale items, as well as the correlations between each item and sum score of scale items, the item total correlations were computed for each items. Values for an item-total correlation (point-biserial) between 0 and 0.19 may indicate that the item is not discriminating well, values between 0.2 and 0.39 indicate good discrimination, and values 0.4 and above indicate very good discrimination (Table 2).

Table 2 shows the item- total correlations which shows the relationship between each item vs the total score of scale items. Hence only functional items were obtained

Table 2: Item total correlation of the items

S.No	Variable	Item Total	Range
1	C54	0.22	
2	C32	0.22	(0.2-0.39) Good discrimination
3	C28	0.24	
4	C3	0.25	
5	C2	0.28	
6	C51	0.39	
7	C41	0.39	
8	C63	0.40	
9	C53	0.46	
10	C45	0.46	
11	C34	0.46	
12	C17	0.48	
13	C56	0.52	
14	C25	0.53	
15	C18	0.56	(0.4 and above) Very Good discrimination
16	C27	0.56	
17	C57	0.57	
18	C61	0.57	
19	C33	0.60	
20	C26	0.63	
21	C10	0.64	
22	C19	0.64	
23	C9	0.65	
24	C30	0.65	
25	C16	0.66	
26	C37	0.66	
27	C15	0.68	
28	C50	0.68	
29	C62	0.70	
30	C12	0.72	
31	C59	0.73	
32	C46	0.73	
33	C35	0.74	
34	C5	0.74	
35	C21	0.74	
36	C39	0.76	
37	C42	0.76	
38	C13	0.76	
39	C22	0.80	
40	C24	0.81	
41	C6	0.83	
42	C60	0.84	
43	C38	0.86	

which were correlated with each other, discriminated between individual cases, underscored a single domain and contributed significantly to our construct (Boating *et al.,* 2018). Figure one depicts the inter item correlations. These inter-item correlations examine the extent to which scores on one item relate to scores on all other scale items and the extent to which the main content is being assessed by the items. As per the interpretation given in Figure 1, the items with very low correlations are less desirable and are considered for potential deletion from the tentative scale. Smaller size denotes lesser correlation which means greater discrimination.

Further to ensure the availability of complete cases for scale development mean imputation method was used for imputing missing cases. With regard to missing cases imputing individual items before scale development is a preferred approach to imputing newly developed scales (Ggottschall *et al.,* 2012) and have shown to produce more efficient estimates over scale – level imputation. Mokken's method of scaling assists in the determination of the dimensionality of tests and scales, and enables consideration of reliability, without reliance on cronbach's alpha (Stochts *et al*.,)

Stage III: Scale Evaluation

Step 6: Testing Dimensionality: The purpose here is to address the underlying relationships and latent structure of scale items. Unidimensionality was tested by MSA (Given as values of binary one in Table 3).

Step 7: Testing reliability to establish if responses are consistent on repetition and are dependable. The purpose is to assess the internal consistency of the scale which is the degree to which the scale items co-vary, relative to their sum score. MSA was used here.

Step 8: Testing validity to ensure that we measure the dimension we intended. Validity and reliability are the yardsticks against which adequacy and accuracy of our scales are evaluated.

Table 3: Selected sixteen items on perceptions scale for farmers for impact of climate change on nutrition (based on MSA)

S. No.	Statements	Binary	H Value (Loevinger's coefficient)	Standard error
1.	Climate Change strips nutrients from food crops (vegetables, legumes, peanuts, cereals *etc.*)	1	0.846	(0.036)
2.	Climate change is reducing yields and impacting food security	1	0.562	(0.072)
3.	Environmental changes (such as water scarcity, increase in temperatures and greater concentration of carbon dioxide) could impact nutritional quality of crops vital to our everyday nutrition.	1	0.797	(0.052)
4.	Climate change is affecting nutritious foods that are more important to a healthy diet.	1	0.819	(0.046)
5.	Farmers, especially women in rural areas, will be most affected by climate change effect on nutrition	1	0.780	(0.059)
6.	Climate change will reduce the nutritional quality of diets.	1	0.828	(0.044)
7.	Climate change will impact nutrition through decreased dietary diversity	1	0.841	(0.040)
8.	Climate change will result in more human and animal diseases	1	0.847	(0.025)
9.	Climate change will impact meat production and nutrition	1	0.645	(0.077)
10.	Unless food is stored properly it can increase risk of spoilage and contamination and result in more food-borne diseases especially in extreme weather conditions	1	0.719	(0.062)
11.	Heat wave will make livestock less fertile and more vulnerable to diseases	1	0.780	(0.039)
12.	Milk production could decline due to climate change affecting dairy cows	1	0.786	(0.052)
13.	Livestock farmers may use more chemicals and medicines which might enter food chain	1	0.872	(0.026)
14.	Climate change will enable more weeds, pests and fungi to survive and result in more unsafe and injudicious use of pesticides	1	0.891	(0.017)
15.	A warmer and more acidic ocean will affect seafood impacted by climate change.	1	0.859	(0.023)
16.	Climate change has implications for food safety and quality	1	0.537	(0.056)

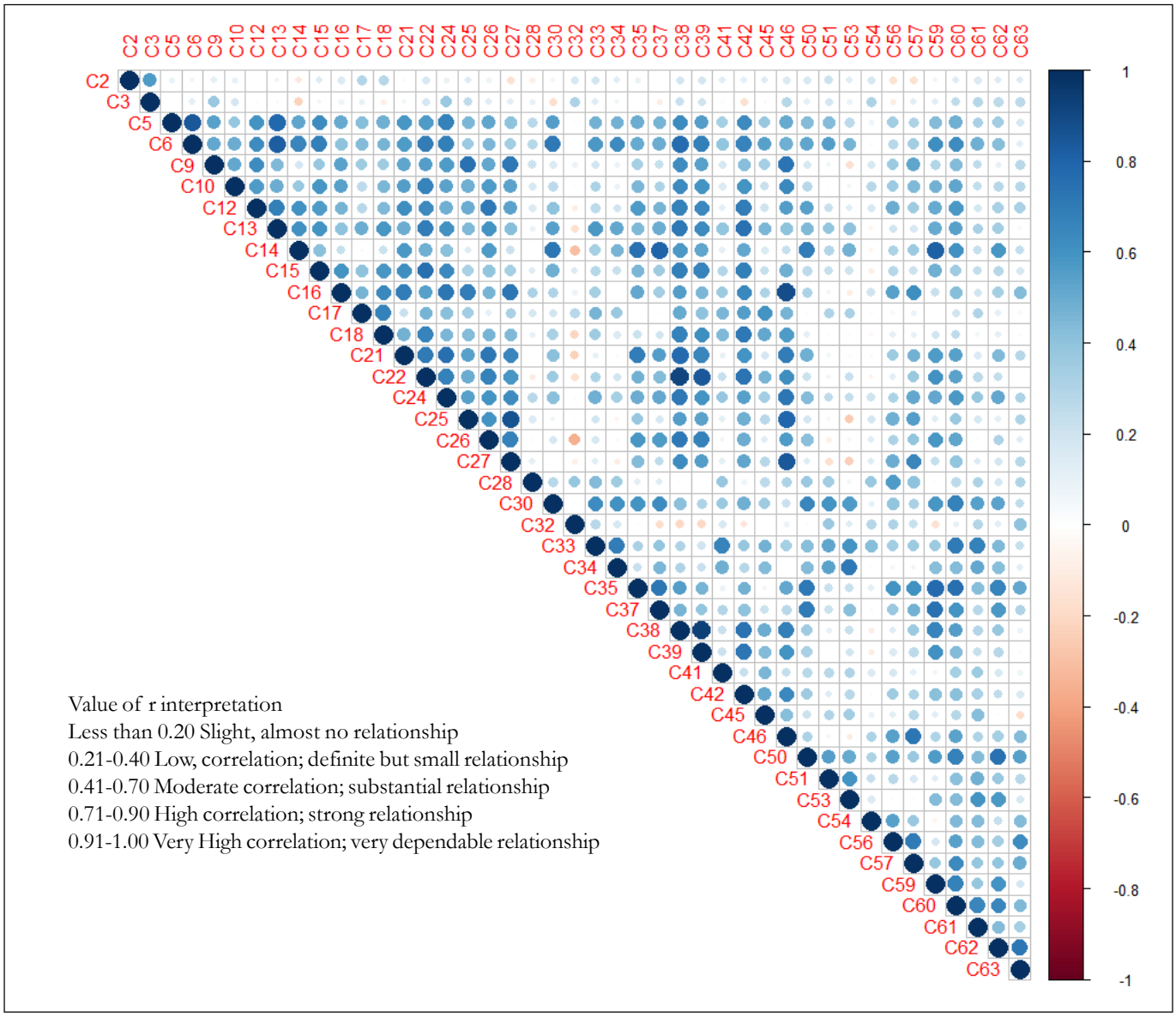

Figure 2: Inter Item correlation plot between the items

Pearson Product moment coefficient was used to suggest support for validity

Lesser the correlation greater is the dicrimination and the items discriminate well among each other suggesting better results for scale items.The circles in the Figure 2 indicates the correlation (inter-item) lessser the size of circle,lesser is the correlation.

RESULTS AND DISCUSSION

On the basis of Mokken scale analysis 16 out of 43 statements were retained for the final scale for farmers. Loevinger's coefficient is calculated for item H (Hi); item pair H (Hij) and for the overall scale (Hs). By this means, and based on the mean scores on items by individuals, a set of items can be selected. In this study, the items which are having Hs>0.4 are selected for men and women farmers.

As a rule of thumb in practical interpretations items with H<0.3 are not considered as unidimensional. Item sets with coefficient higher than 0.3 and lower than 0.4 are indicative of weak scales: unidimensional but not strong in any scaling sense. When H ranges between 0.4 &< 0.5 the scale is considered of medium strength and only when H >0.5 the scale is seen strong. which implies that the items discriminate better among different values of (Seefeld and Linder, 2007) All items can be considered to measure a single underlying construct threshold value , 0.3 level is worthy of retaining the time. A perusal of Table 3 clearly

Table 4: Selected twenty four items on Perception scale for extensionists for Impact of climate change on nutrition (based on MSA)

S. No.	Statements	Binary	H Value (Loevinger's coefficient)	Standard error
1.	Climate change is affecting the nutrients of our vegetables	1	0.579	0.059
2.	Climate change is affecting the nutrients of our legumes crop	1	0.613	0.048
3.	Climate change is affecting nutritious foods that are more important to a healthy diet.	1	0.507	0.095
4.	Farmers, especially women in rural areas, will be most affected by climate change effect on nutrition	1	0.452	0.085
5.	Important micro nutrients for our health (eg. Iron) will be reduced in bones due to climate change	1	0.461	0.087
6.	Anti-nutritional compounds (phytic acid & lead) will be increased due to climate change	1	0.543	0.068
7.	Climate change variability and extremes are the key force behind rise in hunger and malnutrition.	1	0.539	0.060
8.	Climate change stresses will most heavily impact the most nutritional vulnerable/ insecure people	1	0.488	0.104
9.	Climate change will lead to lower levels of essential nutrients such as protein, iron and zinc in our diets	1	0.488	0.092
10.	Climate change will make rice less nutritious	1	0.429	0.090
11.	Some vitamins (eg. Vitamin E) may increase in rice due to climate change effects (eg. rising CO_2)	1	0.469	0.074
12.	A drop in nutritiousness of rice as result of climate change could have profound health effects	1	0.427	0.092
13.	Potatoes may be impacted by climate change in terms of nutritional quality	1	0.473	0.085
14.	Climate change will impact nutrition through decreased food quantity and access	1	0.415	0.132
15.	Climate change will impact nutrition through decreased dietary diversity	1	0.410	0.101
16.	Climate change will result in decreased food nutritional content	1	0.543	0.083
17.	'Double duty' actions that address climate adaptation and nutrition are required	1	0.420	0.097
18.	Rising temperatures may actually improve nutrition but decrease yields (eg. in soybean)	1	0.542	0.065
19.	Crop yields may increase at the cost of nutrition due to climate change	1	0.502	0.071
20.	Rising temperature may safeguard crop nutrition as climate changes	1	0.486	0.072
21.	Bio availability of micro nutrients (esp.. iron & zinc) may be impacted by climate change (increasing CO_2)	1	0.421	0.135
22.	Climate change can potentially intensify the problem of malnutrition	1	0.531	0.112
23.	Effects of climate change may be positive or negative on nutrition and health.	1	0.429	0.114
24.	Climate sensitive crops such as rice, vegetables, cereals, and spices will be affected nutritionally	1	0.500	0.107

depicts that the items have H values above 0.5 indicating a strong scale.

Furthermore it is also important to understand the perceptions of extension personnel with regard to the impact of climate change on nutrition. Hence again, out of 43 items, on the basis of Mokken scale analysis, 24 items having Hs>0.4 were retained. These selected 24 items are given in Table 4.

Unidimensionality refers to measuring a single ability, attribute or construct. Thus this scale measures only perception in context of impact of climate change on nutrition. Even though perception is a psychological concept with many layers of complexity that can be different for different situations, unidimensional data will maximize Cronbach's alpha. Primary values of 1 for all 16 statements (farmer scale) and 24 statements

(extensionists scale) confirm unidimensionality of the scale implying that this scale has only one dimension. The small standard error values indicates that the sample mean is a more actual population mean. It is an estimate of the reliability of our observed sample mean. As per Table 4, twenty four statements have H >0.4 were selected and retained for the final scale for extensionists. Here we note that there are 15 Items in the range of 0.4 to 0.5 (medium strength) and 9 items of H values above 0.5 (strong).

CONCLUSION

The set of items framed has the benefit of being evidence based, policy relevant and readily understood. The next pandemic can be entered with a plan for how to measure farmer perceptions. A better understanding of how farmers (including women farmers) and extensionists perceive the impact of climate change on nutrition is important for policy makers who aim to strengthen links between climate, agriculture and nutrition. On the basis of Mokkan Scale Analysis, two scales were developed for farmers and extensionists for understanding their perceptions regarding impact of climate change on nutrition. These instruments can be used by researchers. Also Climate change and agriculture needs to be seen through a nutrition and gender lens. Urgent policy action is needed to link food system resilience with higher quality diets and nutrition along with a gender sensitive approach. Climate change and nutrition education and communication strategies need to be planned in accordance with these perceptions. Extension programmes need to build on the adaptive capacity of the vulnerable and promote Nutrition Sensitive Agriculture. They may be intertwined with relevant modern and traditional agri-nutri technologies. Based on data and findings generated by using these scales recommendations for effective climate change and nutritional security communication policies can be outlined. We need agriculture to be climate smart and also nutrition and gender smart to meet the needs of communities and nations in these shifting climates with a pro nutrition lens where food production systems are diverse, efficient and resilient. It is a complex and multifaceted connection between climate change and nutrition. More voice and power is needed for food systems with dietary diversity, safe food and less food wastage.

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Dairy Cattle Nutrition Technologies: Pre and Post Intervention Awareness and its Retention in Relation with Independent Variables

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ABSTRACT

A study was conducted to assess participants knowledge enrichment on dairy nutrition technologies, extent of retention with time laps and its relation with their socio-personal profile, post an awareness intervention. A total of 120 participants of vocational training courses at veterinary versity on dairy farming (n=04)were purposively selected.Ten dairy nutrition technologies were selected namely Mineral mixture (MM), Urea treatment of wheat straw (UTWS), Uromin lick (UL), Silage making, Hay making, Bypass fat (BF), Bypass protein (BP), Total mixed ration (TMR), Buffer and Probiotics. Awareness was tested through binary answer type questions.Maximum score for awareness assay was 10 and minimum was zero.The awareness of farmers was assessed at 0 day of training (pre test), last day (post test-I) and six month after the training (post test-II). Statistical techniques of mean, percentage, Cocharan Q test, Chi Square test, ANOVA & Tukey's HSD and Correlation were used for compilation of data.Majority respondents (68.3%) were young (18-30 years), were educated above matriculattion. During pre test, awareness varied between 2.5 (Probiotics) -50% (Silage), in post test I awareness improved significantly ($P<0.05$) (95.8-100%) and declined in Post test II (32.5-100%). Decline was significant for Hay, TMR, Buffers and Probiotics. Inspite of loss, awareness in post test II was significantly higher than pre test. Age, education, herd size were found to affect the awareness level at pre or/and post stage(s). Highest awareness gain was in respondents of >40 yrs age group (91.28%), matriculates (85.79%), >10 yrs of experience (87.2%) and those having herd of <5 animals (84.61%). In pre test independent variables affected awareness but in post test I & II, loss of awareness (from post test I–II) and retention turned out to be statistically similar for all categories. This meant that training camouflaged the influence of independent variables and brought immutable improvement in awareness.

Keywords: Awareness, Retention of awareness, Independent variables, Dairy cattle nutrition technologies

INTRODUCTION

Nutrition is the base of every livestock production enterprise. Apart from onetime expenses, feeding costs 60-70 per cent of daily expenses. Cost cutting by any ways will aid to the efficiency of production. Universities and various research institutions are putting in vigorous efforts to develop new technologies which not only improve digestion and but also enhance the production efficiency of livestock to economise the enterprise. Processing (Urea Treated Wheat Straw), preservation (Hay & silage) and strategic supplementation (Urea Molasses Mineral Block) are some of the arenas where research organizations are focussing upon. Some technologies namely Silage making, Hay making, Bypass fat, Bypass protein, Mineral mixture, Total mixed ration, Urea treatment of wheat straw, Uromin lick, Buffer and Probiotics not only help to cut the feed cost but also alleviate shortage of fodder, increase nutrient digestibility, maintain rumen environment, provide balanced nutrition, protect animals from metabolic and deficiency diseases and help in reducing wastage of feed resources (Bharathidasan *et al.,* 2007). Some of these technologies are widely known to farmers and some are yet to get mass market appeal. The main constraint to large-scale adoption of nutrition technologies in general has been

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identified as the lack of information/knowledge to users (Meena *et al.,* 2010; Quddus, 2012) because adoption depends upon awareness of stakeholders. Specific training and first hand knowledge of scientific dairy farming practices can enhance the animal productivity irrespective of their genetical potentiality which is possible only through prevailing extension services in study area (Roy and Meena, 2020). But knowledge once gained through these interventions may be lost due to non usage of skill, due to longer length of retention interval and infrequent opportunities to practice the skill (Ford *et al.,* 1992) or even doubts about practising the technology in field may also act in. Hence, it is also imperative that awareness once imparted should be tested at a gap of longer interval of time. Keeping above factors in mind a study was planned for evaluation of participants to assess their awareness before, after and at gap of time interval of the training and its relation with sociopersonal profile of respondents.

MATERIALS AND METHODS

The present study was conducted at the only State Veterinary University namely Guru Angad Dev Veterinary and Animal Sciences University, (GADVASU), situated at Ludhiana, Punjab, the north west state of India.GADVASU conducts both formal and non formal education programmes in the field of veterinary science and animal husbandry. Under non formal education programme the university organises vocational training courses for farmers. These training courses are being organised by the extension wing of the university. For the study. 120 farmers were purposively selected from participants of batches (n=04) of 10 days vocational training courses on dairy farming being organised at GADVASU, Ludhiana campus during years 2015-2016 and evaluated for awareness gain & retention and its relation with independent variables.

Questionnaire on awareness test

Ten animal feed technologies (AFTs) were selected, viz: Mineral mixture (MM), Urea treatment of wheat straw (UTWS), Uromin lick (UL), Silage making, Hay making, Bypass fat (BF), Bypass protein (BP), Total mixed ration (TMR), Buffer and Probiotics. The questionnaire had two parts:

a) *Socio personnel profile:* It included age, education, herd size, and experience in dairy farming,

b) *Awareness assay:* It comprised of a list of ten selected technologies and respondents were asked whether they are aware about the existence of the technology or not. The answers were to be given as YES or NO. Score 1 was given to the candidate who answered "YES" to the awareness about the existence of the technology and 0 if the answer was "NO". Maximum score for awareness assay was 10 and minimum possible score was zero.

A prospective, repeated-measures (before and after) quasi experimental design was selected to assess the knowledge of farmers at 3 pre-specified time points (pre test, post test-I and post test-II. The Pre test was the awareness test conducted at 0 day of training, post test-I was awareness test conducted at last day of training, while post test-II was the retention test; conducted 6 months after training. The data was collected by test method. After assessing the awareness in pretest the information on stipulated technologies was imparted to the farmers through specially organized classes during the training at University. For post test-I gain in awareness was recorded through same questionnaire. For post test-II, the data was collected from the same respondents through telephonic contact, personal contact method, post and emails.

Statistical analysis

Statistical techniques of frequency mean, percentage, Cocharan Q test, Chi Square test for independence, ANOVA & Tukey's HSD and Correlation through SPSS version 22.0 were used for compilation of data.

RESULTS AND DISCUSSION

The socio-personal profile of respondents/dairy farmers indicated (Table 1) that a large section of respondents (68.3%) were young (18-30 years). Present findings are in agreement with Ingle and Kubde (1995). Matric was the minimum qualification requirement for training and only 37.5 per cent respondents had matric and rest had higher qualification. (Table 1).

Education and age profile indicated that after acquiring the educational qualification of higher secondary or even after matric, young farmers tend to acquire expertise in the technical knowledge in the enterprise of dairy farming in order to adopt it as a profession thrivingly.

Majority of farmers (56%) had herd size of upto 5 animals and 71 per cent had upto 5 years of experience. 14.2 per cent belonged to 6-10 years category and merely 15.0 per cent respondents had more than 10 years' experience. Lower experience profile of respondents

Table 1: Socio-personal characterization of respondents

Categories	Frequency	Per centage	Average (Min- Max)
Age (years)			
18-30	82	68.3	29(17-65)
31-40	22	18.3	
>40	16	13.4	
Education			
Matriculation	45	37.5	11.95(10-17)
10+2	52	43.3	
Graduation	15	12.5	
Post-graduation	8	6.7	
Herd size (heads)			
Upto 5	67	55.8	6.8(1-60)
6-10	29	24.2	
> 10	24	20.0	
Experience (years)			
Upto 5	85	70.8	5.1(0-40)
6-10	17	14.2	
> 10	18	15.0	

corresponded to their age profile. Their initiative to get hands on training reflected their urge to improve the level of entrepreneurship and may further take them to higher level of adoption of innovations. Present results supported the previous finding of Lokhande (2009).

Table 2 portrays the comparative analysis of mean awareness per centage of respondents across pre test, post test-I and post test-II and statistical significance of difference between the tests and individual technologies as well (Cocharan Q test). There was a significant change in awareness level from Pre test to post test-I ($P<0.01$). The drift became different between post test-I and II and it varied for different technologies as well. The data indicates that during pre test per centage of awareness was highest for Mineral mixture and Silage making as they were known to the 41.7 per cent and 50.0 per cent respondents, respectively. Similar level of awareness (1.7-40.9%) was reported by Kiptot *et al.* (2015). Relatively higher awareness about mineral mixture and silage could be an indicator of better adoption of these technologies, while lack of knowledge among respondents was reason behind non adoption of other technologies (Sathiadas *et al.*, 2001).

Awareness for other technologies varied between 2.5-19.2 per cent for probiotics to bypass fat respectively (Table 2). In post test I the per centage of awareness about these technologies rose significantly ($P<0.01$) to 100 per cent in case of MM, UL, Silage and Bypass fat. For Bypass protein it approached 99.2 per cent, 98.3 per cent for UTWS, 97.5 per cent for TMR, 96.7 per cent for Buffers and Hay and 95.8 per cent for probiotics. However the drift could not be maintained in post test-II as only Mineral mixture and Silage retained their 100 per cent familiarity and Uromin lick and Bypass fat lost their level of familiarity from 100 per cent to 96.7 and 94.2 per cent, respectively but without change in statistical significance from Post test-I. Maximum gain and loss of familiarity was recorded for Probiotics as the per centage of awareness raised from 2.5 per cent

Table 2: Awareness of dairy farmers towards different animal feed technologies over pre test, post test I and post test II

Name of technology	Farmer's awareness/familiarity (N=120)			Cochran's *Q* test	P-value
	Pre test	Post test-I	Post test-II		
Mineral mixture**	50^{a} (41.7)	120^{b} (100)	120^{b} (100)	140.00	0.000
UTWS**	18^{a} (15.0)	118^{b} (98.3)	120^{b} (100)	198.13	0.000
Uromin lick**	16^{a} (13.3)	120^{b} (100)	116^{b} (96.7)	198.40	0.000
Silage**	60^{a} (50.0)	120^{b} (100)	120^{b} (100)	120.00	0.000
Hay**	15^{a} (12.5)	116^{c} (96.7)	80^{b} (66.7)	145.57	0.000
Bypass fat*	23^{a} (19.2)	120^{b} (100)	113^{b} (94.2)	179.16	0.000
Bypass protein**	21^{a} (17.5)	119^{b} (99.2)	111^{b} (92.5)	177.68	0.000
TMR**	9^{a} (7.5)	117^{c} (97.5)	98^{b} (81.7)	179.69	0.000
Buffer**	11^{a} (9.2)	116^{c} (96.7)	73^{b} (60.8)	147.95	0.000
Probiotics**	3^{a} (2.5)	115^{c} (95.8)	39^{b} (32.5)	169.10	0.000

*Figures in parenthesis indicate per centage; UTWS: Urea treatment of wheat straw, TMR: Total mixed ration, Figures with different superscripts in a row differ significantly (**P<0.01)*

to 95.8 per cent in Post test-I and then fell significantly to 32.5 per cent in post test-II. Hay, TMR and Buffers also lost the awareness significantly in post test-II from 96.7, 97.5 and 96.7 to 66.7, 81.7 and 60.8 per cent, respectively. Bypass protein's per centage of familiarity fell from 99.2 to 92.5 per cent but the decrease was non-significant.

The above table infers that during pre test respondents' awareness was highest for silage and mineral mixture and lowest for buffer & Probiotics. awareness about all animal feed technologies improved significantly in post test I but in Post test II awareness sank significantly for Hay, TMR, Buffers and Probiotics reflecting their non inception or adoption in field condition (Sathiadas *et al.,* 2001).

Vidya *et al.* (2010); Hundal *et al.* (2016) and Sharma *et al.* (2014) also recorded gain in awareness by farmers about feeding, reproduction and disease management after an intervention on learning. Sharma *et al.* (2014) also noted adoption of improved and balanced feeding after the intervention which resulted in fewer occurrences of diseases and reduced cost of disease management. On the similar note Nirmala *et al.* (2016) and Dole *et al.* (2016) concluded the favorable effect of multimedia module and training intervention on knowledge gain, retention and empowerment in farmers and farm women. In both studies the respondents gained considerable and highly significant knowledge immediately after exposure to the intervention and they could retain the knowledge even after 30 and 15 days of exposure respectively.

Assessment of correlation of awareness with respect to all selected independent variables is given in Table 3. Correlation of awareness with age indicated that in pre test age was negatively correlated with awareness ($P<0.05$). Trend inversed in post test I and II as here correlation became positive. This change of trend endorses the concept of efficacy of training. Previously, Mande *et al.* (2008) reported that age of dairy animal owners was negatively and non-significantly correlated with their knowledge.

Pre test also depicted that education level and awareness were positively and significantly correlated with each other and this relation stayed positive in post test I and II too but became non significant due to learning effects of training.

Corelation of experience in dairy farming with awareness depicts a negative but non significant relation in pre test and positive but non significant relation in post test I. In post test II relation again became negative and non significant. However, positive trend in post test I depicts higher gain of awareness by experienced respondents while negative relation at a gap of six months depicts higher retention by respondents with lesser experience. This was probably due to the fact that after completion of training lesser experienced respondents adopted the technologies under study. Secondly rigidity of experienced trainees against the adoption of novel techniques may also have played its role. Correlation figures also depict that in pre test respondents having herd of more than 10 animals had significantly highest awareness. Saha *et al.* (2010) also revealed a positive and significant correlation between farming experience & herd size and overall knowledge level of the farmers regarding animal husbandry practices. In post test I this difference between different groups stayed positive but became non significant while in post test II this relation became significantly negative. Which means that at a time gap after completion of training farmers with smaller herd size retained significantly more.

In case of mineral mixture, UTWS, UL, silage and TMR awareness was highest in age group II (31-40 yrs age) and lowest in gp III (>40 yrs age). For Bypass protein and buffers trend was different as percentage of aware respondents was highest in age group I while in case of probiotics It was highest in Gp III. After pre test, In post test I awareness improved immensely for all categories and approached 100% for mineral mixture, UTWS, silage and bypass fat. Awareness in post test I seemed independent

Table 3: Correlation of independent variables of respondents with awareness

Socio personal variable	Awareness					
	Pre test	P value	Post Test I	P value	Post Test II	P value
Age	0.20296*	.0285	0.064814	.481	-0.048	.595
Education	0.2257*.	.0131	-0.0472	.664	0.115	.211
Herd size	0.2767*	.002	0.0518	.580	-0.288*	.0019
Experience	-0.0586	.529	0.123	.180	-0.027	.769

**depits that figure is significant at P<0.05*

Table 4: Awareness of respondents towards different technologies w.r.t. age

Technology	Pre test					Post test I					Post test II				
	18-30 (n=82) I	31-40 (n=22) II	>40 (n=16) III	PSE	p-value	18-30 (n=82) I	31-40 (n=22) II	>40 (n=16) III	PSE	p-value	18-30 (n=82) I	31-40 (n=22) II	>40 (n=16) III	PSE	p-value
Mineral mixture	32(39.0)	13(59.1)	5(31.2)	3.698	0.157	82(100)	22(100)	16(100)	-	-	82(100)	22(100)	16(100)	-	-
UTWS	12(14.6)	5(22.7)	1(6.2)	2.00	0.368	80(97.6)	22(100)	16(100)	0.943	0.624	82(100)	22(100)	16(100)	-	-
UL	12(14.6)	4(18.2)	0(0.00)	3.029	0.220	82(100)	22(100)	16(100)	-	-	79(96.3)	22(100)	15(93.8)	1.208	0.547
Silage	41(50)	15(68.2)	4(25.0)	6.909	0.032*	82(100)	22(100)	16(100)	-	-	82(100)	22(100)	16(100)	-	-
Hay	11(13.4)	3(13.6)	1(6.2)	0.660	0.719	80(97.6)	20(90.9)	16(100)	0.301	0.221	59(72.0)	11(50.0)	10(62.5)	3.905	0.142
Bypass fat	18(22.0)	5(22.7)	0(0.00)	4.384	0.112	82(100)	22(100)	16(100)	-	-	80(97.6)	18(81.8)	15(93.8)	7.832	0.020*
Bypass protein	17(20.7)	4(18.2)	0(0.00)	3.994	0.136	81(98.8)	22(100)	16(100)	0.467	0.792	76(92.7)	19(86.4)	16(100)	2.495	0.287
TMR	7(8.5)	2(9.1)	0(0.00)	1.505	0.471	79(96.3)	21(95.5)	16(100)	1.462	0.490	68(82.9)	17(77.3)	13(81.2)	0.373	0.830
Buffer	8(9.8)	2(9.1)	1(6.2)	0.198	0.906	80(97.6)	21(95.5)	15(93.8)	0.706	0.695	50(61.0)	12(54.5)	11(68.8)	0.787	0.675
Probiotics	2(2.4)	0(0.00)	1(6.2)	1.488	0.475	78(95.1)	21(95.5)	16(100)	0.807	0.668	29(35.4)	4(18.2)	6(37.5)	2.545	0.280

of age categories for all technologies because in all categories awareness was above 95 per cent and difference was non significant (P< 0.05)which means that all technologies were grasped well and equally by all categories. In post test II awareness about mineral mixture, UTWS, silage was retained by 100 per cent of respondents but for hay, bypass fat, bypass protein, TMR, buffers and probiotics awareness was lost. However, the difference of awareness between categories was significant only for bypass fat (P< 0.05) i.e. category II lost it the most (81.8vs 97.6 & 93.8 per cent for category I and III respectively). Kumari *et al.* (2010) also observed that mean knowledge score of respondent (11.5) before training increased to 34.74 after exposure of training but there was a non-significant decline in knowledge (33.37) retained by farmwomen fifteen days after the training as compared to immediately after the training. Statistical analysis depicts that awareness varied with age, but this variation was significant only for two technologies i.e. silage, before the training (highest in category II) and bypass fat, after the training(Highest in category I). Thus it can be inferred that technology wise no definite pattern could be observed. Training improved the awareness irrespective of description of age and technology involved and brought them at a common level.

Table 5 depicts that highest percentage of respondents belonging to education group IV (Post graduates) were aware about all technologies except TMR and buffers. Difference of percentage was significant for Hay (37.5 vs 4.4, 13.5, 20.0 percent for gp I, II and III respectively), (P<0.05), BF (37.5 vs 4.4, 28.5, 20.0 percent, for gp I, II and III respectively) (P<0.01) and BP(37.5 vs 0.0,28.5,20.0 per cent , for gp I, II and III respectively) (P<0.01)i.e. significantly highest percentage of post graduate respondents were aware about these technologies. In pre test familiarity was lowest in matriculates for all technologies except the UL. After the training in post test I awareness soared in all the four categories and varied between 87.5 to 100 per cent irrespective of the group and this difference between categories became non significant for all technologies indicating again that training covered up the effect of education (P<.05). In post test II percentage of aware respondents reduced as compared to Post test I and varied between 26.9 to 100 per cent but it was still higher than pre test.

Technology wise no definite and significant pattern of awareness w.r.t education level was observed except

Table 5: Awareness of respondents towards different technologies w.r.t. education

Name of technology	Pre test						Post test I						Post test II					
	Matri-culation (n=45) I	10+2 (n=52) II	Gradu-ation (n=15) III	PG (n=8) IV	PSE	p-value	Matri culation (n=45) I	10+2 (n=52) II	Grad-uation (n=15) III	PG (n=8) IV	PSE	p–value	Matri-culation (n=45) I	10+2 (n=52) II	Grad-uation (n=15) III	PG (n=8) IV	PSE	p-valve
Mineral mixture	18(40.0)	21(40.4)	8(53.3)	3(37.5)	0.984	0.805	45(100)	52(100)	15(100)	8(100)	-	-	45(100)	52(100)	15(100)	8(100)	-	-
UTWS	6(13.3)	7(13.5)	3(20.0)	2(25.0)	1.116	0.773	45(100)	52(100)	15(100)	7(87.5)	6.767	0.08	45(100)	52(100)	15(100)	8(100)	-	-
UL	7(15.6)	6(11.5)	2(13.3)	1(12.5)	0.342	0.952	45(100)	52(100)	15(100)	8(100)	-	-	43(95.6)	52(100)	14(93.3)	7(87.5)	4.569	0.209
Silage	17(37.8)	31(59.6)	7(46.7)	5(62.5)	5.179	0.159	45(100)	52(100)	15(100)	8(100)	-	-	45(100)	52(100)	15(100)	8(100)	-	-
Hay	2(4.4)	7(13.5)	3(20.0)	3(37.5)	8.057	0.045*	44(97.8)	50(96.2)	14(93.3)	8(100)	1.008	0.799	31 (68.9)	35(67.3)	10(66.7)	4(50.0)	1.110	0.775
Bypass fat	2(4.4)	15(28.8)	3(20.0)	3(37.5)	11.182	0.011**	45(100)	52(100)	15(100)	8(100)	-	-	42(93.3)	49(94.2)	14(93.3)	8(100)	0.572	0.903
Bypass protein	0(0.00)	15(28.8)	3(20.0)	3(37.5)	16.464	0.001**	44(97.8)	52(100)	15(100)	8(100)	-	-	43(95.6)	46(88.5)	14(93.3)	8(100)	2.492	0.477
TMR	3(6.7)	5(9.6)	1(6.7)	0(0.00)	1.044	0.791	44(97.8)	50(96.2)	15(100)	8(100)	.991	0.804	35(77.8)	40(76.9)	15(100)	8(100)	6.399	0.094
Buffer	2(4.4)	7(13.5)	1(6.7)	1(12.5)	2.577	0.462	42(93.3)	52(100)	15(100)	7(87.5)	5.948	0.114	24(53.3)	32(61.5)	11(73.3)	6(75.0)	2.731	0.435
Probiotics	0.00	1(1.9)	1(6.7)	1(12.5)	5.575	0.134	44(97.8)	49(94.2)	15(100)	7(87.5)	2.804	0.423	15(33.3)	14(26.9)	6(40)	4(50.0)	2.253	0.522

Figures in parenthesis indicate per centage; UTWS: Urea treatment of wheat straw, UL: Uromin lick TMR: Total mixed ration, ***P<0.01, *P<0.05*

Table 6: Awareness of respondents towards different technologies w.r.t. experience

Technology	Pre test					Post test I					Post test II				
	Upto 5 (n=85) I	6-10 (n=17) II	>10 (n=18) III	PSE	p-value	Upto 5 (n=85) I	6-10 (n=17) II	>10 (n=18) III	PSE	p-value	Upto 5 (n=85) I	6-10 (n=17) II	>10 (n=18) III	PSE	p-value
Mineral mixture	37 (43.5)	4 (23.5)	9(50.0)	2.936	0.230	85(100)	17(100)	18(100)	-	-	85(100)	17(100)	18(100)	-	-
UTWS	12 (14.1)	4(23.5)	2(11.1)	1.235	0.539	83(97.6)	17(100)	18(100)	0.837	0.658	85(100)	17(100)	18(100)	-	-
UL	12(14.1)	3(17.6)	1(5.6)	1.261	0.532	85(100)	17(100)	18(100)	-	-	82(96.5)	17(100)	17(94.4)	0.872	0.647
Silage	44(51.8)	11(64.7)	5 (27.8)	5.132	0.077	85(100)	17(100)	18(100)	-	-	85(100)	17(100)	18(100)	-	-
Hay	12(14.1)	2(11.8)	1(5.6)	1.005	0.605	82(96.5)	16(94.1)	18(100)	0.974	0.615	61(71.8)	8(47.1)	11(61.1)	4.185	0.123
Bypass fat	18(21.2)	3(17.6)	2(11.1)	1.001	0.606	85(100)	17(100)	18(100)	-	-	81(95.3)	16(94.1)	16(88.9)	1.110	0.574
Bypass protein	15(17.6)	5(29.4)	1(5.6)	3.451	0.178	84(98.8)	17(100)	18(100)	0.415	0.813	79(92.9)	16(94.1)	16(88.9)	0.426	0.808
TMR	7(8.2)	1(5.9)	1(5.6)	0.228	0.892	82(96.5)	17(100)	18(100)	1.267	0.531	69(81.2)	14(82.4)	15(83.3)	0.052	0.974
Buffer	10(11.8)	0(0.00)	1(5.6)	2.687	0.261	82(96.5)	16(94.1)	18(100)	0.974	0.615	52(61.2)	10(58.8)	11(61.1)	0.034	0.983
Probiotics	3(3.5)	0(0.00)	0(0.00)	1.267	0.531	81(95.3)	16(94.1)	18(100)	0.970	0.616	31(36.5)	3(17.6)	5(27.8)	2.503	0.286

for hay, bypass fat and bypass protein that too during pre test only.

Table 6 depicts that in pre test category of 6-10 yrs experience had highest fraction of respondents aware about UTWS, UL, Silage and bypass protein. While for hay bypass fat, TMR, buffers and probiotics highest percentage of aware respondents belonged to gp I (upto 5 yrs experience). But, this difference of awareness among categories was not significant for any technology. In post test I awareness approached 94.1 to 100 per cent and decreased in post test II. In post test I and II difference of awareness among categories was non- significant.

Data in Table 7 depicts that highest percentage of respondents of group II (6-10 herd size) was aware about mineral mixture (55.2%), UTWS (20.7%) and UL (17.2%). While for silage (79.2%), hay (20.8%), bypass fat (37.5%), bypass protein (41.7%), TMR (12.5), Buffer (20.8%) and probiotics (8.3%) highest number of aware respondents belonged to gp III (respondents with herd size of more than 10). Worth mentioning is that difference of awareness among categories was significant for silage, bypass fat and bypass protein. Laldinpuii (2013) also assessed the knowledge level of small medium and large categories of farmers of Punjab regarding nutritional practices and came out with view that larger herd size farmers had better awareness.

In post test I awareness varied between 93.1 to 100 per cent but without any significant difference between the categories for any of the technology. Which means that training covered up difference of awareness between the categories. In post test II awareness for all categories dipped as compared to post test I. However the difference of awareness among categories was significant for probiotics only (P<0.05) wherein highest fraction of Gp I respondents (having herd size upto 5 animals) could retain their awareness about the technology (41.8 vs 13.8 & 29.2 per cent for Gp II & III, respectively), this could be due to their higher vigour.

Table 8 depicts that in pre test awareness was significantly highest in category II (31-40 yrs age) and lowest in category III. This significant difference of awareness between the categories was not evident in Post test I (98.30, 98.19 and 99.37%). At a gap of six months awareness percentage in all three categories lowered down and varied between 83.78, 76.81 and 83.75 per cent (Nonsignificant difference p<0.05). From pre test to post test I gain of

Table 7: Awareness of respondents towards different technologies w.r.t. herd size

Technology	Pre test					Post test I					Post test II				
	Upto 5 (n=67) I	6-10 (n=29) II	>10 (n=24) III	PSE	P-value	Upto 5 (n=67) I	6-10 (n=29) II	>10 (n=24) III	PSE	P-value	Upto 5 (n=67) I	6-10 (n=29) II	>10 (n=24) III	PSE	P-value
Mineral mixture	23 (34.3)	16(55.2)	11(45.8)	3.83	0.147	67(100)	29(100)	24(100)	-	-	67(100)	29(100)	24(100)	-	-
UTWS	9 (13.4)	6(20.7)	3(12.5)	0.983	0.612	65(97.0)	29(100)	24(100)	1.609	0.447	67(100)	29(100)	24(100)	-	-
UL	9 (13.4)	5(17.2)	2(8.3)	0.903	0.637	67(100)	29(100)	24(100)	-	-	65(97.0)	28(96.6)	23(95.8)	0.078	0.962
Silage	25(37.3)	16(55.2)	19(79.2)	12.790	0.002*	67(100)	29(100)	24(100)	-	-	67(100)	29(100)	24(100)	-	-
Hay	5(7.5)	5(17.2)	5(20.8)	3.674	0.159	65(97.0)	28(96.6)	23(95.8)	0.078	0.962	46(68.7)	18(62.1)	16(66.7)	0.395	0.821
Bypass fat	5(7.5)	9(31.0)	9(37.5)	13.767	0.001**	67(100)	29(100)	24(100)	-	-	64(95.5)	27(93.1)	22(91.7)	0.557	0.757
Bypass protein	6(9.0)	5(17.2)	10(41.7)	13.098	0.001**	66(98.5)	29(100)	24(100)	0.798	0.671	64(95.5)	24(82.8)	18(75.0)	3.804	0.149
TMR	4(6.0)	2(6.9)	3(12.5)	1.106	0.575	65(97.0)	28(96.6)	24(100)	0.787	0.675	56(83.6)	24(82.8)	18(75.0)	0.900	0.638
Buffer	4(6.0)	2(6.9)	5(20.8)	4.925	0.085	64(95.5)	29(100)	23(95.8)	1.324	0.516	42(62.7)	15(51.7)	16(66.7)	1.449	0.484
Probiotics	0(0.00)	1(3.4)	2(8.3)	5.175	0.075	64(95.5)	27(93.1)	24(100)	1.601	0.449	28 (41.8)	4(13.8)	7(29.2)	7.384	0.025*

Figures in parenthesis indicate per centage; UTWS: Urea treatment of wheat straw, TMR: Total mixed ration, **P<0.01, *P<0.05

awareness varied between 73.65-91.28 per cent for all the categories of age. Worth mentioning is that among all, category III had significantly highest gain in awareness (P<0.05, one way ANOVA, Tukey's HSD). From post test I – post test II, loss of awareness was there which varied between 14.51 per cent for I, 20.92 for II and 15.62 percent for category III) without any significant difference (p<0.05) between the categories.

If we compare the awareness retained by three categories it was found that category III retained the most and category I retained the least without any significant difference between them (p<0.05). This depicts that age category III gained maximum during the training. Cohen et al (1992) also concluded that intelligent, highly motivated elderly people show very little deficit in the retention of formally acquired knowledge. Category IV had highest awareness (27.5%). In pre test and lowest awareness gain percentage during post test I (68.75%). On the other hand, category I had minimum awareness (12.67%) in pre test but gained the most (85.70%). Despite difference in percentage of awareness in pre test and variation in gain, awareness was significantly similar for all categories in post test I &II, which reflects the efficacy of training. Loss of awareness was minimum in education category IV (10.0 vs 16.67, 17.19, 13.34 percent for category I, II & III respectively). Retention varied between 81.27 percent (senior secondary respondents) and 85.96 per cent (Post graduate respondents, IV) however the difference was non significant.

It was the only variable where difference of awareness among different categories was non significant even during pre test. On evaluation of the data it can be inferred that in pre test experience category I had highest awareness and III had lowest. Gain in awareness was highest for category III and lowest for I. Loss of awareness during post test I-II was lowest for category I and highest for category III. Even retention was highest for category I and minimum for category II. We can conclude that though non significant, category I had highest awareness in Pre test, lowest gain in post test I, lowest loss in post test II and highest retention among all categories. This was probably due to their more eagerness to learn and expand their enterprise.

Category III (>10 yrs exp) had significantly highest and category I has lowest awareness in pre test. Probably

Table 8: Category-wise mean awareness percentage level, gain and retention (One way ANOVA, Tukey' HSD)

Parameter	Categories	Awareness Pre test (%) ±	Awareness post test I (%)	Awareness post test II (%)	Gain in post test I (%)	Loss in post test II (%)	Retention (%)
Age (years)	18-30	19.51±1.885^{ab}	98.30±0.409	83.78±1.161	78.8±1.794^{a}	14.51±1.278	82.61±1.206
	31-40	24.10±1.623^{b}	98.19±0.250	76.81±1.2042	74.08±1.680^{a}	20.92±1.315	76.57±1.707
	>40	8.12±1.276^{a}	99.37±0.501	83.75±1.728	91.28±1.258^{b}	15.62±1.884	83.67±1.199
ANOVA	P value< 0.05	0.0219*	0.6038	0.0767	0.00845*	0.1334	0.0486
Education	Matriculation	12.67±1.476^{a}	98.76±0.404	81.87±1.0931	85.79±1.543^{b}	16.67±1.239	80.46±1.134
	Sr secondary	22.11±1.785^{b}	98.46±0.364	81.53±1.5001	79.43±1.738^{b}	17.19±1.566^{a}	79.30±1.513
	Graduation	21.34±1.684^{ab}	99.33±0.258	85.99±1.0556	77.99±1.656^{ab}	13.34±1.046	83.45±1.022
	P. graduation	27.5±2.866^{b}	96.25±0.744	86.25±1.5059	68.75±2.531^{a}	10.00±2.948	83.50±1.698
ANOVA	P <0.05	0.0192	0.3622	0.5448	0.0120*	0.8580	0.6265
Experience	<5 years	19.99±1.877	98.12±0.449	83.54±1.212	78.13±1.802	12.78±1.332	81.53±1.248
	6-10 years	19.40±1.599	98.23±0.393	79.41±1.477	78.83±1.576	18.82±1.691	77.41±1.532
	>10 years	12.8±1.673	100±0.000	80.55±1.551	87.2±1.673	19.45±1.551	79.27±1.539
ANOVA	P <0.05	0.3082	0.2059	0.3935	0.1376	0.2807	0.4692
Herd size(no.)	<5	13.44±1.572^{a}	98.05±0.434	84.48±1.246	84.61±1.510^{b}	13.57±1.400	83.12±1.271
	6-10	23.09±1.605^{b}	98.63±0.350	79.3±1.193	75.54±1.638^{a}	20.34±1.222	76.96±1.181
	>10	28.74±2.173 ^{b}	99.16±0.048	80.84±1.529	70.42±2.136^{a}	19.15±1.633	77.94±1.557
ANOVA	P <0.05	0.0004*	0.5045	0.1604	0.0009*	0.125	0.06235

*****depicts the variable where one or more categories had significant difference of awareness from another group (ANOVA*P<0.05)*
Figures with different superscripts in a category differ significantly (Tukey's HSD P<0.05)

due to higher awareness in pre test, gain in awareness was relatively low in category III in post test I and was significantly highest for category I. Inspite of minimum awareness in pre test (1.34 vs 2.31 & 2.87 per cent), category I managed to have significantly highest gain of awareness (84.48 vs 75.54 & 70.42 per cent) and highest retention (84.34 vs 78.05 & 79.72%) which indicate higher vigour of the farmers with smaller herds to learn more and expand their enterprise.

Post graduate respondents with >40 yrs age, <5 yrs experience and <5 herd size retained the most. Data depicts a relation of profile (independent variables) with awareness for different technologies in pre test which could not be observed in Post test I & II. This could be explained on the basis that training at a common platform camouflaged the quantitative profile of respondents. This also depicts the efficacy of training that such diverse group gained almost equally. Apart from quantitative profile qualitative profile features like eagerness for learning, cosmopolitan nature etc also play their role. Rathod *et al* (2014) endorse this thought as they reported that knowledge level is non significantly correlated with SE factors like age education social participation livestock size, but is significantly correlated with information seeking behavior, major occupation, scientific orientation and economic orientation.

FINDINGS

- During pre test respondents' awareness was highest for silage and mineral mixture and lowest for buffer & Probiotics.
- In Post test I overall awareness about all animal feed technologies improved significantly I and declined in Post test II. Decline of awareness was significant for Hay, TMR, Buffers and Probiotics only. Still awareness in post test II was significantly higher than pre test. This rise happened irrespective of the sociopersonal profile of the trainees.
- In pre test age was negatively correlated with awareness and the result was significant. Trend inversed in post test I and II as here correlation became weakly positive but non significant. Education was positively and significantly correlated in pre test but in post test I correlation became negative and non significant and in post test II it became positive and non significant. Experience was non significantly related during all the three tests. Herd size seemed to have most pronounced effect because it was negatively and significantly associated in pre and post test II both. Non significance of independent variables just after training reveal the efficacy of training and grasping of trainees.
- Technology wise, awareness for only a few technologies were affected by different independent variables. Age was related with awareness for silage in pre test and bypass fat in post test II. Education affected the awareness for technology of hay, bypass fat and bypass protein in pre test and herd size affected awareness for silage, bypass fat and bypass protein in pre test and probiotics in post test II. Any definite relationship could not be recorded.
- Category wise, before attaining the training (In pre test) awareness was significantly highest in respondents belonging to 31-40 yrs age group, post graduate qualified group, respondents having upto 5 years experience (non significant) and respondents having herd of more than 10 animals.
- After the training highest gain in awareness was recorded for respondents belonging to >40 yrs age group (w.r.t age), matriculation qualified group (w.r.t education), respondents with more than 10 yrs of experience (w.r.t. experience) and respondents having herd of <5 animals (w.r.t herd size).
- In post test I & II non significant difference was recorded in percentage of awareness among all categories of independent variables.
- No significant difference was there in percentage loss of awareness (from post test I – II) and retention for any of category of any independent variable.

CONCLUSION

Before the training all variables under study (except experience in dairy farming) affected the awareness about dairy nutrition technologies. Learning during the training camouflaged these effects and brought the trainees at a similar level of cognition. A gap of six months after the training lowered this cognition level for all the technologies but, non significantly. Hay, TMR, Buffers and Probiotics were the few exceptions where the decline of awareness was significant depicting their non inception in field. After the training highest gain in awareness was recorded for experienced and lower qualified respondents of higher age group and those having small herd size. However,

overall awareness percentage at a gap of six months after the training and percent retention was statistically similar for all categories. Which means that training camouflaged the effect of independent variables and brought immutable improvement in awareness. Improvement in awareness depicts that extension training programme should be extensively and regularly organized to inculcate the scientific information into farmer minds. Further. For covering up the loss of knowledge due to time gap after learning or lack of adoption, regular sending the salient points to farmers through various tools and technological backstopping can refresh his information and persuade him to adopt the technologies.

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Review of the Mahatma Gandhi National Rural Employment Guarantee Act: with Special Reference to Jammu and Kashmir

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ABSTRACT

The act started functioning from 2nd February 2006. It was renamed as 'Mahatma Gandhi National Rural Employment Guarantee Act' on 2-10-2009. Initially, it was renamed in 200 districts of the country and later extended to all districts in the country. The present study by using secondary data has shown that the programme has a positive impact upon the wage employment and also helped in raising the livelihood and the living standard of the rural areas. The Act has restricted the rural poor to their areas and stopped migration to the cities. So, it has helped in solving the problem of distress migration. The impact of the migration is multi-dimensional as it has helped in ameliorating the situation of the rural women, in particular and rural society, in general. The present study has also focused upon the UT of J&K with respect to its performance in the scheme. The study has brought out that the UT has fared well on many grounds but still lacking in some aspects. A comparative analysis of the UT with respect to nation has also been made. Finally, the study has delineated some policy recommendations for the improvement in the scheme.

Keywords: Distress migration, MGNREGA, Wage employment

INTRODUCTION

MGNREGA was the programme initiated by the government of India was unprecedented in nature. This programme aims at the 'right to work' and enhancing livelihood security in rural areas by providing at least 100 days of wage employment to unskilled manual workers. Also, another aim of MGNREGA is to create durable assets (such as roads, canals, ponds and wells). Therefore, this programme not only created the employment opportunities for rural sector but also helps in the development of the rural infrastructure. This programme has so much impact on the rural development that the World Development Report 2014 termed it as a "Stellar example of rural development". The magnitude of this programme was to the extent that the World Bank has referred to it as the "largest public works programme". It therefore, will not be inappropriate to say that MGNREGA has no parallel in existence in present scenario. This act was first proposed by Rao (1991) but was finally approved by the Indian parliament in September 2005 and was starting functioning from 2nd February 2006. It was renamed as 'Mahatma Gandhi National Rural Employment Guarantee Act' on 2-10-2009.

As far as the state of Jammu & Kashmir is concerned, the implementation of the scheme was started from 2005-06 in districts of Poonch, Doda and Kupwara. The scheme is implemented by the Assistant Commissioner Development (Project Officer, Wage Employment) as District Programme Coordinator at the district level and by the Block Development Officers as the programme officers at the block level. Annu Devi Gora (2016) found out in the study on Job satisfaction and problems perceived by the women workers of MGNREGA in Jaipur district of Rajasthan that a major chunk of the women were from the marginalized groups. About 41.67 per cent were from the Scheduled caste groups. Bhati *et al.* (2016) studied and delineated the major constraints faced by the beneficiaries of MGNREGA. The major constraints includes lack of medical facilities, lack of unemployment allowance, no variations in the wage rate etc. Prasad (2017) has showed the positive impacts of the MGNREGA on the rural poor like the increase in wages, income, employment days etc. Ashish *et al.* (2018) in their study found out the per family average annual income from the five different earning systems, which composed of three occupations i.e., NTFPs collection, agriculture (kharif rice) and wage earning,

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respectively. The study revealed that that among the wage-earning section, the respondents were mostly engaged with the MGNREGA works. Naikoo and Guroo (2018) has found in their study on Kulgram district of J&K that the act has a great impact on the peoples health and hygiene, created assets for economic development, provided irrigational facilities which led to agricultural growth, arranged the proper drainage system and made the flood control bunds for the safety of agricultural land. The study also analyzed that the women of the study area are interesting to work under MGNREGA. This act provided greater economic independence to women and provided them opportunity to earn in their locality.

MATERIALS AND METHODS

Data were collected from secondary sources like government documents, research papers, MGNREGA official internet site etc. The simple analytical tools like graphs and tabulation were employed for making out the analysis and the comparative studies.

RESULTS AND DISCUSSION

According to the Sameeksha report of 2012, MGNREGA has provided around Rs 1,10,700 crore (66% of the total expenditure of around Rs 1,66,000 crore) as worker wages from FY 2006 up to FY 2011–12. So, the scheme has resulted in the enhancement of the rural purchasing power which has overall increased the demand side of the rural economy. The importance of MGNREGA as a supplementary source of income is also noted by some studies. In a longitudinal survey of 1,064 rural households across Medak district of Andhra Pradesh, around 12 per cent of the households indicated that their household income had increased as more members of the same household were being able to work. Further, evidence suggests that MGNREGA is succeeding as a self-targeting program, with high participation from marginalized groups including the SCs and STs. Evidence suggests that women are participating in the Scheme more actively than in other works which has further led to the reduction of the traditional gender-wage discrimination. Research also indicates that MGNREGA is an important work opportunity for women who would have otherwise remained unemployed or underemployed. MGNREGA has also led to the economic independence and empowerment of women. Preliminary findings suggest that the increased access to paid work due to MGNREGA has had a positive impact on women's socio-economic status and general well-being. In Kerala, *Kudumbashree* (started by the Government of Kerala) is a unique program that aimed at the reduction of the poverty and strengthening of the community development societies, which works at the village panchayat levels. This thus pave the way of the better implementation of the scheme by approaching the "bottom-up" approach rather than the "top-down" approach. These societies working in tandem with those of the Panchayats. Therefore, in this way it also helps in achieving the goal of democratization of democracy.

Studies have indicated a positive return on investment for MGNREGA assets. The scheme has led to the increase in the water availability via increasing groundwater levels. In this way, the scheme paved the way for increasing the productivity of the rainfed areas. As the groundwater is less polluted, there has been observance of the increment in the availability of the drinking water for humans and livestock.

Bhaskar *et al* (2015) reported that the MGNREGA assets, specifically wells, can lay the foundation stone for improvements in agricultural production, increased income and better livelihood. One of the main advantages of MGNREGA is that it provided a dignified life to the labourers. By breaking the shackles of the debt-bondage or contract labour, the scheme has lifted the living standard of the rural masses and helped in achieving the goal of reducing overall in-equality in the society.

Further, the scheme has resulted in the reduction of the distress migration from rural areas to the urban areas. This has not only reduced the burden over the cities but also increase the overall productivity of the masses as now they can work in the proximity of their homes. Though the scheme was not directly entitled for the marginalized groups as such, but, the scheme has very positive impact upon them. The scheme has led to the enhancement in the income of these groups by increasing their productivity levels. Take for example, the *Kapildhara* Scheme. The *Kapildhara* Scheme in Madhya Pradesh is a convergence between MGNREGA, agriculture and horticulture departments. The Scheme provides farm ponds, dug wells, tanks for increasing water availability on the lands of farmers who have more than 1 hectare of land and belong

Table 1: All states physical progress (As on 20.12.2019)

SC person days % as of total person days	19.96
ST person days % as of total person days	17.87
Women person days out of total (%)	55.73
Average days of employment provided per household	39.69
Average wage rate per day per person (Rs)	181.38
Total no. households completed 100 days of wage employment	1106781

(*Source*: https://mnregaweb2.nic.in)

to SC/ST and BPL families. Gora (2016) study on Job satisfaction and problems perceived by the women workers of MGNREGA in Jaipur district of Rajasthan showed that the majority of the women i.e. about 41.67% were from Scheduled caste (Table 1).

Preliminary findings indicate that MGNREGA works have led to a rise in groundwater, improvement in soil quality and reduction in vulnerability of production systems to climate variability (by strengthening livelihood and water security). Micro-level studies indicate that the water conservation structures, desilting of traditional water bodies, plantations and other works taken up in MGNREGA, have improved water percolation and helped recharge groundwater. Aplication of excavated silt from MGNREGA works has added to soil fertility. Further, MGNREGA has created an important linkage between the agriculture and sustainable development by creating "green jobs" (Table 2).

MGNREGA, thus, helps a lot in the improvement in the cropping intensity, thereby, it can assist in meeting the food security of the nation by increasing the cropping intensity per unit area (Figure 1). Andhra Pradesh has the highest success in the agriculture-related works. This can be accounted to their perspective towards the agriculture sector as they look agriculture in terms of the family values. Further, the expenditure on agriculture and related NRM (Natural Resource Management) is commendable as can be observed from the Table 3.

The Figure 2 shows the asset generation status of the state. State has formulated the State Convergence Plan (SCP) for the FY 2016-2017 for the creation of durable and sustainable assets (in numbers) under the scheme (Figure 2). As the Jammu and Kashmir is the second largest union territory after Ladakh, the villages are located at the distant places in comparison to each other and at the same time, these were not well connected. MGNREGA assisted the state in the rural connectivity as the maximum expenditure was allocated to the rural connectivity (As on 21.12.2019) as shown in Figure 3. At the erstwhile state level, the maximum benefit has been to the land development category. Land development is a broad category that includes the range of activities like soil development, land development, development of waste

Table 3: All States Program Specific Details on MGNREGA (As on 20.12.2019)

Total No. of works taken up (new + spill over)	15792000
Number of ongoing work	10594000
Number of completed work	5198000
Number of GPs with NIL exp	12278
Total no. of workers	262792000
Percentage of NRM Exp. (Public + Individual)	67.31
Percentage of expenditure on agriculture and agriculture allied works	70.86

(*Source :* https://mnregaweb2.nic.in)

Table 2: Impact of MGNREGA Works On Irrigation (as reported by the beneficiaries in the four districts in the four states.) - A Case Study

District (State)	No. of villages reporting increase in irrigated area	Increase in irrigated area (ha)	No. of villages reporting increase in the number of days of water availability	Increase in the average number of days of water availability	Percentage increase in cropping intensity
Medak (Andhra Pradesh)	4	12.4-57.0	10	13-88 days	0.9-15.9
Chitradurga (Karnataka)	8	1.7-44.1	5	5-45 days	5.8-26.7
Dhar (Madhya Pradesh)	10	0.9-5.8	10	190-365 days	53.9-123.1
Bhilwara (Rajasthan)	8	0.2-2.3	7	30-90 days	0

(*Source :* MGNREGA, Sameeksha two)

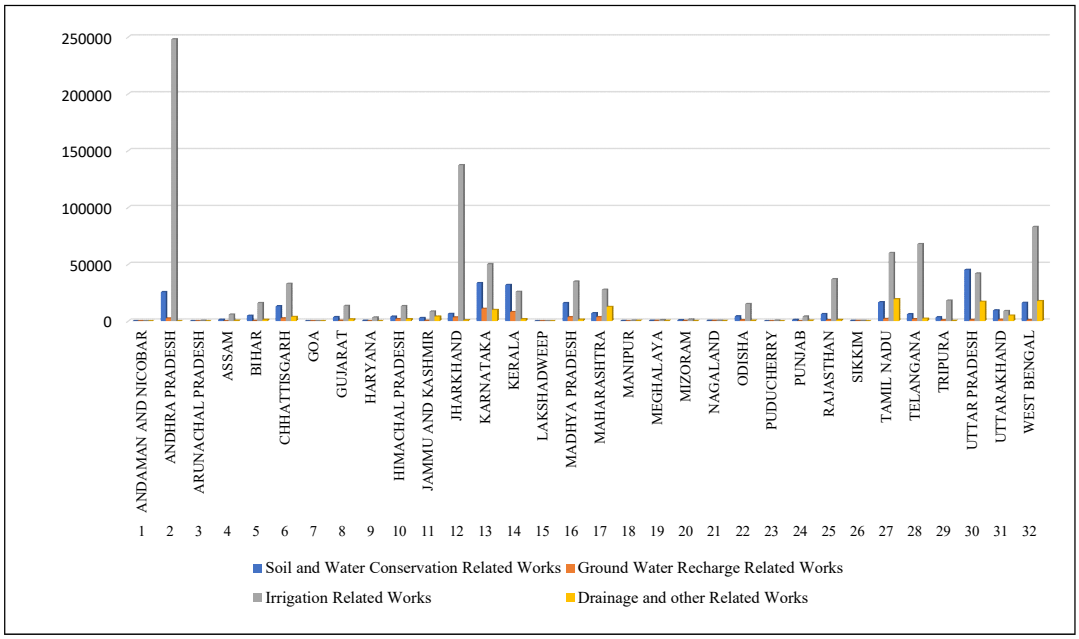


Figure 1: Total number of the agriculture-related works of different states
(Source :https://mnregaweb2.nic.in)

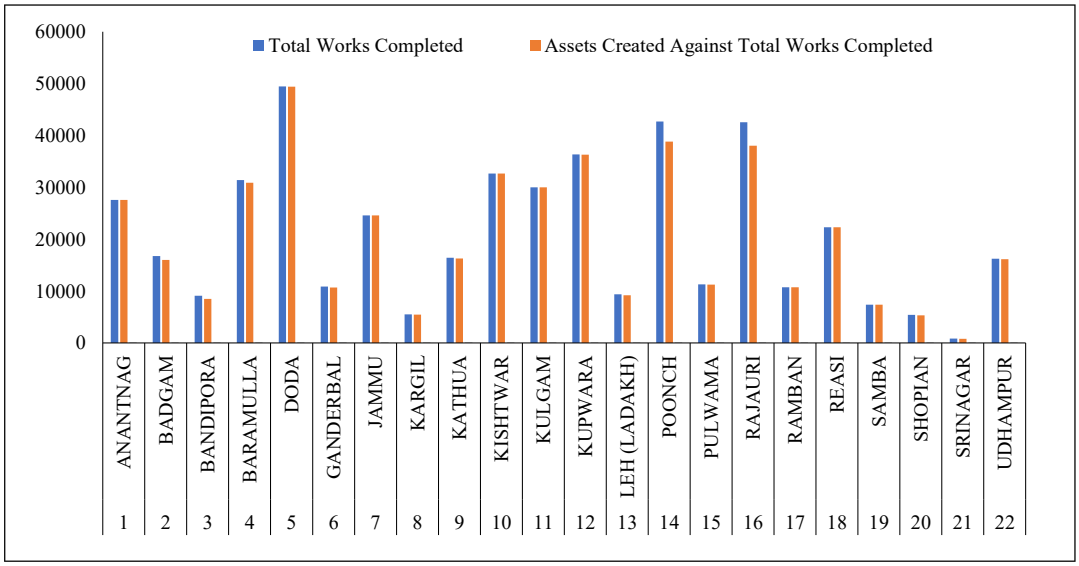


Figure 2:
(*Source :* https://mnregaweb2.nic.in/)

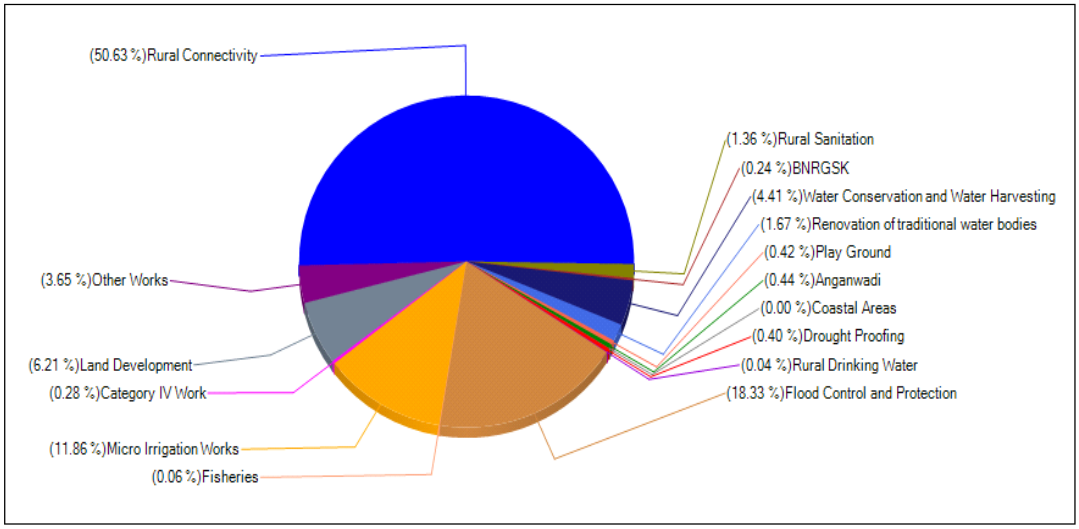


Figure 3: Expenditure on Works Taken up in FY 2017-2018
(*Source* : https://mnregaweb2.nic.in)

Table 4: Works Outcome at UT Level

Work Category Name/ Work Type	Completed Works	Outcome/Area Benefited
Water Conservation	2942	10886
Irrigation	8771	57887
Traditional water bodies	3428	4456
Afforestation	209	460
Land development	6672	113421
Total	22022	187110

(*Source:* MGNREGA Division, MoRD, GOI, 2016)

land, construction of drainage channels, improve the fallow land etc. (Table 4). So, the UT has encountered a development in the assets creation and also helped in not only providing the income to the farmers but also in the overall development of the rural area. The following graph shows the progress of J&K over the last four years (as on 05.01.2020). So, there has been increase in the average wage rate per day per person over the years. So, the scheme has led to the enhancement of the purchasing power of the rural sector in the rural areas (Figure 4).

Though the J&K has gained a lot from the inception of the scheme. But still, lot more has to be done before the J&K stands among the leading states and UTs. The expenditure performance on agriculture of the J&K is abysmal as compared to the state level. According to a report, the percentage expenditure of agriculture and allied works in UT is less than 40 per cent, whereas, it is as high as 70 per cent in case of India as shown in Figure 5. Moreover, the works related to the afforestation is also not very significant when compared to the national level. This has been to be seen in the context of the geographical

Figure 4:
(*Source :* https://mnregaweb2.nic.in/)

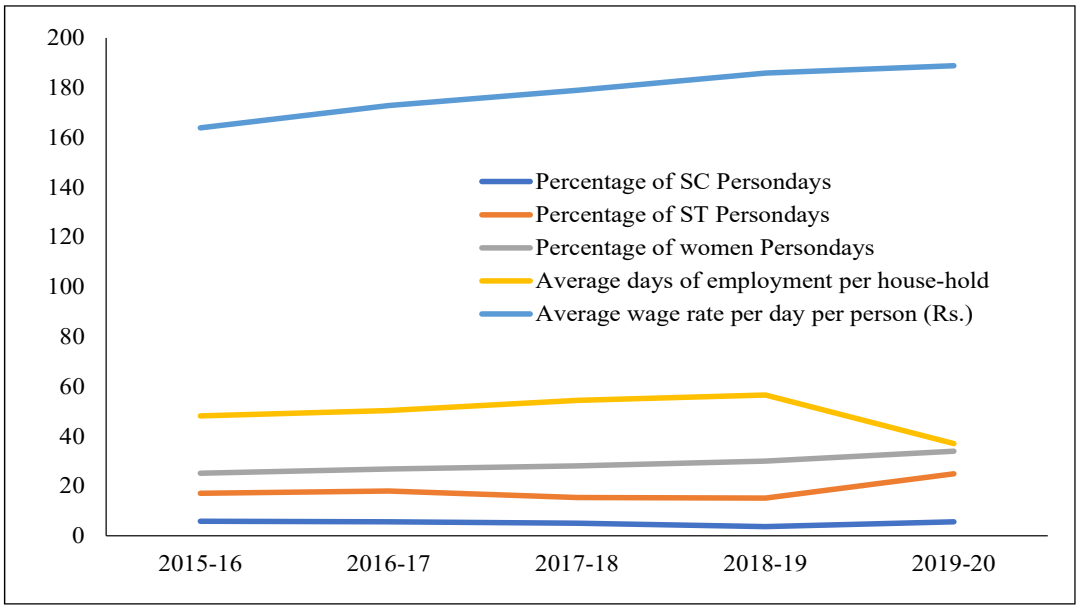
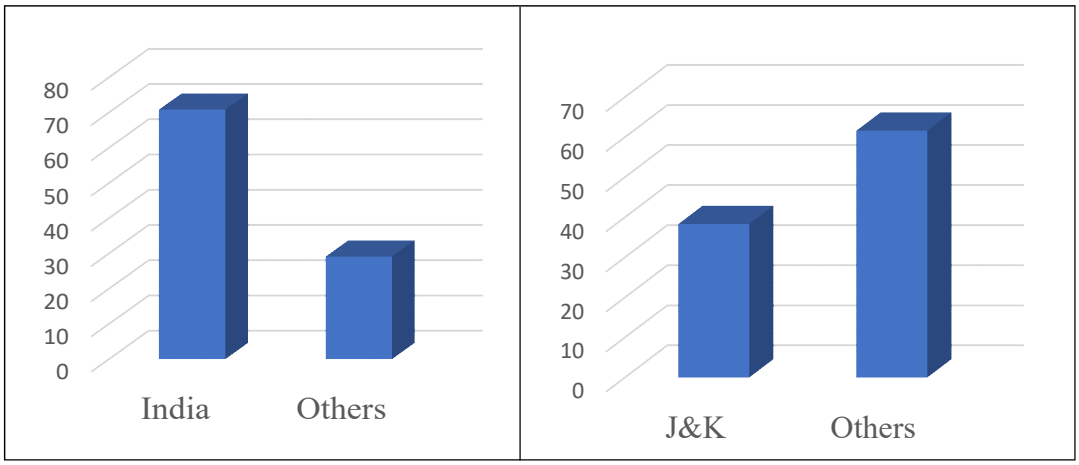


Figure 5: Status of J& K viz-a-viz India



landscape of the Ut where the UT has been blessed with conditions favourable for the afforestation. The major difference can be observed among the liabilities. There are huge liabilities in MGNREGA in J&K as compared to almost nil in case of India. There is an issue of delay in payment of wages. In addition, there is widespread corruption among the grass-root levels.

CONCLUSION

From the above discussion, it can be concluded that there is huge need of overall increasing expenditure level in the agriculture sector. The share of agriculture in the UT gross domestic product is more than the national level and it stands around 16 per cent. So, the increasing expenditure will give an impetus to the UT GDP. The corruption at the lower level i.e. sarpanch and panch level needs to be minimised. This can be done by the proper implementation of the auditing process as well as the right to information act. The minimisation of the corruption will help in the upgradation of the conditions for the marginalized sections. This will further help in the better implementation of the scheme. Further, the *Kapildhara* type schemes needs to be initiated in the J&K for two major benefits.

Primarily, the scheme will integrate the agriculture and the horticulture sectors. Horticulture is one of the most important sectors of the UT which contributes directly or indirectly to the poverty alleviation by improving the employment generation potential of the UT. Secondly, this type of scheme will help in ameliorating the conditions of the marginalized sections in particular, and the rural sector, in general. No doubt, MGNREGA has helped in lifting the living standards of the marginalized sections but still the lot more has to be done to benefit the most vulnerable sections of the population and higher wages, more work opportunities, proper implementation and the enhanced role of the women is required, if this policy has to attain its goals (Breitkreuz, 2017). The MGNREGA has a particular benefit for the rainfed or "kandi" areas of the J&K for three main reasons. First, it will help in the construction of the rural assets. Secondly, it will help in increasing the income level of the farmers of the "kandi" areas where the farmers are generally poorer as compared to the farmers of the irrigated areas. Finally, the activities like construction of wells, introduction of plantation crops, etc. has some capability to recharge the ground water table of these regions to some extent. Last, but not the least, the role of SHGs cannot be disregarded, as the studies (Mridula, 2018) indicated that the SHGs maintained a considerable level of goodwill among the respondents that helps them not only in phasing out the constraints, but, at the same time, helped in the adopting the schemes suitable for the community in general. MGNREGA has provided employment to the rural people when their jobs were curtailed due to the shutdown of the industrial units in the urban cities. A case study of Trichy village indicated that the farmers are exhorting the government to enhance the number of days from 100 to 150 days as it will assure the farmers of attaining some income during the period of pandemic (PIB, 2020).

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SWOT Analysis of Horticulture Based Entrepreneurial Development Potential in Uttar Pradesh and Maharashtra

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ABSTRACT

The present study was conducted to analyse the potential of entrepreneurial development in Maharashtra and Uttar Pradesh, considering its significance in the national horticulture production. Nasik and Nagpur from Maharashtra and Agra and Lucknow from Uttar Pradesh were selected purposively for the study. While employing the SWOT methodology, it was found that the raw material's timely availability (MPS = 93.33) and high aspiration of people to diversify their source of income (MPS = 90.00) were the two major strengths in the entrepreneurial environment of Uttar Pradesh. At the same time, the prevalence of resource-poor small and marginal farmers (MPS = 90.00) and inadequate information and technical support on a regular basis (MPS = 86.66) were the critical weaknesses. While in the case of Maharashtra, strong network of farmers cooperatives/organizations (MPS=90.00) and positive entrepreneurial culture (MPS = 83.33) were identified as significant strengths for hortibased entreneurial development. However, the seasonality of raw products (MPS = 86.66), lack of access to modern machinery (MPS = 83.33), and poor access to credit to small farmers were the critical weaknesses. This study suggests the need to develop timely and need-based government intervention and favorable policy supports to address the limitation and fully realize the true potential of horticulture.

Keywords: Entrepreneurial culture, Institutions, SWOT analysis

INTRODUCTION

The growth and sustainable development of the Indian economy predominantly depends on agriculture. It is an essential raw materials source for industries like fertilizers, pesticides, and various consumer goods (Bairwa *et al.*, 2014). Among the different sectors of agriculture, horticulture has been increasingly recognized as the sunrise sector because of its potential to increase farm income, the support provided to the nation's livelihood and nutritional security, and its capacity to secure foreign exchange through export (Jha *et al.,* 2018). India is the second-largest producer of fruits and horticulture in the world after China. The horticultural sector's significance in the Indian economy is well evident as it accounts for 30 per cent of India's agricultural GDP from a cropped area of 8.5 per cent. Though the production front of Indian horticulture has made many advancements, a significant portion of the produce goes wasted due to the poor after harvest management practices and deficiencies observed in the infrastructure development. In India, Uttar Pradesh and Maharashtra are the two most important states as horticulture production is concerned. Uttar Pradesh accounted for 1.25 million hectares of vegetables, with a production of 27703.82 '000 MT and 491 thousand hectares of fruits with a production of 10651.26 '000 MT (Statista, 2020; GOI, 2019). Uttar Pradesh is the largest producer of mango in the country, with a nearly twenty-four percent contribution in total production. However, post-harvest losses at the different stages are pretty staggering, almost 19.5 per cent (Gurjar *et al.*, 2017).

Similarly, Maharashtra contributes about 5.9 per cent of total vegetable production in India and the largest producer of the fruits like oranges, grapes etc. (NHB, 2017). Despite being one of the largest producers of horticultural crops, the post-harvest losses in relatively high ranging from 20-25 per cent in the state (Kumar *et al.,* 2018). The

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quantum of the post-harvest losses demands urgent intervention in the value chain development side to make the production a profitable venture. The foremost thing for the value chain development is creating an entrepreneurial environment that motivates the actors to participate in the post-harvest and value addition activities. According to Gnyawali and Fogel (1994), entrepreneurial environments can be defined as collecting all tangible and intangible factors critical for developing entrepreneurship or business opportunities in a particular region. It varies from location to location as the external factors vary. In this context, this study was planned to assess the significant potentials and constraints as perceived by the stakeholders in initiating/establishing the small-scale entrepreneurial ventures in horticulture in both the states.

MATERIALS AND METHODS

The present study was conducted in the Uttar Pradesh and Maharashtra states. Considering the production potentials, Agra and Lucknow district from the Uttar Pradesh and Nasik and Nagpur districts from Maharashtra were selected purposively for this study. Other than the farmer respondents, ten extension personnel from various institutions like line departments, district industrial centers, research institutes, financial institutes, and farmer organizations were selected from each district. SWOT methodology was used to identify the potentials, weaknesses, opportunities, and threats associated with the two states' entrepreneurial development environment.

This methodology uses the internal analysis to identify resources, capabilities, core competencies, and competitive advantages inherent to the system and the external analysis to identify market opportunities and threats by looking at competitors' resources, the industry environment, and the general environment. In the first phase of the study, a detailed review of the literature and elaborate discussion was done to identify the various elements considered for the study. In this way, an exhaustive list of various dimensions regarding strength, weakness, opportunities, and threats in Horti-based entrepreneurial development was prepared. Then, the strengths, weaknesses, opportunities, and potential threats of the respective states were categorized, and respondents were asked to rate them as per their perceived importance on a 3 point continuum. Based on the respondents' responses, mean percentage scores were calculated, and ranks were assigned to each statement.

RESULTS AND DISCUSSION

The finding of the study is purely based on the perception of the stakeholders/respondents. Results presented in Table 1 showed that the timely availability of the raw materials for the value addition (with a mean percentage score of 93.33) was the most crucial forte of the available entrepreneurial environment of Uttar Pradesh as identified by the farmers. It was followed by the people's high aspiration to diversify their source of income (mean percentage score 90.00). Relatively high productivity of horticultural crops in the area (MPS = 86.66) and the connectivity and available transportation facilities in the state (MPS = 83.33) are also identified as the major strength of the entrepreneurial environment of the state.

The presence of a large number of resource-poor small and marginal farmers (mean percentage score of 90.00) was reported as the most crucial weakness by experts, followed by inadequate informational and technological support regularly with MPS equal to 86.66. Lack of awareness (MPS = 83.33) about different aspects of the processing and marketing (MPS = 76.66) and lack of the desired level of infrastructure (MPS = 80.00) were ranked as 3rd and 4th respectively among the identified weaknesses. Weakness like lack of adequate provision of credit support (MPS = 76.66), inadequate institutional support (MPS = 73.33), and lack of entrepreneurial spirit (MPS = 66.60) among the masses was perceived with a rank of 5th, 6th and 7th, respectively in the horticulture sector in the concerned study area of U.P.

While analyzing the opportunities, it was found that the ever-increasing demand for processed fruit and vegetable products (MPS = 86.66) was ranked as the significant opportunity available in the entrepreneurial environment of Uttar Pradesh. The facilitation observed in the government policy implementation (MPS = 83.33) and many skill-based institutes present in the state (MPS = 80.00) were also identified as the significant opportunities for the potential benefits reap from horticulture-based entrepreneurship. The inflow of private sector investment in the agro-processing sector (MPS = 76.66), mobilization of farmers into farmers group (MPS = 73.33), and developing cold storage and preservation unit (MPS = 70.00) were considered other significant emerging opportunities for entrepreneurial development in the horticulture sector in the state.

Table 1: SWOT Analysis of Uttar Pradesh for potential of entrepreneurial development in horticulture sector (n=20)

No.	Strength	MPS	Rank	Weakness	MPS	Rank
1	Availability of raw material	93.33	I	Lack of awareness	83.33	III
2	Availability skilled labour at optimal rate	63.33	VII	Resource poor small and marginal farmer	90.00	I
3	Demand of processed products in the local area and nearby cities	66.66	VI	Lack of institutional support	73.33	VI
4	Nearby market facilities	73.33	V	Lack of desired infrastructure	80.00	IV
5	Road connectivity and transportation facilities	83.33	IV	Lack of timely and adequately credit support	76.66	V
6	High aspiration of people to diversify their source of income	90.00	II	Inadequate informational and technological support on regular basis	86.66	II
7	Productivity of horticultural crops are relatively high	86.66	III	Lack of entrepreneurial spirit among the masses	66.60	VII
	Opportunities			**Threats**		
1	Increasing demand for processed fruits and vegetable products	86.66	I	Increased competition from multinationalcompanies	90.00	I
2	Government policy facilitation	83.33	II	High standards of processed and value added products in global market	83.33	III
3	Development of new cold storage and preservation unit	70.00	VI	Inability to cope up with the technological advancement (in processing, testing, quality control) etc.	86.67	II
4	Mobilization of farmers into farmers producer group	73.33	V	Lack of inter- institutional coordination among various institutions	70.00	V
5	Presence of skill based institutes	80.00	III	Knowledge gap of farmer / farmers cum processor	76.66	IV
6	Inflow of private investment in processing sector	76.66	IV			

*MPS = Mean Percentage Score

Increased competition from multinational companies with a mean percentage score (80.00) was the most severe threat concerned with the state's current entrepreneurial environment. It was followed by an inability to cope with rapidly changing technological advancement in processing (MPS = 86.67) and a high standard of fresh and processed fruits and vegetable products in the global market (MPS = 83.33). The knowledge gap of farmers/farmer cum processors (MPS = 76.66) was perceived as another significant threat. The reduced level of coordination of various institutions at the intra-divisional and inter-organizational level (MPS = 70) was also identified as a major threat for developing a value chain-based entrepreneurial climate in the state.

The SWOT analysis (Table 2) done for the state of Maharashtra regarding the perceived potential of entrepreneurial development with the help of experts revealed that the state's primary strength is the strong network of farmers' cooperatives/organizations (MPS = 90.00). the observed level of positive entrepreneurial culture (MPS = 83.33) and strong resource base of farmers (MPS = 80.00) were ranked as 2nd and 3rd important strengthening factors. Other major strengths responsible for the high growth of horticultural-based enterprises in the state were the availability of an adequate technological and informational support system (MPS = 76.66), suitable geographical location, and climate of the state (MPS=73.33), risk taking ability of farmers (MPS = 72.22) and skilled human resource.

Among the various weaknesses, raw products' seasonality (MPS = 86.66) was identified as the most critical element. It was followed by a lack of access to modern machinery (MPS = 83.33) and the cumbersome formalities to establishes an enterprise (MPS=80.00). Similarly, poor access to credit to small farmers as well as small to medium scale processor (MPS = 76.66), lack of knowledge (MPS = 73.33), and lack of professional management of farm enterprises (MPS = 70.00) were found to be some other weakness in realizing the true potential of entrepreneurial opportunities existed in horticulture. From the data in table 2 it was clear that the existence of a vast market (domestic as well as international) for processed and value-added products was a significant opportunity (MPS = 90.00) for the available entrepreneurial environment of Maharashtra state. It was followed by the favourable policy environment and government support (MPS = 8.66) and a strong production base at very competitive cost pricing (MPS =

Table 2: SWOT Analysis of Maharashtra for potential of entrepreneurial development in horticulture sector (n=20)

No.	Strength	MPS	Rank	Weakness	MPS	Rank
1	Suitable geographical conditions	73.33	V	Lack of knowledge	73.33	V
2	Strong resource base of farmers	80.00	III	Poor access to credit to farmers as well as small to medium scale processor	77.66	IV
3	Positive entrepreneurial culture	83.33	II	Lack of professional management	70.00	VI
4	Uninterrupted power supply	70.00	VII	Lack of access to modern machinery	83.33	II
5	Strong network of farmers' co-operative /Organization	90.00	I	Seasonality of raw products	86.66	I
6	Adequate technological and information support system	76.66	IV	Cumbersome formalities to establishes anenterprise	80.00	III
7	Educated and skilled human resource	66.66	VIII			
8	Risk taking ability of people	72.22	VI			
	Opportunities			**Threats**		
1	Large market for export in local and global market	90.00	I	Extreme competition from globally established brand.	73.33	III
2	Increasing demand for processed fruit and vegetable products in domestic as well as international markets	86.66	II	Largely small scale capital investment	80.00	II
3	Changing consumption and expenditure pattern of people	73.33	V	Lack of adequate institutional support	70.00	V
4	Growing penetration of organized retail in the country	76.66	IV	Vulnerability to climatic variations	90.00	I
5	Strong production base at very competitive	83.33	III	Lack of Professional business management and expansion expertise and experience	73.33	IV

*MPS = Mean Percentage Sco

83.33). Changing food consumption and expenditure pattern of people (MPS = 76.66) and the increasing quality of infrastructure facilities, and better price realization were other opportunities that need to be exploited to realize the entrepreneurial potential that exists in the horticulture sector.

Some possible threats which the experts identified regarding the growth and development of entrepreneurial opportunities in the study area are given in Table 2. Vulnerability to climatic variations was considered as the most critical threat, with a mean percentage score of 90.00. It was followed by farmers' small-scale capital investment capacity (MPS = 80.00) and extreme competition from other global players (MPS = 73.33). Lack of professional business management and expansion skill and experience were other important threats (MPS = 73.33).

CONCLUSION

In order to ensure the holistic developments of the horticulture sector, there is a need to move from production to post-production management, especially in horticulture produces. It points to further need to promote horticultural-based enterprise, particularly small-scale processing and value addition firms, which can help farmers enhance income and reduce post-harvest losses. In the present study, significant strengths of the states as identified by the experts were improved infrastructure, institutional support offered by the government, availability of the raw material, increasing demand for processed products etc. Simultaneously, there is a need to work on the limitation/weakness that is restraining the farmers from realizing the true potential for hortibased entrepreneurial development. Some of the weaknesses which were identified by the experts from both the study area were lack of institutional support, lack of awareness about the various entrepreneurial opportunities etc. Timely and need-based government intervention and favorable policy support are needed to address the limitation and fully realize the true potential of horticulture.

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Relative Performance and Outscaling of Basmati Varieties in Northern India

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ABSTRACT

Paddy is an important cereal crop and is grown almost in every country of the world. In the Indian economy basmati rice assume importance as an important crop having export potential. Northern plain occupies a prominent place in basmati rice production on India. Scores of paddy basmati varieties have been developed by Indian Agricultural Research Institute over the last two decades to meet the growing demand in the Northern region of the country. Presently two front runner paddy varieties PB 1121 and PB 1509 have become widely popular in the region and acquired a major share in area and production under basmati rice in the country. An on-farm study was carried out in the project village Rajpur, Block Khair, District Aligarh (Uttar Pradesh). The two varieties were regularly demonstrated from 2015 to 2019 on the selected farmers' fields in the village. The demonstration plots were regularly monitored in the crop season by a team of scientists. Focused group discussion method was employed to collect the data from farmers. The comparative analysis shows that both the improved varieties PB 1121 and PB 1509 have performed better than the local variety PB 1. Only in the starting year 2015, PB 1509 has lagged behind in yield (44.64q/ha) as compared to PB 1121 (51.15 q/ha). But thereafter in subsequent years from 2016 onwards, PB 1509 has surged ahead in productivity and profitability. The higher level of productivity of PB 1509 more than compensates the little lesser price it fetches in the market as compared to PB 1121, thereby establishing itself as the highest net earner per unit area. This intervention has resulted in out-scaling of the two varieties in the project village and its surroundings. The limited seed input supplied for demonstration yearly from 2015 to 2020, has led to their multiplication and spread in terms of increased acreage and production in the region. Within the span of 6 years, PB 1121 and PB 1509 have expected to spread in an area of 5577.82 ha and 3440.49 ha respectively.

Keywords: Basmati rice, Northern India, Relative performance, PB 1121, PB 1509

INTRODUCTION

Indian Agricultural Research Institute has been working untiringly since its inception in 1905 in developing technologies for development of agriculture and uplifting socio-economic conditions of the farming community all over the country. The Institute has developed improved varieties of different crops with an aim to ensure food and nutritional security for the ever growing population. In the sector of basmati rice technology, IARI has charted unparalleled and unrivalled pathway of success. The Institute has pioneered in breeding basmati rice varieties which have performed very well across the Northern India spanning a period of over three decades, starting right from the first breakthrough of developing first improved rice variety, PB 1 in 1989. The Institute is continuing its progress in breeding high yielding paddy varieties, predominantly basmati varieties, dishing out scores of varieties year after year with several of them having tremendous potentiality. Most of these improved varieties have carved out their own place in the farming system of Northern India it served with great satisfaction the need of the farmers, on one hand, and the consumers, on the other, with respect to grain size, taste, flavor, aroma and other cooking qualities.

The production statistics reveal that rice variety PB 1509 along with other varieties- PB 1121 and PB 1718, is cultivated in 1.6 of 1.8 million ha total area under basmati cultivation and it has major share of INR 25,000 crore

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value of annual export of premium basmati rice grains of IARI. Also grains produced by Pusa basmati 1509 and Pusa basmati 1121 are world's largest cooked rice grains (Hossain *et al.,* 2020). Therefore, an assessment was done to identify the relative potential of basmati paddy varieties PB 1121 and PB 1509 in terms of yield and economic profit.

MATERIALS AND METHODOLOGY

The on-farm assessment of basmati paddy varieties PB 1121 and PB 1509 have been done in different locations of Northern India under various projects of the Institute and the performance of the varieties with regard to various parameters have been recorded. The varieties have been assessed and tested in action research mode on farmers' fields under the project 'Out scaling Agricultural Innovations for Enhancing Farm Income and Employment' which is being implemented by the Institute in NCR region of Delhi. The data generated from the regular demonstration of the varieties from *kharif* 2015 to *kharif* 2019 in the farmers' fields in village Rajpur, block Khair, district Aligarh (UP) has been compiled and analyzed. Sharma *et al.* (2020) reported that the field level and farmers' experienced feedback to the research system communicated to the research system ICAR-IARI resulted in refinement of two paddy varieties namely P 2511 and PB 1121, the respective new varieties namely P 1612 and PB 1509 were evolved incorporating the bacterial blight resistance and bakane resistance respectively.

The farmers who were cultivating paddy in the project village Rajpur, district Aligarh have been purposively selected for laying out demonstration of both the basmati varieties PB 1121 and PB 1509. The demonstration fields were regularly monitored by the team of project scientists of the Institute during various stages of the crop in the field. Structured schedule has been prepared and administered for collection of data. The locally adapted variety (PB 1) has been treated as check for assessing relative advantages from the introduced varieties in terms of increase in productivity and income to the farmers. Focus group discussion method has been employed to collect data from farmers on productivity and profitability from the crop interventions.

RESULTS

Comparative Performance of the Varieties: The result in terms of yield performance of the basmati varieties, PB 1121 and PB 1509 demonstrations on the farmers' field is depicted in the Table 1. Both the varieties have consistently performed better than the local check variety PB 1 throughout the study period 2015-2019 in terms of average yield. The table also reveals that in the year 2015, PB 1121 has recorded the higher productivity (51.15 q/ha) followed by PB 1509 (44.64 q/ha) and the check PB 1 (40 q/ha). In the subsequent years from 2016 to 2019, basmati PB 1509 has surged ahead of PB 1121 in productivity, recording productivity in the range of 42.94 q/ha in 2019 to 50.59 q/ha in 2016. The average yield of PB 1509 has been consistently more than 45.0 q/ha from 2016 onwards. The sharp dip in the productivity of PB 1509 (42.94 q/ha) in 2019 was primarily owing to biotic stress (severe pest attack) leading to extensive crop damage. The corresponding data for other varieties shows that all the demonstrated varieties have been affected as reflected by their poor yield performances in 2019 due to the obvious reason.

Table 1: Yield performance of basmati varieties PB 1121 and PB 1509

Year	Local Check (PB 1) (q/ha)	Paddy PB-1121 (q/ha)	Paddy PB-1509 (q/ha)
2015	40	51.15	44.64
2016	40	47.79	50.59
2017	40	44.38	45.25
2018	38	41.38	46.75
2019	35	39.67	42.94

These varieties have consistently performed well in the area and become the most popular varieties in the region within a short span of time. It is the traits of the variety, PB 1509 alone which has catapulted it to the top position. Kumbhare et al (2020) also reported the percent yield gain over local check was 35.06 in Pusa 1509 followed by Pusa 1121 (25.97%).

Economic Performance: These two basmati varieties PB 1121 and PB 1509 has become most popular among the farming communities in terms of acreage and production in Northern India. One of the major factors contributing to increase in the acreage under the varieties, as evident may be higher productivity. Beside production, the economic impact of the varieties in terms of profitability is another critical factor which needs probing.

The Table 2 indicates the economic performance of paddy PB 1121 successively from 2015 to 2019. It is evident

Table 2: Economic performance of paddy PB 1121

Year	Average Net Return (Rs/ha)		Increase in net	Benefit Cost Ratio	
	Demo (PB 1121)	Check (PB 1)	Income (Rs/ha)	Demo (PB 1121)	Check (PB 1)
2015	50385	43500	6885	2.48	2.34
2016	58988	43000	15988	2.28	1.96
2017	86102	73500	12602	3.02	2.73
2018	84916	64300	20616	2.79	2.46
2019	62516	46000	16516	2.29	2.02

from the table that the variety has contributed in enhancing the farm income, fetching higher net income over the check PB 1 during 2015-19. The increase in the net income has been recorded as the highest (Rs. 20616/- per ha) in 2018 and the lowest (Rs. 6885/-per ha) in 2015. The cost benefit ratio for the improved variety was higher than the local check, ranging in between 2.28 to 3.02.

The Table 3 shows the economic performance of paddy PB 1509 during 2015-19. It is evident that the highest average net returns of Rs. 88378/ha has been accrued in 2018 whereas, the lowest net returns of Rs. 32728/ha in the initial year of 2015. The net returns is a function of productivity as well as market price, both as it can be seen from the Table 1 that the highest productivity of 50.59 q/ha is obtained in 2016 though the maximum net returns of Rs. 88378/ha has been realized in 2018. The farmers have realized enhanced income in the range of Rs. 3916/ha to Rs. 24078/ha in the corresponding years of 2016 and 2018. The benefit cost ratio of the demonstrated variety has been superior to check, ranging from 2.02 to 3.26.

The dynamics of productivity and net income from the improved paddy varieties as presented in the Tables 1 and 2 has revealed interesting fact as regard to paddy variety PB 1509, starting at a low key in productivity and net income during 2015-16, went on, over the time, to take over the variety PB 1121. The same has been depicted in the Figure 1. Paddy PB 1509 has a low net average income of Rs 32728/ha in the initial year 2015 which is much lower compared to not only paddy PB 1121 (Rs 50385/ha), but also check variety PB 1 (Rs 43500/ha). During the subsequent year 2016, PB 1509 has accrued better net income than the check than paddy PB 1121. In course of time from 2017 onwards, paddy 1509 surpassed both the check PB 1 as well as variety PB 1121.

Spread of Paddy Varieties: The spread of varieties in terms of production and acreages is an important indicator of their growing popularity among the farming community. It has been estimated that almost 75-80% of the area in project village is saturated by the two leading paddy varieties PB 1121 and PB 1509. An estimate of

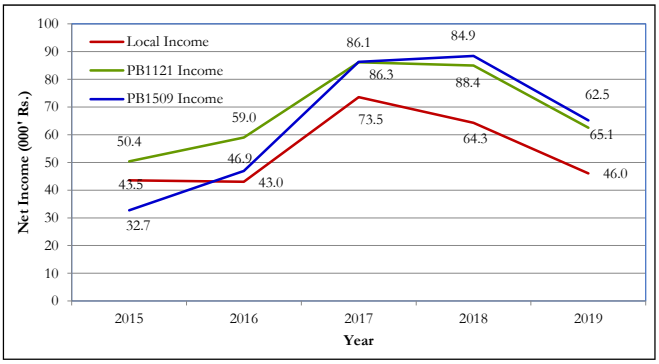

Figure 1: Relative level of net income from paddy varieties PB 1121 and PB 1509

Table: 3 Economic performance of paddy PB 1509

Year	Average Net Return (Rs/ha)		Increase in net	Benefit Cost Ratio	
	Demo	Check	Income (Rs/ha)	Demo	Check
2015	32728	43500	10772	2.02	2.34
2016	46916	43000	3916	2.06	1.96
2017	86263	73500	12763	3.26	2.73
2018	88378	64300	24078	2.97	2.46
2019	65144	46000	19144	2.4	2.02

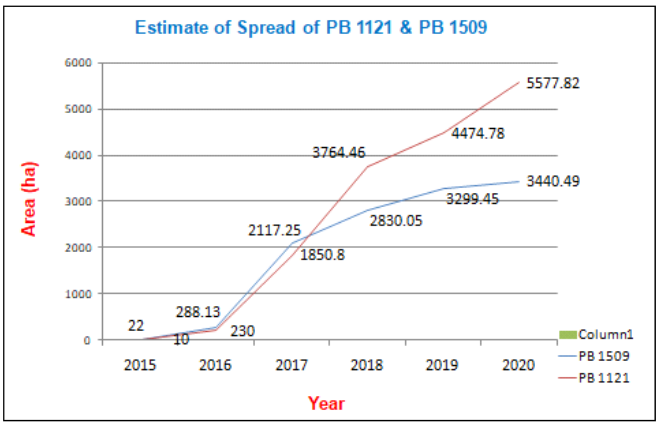

Figure 2: An estimate of spread in area of PB 1121 and PB 1509

spread of paddy varieties PB 1121 and PB 1509 has been depicted in the following graphical presentation. The presented estimate of spread of the two paddy varieties in terms of increase in acreages is purely based on the input seed materials of the two varieties supplied yearly from 2015 to 2019 for demonstrations in the farmers' fields.

The Figure 2 shows that starting with the coverage of 10.0 ha area under demonstrations in the initial year 2015, the area under paddy PB 1121 has spread to a mammoth 5572.82 ha in 2020. In case of paddy PB 1509 the demonstrations were started on a meager 22.0 ha area in 2015 and it spread to 3440.49 ha area in the corresponding period. The estimation of spread is based on the assumption that in case of improved and high potential varieties, farmers save almost 6% seeds of the total produce for sowing in the following year and further almost 2% of the produce in the second year for sowing in the subsequent year. As observed by Sharma et al., (2017), for the farmers the acceptance of basmati variety depends on the market demand. Seed availability for adoption and outscaling is an important criterion as observed for the rice varieties Pusa Basmati 1 and Pusa Basmati 1509. Farmers as producers are least concerned about organoleptic traits like aroma, taste and post cooking quality. Singh and Singh (2008) has also verified that yield advantages can be attained by the use of improved varieties, integrated weed management and resource conservation technologies in farmers' conditions.

CONCLUSION

The two paddy varieties PB 1121 and PB 1509 have gained wide popularity in the region and acquired a major share in production and acreage of basmati rice in the country. The popularity of the variety indicates that they are dovetailed to cater to the specific needs of the farming system as well as taste of consumers. The comparative analysis shows that both the improved varieties PB 1121 and PB 1509 have performed better than the locally adopted variety PB 1. Amongst the two leading varieties, PB 1509 has less yield (44.64q/ha) as compared to PB 1121 only in the initial phase (2015). PB 1509 has surged ahead in productivity onwards from 2016. The higher level of productivity of PB 1509 more than compensates the somewhat lower market price of the variety as compared to PB 1121, making it the highest net earner per unit area. The intervention has resulted in out-scaling of the two varieties in the project village and its surroundings. The limited seed input supplied for demonstration yearly from 2015 to 2020, has led to their multiplication and spread in terms of increased acreage and production in the region.

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Semantic Differential Technique and Force Field Analysis to Identify Entrepreneurial Behaviour and Environment Respectively Between Processor and Producer

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ABSTRACT

An enterprise's success or failure depends on internal (entrepreneurial behaviour) and external (entrepreneurial environment) factors of that particular location. In the present study, the entrepreneurial behaviour of producers and processors was studied using the semantic differential technique. The distance statistic between processor and producer obtained as 2.33, which is significant in Mann Whitney test statistic ($U= 2$; $p<0.001$). The producers were found to have low risk-taking ability (3.5), lower innovativeness (3.03), lack scientific orientation (3.43), inactive (1.89), external locus of control (2.71), lower creativity (2.92), and inquisitiveness (3.04) than processors. Among processors, food grain processors (17.6) possessed more entrepreneurial behaviour followed by vegetable processors (15.61), and fruit processors (15.29). The entrepreneurial environment was assessed by *Force Field analysis* and found that in the case of driving forces, the processors (39.10) possessed a higher mean rank than producers (21.90), probably due to lower access to institutional support ($F=1.4$; $P=3.63$), collective marketing (1.8) and food processing courses ($F=2.4$; $P=3.6$) of the producer. For restraining forces, the producers (45.33) possessed a higher mean rank than processors (15.67). The processors lacked awareness about processing technology (4.8), inadequate support to start up (3.8), lacking exposure visit (4.6), the existence of middlemen (5), lacking economic motivation (5), lacking marketing orientation (3.8), and perceiving processing as a cumbersome process (3.2) etc.

Keywords. Semantic differential technique, Force field analysis, Driving forces, Restraining forces, Entrepreneurial behaviour, Entrepreneurial environment

INTRODUCTION

An enterprise is the result of the continuous interaction of entrepreneurial behaviour and entrepreneurial environment. The literature also suggested that enterprises' success is a function of both external and internal factors (Penrose, 1959; Mc Cline *et al.*, 2000 and Markman, 2003). However, some of the authors believed that entrepreneurial success is also measured by goal achievement, economic success, lifestyle success, and company growth (Rauch, 2000; Steffens *et al.*, 2012). Black *et al.* (2010) investigated the likely traits, skills, or abilities present in individuals to predict entrepreneurial success. Furthermore, both internal and external factors have been found to influence technology-based start-up firms' success (Berte and Neely, 2009). The present study considered the internal factor as entrepreneurial behaviour and external factor as the entrepreneurial environment. Thus, according to previous studies, the entrepreneurial behaviour seen in an organization entails different processes undertaken by individuals in the creation of new firms instead of the people's activities in managing the firm (Gartner *et al.*, 1992). To be specific, entrepreneurship focuses on exploring and exploiting opportunities with the combination of old and new resources to obtain a competitive advantage (Zahra, 2005). Thus, entrepreneurial behaviour is essential for an enterprise to react and flow with economic and environmental changes like competitors' actions, preferences of the consumer, and technological advancements.

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The second factor which determines the enterprises' success or failure is the entrepreneurial environment. Guzman and Santos (2001) listed external factors to include socio-demographics, markets (local, international, emerging, and established markets), cultural, economic, political, institutional, legal, productive, technological, infrastructure, and other physical factors of that particular environment. According to Miller and Dess (1996), the enterprise's external environment can be classified into two, namely, general and competitive environments. The general environment consists of the political-legal, macroeconomic, socio-cultural, technological, demographic, and global factors that might affect the organization's activities. On the other hand, the competitive environment consists of other specific organizations that are likely to influence the profitability of the enterprise, such as customers, suppliers, and competitors. In the present study, an attempt was made to identify various determinants of the entrepreneurial environment its mode of effect (driving or restraining) in a given situation. Hence, the study was conducted with following alternate hypothesis:

H_1: There was significant difference in entrepreneurial behaviour of processors and producers

H_2: The driving force was higher in processors than producers

H_2: The restraining force was higher in producers than processors

MATERIALS AND METHODS

The nine agricultural commodities like food grains (Maize, Wheat, and Soybean); vegetables (Potato, Tomato, and Mushroom), and fruits (Mango, Guava, and Aonla) were selected purposively based on their post-harvest losses and/or potential for undergoing value addition. After selecting agricultural commodities, the states and further districts were selected purposively for each identified agrarian commodities based on data of production and potential for value addition. Districts chosen for the study were Samastipur (Maize), Meerut (Potato), Lucknow (Mango), Allahabad (Guava), Pratapgarh (Aonla), Sonepat (Mushroom), and Indore (Wheat, Soybean, Tomato). Fifteen processors and 20 producers were selected from each selected commodity; thus, 135 processors and 180 producers were interviewed.

The semantic differential technique was used to compare the entrepreneurial behaviour between processors and producers for value chain development. Later, the variables measuring entrepreneurial behaviour (concepts) were selected. Most often, a seven-point scale was considered, and suitable bipolar adjectives were found after discussion with experts. Thereafter, the variables were categorized into evaluative, potency, and activity (EPA) factors as followed by most authors through restricted factor analysis (Osgood *et al.*, 1957; Heise, 1970). The Kurt Lewin's Force Field Analysis was used to identify the driving and restraining forces between producers and processors. The driving forces were identified through the review of literature, expert opinion in six dimensions, namely technical, infrastructure, market, financial, legal and socio-personal, and for restraining forces. The scale developed by Gills (2015) with modification was used. Thus, for its standardization, reliability and validity were calculated. The reliability coefficient as per Spearman Brown for restraining forces was 0.95, and Cronbach's alpha was 0.92. The content validity S-CVI/Ave (content validity index for overall scale) using Lynns' method was worked out to be 0.90, which indicates the high reliability and validity of the scale. Comparative analysis was done using Mann Whitney U test.

RESULTS AND DISCUSSION

To divide the entrepreneurial behaviour into the EPA structure, restricted factor analysis was done, followed by the Principal Component Analysis extraction method with Normalized varimax rotation and polychoric correlation. Thus, obtained KMO test statistic 0.838 and Bartlett's statistic = 660.2 (df = 105; $P < 0.001$) was significant for processors. For producers, the KMO test statistic was found to be 0.599, and Bartlett's statistic was 565.4 (df = 105; $P < 0.001$). Due to restricted factor analysis, only three factors having an eigen value more than 1 from both the group were considered. The variables having a value of more than 0.4 were selected from the rotated component matrix in every three factors, i.e. Evaluative, Potency, and Activity (EPA). In both cases, three variables were dropped due to values less than 0.4.

Distribution of entrepreneurial behaviour into EPA Factors: The obtained entrepreneurial behaviours from the rotated component matrix in evaluative factor for processors were risk-taking, achievement motivation, innovativeness, autonomy, and proactive as indicated in Table 1. In the potency factor, the obtained variables were the hope of success, resiliency, locus of control, manageability, and persistence, whereas in activity factor,

Table 1: Distribution of entrepreneurial behaviours into EPA structure for processors and producers

Processors			Producers		
Evaluative	**Potency**	**Activity**	**Evaluative**	**Potency**	**Activity**
Risk-taking	Hope of success	Creativity	Innovativeness	Risk-taking	Achievement motivation
Achievement motivation	Resiliency	Critical thinking	Scientific	Resiliency orientation	Hope of success
Innovativeness	Locus of control	Inquisitiveness	Autonomy	Creativity	Locus of control
Autonomy	Manageability	Feedback	Critical thinking	Knowledge	Self-efficacy
Proactive	Persistence	Knowledge	Inquisitiveness Persistence		Feedback

Table 2: Comparison of EPA scores of processors and producers

Concepts	Scores in Major Dimensions		
	Evaluative	**Potency**	**Activity**
Processors (n=135)	5.39	5.30	5.34
Producers (n=180)	3.43	3.55	2.93

the variables were creativity, critical thinking, inquisitiveness, feedback user, and knowledge for the processor. In the case of producers, the obtained entrepreneurial behaviors for producers in evaluative factors were innovativeness, scientific orientation, autonomy, critical thinking, inquisitiveness, and persistence. In the potency factor, the obtained variables were risk-taking, resiliency, creativity, and knowledge. For activity, factors were achievement motivation, hope of success, locus of control, self-efficacy, and feedback user for producers.

$$D_{pf} = \sqrt{(5.39-3.43)^2 + (5.03-3.55)^2 + (5.34-2.93)^2} = + 2.33$$

In the processor, the average evaluative score was 5.39, the potency and activity average scores were found as 5.30 and 5.34, respectively. In the case of producers, evaluative, potency, and activity average scores were 3.43, 3.55, and 2.98, respectively. The D-statistic (Distance statistic) between processors and producers was calculated and found as 2.33 as given below. The D-statistic indicated the difference between processors and producers for possessing entrepreneurial behaviour. To check whether the difference of entrepreneurial behaviour between processor and producer was significant or not Mann Whitney test was used. A significant difference was found in the entrepreneurial behaviour of processors (23) and producers (8) through test statistic ($U= 2$; $p<0.001$) from Table 3. Thus, the null hypothesis was rejected, and the alternate hypothesis was accepted. It can be concluded that the entrepreneurial behaviour of processors was higher than producers.

Figure 1 represents the average scores for entrepreneurial behaviour of processors and producers through a semantic differential chart. It was found that the producers possessed low risk-taking ability (3.5), lower innovativeness (3.03), lack scientific orientation (3.43), more degree of inactiveness (1.89), external locus of control (2.71), lower creativity (2.92) and inquisitiveness (3.04) than processors. It was observed that producers were following the traditional method of farming, especially among food grain (maize, wheat, and soybean) growers, lack scientific approach of farming, mainly among fruit producer (aonla, guava, and mango), and were found to be less inquisitive towards new technology as well as avoid taking the risk. However, they were found persistent (4.29) towards their farming, had good knowledge about the package of practice (4.42), and were able to manage (3.86) their farm competently.

In the case of processors, motivation towards the achievement (5.44) was high, and they were more

Table 3: The entrepreneurial behaviour between processors and producers of total EPA variables through Mann Whitney U test

Particular	Respondent	No. of variables	Mean rank	Mann-whitney U	Wilcoxon W	Z
Entrepreneurial Behaviour	Processors	15	23.0	2.00($p<0.001$)	120	-4.662
	Producers	15	8.0			

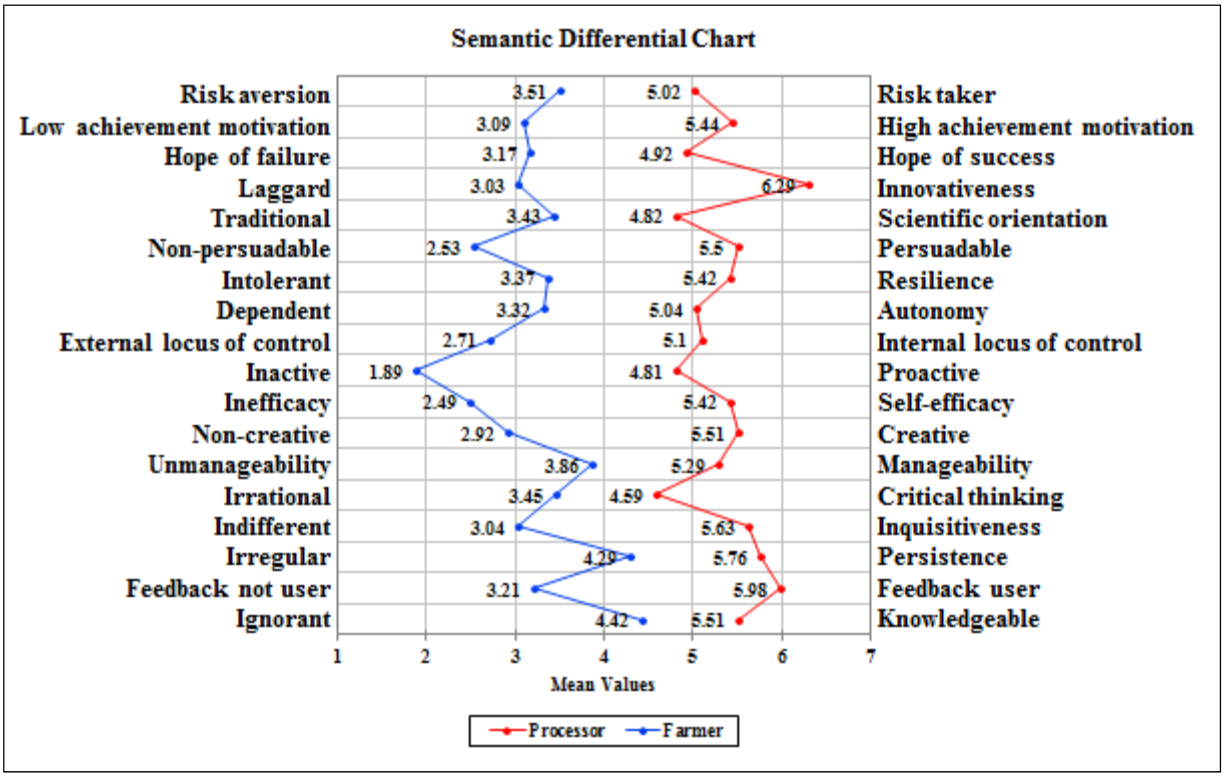

Figure 1: Entrepreneurial behaviour of processors and producers through semantic differential chart

innovative (6.29), scientifically orientated (4.82), resilient (5.42), autonomous (5.04), inquisitive (5.63), and persistent (5.76). It was observed that processors were more risk-taker compared to producers due to high initial investment, more innovative towards introducing new products in the market, following the scientific method of processing through consultant and support of food technologist, were more inquisitive towards new technology, and more resilient towards the adverse situation.

Comparing entrepreneurial behaviour among different processors (fruit, vegetable and food grain)

$$D_{vf} = 0.493;\ D_{Fgf} = 1.61\ ;\ D_{Fgv} = 1.23$$

D_{vf}=Distance between vegetable processors & fruit processors

D_{Fgf}=Distance between food grain processors & fruit processors

D_{Fgv}=Distance between food grain processors and vegetable processors

From Table 4, it can be inferred that food grain processors (17.6) possessed more entrepreneurial behaviour followed by vegetable processors (15.61) and then fruit processors (15.29). It was observed that there was a slight difference (D_{vf} = 0.49) between vegetable processors and fruit processors for entrepreneurial behaviour. However, the difference between the entrepreneurial behaviour of food grain processors and fruit processors (D_{Fgf} = 1.61) was high than the entrepreneurial behaviour of food grain processors and vegetable processors (D_{Fgv} = 1.23).

Table 4: Distribution of EPA scores among three types of processors

Factors	Fruit processors	Vegetable processors	Food grain processors
Evaluative	5.44	5.45	5.92
Potency	5.20	5.05	5.53
Activity	4.65	5.11	6.15
Total	**15.29**	**15.61**	**17.6**

Figure 2 represented the entrepreneurial behaviour among processors. The risk-taking ability was more among food grain processors (6.45) compared to fruit (4.2) and vegetable processors (4.4). It may be due to food grain enterprises were larger compared to the other two. Among fruit processors (3.2) scientific orientation was found to be low compared to others as they didn't followed much

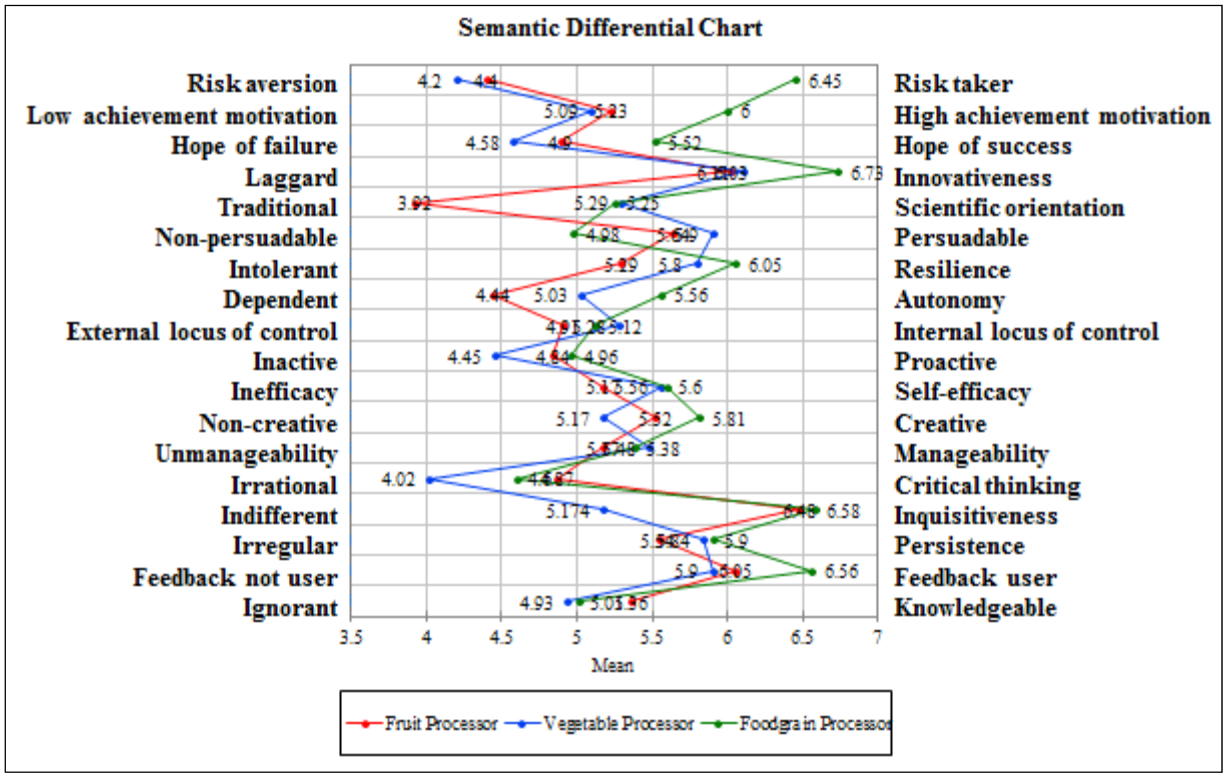

Figure 2: Entrepreneurial behaviour among different types of processors (fruit, vegetable and food grain) through semantic differential chart

scientific approach of processing and their lack of exposure to training. Many fruit processors entered into business after learning processing techniques through friends, neighbours etc., and started selling locally. Thus, they lack scientific orientation. The food grain processors possessed more entrepreneurial behaviour like innovativeness (6.73), the hope of success (5.52), scientific orientation (5.25), achievement motivation (6), resilience (6.05), and utilize feedback in a positive way (6.56).

Force Field analysis to identify the driving and restraining forces of entrepreneurial environment between processors and producers

The driving forces were significantly higher in case of processors (107.84) compared to producers (87.4) as indicated in Figures 3 and 4. The reason behind this is probably the fact that the producers were having low access to institutional support (F=1.4; P=3.63), collective marketing (1.8), and food processing courses (F=2.4; P=3.6). A similar finding was reported in the study conducted at Samastipur, Bihar, for maize processors, where driving forces were higher compared to restraining forces (Shruti, 2018). However, it was observed that the producers were having many opportunities like local access to raw material (5), affordability of raw material (4.8), direct contact with the processor (3.1) etc. Instead of many opportunities, producers were unable to utilize them effectively due to the following restraining forces: lack of awareness about processing technology (4.8), inadequate support to start up (3.8), lacking exposure visit (4.6), middleman existence (5), lacking economic motivation (5), lacking marketing orientation (3.8), and perceiving

Table 5: Comparing producers and processors for driving and restraining forces

Forces	Respondent	Mean rank	Mann-Whitney U	Wilcoxon W	Z
Driving	Processors	39.10	192(p<0.001)	657	-3.816
	Producers	21.90			
Restraining	Processors	15.67	5(p<0.001)	470	-6.584
	Producers	45.33			

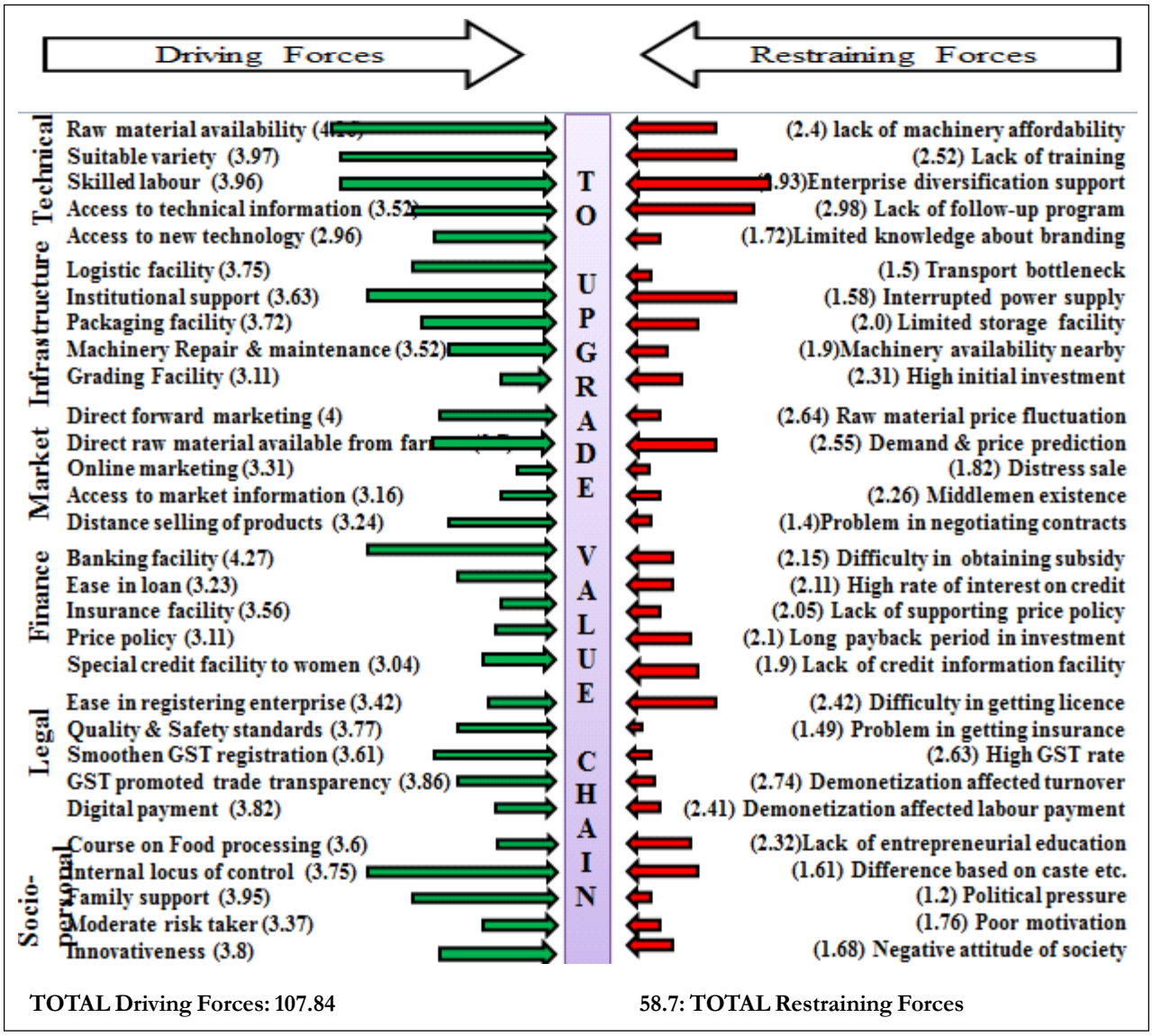

Figure 3: Force field Analysis showing driving and restraining forces of processors

processing as a cumbersome process (3.2). Hence, it can be inferred that there was a significant difference in the restraining forces of producers (117) and processors (58.7). In the case of driving forces, processors (39.10) possessed a higher mean rank than producers (21.90), and the test statistic of Mann Whitney was significant (U=192; $p<0.001$) as indicated in Table 5. Thus, the null hypothesis was rejected, and the alternate hypothesis was accepted. For restraining forces, producers (45.33) possessed a higher mean rank than processors (15.67), and the test statistic of Mann Whitney was significant (U=5; $p<0.001$). Therefore, the alternate hypothesis was accepted. Thus, it can be inferred that driving forces were higher for processors and restraining forces were higher for producers.

CONCLUSION

The present study has identified the significant difference between processors and producers for possessing entrepreneurial behaviour (D statistic 2.33 and U= 2; $p<0.001$). Besides through *Force Field analysis,* the driving forces were found significantly more in processors (mean rank 39.10) than producers (mean rank 21.90). However, for restraining forces, the producers (45.33) possessed a higher mean rank than processors (15.67). Hence, for processor, the driving forces were more, and for producers, restraining forces were more which may be due to more risk-taking ability, more opportunity-seeking nature, internal locus of control, inquisitive and innovativeness of processors than the producer. So, the

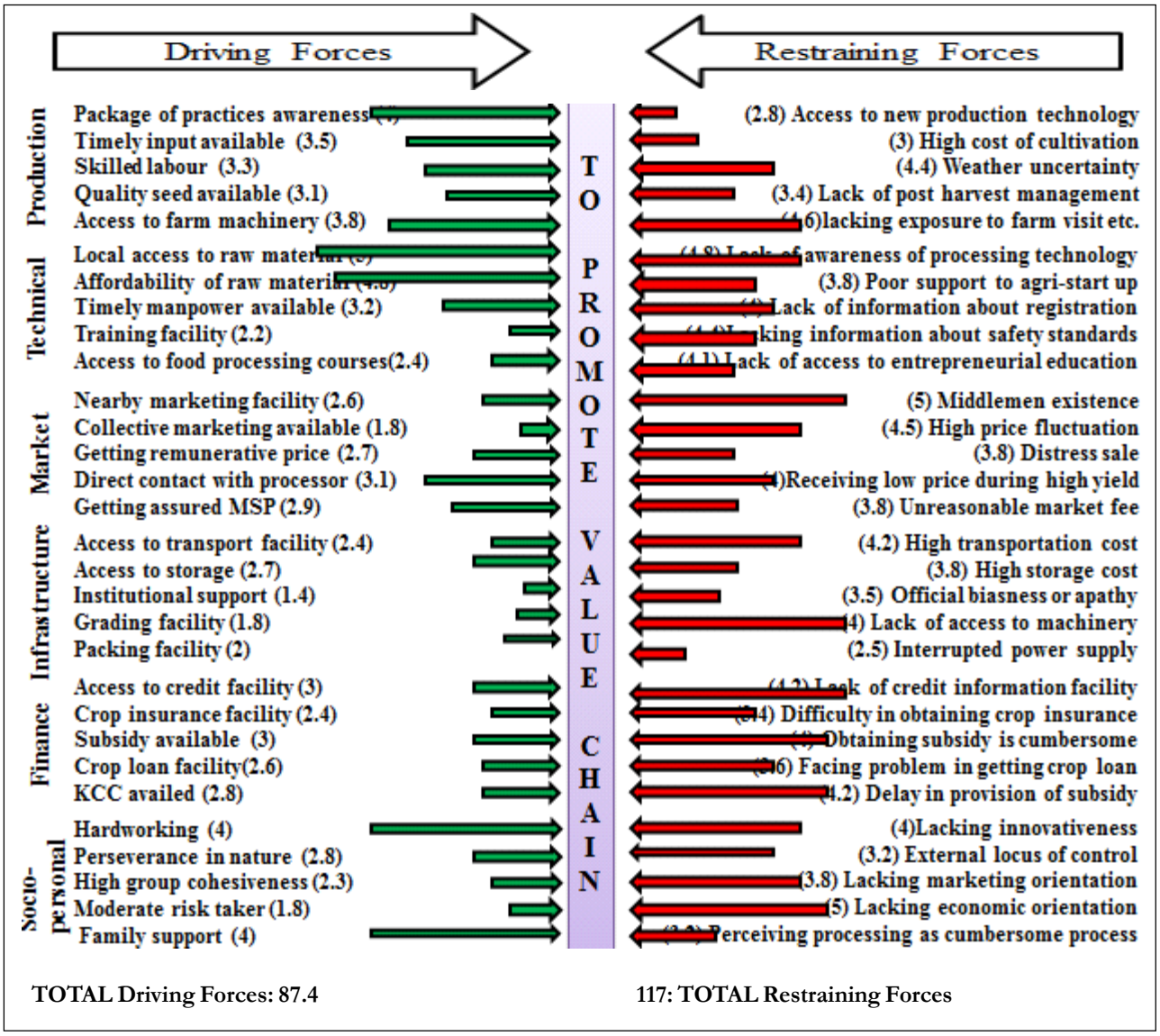

Figure 4: Force field analysis representing the driving and restraining forces of producers

need of the hour is to focus more on creating awareness among producers about post-harvest management, especially value addition of their produce through awareness camps and training and promoting more entrepreneurship development programmes to local processors and producers. Emphasis should be given on linking producers to market, especially online marketing, to sell their produce at a reasonable price at the right time.

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Municipal Waste Management: From Socio-ecological and Techno Managerial Perspective

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ABSTRACT

The social ecology of waste recycling implies the structural, functional and managerial intervention of waste generation process. The present study takes place in Kalyani and Jalpaiguri municipalities with 21 independent variables and 4 dependent variables. Total 150 respondents, 75 from each municipal area have been random sampling. The application of artificial neural network has gone effective in identifying variables with dominant effect as relevant for both Jalpaiguri and Kalyani municipality, with intern invites immediate intervention for up scaling the status of waste recycling and management for both the municipalities. The input variables passing through hidden layers and minimizes errors and give effective output. Artificial neural network describe the relationship between independent and dependent variable and minimize errors.

Keywords: Community participation, Ecological services, Social ecology, Waste management, Waste recycling

INTRODUCTION

Waste is for the most part an urban wonder, and is commonly an urban Issue. Today, over half of the World's populace lives in the urban areas and the pace of urbanization is expanding rapidly. The production of municipal solid waste represents one of the greatest challenges currently faced by waste managers all around the world (Raquel *et al.*, 2017). Due to the increase in the world's population and most of it moving to urban cities, there is increased demand for food, and this has resulted in the production of large amounts of agricultural wastes, both at farmer, municipality and city levels (Sabiiti, 2011). Solid Waste age is the side-effect of the Urbanization. Waste is a great concern of urban life in every city of the world. Developed cities of world are using modern disposal and recycling technologies as well as state of the art equipments and ensuring their dwelling neat and tidy (Islam, 2012). Management of solid waste may be defined as that discipline associated with the control of generation, storage, collection, transfer and transport, processing, and disposal of solid wastes in a manner that is in accord with the best principles of public health, economics, engineering, conservation, aesthetics, and other environmental considerations. Solid Waste generation is the by-product of the Urbanization. It is highly related with Economic growth, degree of industrialization and consumption pattern. With the increase of urban population of the cities and towns all other activities associated with population also increases resulting in more and more generation of Municipal Solid Waste. And in the absence of technology and efficient and effective methods of disposing refuse worsen the quality of Air of the urban centers which have detrimental impacts on human health. The world paper industry produces a great amount of industrial solid waste that undergoes a treatment process that can be primary, secondary, or tertiary, in order to adapt the waste for correct disposal (Afonso *et al.*, 2019). The pulp and paper industry traditionally generates large amounts of wastes at different stages of its production process, such as primary sludge that is extremely wet (Afonso *et al.*, 2020). Electronic waste or E-waste is one of the main sources of harmful toxic pollutants (polyvinyl chlorides, polychlorinated biphenyls, lead and mercury). E-waste also represents a potent source of valuable metals such as gold, silver, palladium, and copper (Irani *et al.*, 2016). Due to the growing concerns about the increasing release of consumer products to the environment, especially for defective electronic products, the management of the closed-loop supply chain (CLSC) is emerging. To do this, a chain consisting of a manufacturer, a retailer, and a collector is offered in a

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manufacturer-led Stackelberg game (Rezayat, 2020). Civil construction is responsible for the excessive consumption of natural resources and the generation of the largest share of solid urban waste (Calcado, 2019). Environmental contamination due to solid waste mismanagement is a global issue. Open dumping and open burning are the main implemented waste treatment and final disposal systems, mainly visible in low-income countries (Ferronato *et al.*, 2019). Solid Waste generation is the by-product of the Urbanization. It is highly related with Economic growth, degree of industrialization and consumption pattern. With the increase of urban population of the cities and towns all other activities associated with population also increases resulting in more and more generation of Municipal Solid Waste. And in the absence of technology and efficient and effective methods of disposing refuse worsen the quality of Air of the urban centers which have detrimental impacts on human health.

Wastes are the by-product of a process called "Modernization and Urbanization" with the generation of urban amenities and livelihood. Municipal solid waste management (MSWM) is an important environmental challenge and subject in urban planning (Jen *et al.*, 2012). The ecological impact of waste recycling certainty implies the structural functional and managerial nature and intervention of the waste generation process. Population growth associated with population migration to urban areas and industrial developments have led to consumption relations that result in environmental, social, and economic problems. With respect to the environment, a critical concern is the lack of control and the inadequate management of the solid waste generated in urban centers (Angelina *et al.*, 2017). Among the challenges are proper waste-collection management, treatment, and disposal, with an emphasis on sustainable management. Every year in India we are producing 133760 tons of wastes comprising of both bio degradable and non bio degradable materials. Out of this total waste generation 91,152 tons of wastes are collected and 25,884 tons of wastes are treated for different purposes. Medical bio wastes drifted by Hospitals and private Nursing homes are also a serious concern. Medical care is vital for our life, health and wellbeing. But the waste generated from medical activities can be hazardous, toxic and even lethal because of their high potential for diseases transmission. The hazardous and toxic parts of waste from healthcare establishments comprising infectious, medical and radioactive material as well as sharps constitute a grave risks to mankind and the environment, if these are not properly treated / disposed or are allowed to be mixed with other municipal waste (Babanyara *et al.*, 2013). Composting of organic waste is a possible solution to the long-standing rubbish problem, limiting the amount of waste going to final disposal. Fertilization with composted waste could have positive agronomic and environmental effects if the doses are balanced against the N requirements of crops (Fragnano, 2011). When wastes are properly recycled treated and managed it can add values and resources but incase it is not properly managed it contributes to pernicious pollution. The bio wastes and residues from agriculture field a well are transformed into bio resources in the form of organic manure and different bio products, available and amenable to mobilize sustainable agriculture. Not only agricultural waste fish waste can also be used in organic farming. The production and uses of fertilizers from fish and fish waste (FW) can be applicable for certified organic farming, with a focus on crop and horticultural plants. Fish industries generate a substantial amount of Fish waste. Depending on the level of processing or type of fish, 30–70 per cent of the original fish is Fish waste. Circular economy and organic farming concepts were used to evaluate the potential of production of fertilizers from captured fish. Fertilizers produced from captured fish promote the recycling of nutrients from the sea and back to terrestrial environments (Ahuja, 2020). A typical waste management system comprises collection, transportation, pre-treatment, processing, and final settlement of residues. The waste management system consists of the whole set of activities related to handling, treating, disposing or recycling the waste materials (Demirbas, 2011).

Kalyani Civil territory, that is 21 wards, was chosen for the investigation. In Kalyani town wastes the executives is a difficult issue and carefully need legislative concern. In Kalyani civil territory around all out 52 Mt wastes produces every day. This town has 9 vegetable markets and 8 fish markets. Roughly 6-8 Mt of wastes produces structure vegetable markets and around 1Mt of wastes create structure fish showcase. Out of all out waste age, household wastes contribute 75 per cent, wellbeing units contribute 2 per cent, Markets contribute 10 per cent, office and foundations contribute 3 per cent, modern wastes contribute 2 per cent and street clearing contributes 8 per cent wastes and 60 per cent of absolute wastes are bio degradable in nature. Kalyani district has acquainted a framework with gather collected solid waste from singular premises in two separate holders. Bio degradable wastes

in green dustbin and non bio degradable waste in yellow dust bin. Collection of wastes is done through house to house collection and network canister collection. After collection, waste is moved to dumping ground. From collection to disposal to the damping ground the whole procedure confronting difficult issues. Unhygienic open dumping is pervasive in dumping ground that dirties the ecosystem. Jalpaiguri Municipality area that is 1to 25 wards were selected for the study. In Jalpaiguri town Waste Management is a serious problem and strictly need governmental concern. In west Bengal approximately total 12552 MT wastes per day. In Jalpaiguri town approximately 52520 kg wastes produced every day. Out of total waste generation, 29490 kg wastes are bio degradable in nature and 23020 kg of waste are non biodegradable in nature. The solid waste management system for Jalpaiguri municipality has been prepared for improvement of the present solid waste management system of the town. Project has been developed and requires 12.2 acres of land. Jalpaiguri municipality already has 14 acres of land for this purpose. At present solid waste management programmer is going through ward committee of different wards with direct supervision of the sanitary department of Jalpaiguri municipality. This scheme has implemented in 16 wards. Jalpaiguri municipality has introduced a system to collect accumulated solid waste from individual premises in two separate containers i.e. bio degradable wastes in green container and non bio degradable waste in yellow container. Collection of waste is done through house to house collection and community bin collection. After collection, waste is transferred to dumping ground. The function of entire system has been facing various problems such as non approval of vermi composting project, require number of vehicles, implements etc.

Municipalities have been facing problems to keep the management of their municipal solid waste (MSW) in financial balance. Increasing public awareness, stricter legislation and large generation of MSW have led to high costs concerning related services (Alzamora, 2020). Both Jalpaiguri and Kalyani municipal areas have great ecological diversity. Jalpaiguri which is situated at the northern part of West Bengal, India is surrounded by beautiful Hills, Forests and rivers and Kalyani which is situated at southern part of West Bengal, India, is a very beautiful planned city, which is surrounded by lakes, trees and have diversified ecosystem. Both municipalities are trying to keep the cities clean. But the function of entire system has been facing various problems such as non approval of vermi composting project, require number of vehicles, implements etc. Unhygienic open dumping is also prevalent in both towns. Medicinal wastes require recycling facility. Recycling facility, incineration facility is not available in towns. Adequate fund is also required to run the solid waste management programmer under both Kalyani and Jalpaiguri Municipality as the system is a continuous process. Presently Jalpaiguri municipal authority has decided to engage private agency, NGO, and institution as recognized by the government to run the project of solid waste management because a sound waste management guarantees better stewardship for guaranteeing bio security and natural wellbeing and knowledge of waste recycling will reduce improper waste disposal and save the environment and ecological diversity of these towns. In this way, with the end goal of the investigation, a model has been developed for reasonable waste management so biological expectations can be followed out dovetailed to the working financial capacities.

The specific objective of the research was to isolate and identify the system variables characterizing and the management of waste recycling process and to estimate intra and inter level of interaction amongst and between the variables for respective, inductive and interactive contribution.

MATERIALS AND METHODS

Locale of Research: The present study was conducted in two districts namely Jalpaiguri district and Nadia district, West Bengal, India. In Jalpaiguri district, Jalpaiguri Municipal area and in Nadia district Kalyani Municipal area were selected for the study. The area had been selected for the study because of there is a large scope for collecting relevant data for the present study, acquaintance with the local people as well as local language, The closure familiarities of the researcher with area, people, officials and local dialects.

Pilot Study: Before taking up actual study, a pilot study was conducted to understand the areas, it people, institutions, communication and extension system and the knowledge, perception level and attitude towards waste management practices and its impact on ecology.

Sampling Design: The state, district, sub divisions were selected using non-probability sampling technique called purposive sampling and the respondents were selected using simple random sampling method. The two

municipalities were selected purposively. Out of two municipalities total 150 respondents were selected, 75 respondents from each municipality from five respective locations (Vegetable market, Fish market, Hospital area, Railway stations, Ward area) were selected randomly for final data collection.

Preparation of Interview schedule: On the basis of findings of pilot study a preliminary interview schedule was formed with the help of literature, and by the assistance of Chairman of Advisory Committee and subsequent discussion with the members of the advisory Committee.

Finalizing of schedule after Pre-Testing: The draft schedule for collection of data, incorporating the tools and techniques of different variables were presented twice each time on respondents. The quantification was done for each and every variable after operationalized them. Before starting final data collection, entire schedule was pretested for elimination, addition and alternation with respondents of the study area.

Techniques of Field Data Collection: This was personally interviewed during puja vacation and summer vacation. The items were asked in Bengali as well as English version in a simple term so that the members could understand easily. The entries were done in the schedule by student investigator himself at the time of interview.

Variables and their measurements: After reviewing various literature related to the field of study and consultation with the respected chairman of Advisory Committee and other experts, a list of variables was prepared. On the basis of selected variables, a schedule was formed. Analysis was done by SPSS V20.0 software and opstat.com.

PROPER DESCRIPTION OF VARIABLES

Age (X_1): In all societies, age is one of the most important determinants of social status and social role of the individual. Age of the head member of the family has only been considered for the purpose of the study.

Education (X_2): Education is instrumental in building personality structure and helps in charging one's behavior in social life. In the present study qualification of the head member of family has been considered (i.e. if the person complete matriculation it denoted by 10 if he/she passed higher secondary if denoted by 12, if he/she completed graduation it denoted by 15 etc.

Total number of the family member (X_3): Total numbers of adult and minor member present in a family were considered for the study.

Total cost of energy per month (X_4): Total cost of energy per month is an important parameter to access the economic status of a family in the society. Data was taken by dividing the cost of energy per month by family member.

Total household land (X_5): Household land refers to a parcel of property jointly owned by all members of a particular family. In this study household land has been divided into two parts i.e. total covered area and green covered area. Data was taken by dividing total green area by total cover area.

Income (X_6): The Monthly Income of a person is an important parameter to assess the economic status of the person in the society. In this study income has been classified into three categories i.e. service, business, and farmer and the income of the family head have been considered for the study and it is divided by family member.

Expenditure (X_7): The expenses or disbursements made by a family purely for personal consumption during the reference period. Data was taken by dividing monthly expenditure by family member.

Total volume of waste generation from household per day (X_8): Total amount of waste generation is an important parameter for the purpose of the study. Data was taken by dividing total volume of waste by family member.

Water consumption per day (X_9): Data was collected by dividing total consumption of water per day by family member.

Total bio diversity (X_{10}): Biodiversity is the variety and variability of life on Earth. Biodiversity is typically a measure of variation at the genetic, species, and ecosystem level. In this study bio diversity measured the total area covered by the vegetable, flower, orchard and others. For the purpose of the study total bio diversity has divided by the family member.

Impact of wastes management and recycling on Household (X_{11}): Data has been collected through 10 point scale. Question was asked to the respondents and they gave score out of 10 on the basis of their preferences.

Impact of wastes management and recycling on Agriculture (X_{12}): Data has been collected through 10 point scale. Question was asked to the respondents and they gave score out of 10 on the basis of their preferences.

Impact of wastes management and recycling on Livestock (X_{13}): Data has been collected through 10 point scale. Question was asked to the respondents and they gave score out of 10 on the basis of their preferences.

Impact of wastes management and recycling on Water (X_{14}): Data has been collected through 10 point scale. Question was asked to the respondents and they gave score out of 10 on the basis of their preferences.

Impact of wastes management and recycling on Soil (X_{15}): Data has been collected through 10 point scale. Question was asked to the respondents and they gave score out of 10 on the basis of their preferences.

Impact of wastes management and recycling on Micro flora and fauna (X_{16}): Data has been collected through 10 point scale. Question was asked to the respondents and they gave score out of 10 on the basis of their preferences.

Exposure to Media (X_{17}): This variable has been classified in to four categories that are Radio, Television, Newspaper, Mobile phone and the ranking were done by adaptability of these media and total values has been divided by family member.

Training received regarding waste management (X_{18}): Training is teaching, or developing in oneself or others, any skills and knowledge or fitness that relate to specific useful competencies. Data collected on the basis of number of training received.

People's participation in waste recycling programmer (X_{19}): Data collected on the basis of number of people participated in waste recycling programme.

Perception on Environmental impact of waste management (X_{20}): Four types of question were asked to the respondents and scores have been given according to their preferences.

Waste management at Household level (X_{21}): Data has been collected on the basis of what percentage of household wastes can be utilized for compost making or for other uses.

Volume of waste used for different purposes (Y_1): Amount of non bio degradable wastes used for recycling and amount of bio degradable wastes used for composting has been considered for the study.

Knowledge of waste recycling (Y_2): Knowledge of waste recycling has been classified into three different categories. Questions were asked and scores were given on 10 point scale and normalization by z test.

Motivation of waste recycling (Y_3): Types of motivation have been classified into two categories. Data has collected on 10 point scale basis and normalization by z test.

Waste reduction methods (Y_4): Waste reduction methods have been classified into three categories and data were collected on 10 point scale.

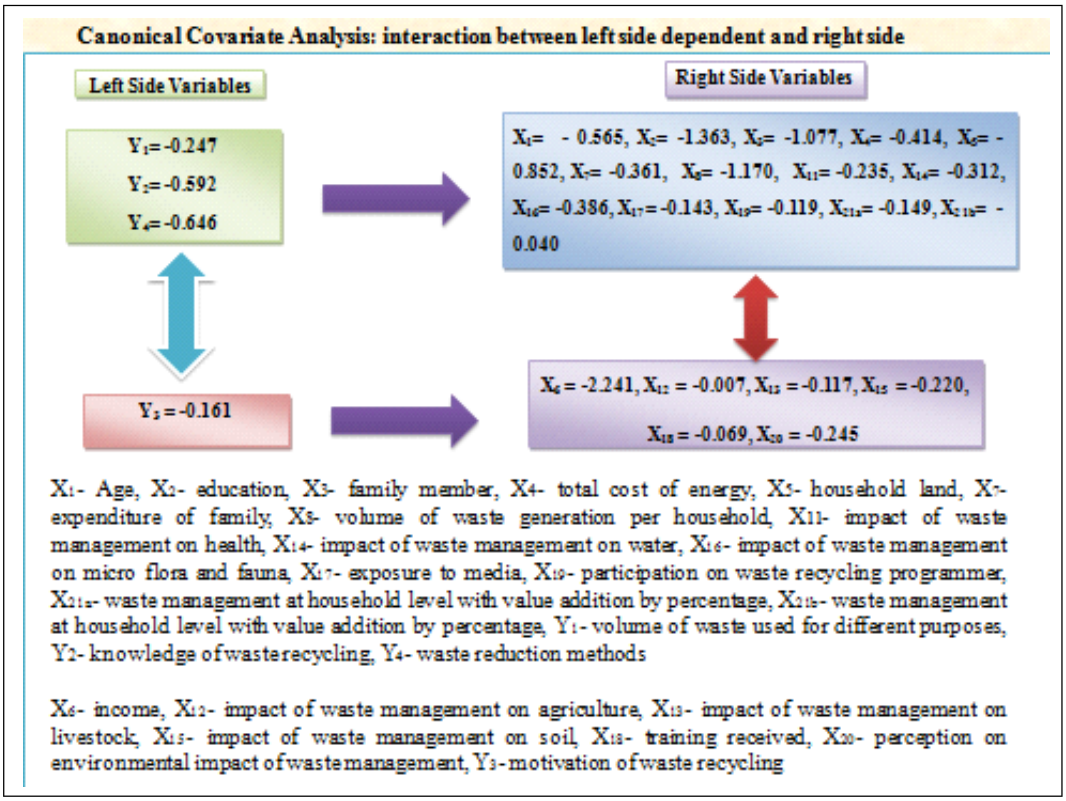
RESULTS AND DISCUSSION

Canonical Covariate Analysis: interaction between left side dependent and right side independent variables for Kalyani municipal area: Model 1, Presents the canonical covariate analysis wherein two sets of variables (y and x) runs through clandestine interactions. From the left side variables it has been seen that the y variables; volume of wastes used for different purposes (y_1), knowledge of waste recycling (y_2), waste reduction methods (y_4) have made a conglomeration and the other dependent variable motivation of waste recycling (y_3), are prefer to move in a solitary manner.

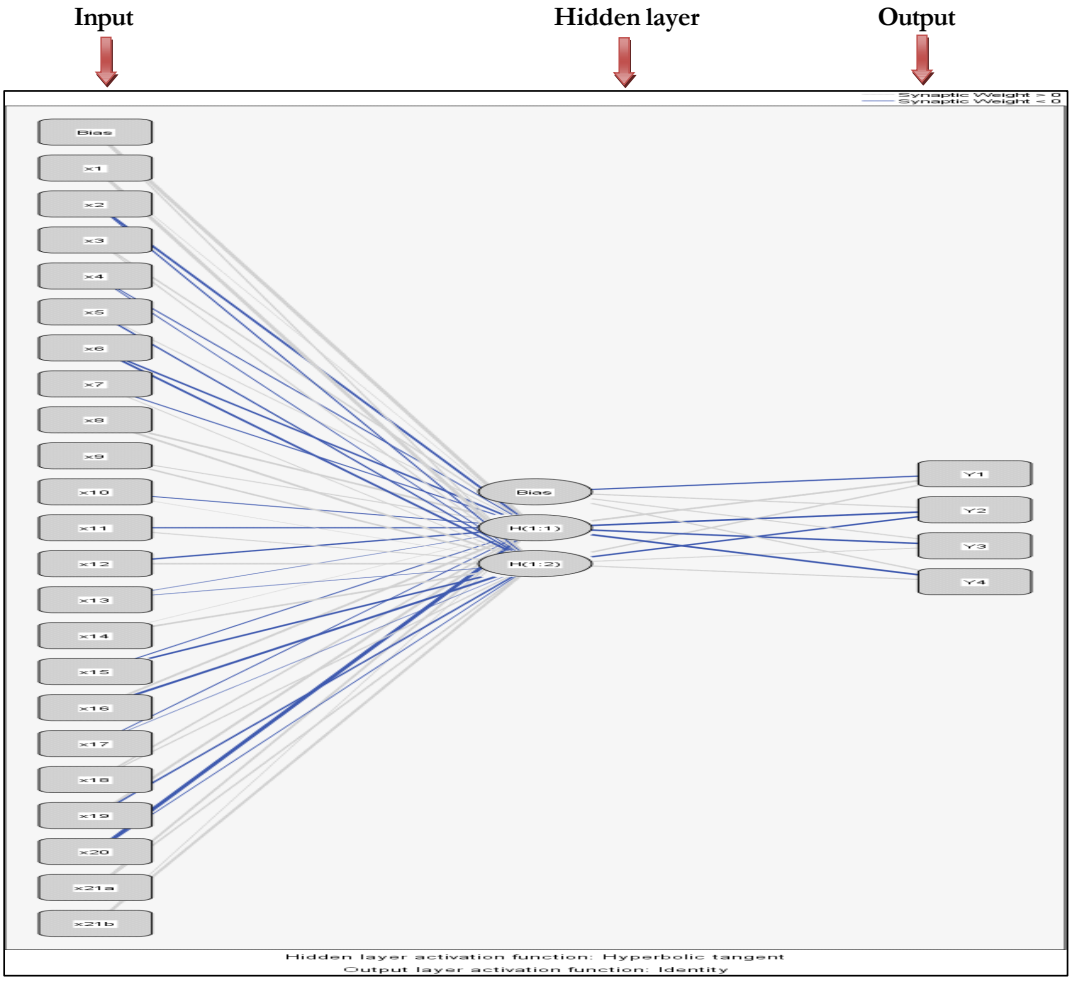
The first conglomeration of y variables can be renamed as waste management operations and have gone precisely interaction with right side variables. Similarly, the motivation of waste recycling (y_3) variable, while performing in a solitary manner has displayed a strategic interaction in the following right side variables. Thus canonical co variance analysis can help to identify whether there has been any sub conglomeration in y and x set of variables and also depicts their network of interaction in a solitary way.

Artificial Neural Network for Kalyani municipal area: Model 2 present the Artificial Neural Network where in 21 input variables have been driven through Neurons having, hidden layers and ultimately contributed to predict the four output volume of wastes used for different purposes (y_1), knowledge of waste recycling (y_2), motivation of wastes recycling (y_3) and wastes reduction methods (y_4). It has found that input variable education (x_2), after being activated by weightage by hidden layer H (1:1) and H (1:2) and subsequently contributed to output

Model 1: Canonical Covariate Analysis: interaction between left side dependent and right side independent variables



Model 2: Artificial neural network of Kalyani municipal area



variables knowledge of waste recycling (y_2), motivation of wastes recycling (y_3) and wastes reduction methods (y_4). Similarly the input variables total cost of energy per month (x_4), income (x_6), impact of waste management on livestock (x_{13}), impact of waste management on soil (x_{15}), exposure to media(x_{17}) and perception on environmental impact of waste management (x_{20}) after being activated by both hidden layers H(1:1) and H(1:2) dominantly impact on output variables knowledge of waste recycling (y_2), motivation of wastes recycling (y_3) and wastes reduction methods (y_4).

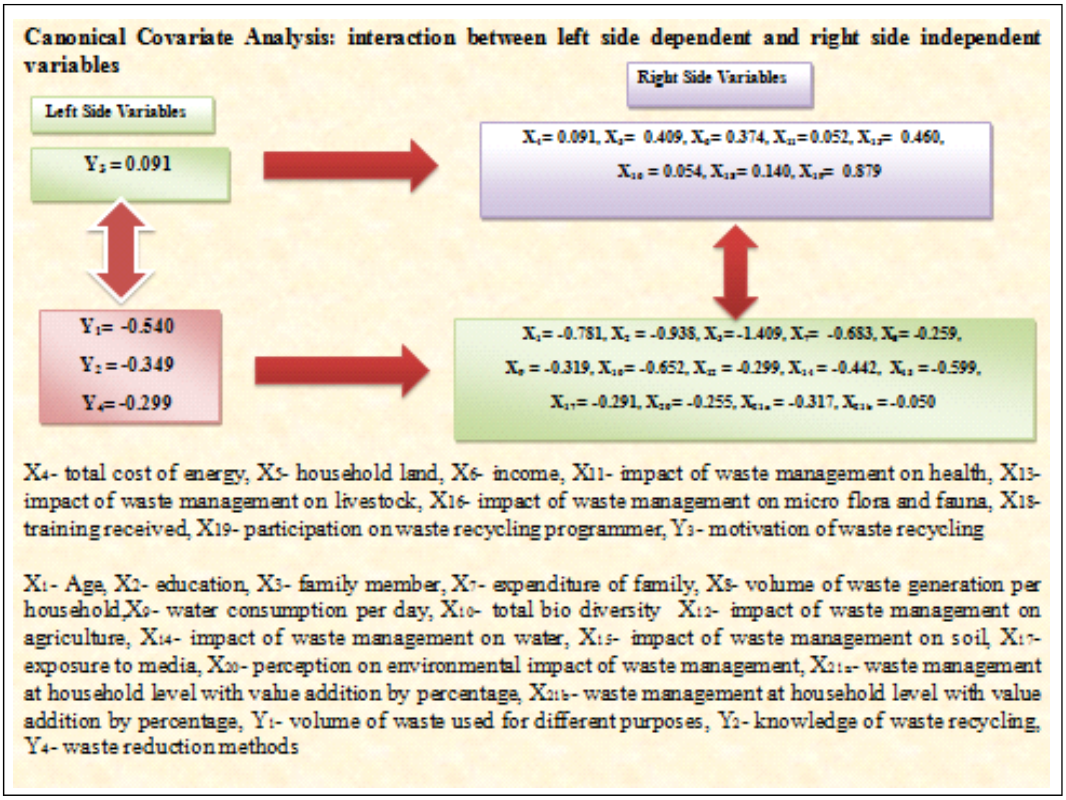
The input variables expenditure (x_7), total bio diversity (x_{10}), impact of waste management on health (x_{11}) and impact of waste management on agriculture (x_{12}) have been activated form hidden layer H(1:1) and subsequently contributed to output variables knowledge of waste recycling (y_2), motivation of wastes recycling (y_3) and wastes reduction methods (y_4). Similarly the input variables total household land (x_5), impact of waste management on micro flora and fauna (x_{16}) and participation on waste recycling programmer (x_{19}) after being activated form hidden layer H(1:2) have subsequently contributed to output variable knowledge of waste recycling (y_2).

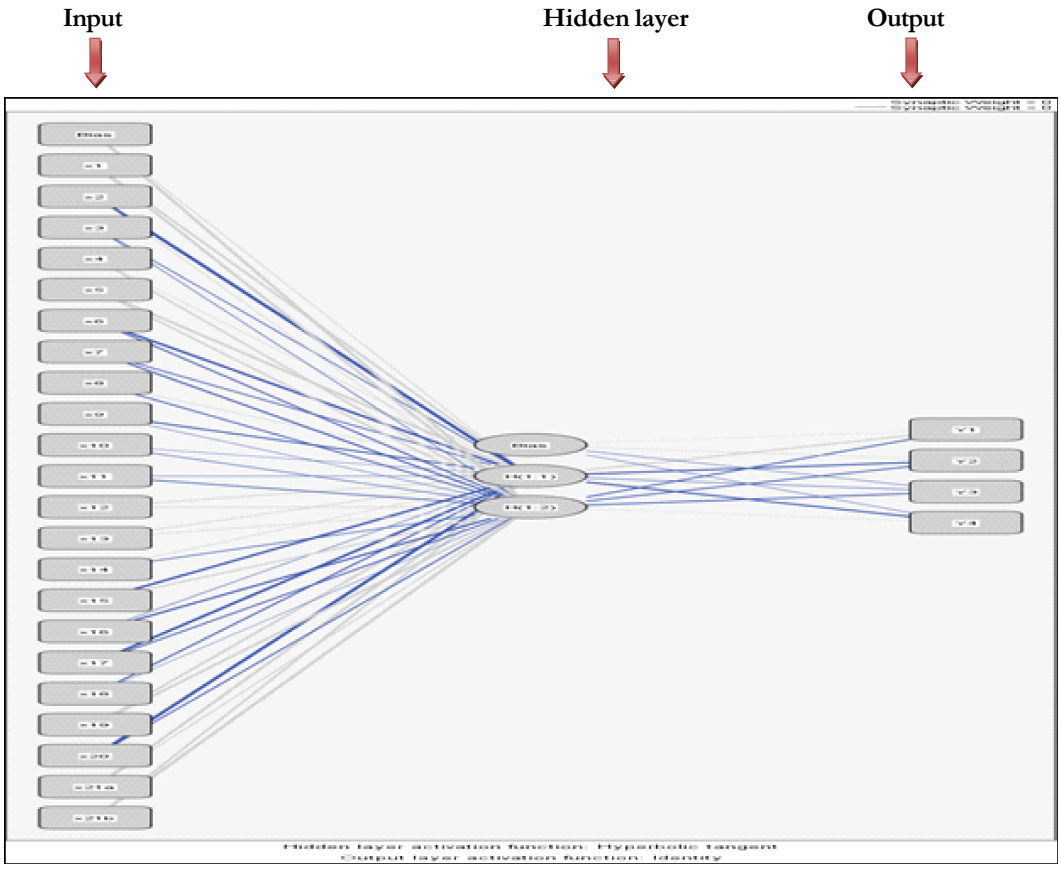
Canonical Covariate Analysis: interaction between left side dependent and right side independent variables for Jalpaiguri municipal area: Model 3, Presents the canonical covariate analyses in two sets of variables (y and x) runs through clandestine interactions. From the left side variables it has been seen that the y variables; volume of wastes used for different purposes (y_1), knowledge of waste recycling (y_2), waste reduction methods (y_4) have made a conglomeration and the other dependent variable motivation of waste recycling (y_3), are prefer to move in a solitary manner.

The first conglomeration of y variables can be renamed as waste management operations and have gone precisely interaction with right side variables. Similarly, the motivation of waste recycling (y_3) variable, while performing in a solitary manner has displayed a strategic interaction in the following right side variables. Thus canonical co variance analysis can help to identify whether there has been any sub conglomeration in y and x set of variables and also depicts their network of interaction in a solitary way.

Artificial Neural Network for Jalpaiguri municipal area: Model 4, present the Artificial Neural Network where in 21 input variables have been driven through Neurons

Model 3: Canonical Covariate Analysis: interaction between left side dependent and right side independent variables





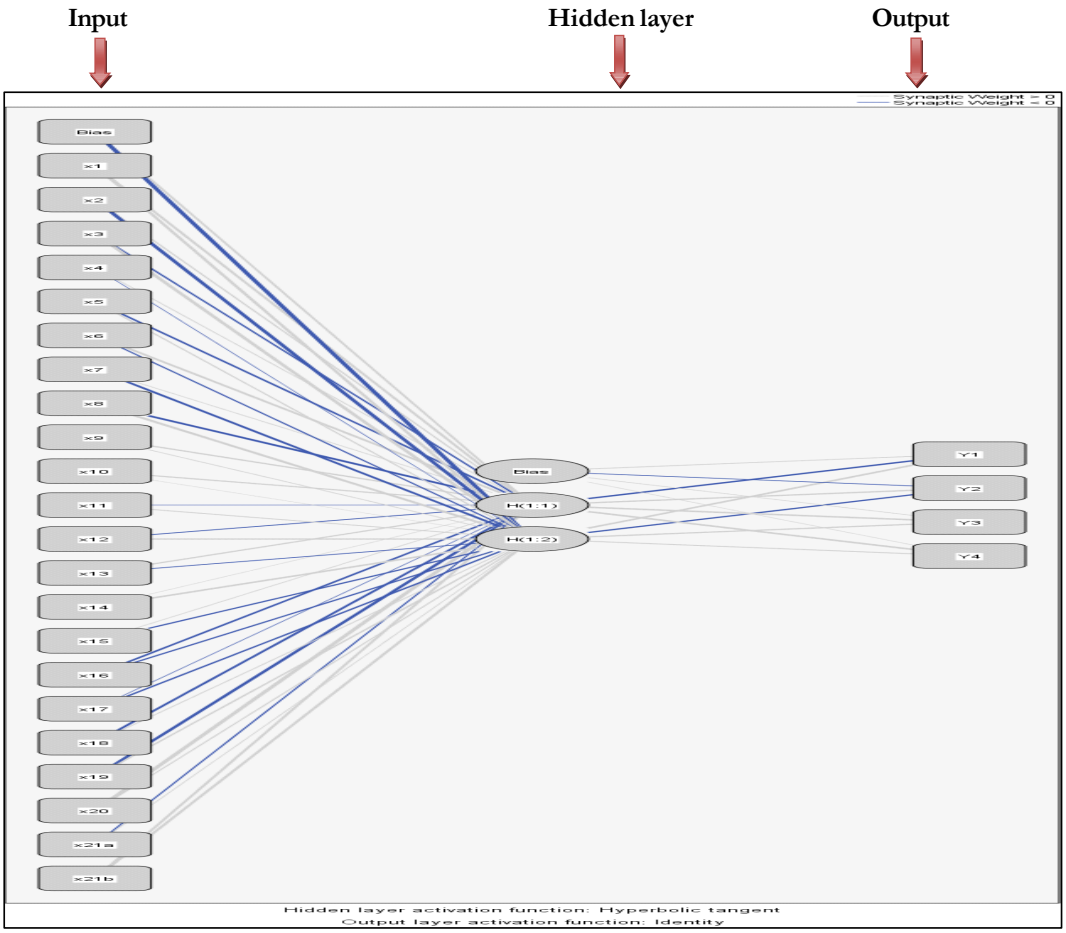
Model 4: Artificial neural network of Jalpaiguri municipal area

having, hidden layers and ultimately contributed to predict the four output volume of wastes used for different purposes (y_1), knowledge of waste recycling (y_2), motivation of wastes recycling (y_3) and wastes reduction methods (y_4). It has found that input variable total family member (x_3), after being activated by weightage from hidden layer H (1:1) and H (1:2) and subsequently contributed to output variables volume of wastes used for different purposes (y_1), knowledge of waste recycling (y_2), motivation of wastes recycling (y_3) and wastes reduction methods(y_4). Similarly the input variables income (x_6), expenditure (x_7), water consumption per day (x_9), total bio diversity (x_{10}), impact of waste management on health(x_{11}),impact of waste management on micro flora and fauna (x_{16}), exposure to media (x_{17}), training received (x_{18}) and perception on environmental impact of waste management (x_{20}) after being activated by both hidden layers H(1:1) and H(1:2) dominantly impact on output variables volume of wastes used for different purposes (y_1), knowledge of waste recycling (y_2), motivation of wastes recycling (y_3) and wastes reduction methods (y_4).

The input variables education (x_2) and impact of waste management on soil (x_{15}) have been activated form hidden layer H (1:1) and subsequently contributed to output variables knowledge of waste recycling (y_2), motivation of wastes recycling (y_3) and wastes reduction methods (y_4). Similarly the input variables total volume of waste generation from household (x_8) and impact of waste management on water (x_{14}) after being activated form hidden layer H(1:2) have subsequently contributed to output variables volume of wastes used for different purposes (y_1), knowledge of waste recycling (y_2) and motivation of waste recycling (y_3).

Combined Pull Data of Artificial Neural Network: Model 5, present the Artificial Neural Network where in 21 input variables have been driven through Neurons having, hidden layers and ultimately contributed to predict the four output volume of wastes used for different purposes (y_1), knowledge of waste recycling (y_2), motivation of wastes recycling (y_3) and wastes reduction methods (y_4). It has found that input variables impact of waste management on micro flora and fauna (x_{16}) and exposure to media (x_{17}) after being activated by weightage from hidden layer H (1:1) and H (1:2) and subsequently contributed to output variables volume of wastes used for different purposes (y_1), knowledge of waste recycling (y_2).

Model 5: Combine pull data of Artificial neural network



The input variables education (x_2) after being activated form hidden layer H (1:1) and subsequently contributed to output variables volume of wastes used for different purposes (y_1). Similarly the input variables family member (x_3), household land (x_5), volume of waste generation from household (x_8), impact of waste management on health (x_{11}), impact of waste management on agriculture (x_{12}), training received (x_{18}) and participation on waste recycling programmer (x_{19}) have been activated form hidden layer H (1:1) and subsequently contributed to output variable volume of wastes used for different purposes (y_1). The input variable total cost of energy per month (x_4) after being activated form hidden layer H(1:2) have subsequently contributed to output variables knowledge of waste recycling (y_2). Similarly, the input variables income (x_6), expenditure (x_7), impact of waste management on livestock (x_{13}), impact of waste management on soil (x_{15}) and value addition by percentage at household level (x_{21a}) have been activated from hidden layer H(1:2) and subsequently contributed to output variable knowledge of waste recycling (y_2).

CONCLUSION

The application of artificial neural network has gone effective in identifying variables with dominant effect as relevant for both Jalpaiguri and Kalyani municipality, with intern invites immediate intervention for up scaling the status of waste recycling and management for both the municipalities. Input variables passing through hidden layers and minimizes errors and give effective output. Artificial neural network describe the relationship between independent and dependent variable and minimize errors. The whole gamut of the study has identified unless community participation are being dovetailed to municipal management functions, the ecological health of the respective municipalities will be jeopardize and ultimately disburse the normal functioning of normal life. Recently, burning of waste materials including plastic, hospital waste in Kalyani has made the situation precarious and complex. What is needed in the juncture is the long term planning for both the municipalities and in general and with some location specific interventions for both Kalyani and Jalpaiguri municipalities.

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Value Chain Dynamics of Freshwater Aquaculture: A Study from Peri-Urban Areas of National Capital Region, India

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ABSTRACT

Fisheries and aquaculture are the critical sources of nutrition, livelihood, and income-making venture in many low-income and developing countries. In India, it acts as a major sector with huge export potential. Though the nation has created a significant market niche for fresh and processed fish products, the marketing sector is not exempted from intermediary people's exploitation. In the present study, attempts were made to compare the cost of production and net income of fish growers and processors and map various channels of peri-urban areas. A significant difference was observed in the cost of production of fish growers and processors ($t = 5.630$, $p < 0.05$), whereas no significant difference was observed in terms of net income (($t = 1.453$, $p=.171$). Three different marketing channels were identified among fish growers and fish processors. Producers' share in consumers' price was varied from 50.44 percent to 100 percent in different channels. The study further revealed that the marketed and marketable surplus availability of the produced fish (mean rank 11.25) is the primary element motivating the fish farmers to opt for value addition.

Keywords: Marketing channels, Marketing efficiency, Price spread and Postharvest Decision

INTRODUCTION

India's agriculture and allied sectors face the most important challenge of how the farmers can escape from the vicarious circle of financial losses and make it a life-supporting profitable venture. Among many of the allied components of agriculture, fisheries are considered an important option for attaining economic viability and sustainability of the farming activities (Jayasankar, 2018). India's fisheries sector went through its loftiness during the blue revolution era and continues its superior position in the Indian agriculture sector with the largest volume in India's agricultural exports with 10.51 lakhs tonnes of fish and fish products in terms of quantity and Rs. 33,442 crores in economic value (NFDB, 2015). Simultaneously, the consumers' food preferences and consumption patterns have contributed to its increased demand. People are more cautious in selecting nutritionally rich and quality products in ready-to-eat or cook forms of fish-based products. The mounting demand for fish and fishery products is mostly met from aquaculture and culture-based capture fisheries in India's water bodies and ponds. Inland fish production has shown a remarkable increase from 0.22 million tons in 1950-51 (Singh *et al.,* 2015) to about 3.4 million tons in 2014-2015 (NFDB, 2015).

As a means of additional income generation, processing, value addition, and innovations in fisheries' marketing have been suggested by many agencies working for farmer's welfare and development in this region. Since India's marketing system is very much fragmented and middlemen are the main agents, farmers and processors need to face many hurdles even after processing. In this present study, an attempt has been made to determine the different preferred marketing channels among the fish farmers and fish processors. A detailed economic analysis in terms of marketing efficiency, producers share in consumer price etc., also has been made. In the end, a qualitative analysis of the determinants of post-harvest decision-making among the fish processors was also studied and discussed.

MATERIALS AND METHODS

The present study was conducted in peri-urban area of NCR. Haryana ranks 2nd in the country in per unit fish productivity of 5,800 kg/ha/per year during 2013-14,

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followed by Punjab (Economic Survey of Haryana, 2015) and situated in the peri-urban area of NCR. Karnal district has located a place with a more outstanding market and institutional accessibility concerning fisheries. Hence, the Karnal district of Haryana state was selected purposively as the study area for the present study. An inclusive list of fish farmers and fish processors of Karnal was collected with the help of experts from ICAR institutes like Krishi Vigyan Kendra (KVK) of National Dairy Research Institute (NDRI), Regional Station of Indian Agricultural Research Institute (IARI), Fisheries Department of Haryana state and progressive/ contact fish farmers in the Karnal region. The reliability and validity of the scale developed for identifying the motivating factors of post-harvest decision-making were tested with a sample selected from the recognized fish processors. Twenty respondents comprised of ten processors and ten fish growers were chosen randomly for the actual measurement of different variables like market channel identification, measurement of marketing efficiency in different identified channels, and the factors contributing to the post-harvest decision taking among the fish processors. For identifying different marketing channels, detailed personal interviews of intermediaries, market personnel, and discussion with fish farmers groups were also carried out. Data collection, detailed study, and interpretation were conducted from December 2014 to May 2015. Data collected were analyzed with the help of SPSS 20 and Excel Stat software to draw a valid conclusion. The comparison of the average cost of production and average net income of fish farmers and processors was made by employing students 't' test. In this region, the fish farmers were growing fish in the open ponds owned by them or the panchayath ponds taken by lease. The cost of production and profitability analysis was done by taking one hectare of the pond as a unit. For analyzing the marketing efficiency in different channels recognized in the study area Shepherd's (1972) marketing efficiency index and Acharya's marketing efficiency index (Acharya and Agarwal, 2001) were used.

A Likert-like summated rating scale was adopted for measuring the motivating factors for the post-harvest decision-making among processors (Likert, 1932). Construction of this scale involved the following steps, defining the construct (which one can able to measure the magnitude. Here the construct was motivating factors for processing among the fish growers), identification and operationalization of dimensions under the construct (three different dimensions identified were market-related factors, income-related factors, and consumers preference related factors), finally collection and development of items (these are the statements representing each dimension of the construct under study). Items were collected and developed based on the literature review, consultation with the experts from Agricultural Extension, Agricultural Economics and Post Harvest Technology Divisions of IARI, and the field experience. The selection of the items was in line with the criteria suggested by Edward (1969). Items were analyzed with the help of experts and a group of 40 respondents during the study. Selected items for the scale were primarily given to the respondents for rating in 3 point continuum. A scoring pattern of 1 to 3 was adopted for the continuum, starting from least important to most important. A reverse scoring pattern was adopted in negative statements. On the basis of the total score, upper and lower 25 percent of the subjects were selected as a referent group for calculating 't' value. Items or statements were chosen on the basis of a higher 't' value over a cut-off point of 1.75.

RESULTS AND DISCUSSION

Net income and cost of production of fish per hectare were analyzed in both the fish processors group and fish producers group. It is evident from Table 1 that, the total cost of production of fish/ha and total cost of production cum value addition of fish in terms of cutting, cleaning, packing, storing, and giving place utility these are the major form of value addition done by the fish growers in peri-urban region of NCR) differed significantly ($t = 5.630$, $p < 0.05$) among fish producers and fish processors. The total cost of production of fish/ha was about Rs. 117397.50 ± 2619.83 and total cost of production cum value addition of fish/ha was about Rs. 172561.30 ± 9441.22. The average net income of fish processors was Rs. 332088.70 ± 39332.28/ ha and that for producers was Rs. 269302.50 ± 17874.72/ ha. Analysis of fish processors and producers' average income did not show a statistically significant difference ($t = 1.453$, $p=.171$). From these results, it is evident that even if there is a difference in fish processors and producers' net return, value addition in fish considered under this study did not make a huge difference in net return. Similar results were observed in the findings of Nowsad (2005) and Ghorai *et al.* (2014). Value addition and processing of fish would make a huge difference in the income of fish farmers if they were supported with all technologies to make value-added products provided a high demand for the processed food.

Table 1: Average net income and average production cost of fish processors and fish producers

Cost/Returns (Rs/ha)	Respondents	Mean	Std. error of mean	Levene's Test for Equality of Variances	t-test
				F(Prob. F)	t, DF(Prob. t)
Total cost	Processor	172561.30	9441.22	6.435	5.630, 10.37
	Producer	117397.50	2619.83	(p=.021)	(p<0.001)
Net returns	Processor	332088.70	39332.28	12.396	1.453, 12.56
	Producers	269302.50	17874.72	(p=.002)	(p=.171)

*DF=Degrees of freedom; F=Value of the F-statistic; t= Value of the t statistic; p = probability

Consumers' preference revealed that the demand for fish in raw form or cleaned and value-added form was more or less the same. Ganesh Kumar *et al.* (2008) showed that the fish marketing and processing system is inferior and highly inefficient in India compared to fish production achievements.

Detailed interviews conducted among the processors, producers, and market intermediaries in the study area (Karnal) revealed that there were three well-established marketing channels for value-added fish and fish as such (Figure 1). As the number of middlemen increases, some remarkable difference was found in the market margin and price spread among these channels.

The respondents under fish processors also held the title of a producer too. They were cultivating fish by themselves and making value addition to it. Three channels identified among them were as follows; channel I producer/processor - consumer or direct marketing channel, channel II producer/processor - wholesaler/ retailer - consumer with one intermediary between processor and consumers, and channel III, producer/ processor – wholesaler – retailer - consumer with two intermediaries (Figure 1). These intermediaries may come from Delhi and some other urban areas. Similarly, among fish producers also three different channels were identified as Channel I (producer-consumer), Channel II (producer

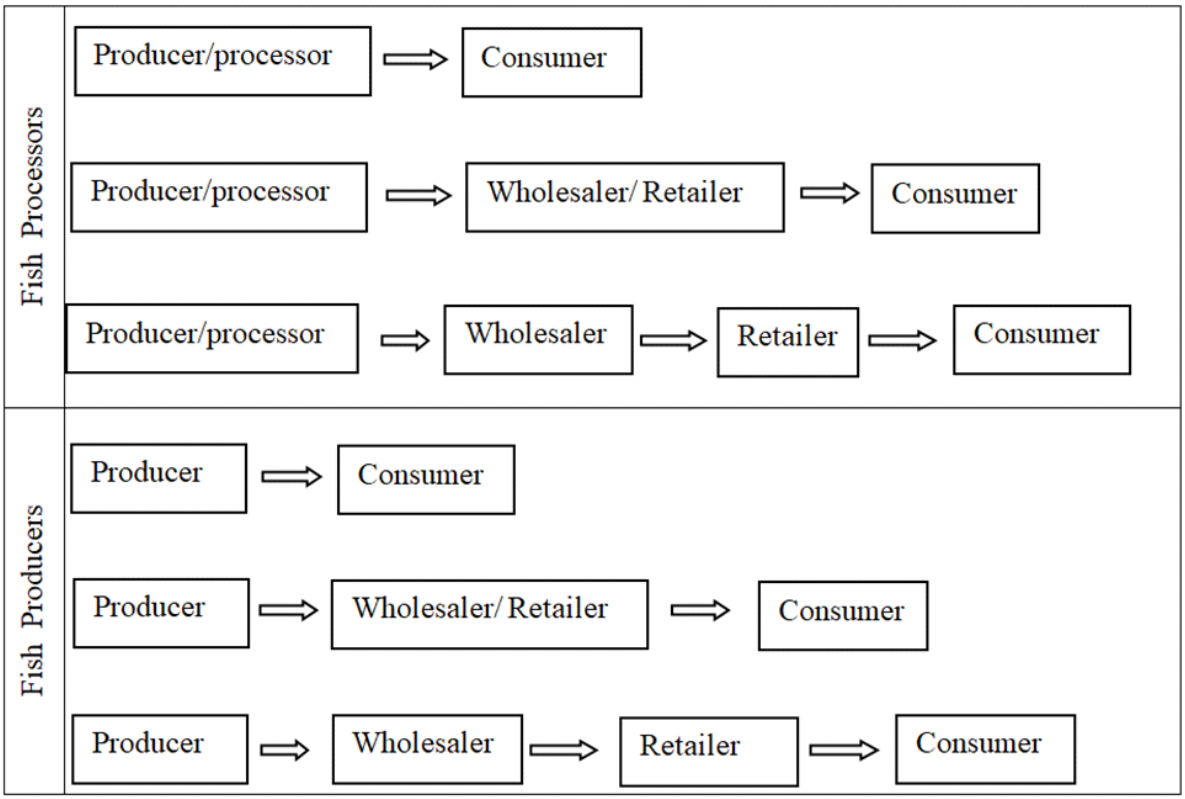

Figure 1: Existing marketing channels identified among fish processors and producers

- wholesaler/retailer - consumer), and Channel III (producer – wholesaler – retailer - consumer). Similar results were observed in the studies of Devi *et al.* (2014). According to them, the channels identified were Dealers - Small retailers - Consumers and Dealers - Large retailers - Consumers. The marketing costs and margins were also found to be less in direct selling channels because of the reduced length. Hossain *et al.* (2015) and Aswathy *et al.* (2014) were also indicated the same.

From Table 2 it is well evident that fish producers were getting more net returns (Rs. 262752.5/ha) than the persons whoever were doing the value addition (Rs. 195071.2/ha), inclusive of all marketing cost. Marketing channel analysis showed that in both the group (fish processor and fish producer) channel I (direct selling channel) was the most efficient channel with 100 percent of producers share in consumer's price. In channel II of fish processors, producers' share in consumers' price was about 60.78 percent. In this channel about 40 percent of consumer price was taken up by the intermediaries. Channel III was identified with the lowest percentage of producers share in consumers' price (50.44%). In the case of fish producers, channel II has been giving 73.72 percent producers share in consumers' price, whereas channel III gave only 54.56 percent share. Similar findings were also reported by Goswami *et al.* (2013) that fish farming is an economically viable enterprise with the benefit-cost ratio ranging from 2.22 to 4.44 and producer's share in consumer's rupee ranges from 52 percent to 93 percent. The opportunity to take margin by the intermediaries or middlemen was found low in the fish producers' channel than the fish producer cum processor channel. Marketing efficiency by Shepherd's formula also indicated the same. This index was found in increasing order in channel I, channel II and channel III of the fish processor, which showed the opportunity of middlemen to make more profit when the length of the chain is increasing. But in the case of fish producers, it has been observed in decreasing order (Channel I - 55.24, Channel II -20.69, and Channel III - 20.5). It revealed the less opportunity of intermediaries to take much margin. These results were on par with the findings of Sathiadhas *et al.* (2011) and Aswathy *et al.* (2014). Present study results were also comparable with earlier results (Gupta, 1984) wherein fishermen's share was reported uppermost (95%) in direct selling channel to consumers and lowest (27.9%) in channels involving multiple players and multi-locations. Another study by Ganesh Kumar *et al.* (2008) showed that marketing efficiencies in different marketing channels of fish varied from 34 percent to 74 percent, depending on the span and length of the market channel. As the present study also identified that the increased number of intermediaries reduced the marketing efficiency of the channel, findings

Table 2: Average price spread in different marketing channels of value-added fish and raw fish

S. No.	Particulars	Fish Processors (Rs. /ha)			Fish Producers (Rs. /ha)		
		Channel I	Channel II	Channel III	Channel I	Channel II	Channel III
1.	Cost of production	172561.3	172561.3	172561.3	117397.5	117397.5	117397.5
2.	Marketing cost of producer/processor	137017.5	137017.5	137017.5	6550.0	6550.0	6550.0
3.	Gross returns to producer/processor	504650.0	504650.0	504650.0	386700.0	386700.0	386700.0
4.	Net returns of Producer/processor (MM) (3-(1+2))	195071.2	195071.2	195071.2	262752.5	262752.5	262752.5
5.	MC of wholesaler	0.00	35120.0	35120.0	0.00	18790.0	18790.0
6.	MM of wholesaler (7-3+5)	0.00	140480.0	140480.0	0.00	119010.0	119010.0
7.	Gross price to wholesaler	0.00	830200.0	830200.0	0.00	524500.0	524500.0
8.	MC of retailer	0.00	0.00	22790.0	0.00	0.00	7610.0
9.	MM of retailer (10-7+8)	0.00	0.00	11550.0	0.00	0.00	176640.0
10.	Consumer price	504650.0	830200.0	1000350.0	368400.0	524500.0	708750.0
11.	Producers share in consumers price (3/10)*100	100.00%	60.78%	50.44%	100.00%	73.72	54.56%
12.	Marketing efficiency (Shepherd) [(V/TMC)-1]	2.68	3.82	4.13	55.24	20.69	20.5
13.	Marketing efficiency (Acharya) [Gross return of producer/(TMC+TMM)]	3.22	0.99	0.93	1.43	0.94	0.65

were on par with the previously stated results. But the study by Madugu and Edward (2011) revealed that processed fish marketing was profitable compared to the fresh fish market. According to Acharya's method, marketing efficiency indicated channel I was most efficient in terms of profit obtained by the producer cum processor. It was followed by channel II and channel III. The same case has been observed in the marketing channels of fish producers also. Fish marketing in India has received little attention from public agencies and is mainly handled by the private sector. As a result, there are many intermediaries in the marketing channels, especially in the freshwater fish sub-sector, thus reducing the share of fishers/aquaculturists in consumer rupee and contributing to the high retail prices (Ganesh Kumar *et al.,* 2010).

The profitability pattern of producers and processors obtained from the study results tossed a question in front of us. What motivates the processors to persist with processors' status, even after values addition in the inland fish marketing chain is less profitable. Respondents were asked to mark their preference in a 3 point continuum for the perceived importance of selected 13 factors for post-harvest decision-taking. These factors were compared using Friedman's two-way ANOVA. It can be inferred from the results ($p < 0.05$, Chi-Square = 66.772 and df = 12), that the level of influence of different factors on the post-harvest decision making among fish processors has differed significantly. Since the fish processors were fish producers too, marketed and marketable surplus availability of the fish (Mean Rank 11.25) with the producers was identified as the most critical factor in post-harvest decision-making (Table 3). They were selling value-added fish in their brand name, and the acceptance of these products and the credibility which has been obtained from the brand name, in turn, make more demand for their products. Because of the above-stated reason, processors identified branding and new look of products (Mean Rank 10.75) as the second most crucial factor which motivates them to undertake post-harvest operations of fish. Price of value-added food (Mean Rank 10.40) and increasing demand for fish products in urban areas (Mean Rank 9.90) were also important motivators identified by the fish processors. Consumer satisfaction and loyalty, labour availability, and rising disposable income in hand with mean ranks 7.10, 6.70, and 6.30 respectively have been identified as moderately important motivators (Table 3). Fish has been in high demand and gets a remunerable price all season in northern India. Since the fish farmers are not troubled by the lack of consumer markets, the reason to avoid distress sales has been given the lowest rank (Mean Rank 3.85) by the respondents. It was identified as the least important factor to motivate the processor to take post-harvest decisions. Similarly, market margin obtained due to elimination of middle man (Mean Rank 3.85) also rated as a least critical motivator to take post-harvest decisions. It is well evident from the market channels identified in the study area that many players and middlemen were also

Table 3: Motivating factors for post-harvest decision making among fish processors based on mean ranks of Friedman's test

S.No.	Factors	Mean Rank	Groups**		
1.	Marketed and marketable surplus availability	11.25	A		
2.	Branding and new look of products	10.75	A	B	
3.	Price of value-added food	10.40	A	B	
4.	Increasing food demand in urban areas	9.90	A	B	
5.	Consumer satisfaction and loyalty	7.10	A	B	C
6.	Labour availability	6.70	A	B	C
7.	Rising disposable income in hand	6.30	A	B	C
8.	Transportation facilities to market	5.75	A	B	C
9.	Changing consumer needs and choice	5.75	A	B	C
10.	To minimize wastage	5.45		B	C
11.	Competition from the market	3.95			C
12.	Market margin obtained due to elimination of middle man	3.85			C
13.	To avoid distress sale	3.85			C

**Mean ranks having same letters are not significantly different

present in value-added fish marketing. It would not be possible to eliminate them since the production of fish was consistently high in the study area, and in the local market, they cannot be able to sell all the produce. Multiple pairwise comparisons using Nemenyi's procedure revealed that 13 motivating factors identified can be grouped into three different homogenous groups (since letter groupings are A, B, and C). But the effect of marketed and marketable surplus availability is identified as quite prominent for taking the post-harvest decisions by the fish farmers. Since fish is a high-value commodity with the assured market in the urban and peri-urban areas and with many intermediaries in the channel, competition from the market, market margins obtained, and distress sale were identified as the minor motivating factors for the post-harvest decisions making. The products' market availability and price are the two critical components in the sustainment of fish farming and processing, as identified by the previous studies (Ganesh Kumar *et al.,* 2008 and Ayyappan *et al.,* 2009).

CONCLUSION

The inland fisheries sector in India needs to develop more in terms of processing and value addition to harness economic potentiality and reduce post-harvest losses. From this study results, it can be concluded that value addition in terms of cutting, cleaning, packing, etc., to create time and place utility could not produce much profit to the processors compared with fish producers ($t = 1.453$, $p=.171$). To make a substantial profit, processors need to concentrate more on producing value-added products like fish chips, fish fingers, fish balls etc., which has an excellent domestic and export market. Since the initial investment for fish processing units is very high, it might not be in an affordable cost range for single processors. Group funding and processing have been identified as viable options to overcome this condition.

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Determinants of Post-Harvest Losses in Onion in Pune and Nashik Districts of Maharashtra

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ABSTRACT

Horticulture has a huge potential for development of Indian agriculture in particular and Indian economy in general. India is the second largest producer of fruits and vegetables in the world after China. But a major amount of this produce, estimated to be 30 per cent is lost annually in the form of post-harvest losses. It has been observed that there are many factors which lead to post-harvest losses at the farm level. It becomes necessary to isolate such factors or determinants which are majorly associated with the high post-harvest losses. The present study is an attempt to identify the determinants of post-harvest losses with respect to onion. The primary study was conducted in purposively selected Junnar and Dindori blocks of Pune and Nashik districts, respectively. The study revealed that Farm Size, Knowledge level, Training received on post-harvest handling, Variety, Timely labour availability, Quantity harvested and Storage duration were the factors which positively and significantly influenced the quantum of post-harvest losses. So, the emphasis should be on capacity building, knowledge enhancement, breeding and diffusion of the improved varieties to the grass-root farmers and improved infrastructure for better post-harvest management. Concentrated efforts have to be made by all the stakeholders like policy-makers, research organisations, private companies, etc. along with all the actors of onion value chain in order to address these location-specific issues and reduce the post-harvest losses.

Keywords: Determinants, Knowledge, Labour, Onion, Post-harvest losses, Post-harvest management storage, Training, Variety

INTRODUCTION

India is a leading producer of many of the vegetables. It enjoys the status of being the second largest onion producer in the world after China. During 2017-18, the area under onion in India was 1.29 million hectares with a production of 23.262 million tonnes. Maharashtra is the largest producer of onion with about 33 per cent of the total production in the country. The major onion growing districts are Nashik, Ahmednagar, Pune and Satara (DAC&FW, 2018). Almost 30 per cent of fruits and vegetables produced in India is lost. A significant amount of the produce goes wasted in onion too. From the standpoint of economy, maintaining the food and nutritional security for the population of the country, there is a need to reduce such post-harvest losses. For effective implementation of strategies to reduce the post-harvest losses, it is pre-requisite to understand, quantify and correlate the determinants of the losses at different stages of any commodity value chain (Hodges *et al.,* 2011; Affognon *et al.,* 2015). Since the value chain of any specific agricultural produce varies temporally and spatially across the regions (Harris & Lindblad, 1978; Lundqvist *et al.*, 2008; Mulualem *et al.*, 2015), identifying the exact determining factors contributing to the post-harvest losses will help to devise appropriate loss reduction strategies (Snowdon, 1988; Hengsdijk and de Boer, 2017) and also significantly contribute to the effective location-specific planning of socio-economic development programmes (FAO, 2011). This shows the importance of identifying the determinants of post-harvest losses in specific regions for individual crops. In this study, we tried to identify and establish the determinants and quantum of the postharvest losses associated with Onion crop in Pune and Nashik districts of Maharashtra.

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MATERIALS AND METHODS

The present study was carried out in Maharashtra. Two major onion producing districts Pune and Nashik of Maharashtra state were purposively selected to collect the primary data on onion growers' post-harvest losses and the possible determinants for these losses. The blocks Junnar from Pune and Dindori from Nashik district were purposively selected. The villages viz. Narayangaon and Agar from Junnar block and Janori and Lakhamapur villages from Dindori block were selected through random sampling method. Twenty-five farmers from each village, totalling 100 were chosen from these four villages through random selection. The data were collected with the help of well-structured and pretested interview schedule comprising the items for assessment of post-harvest losses and the probable determinants (Farm size, Knowledge on the recommended package of practices on pre- and post-harvest handling, Farming experience, Training received on post-harvest handling, Variety grown, Timely availability of labour, Quantity harvested, Days of storage/ time between harvesting and selling the produce, Distance from farm to market). The ordinal logistic regression method was used to analyse the data to draw tangible inferences about the possible relations between the losses and the determinants.

RESULTS AND DISCUSSION

Though, in past, a bunch of the different determining factors were identified by different researchers in different commodities (Hewett, 2006; Abass *et al.*, 2014; Affognon *et al.,* 2015), for this study, 9 different independent variables in this study; Farm size, Knowledge on the recommended package of practices on pre- and post-harvest handling, Farming experience, Training received on post-harvest handling, Variety grown, Timely availability of labour, Quantity harvested, Days of storage/ time between harvesting and selling the produce, Distance from farm to market were selected considering the regional dynamics of the study area. The independent variables used in the econometric model have been represented in Table 1. The variables like Farm size (ha), Farming experience (years), Storage duration (days), Quantity harvested (Quintals/ Hectare) and Distance from farm to market (Km) were taken in the numerical scale and the variables like Variety grown, Knowledge level, Training received and Timely labour availability were measured as categorical variables for the proposed econometric model.

To get the established relationship of factors and the quantum of post-harvest losses associated, the observed range of the postharvest losses (q/ha) of onion crop were rearranged into three ordered categories of low, medium and high values. After calculating the losses for individual respondents, the mean and standard deviation for the losses incurred by the respondents was obtained. Based on the mean and standard deviation, the losses were categorised into three categories, i.e. low, medium and high losses. Data pertaining to this is presented in Table 2.

Table 2. Distribution of respondents on basis of the dependent variable (Post-harvest losses)

Post-harvest loss (q/ha) in Onion	Frequency (%)
Low (< 34.5)	9 (16.67)
Medium (34.5 –82.6)	27 (25)
High (> 82.6)	24 (58.33)
Mean	58.55
Standard Deviation	24.05

Table 1: Explanatory variables used in the regression model

Variable	Description	Measurement
FRM	Farm size	Area under Crop (hectares)
KNW	Knowledge	Low level = 1, Medium level = 2, High level = 3
EXP	Experience	Number of years engaged in farming
TRA	Training received on post-harvest handling	Yes = 1, No = 0
VAR	Variety grown	Improved = 1, Local = 0
LAB	Timely availability of labour	Yes = 1, No = 0
PRO	Quantity harvested	Quintals/hectare
STO	Storage duration	Days
DIS	Distance from farm to market	Kilometres

The multi-collinearity refers to the correlations or multiple correlations present amongst the explanatory variables in a sufficient magnitude to potentially affect regression estimates of the model adversely. Variables selected were tested to check their suitability in the model fitting. Results were presented in Table 3 which shows that the problem of multi-collinearity was not existing among the explanatory variables used in the regression model, since the variance inflation factors were less than 5, while all the tolerance values were greater than 0.2. Therefore, all of the proposed explanatory variables were fit to be used in the model.

Table 3: Test to assess the degree of multi-collinearity between explanatory variables

Variables	VIF	Tolerance (1/VIF)
FRM	1.56	0.641
KNW	1.66	0.602
EXP	1.53	0.653
TRA	1.52	0.657
VAR	1.37	0.729
LAB	1.25	0.800
PRO	1.23	0.813
STO	1.21	0.826
DIS	1.10	0.909
Mean	1.38	

The model regression results including the model fitting information, goodness of fit, pseudo R^2, parameter estimates, test of parallel lines have been presented in Table 4. Amongst the independent variables, using ordered logistic estimates, those that have significant influence on onion post-harvest losses include Farm Size, Knowledge level, Training received on post-harvest handling, Variety, Timely labour availability, Quantity harvested and Storage duration. The statistical significance of the model indicates that there was significant improvement in fit of model as compared to the baseline model with no predictors. The model fits the data well as evident with the non-significant Pearson c^2 test statistics. From the pseudo R^2 value (provided at the end of the table), it can be inferred that the specified variables explained 46 percent of variance of post-harvest losses in onion. The result of the test of parallel lines indicate non-significance, from which we can interpret that the assumption of *Proportional odds* stands fulfilled. So, we can safely say that the relationship between the independent variables are same across all possible comparisons.

Farm size (refers to the total farm area under which the said crop was cultivated during the survey period) is a factor that was hypothesised to be positively related to the quantity of post-harvest losses in all the crops. The results of the present study showed a positive and statistically significant relationship at 5% level between farm size and postharvest losses in onion. This denotes that with every one unit increase in the farm size, there is a predicted increase of 0.031 in the log odds of incurring higher post-harvest loss by the onion farmers. As the farm size increases, the onion farmers will need more skilled labour for managing the farm activities and for timely harvesting. It was observed that the timely availability of skilled labour was a major problem for the onion in the study location, so higher losses with increasing farm size were imminent.

From the study, it was found that knowledge level was significantly influencing the post-harvest losses in onion crop. High knowledge level was taken as the reference category in the model. The estimates for onion crop indicate that the log odds of incurring high post-harvest losses increased by 0.754 for persons with low knowledge and by 0.345 for persons with medium knowledge level as compared to those with high knowledge on pre-harvest and post-harvest management practices. It was expected that the farmers with more experience in crop production appear to have better knowledge on post-harvest management and thus incur lower losses. Thus, it was hypothesized to have a negative influence on quantity of postharvest loss. Farm experience was found to be negatively associated with the post-harvest losses but the association was not significant.

Training on Postharvest handling had a statistically significant relationship with postharvest losses for onion at 1% level. This implied that the onion farmers who didn't attend training were more likely to experience higher postharvest losses as compared to those who attended training on postharvest handling. Cultivation of improved varieties was expected to be associated with lower levels of losses as these varieties have superior traits like disease resistance, abiotic stress tolerance, storability, firmness, etc. as compared to the local varieties. And the findings were consistent with a-priori expectation. The farmers using local varieties were more likely to have higher losses as compared to the ones growing improved varieties. The log odds of having higher post-harvest losses was 0.15 points higher on average for the onion farmers who used the local varieties as compared to the farmers growing improved varieties.

Table 4: Ordered logistic regression results

Independent Variables	Estimate	Std error	p-value
Farm Size	0.031**	0.015	0.036
Knowledge (Low = 1)	0.754**	0.354	0.033
Knowledge (Medium = 2)	0.345**	0.334	0.031
Knowledge (High = 3)	0[a]	-	-
Experience	-0.832	0.519	0.109
Training (No training received = 0)	0.880***	0.519	0.009
Training (Training received = 1)	0[a]	-	-
Variety (Local variety = 0)	0.150*	0.088	0.091
Variety (Improved variety = 1)	0[a]	-	-
Timely Labour availability (No = 0)	0.063**	0.024	0.010
Timely Labour availability (Yes = 1)	0[a]	-	-
Quantity harvested	0.161***	0.232	0.006
Storage duration	0.034***	0.043	0.001
Distance from farm to market	0.060	0.091	0.181
Model fit	$\chi^2(9) = 45.471, p = 0.001$		
Goodness of fit (Pearson)	$\chi^2(198) = 175.471, p = 0.12$		
Pseudo R-square (Nagelkerke)	0.468		
Test of parallel lines	$\chi^2(9) = 15.471, p = 0.462$		

*, **, *** means the coefficient is statistically significant at 10%, 5% and 1% levels respectively

Timely labour availability was found to have a significant relationship with the level of post-harvest losses. Onion farmers who had timely availability of skilled labour tended to have lower levels of post-harvest losses as compared to ones who did not have timely labour availability. It was expected that more the quantity of produce harvested, the more the losses. Results from the ordinal logistic regression indicate that the quantity harvested was positively and significantly related to the quantity lost in onion. With a unit change in quantity of onion harvested, there is a predicted increase of 0.161 in the log odds of experiencing high post-harvest loss. The storage duration was a positive and significant factor for post-harvest losses in onion. As the number of days increased between harvesting and selling the produce, the onion farmers were more likely to report higher post-harvest losses. The distance from farm to market was expected to have an overall positive effect on postharvest losses. The results for onion showed positive though statistically insignificant relationship.

CONCLUSION

The study revealed that Farm Size, Knowledge level, Training received on post-harvest handling, Variety, Timely labour availability, Quantity harvested and Storage duration were the factors which positively and significantly influenced the quantum of post-harvest losses. So, concerted efforts have to be made to make improvements in these areas in order to reduce the post-harvest losses experienced by the onion farmers of Pune and Nashik. This can be achieved by the proactive interventions of state government in areas of knowledge, training, varieties, and storage. Government should make necessary arrangements for awareness and capacity building programs on regular and timely basis for the farmers to increase their knowledge level and skill regarding the basic concepts and the technical part of the recommended pre- and post-harvest management factors. Government should invest more in research for development of improved varieties through various research organisations and SAUs with focus on disease resistance, abiotic stress tolerance, good storability, higher yield, enhanced taste and nutrition. It should also pay attention to the wider dissemination to the farmers through KVKs, ATMA, etc. and ensure timely adoption of such varieties and improved technologies by the grass-root farmers. State government should focus on providing state-of-the-art infrastructural facilities like cold storage or controlled atmosphere storage facilities at the

village level so that farmers of all categories (small/ medium/large) can reap maximum advantage of the same by reducing wastage and benefitting from off-season sales. Based on these findings, the policy makers and administrators can chalk out the strategies focusing on the problem areas to improve post-harvest management at the field level, so as to reduce the maximum wastage of the agricultural produce.

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Comparative Study of Direct Seeded Rice and Transplanted Rice Against Incidence and Intensity of Stem Borer and Leaf Folder

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ABSTRACT

Present study was conducted in 2014 and 2015 to endow with appropriate information for implementing Integrated Pest Management (IPM) practices for controlling the stem borers and leaf folder in rice crop. Treatments comprised the crop sown on four different dates at the ten days intervals starting from the 10th July with direct seeded (T_1) and rest three by transplanting on 20th July (15 days old seedling) (T_2), 30th July (30days old seedling) (T_3) and on 10th August (40 days old seedling) (T_4), to observe the rate of stem borer and leaf folder infestation. The data on the incidences of insect pests and yield performances of rice were studied. Dead heart (per sq.m) were highest (16.1) in T_4 and lowest (4.9) in T_2. The yield of the crop was highest in treatment T_2 with B:C ratio of 2.46. Rice leaf folder and stem borer incidence were observed maximum during crop growth period in direct seeded rice under unprotected situation in both the seasons. Maximum dead heart caused by stem borer was noticed in vegetative phase of the crop while the peak incidence of white ears was observed in direct seeded field. Stem borer population emerged more from stubbles in direct seeded as compared to transplanted rice. It was found that transplanting on 20th July with 15 days old seedling was the most resistant having the lowest stem borer and leaf folder infestation among other plantings.

Keywords: *Cnaphalocrocis medinalis*, Direct seeded rice, Planting time, Puddled transplanted rice, Resistance, *Scirpophaga incertulas*

INTRODUCTION

Rice (*Oryza sativa* L.) is the dominant staple food in the developing world. More than 90 per cent of the world's rice is produced and consumed in Asia (Schoenly *et al.,* 1998). It is the staple food of more than half of the population of the world. Rice is an important target crop to provide food security and livelihoods for millions. In India, rice is grown mainly by transplanting the seedlings into puddled soil, which require large amount of water and labours, in recent years both are scarce and expensive, making rice production less profitable. Excessive use of nitrogenous fertilizers and abuse of agrochemicals have further aggravated the pest menace in transplanted rice (Anonymous, 2010).

Among the major insect pests attacking rice are rice leaf folder, *Cnaphalocrocis medinalis* (Guenee) and stem borer, *Scirpophaga incertulas* (Walk.). The loss due to yellow stem borer and leaf folder ranged from 3 to 65 per cent (Muralidharan and Pasalu, 2005) and 5 to 39 per cent (Shanmugam *et al.,* 2006), respectively. Changes in dates of transplanting may affect the status of various pests. The main factors that influence pest status are exposure of very young seedlings to pests, longer plant duration in the field.

Several insects feed on rice, but stem borers are considered the most important rice pests, (Sigsgaard, 2000). Stem borer usually comprised more than 90 per cent of the borer population in rice. The onset of flooding and stem elongation provided a more favorable environment for it. The rice borers' activity increased steadily during the first 3 to 4 months of flooding, to average 23 per cent damaged stems by the flowering stage. Borer's activity continued at about the same level as the water receded; to reach maximum annual levels of 38 to 44 per cent damaged stems at the late-ripening stage. At harvest, 60 per cent of the fields were at outbreak level (> 40% damaged stems) (Catling *et al.,* 1984). It is the serious pest species of rice throughout the orient, and abundant both on lowland rice

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and upland rice attacking young plant even in the nursery stage (Litsinger *et al.,* 1987). The rice stem borer, infesting the plant from seedling to maturity, is one of the main problems and yield limiting factors in the rice fields (Sarwar *et al.,* 2007; Sarwar, 2011).

Farmers depend on a great deal of insecticide applications, even though a lot of insecticide applications are not effectual (Sarwar *et al.,* 2005). Therefore, the challenge before the agricultural scientists today is to produce insect resistant plants. Insect resistant plants have the ability to withstand the effects of an insect by becoming resistant to its ill effects by means of genetic manipulation (Sarwar *et al.,* 2010).

We certainly need new technology to accomplish this task as the prevailing technologies alone do not seem to be adequate. To achieve this aim, pest control will have to rely on integrated management practices which include crop planting techniques and insect resistant plants (Baloch and Abdullah, 2011) to improve productivity and sustainability. This study is intended to assess the stem borer infestation and grain yield of four rice cultivars grown in diverse planting times to reveal appropriate date of sowing. The study is projected to endow with appropriate information for implementing Integrated Pest Management (IPM) practices for controlling the stem borers in rice crop.

MATERIALS AND METHODS

On farm trials were carried out in the kharif season of 2014 and 2015 on the field of twelve farmers of district Hazaribag, under close observation. Experiment conducted with three replications having four treatment combinations/technical options. The treatment combinations/technical options consisted of the crop sown on four different dates at the ten days intervals starting from the 10th July with direct seeded (T_1) and rest three by transplanting on 20th July (15 days old seedling) (T_2), 30th July (30 days old seedling) (T_3) and on 10th August (40 days old seedling) (T_4), to observe the rate of stem borer and leaf folder infestation. The data on the incidences of insect pests and yield performances of rice varieties were studied. The observation on status of insect-pests direct seeded rice (DSR) and transplanted rice crop were recorded. Stem borer incidence in terms of dead hearts (prior to ear head formation) and white ears on 10 randomly selected hills in each quadrant. The per cent dead heart or white ears were calculated using following formula as suggested by Chakraborty (2011).

$$\% \text{ stem borer incidence} = \frac{\text{No. of dead heart/white ears}}{\text{Total No. of plants/panicles}} \times 100$$

Leaf folder incidence was assessed by damaged leaves and total leaves from 10 randomly selected hills in each quadrant. Per cent of leaf damage was calculated by using the following formula as advised by Sagheeer *et al.* (2008).

$$\% \text{ leaf folder incidence} = \frac{\text{No. of damaged leaves}}{\text{Total No. of healthy leaves}} \times 100$$

The other agronomic parameters like yield, yield components and economics of the production i.e. no. of effective tillers/hill, no. of spikelet/panicle, test grain weight, yield of grain (q/ha), cost of cultivation and benefit: cost ratio calculated scientifically.

RESULT AND DISCUSSION

Stem borer and rice leaf folder incidence was observed maximum during crop growth period in treatment T_4 (transplanting on 10th August with 40 days old nursery) in both the seasons. The incidence of stem borer in terms of dead heart and percentage infestation was lowest in direct seeded rice i.e. T_1 and highest was observed in T_4 i.e. transplanting on 10th August with 40 days old nursery.

Dead heart (per sq.m) were 3.4, 4.9, 10.9 and 16.1 in treatment 1, treatment 2, treatment 3 and treatment 4, respectively (Table 1). Stem borer infestation was highest in the treatment 4 (Table 2). These findings are in close conformity with the report of Mohan and Janarthanan (1985). Rice leaf folder damage was noticed maximum between 70 and 80 days after sowing. The results of present study are in agreement with the findings of Ashrith *et al.* (2016). Anonymous (2012) opined that rice leaf folder damage was more in old seedlings than young and direct seeded rice.

Table 1: Comparative study of DSR and transplanted rice yield and yield components

Technology option	Yield component		Yield (q/ha)	B:C ratio
	No. of effective tillers/hill	No. of spikelet /panicle		
T_1	14	11	53.0	2.39:1
T_2	16	10	40.0	2.46:1
T_3	11	7	45.0	1.84:1
T_4	8	5	36.0	1.47:1

The yield and yield component were observed as per the treatments (Table 2). No. of effective tillers/hill were highest in treatment 2 i.e. transplanting on 20th July with 15 days old seedlings and lowest in treatment 4 (transplanting on 10 august with 40 days old seedling). Almost similar pattern have been observed in case of no. of spikelet/panicle. Disease and insect pest incidence were 6.3 and 8.5% in T1 and T2, respectively; while it was highest (19.3%) in late transplanting with old seedlings (T4). The findings are in conformation with Hegde and Nagappa (2011) and Anon (2012). Highest grain yield and benefit : cost were obtained from the treatment 2 i.e. early transplanting with 15 days young seedlings. The gross return and net return was best with the treatment 2 (Table 3).

Table 2: Comparative study of DSR and transplanted rice against incidence and intensity of insect/pest

Technical Option	Stem borer (plant %)	Dead heart (per sq.m)	Disease/ insect pest incidence (%)	Yield (q/ha)
T_1	6.3	3.4	6.3	5.3
T_2	8.5	4.9	8.5	6.0
T_3	14.9	10.2	14.9	4.5
T_4	19.3	16.1	19.3	3.6

Table 3: Comparative study of DSR and transplanted rice against incidence and intensity of stem borer and leaf folder and economics of the cultivation

Technology option	Cost of cultivation (Rs./ha)	Gross return (Rs/ha)	Net return (Rs./ha)	B:C ratio
T_1	24300.00	58700.00	34000.00	2.39:1
T_2	26800.00	66000.00	39200.00	2.46:1
T_3	26800.00	49500.00	22700.00	1.84:1
T_4	26800.00	39600.00	12800.00	1.47:1

CONCLUSION

Based on the results of present study it is worth mentioning that transplanting of 15 days seedling with early dates will be more suitable and profitable as compared to early DSR as well as late transplanting with old seedlings. The incidence of stem borer and leaf folder was found to be more in late transplanted crop with old seedlings. Among both the rice ecosystems, more insect pests and crop damage were noticed in late puddle transplanted rice with old seedlings than the direct seeded rice ecosystems.

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Use of Technology in Creating Conducive Learning Environment in Higher Education

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ABSTRACT

The role of Information and Communication Technologies (ICTs) particularly technology integrated learning is playing a major role in enabling conducive learning environments for the students in which the interactions between the various players of the learning system is favorable helping in the better retention of information. The integration of teaching with online tools for assessment, online games for understanding of complex information, screen capture for learning software tools in the real time, etc. is helping create a new dimension in enabling environments for better learning to take place. This paper provides with an overview of the 21st century skills that teacher needs to learn and practice in the classrooms for better educational attainment among the learning community.

Keywords: Learning, Environment, Technology, Skills, Tools

INTRODUCTION

The teachers and learners of the 21st century must possess the necessary information technology skills to create conducive learning environments among the student. The teacher's access to technology is the most important factor followed by the implementation of technology themselves by the teachers (McKnight *et al.,* 2016). With increasing globalization and an impetus on advanced learning, Indian universities have been fortunate to upgrade the technological paradigm at the workplaces in quick time. The comparative researches on the traditional learning and digital learning experiences are still in its infancy and are yet to show any striking results (Bernard *et al.,* 2004), but enabling technology in classroom has led to many improvements in the retention capacity and learning ability to the current age students.

The rapid proliferation of education and learning opportunities could be said to have started from the times of the printing press during the 15th century. Printing press was a revolution in the field of teaching and learning which enabled the creation of learning opportunities for the masses through wide publication of books and reading material. The manuscript could only be transcribed manually before this era resulting in the very limited coverage of education, mostly among the rich and elite. The education system on the whole has experienced major reforms over the ages particularly from the 18th century when public education was first conceptualized and imparted through universities and dedicated institutions. Over the years, the education scenario has experienced major shift in the strategy used to create learning experiences among the students. A few of such tools to create learning experiences among the students is discussed below:

***Use of audiovisual aids*:** During the early 1900, a need was felt to integrate graphics, reading material, and audio communication. There was a wide use of radio, film strip projector, and overhead projector to make the content more appealing to the learners.

***Use of one-way information tools*:** The tools like television, Video Cassette Recorder (VCR), Video Home System (VHS) tape, audio tape was extensively used from 1960-1990s for creating learning environment in which teaching was substantiated with motion pictures to generate better comprehension of the subject.

***Use of computers to enhance teaching experiences*:** The interactive boards popularly known as Smart boards

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along with the support of computers was extensively used from the year 1991–1995 which helped the teachers to provide better demonstrations and increase comprehension on the topic. The examples could be demonstrated in a better way with lively images through the interactive boards which promoted learning experiences.

***Use of digital technologies in education*:** The digital stage during the year 2005–2010 which saw possibilities to connect computers located at distant locations and helped in fostering collaboration among students and institutions. The digital technologies were quite useful to communicate easily across locations and made sharing of content extremely easy and practical.

***Use of information and communication technologies (ICTs)*:** The interactive age began from the year 2000 and is still in continuation. This age has witnessed the simultaneous deployment of learning and feedback mechanism for understating the context in a collaborative way with the teacher acting more as a facilitator. The interactive tools like responsive dashboards, smartphones and devices using radio frequency allowing the student to anonymously respond to questions posed by the teacher makes the class interactive and allows the teacher to understand the needs of the students on a real-time basis. The use of technology in education is imperative in a knowledge economy where education is focused on the development of skills for social, educational and economic changes.

ICT skills required by teachers

The basic ICT skills required in a teacher of 21st century are as follows:

- Word processing
- File navigation
- Email groups
- Presentation packages
- Spreadsheets
- Creation of surveys and basis analysis tools
- Video and audio editing tools
- Learning Management Systems

Word processing and Microsoft Office tools are necessary for basic writing and reports preparation. The navigation to the internet for accessing the desired information is of importance in the present age. Navigating through files, basic naming of folders, transfer among different drives is also necessary. The use of email groups makes it a lot easier to share information. The basic presentation package makes it easier to present the topic in a vivid and interesting way. The use of spreadsheets is important to watch out for the students' progress, grades, storage of curriculum and other functions for easy storage, sharing and retrieval of data. Knowledge on Learning Management System makes the teacher comfortable to offer the courses on digital medium with better blend of online and offline teaching.

Need for the integration of technology in education

The use of technology in education have made learning an interesting process where the students are more engaged, and focused. The digital natives are more interested to complete the assignment using innovative modern information and communication technology (ICT) tools rather than the traditional pen and paper assignments. ICTs has provided unique opportunities to promote problem-solving skills among the students for enhanced creativity along with promotion of engaging classroom environment. The shift in the teaching process from a teacher acting as a facilitator rather than instructor provides great room to collaborative learning. The principles of collaborative learning are based on the principles of 6 C's namely choice, collaboration, communication, critical thinking, creativity and caring (Ruhl, 2015) with an effective integration of ICTs. The way ICT is used will depend on the nature of the subject being taught, the learning objectives and the expectations from the students. Effective communication is the key aspect of the learning process which helps the students to make best use of collaboration opportunities among the peers for improving their critical thinking and creativity skills. The current demands of the labour market in India and worldwide demands skills in addition to knowledge. The skills are necessary to cope up with the job requirements and become market-ready immediately after the completion of the degree requirements.

CONCLUSION

The current century demands highly skilled teachers on the information technology front to impact learning experiences among the students. The students born after the year 2000 popularly known as millennials has experienced digital ways of living since their birth. As such, the traditional lecture method using chalk and blackboard

as well as assignments using pen and paper could not always be the preferred way of imparting teaching and learning among such students. The teachers of the current age must be conversant with the new tools and technologies like editing tools of videos/ audios, gamification of important concepts in teaching and learning, online assessment using several options opted by the students etc. to create a lively classroom situation in which learning could be easily imbibed by the students.

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Short Communication

Content Analysis of Rural Development Issues of Kurukshetra Magazine

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ABSTRACT

Kurukshetra is the leading magazine on rural development issues. This is the platform where academicians, planners, NGOs and thinkers discuss issues on rural development. The present study entitled "Content analysis of rural development issues of Kurukshetra magazine" was undertaken to analyze the contents of magazine. Twelve issues of selected magazine from August 2018 to August 2019 were taken up for the purpose of content analysis. The study revealed that in contents of the selected magazine articles, photographs, illustrations, news, success stories, editorials and advertisements occupied the space in the descending order. Among articles rural empowerment issues obtained maximum space (5107.9 cm) followed by health and sanitation (5, 019.79 cm) and Agriculture (3238.7 cm). Issues related to rural budgeting occupied less space (500.4 cm) in compare in to other issues. Among rural empowerment issues majority of the articles were related to rural employment.

Keywords: Content analysis, Empowerment, Health and Sanitation, Magazine, Rural

Rural development is the process of improving the quality of life and economic well-being of people living in relatively isolated and sparsely populated areas. Rural development has traditionally centered on the exploitation of land-intensive natural resources such as agriculture and forestry. However, changes in global production networks and increased urbanization have changed the character of rural areas. Rural development is conceived as strategy aimed at finding ways to improve the rural lives with participation of the rural people themselves so as to meet the required need of the rural area. According to World Bank (2005), rural development is the process of rural modernization and the monetization of the rural society leading to its transition from traditional isolation to integration with the national economy. Also, rural development is perceived as a process of not only increasing the level of per capital income in the rural areas but also the standard of living of the rural population measured by food and nutrition level, health education, housing, recreation and security. Rural development as a concept suggests the overall development of the areas and sustaining improvement in the quality of life of rural people. Today, apart from governments, rural development has become a matter of interest to industrialists, financiers, bankers and philanthropists as well. For the rapid rural development, there is a need for constant flow of technological information from research system to extension system and there upon to the farmers for adoption. Print media has acquired a significant role in dissemination of information on improved agricultural practices and other useful information to the rural community. Printed literature includes books, booklets, farm magazine, newspaper, bulletins, folders, leaflets, pamphlets etc. and convey precise and clear information through words, pictures and diagram on a mass scale. A magazine plays a vital role in modernizing Indian rural community. A magazine is a publication usually a periodical publication, which is printed or electronically published (sometimes referred to as an online magazine). It generally contains articles, features, interviews, stories, reports, news, and illustrations. Magazines are generally published on a regular schedule and contain a variety of content.

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Kurukshetra is a monthly magazine published in English and many other regional languages of India. The magazine gives different shades of opinion and views on rural development issues. The articles in the magazine are easy to read and understand and fairly brief in length. Its attractive appearance, eye-catching cover page and quality paper make it more appealing to readers. Content published in magazines can be analyzed quantitavely as well as qualitatively by a technique called content analysis which utilizes various approach.

Philip Weber in 1990 defined content analysis as a research method that uses a set of procedure to make valid inferences from text. Content analysis has several advantages over other data generating and analysis techniques. Content analysis of magazine allows studying identifying and describing the focus of attention of individuals, groups and communities by print and electronic media. However, no attempt has been made to know the quantitative and qualitative coverage of rural development issues.

For the present study Kurukshetra magazine was selected purposively because it is fully dedicated to rural community. The rural development reportage published in the selected magazine for the period of August 2018-August 2019 comprises the sample of the study. For the selection of sample purposive selection of "*Rural development*" issues was made. The data was collected in terms of column cm. Content quantitative analysis was done by analysis the space and ratio of total space devoted to rural development issues. Qualitative analysis was done by evaluating format of coverage of rural development issues. Editorial, Articles, news, advertisement, photographs, Illustrations and success stories related to rural development were analysed.

The Kurukshetra is an English language monthly magazine published from New Delhi, India. It was founded on July 1996. The Kurukshetra had maximum number of pages are 50-76 it can be varies according to the number of articles. Cost of the magazine was 22-30 Rs. / issue. The magazine is published in 13 languages viz. English, Hindi, Urdu, Punjabi, Marathi, Gujarati, Bengali, Assamese, Telugu, Tamil, Kannada, Malayalam and Odia and it has only one issue per month.

Table 1: General information about the selected magazine

Profile of magazine	
Cost of magazine/ issue (Rs.)	22-30 Rs./ issue
Establishing year	July 1996
No. issues/ month	1
Average no. of printed pages	50-76
Total languages in which magazine published	13

Space allotted to different rural development issues in selected magazine is shown in Table 2. Table indicates that space covered by rural empowerment issues ranked Ist and the total space occupied by the issue was 5107.9 cm. Issues related to health and sanitation got second highest space i.e. 5019.79 cm and ranked IInd. Another issue to which sufficient coverage was accorded by the magazine was Agricultural issues (3238.7 cm) followed by Rural non farm sector (2495.5 cm), Rural infrastructure (1334.6 cm) and rural budgeting (500.4 cm) ranked IIIrd, IVth, Vth and VIth respectively. Similar findings were also reported by Srinivas *et al.* (2013) and Archana *et al.* (2017).

Format of coverage is another key pointer of the significance attached to any item in the magazine. Format of magazine comprises of short pieces, editorials, regular columns, articles, features (main stories) and even shorter stories.

Photographs were most used format for publishing rural development issues. Most preferred format of coverage of rural development issues by editor were

Table 2: No of Items and space covered by different issues

S.No	Main item of information	No. of Items	Space covered	Rank
1.	Rural empowerment	41	5107.9	I
2.	Agriculture	24	3238.7	III
3.	Health and sanitation	40	5,019.79	II
4.	Rural Budgeting	4	500.4	VI
5.	Rural infrastructure	10	1334.6	V
6.	Rural nonfarm sectors	20	2495.5	IV
	Total	**139**	**17,696.89**	

Table 3: Format of coverage regarding rural development issues

S.N.	Main items of information	No. of items	Space covered (cm)	Rank
1.	Article	124	12,587.3	I
2.	News	33	506.9	IV
3.	Advertisement	22	164.5	VI
4.	Editorial	12	276	VII
5.	Photographs	141	5,884.8	II
6.	Success stories	31	373	V
7.	Illustrations	110	710	III

photographs (141) ranked Ist followed by Articles (124), Illustrations (110), and News (33) Success stories (31), Advertisement (22) and Editorial (12) ranked IInd, IIIrd, IVth, Vth, VIth and VIIth respectively.

In case of space occupied by the different format, articles occupied maximum space which was 12,587.3 cm followed by photographs (5884.8 cm), Illustrations (710 cm), News (506.9 cm), success stories (373 cm), editorials (276 cm) and advertisement (164.5 cm). The findings are also inline with those of Kaur and Kaur (2014) who found that contents of the magazine comprised of editorials, articles, illustrations, photographs, advertisements, success stories and miscellaneous items.

CONCLUSION

Content analysis is a sizable part of any form of message. Content analysis is an important tool which can provide the feedback of readers/viewers which is generally ignored by the mass media communication. The study on Content analysis of rural development issues of Kurukshetra magazine revealed that Kurukshetra had maximum 22-30 pages and it varies according to the number and length of the article. The result of the study also indicated that total space covered regarding rural development issues in Kurukshetra magazine in one year was 17,696.89 cm. Issues related to rural empowerment has given maximum space (5107.9 cm) followed by health and sanitation (5019.79 cm) and agriculture (3238.7 cm). Study further revealed that first priority in format of coverage in all the month was photographs, second was articles and third was illustrations.

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