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MOBILIZATION Society was established in 2003 as a non-profit professional society aimed at sensitizing and mobilizing community for sustainable development. The society, during these ensuing years has successfully mobilized several researchers, academicians, planners, grassroot mobilizers and students and created conducive intellectual atmosphere for introspective deliberations and conducted national seminars to address the emerging problems experienced by the agrarian mass. 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 closed and reciprocal linkages among the institutions for sustainable rural development.
4. To disseminate the documented knowledge to the global partners through appropriate abstracting, indexing, etc.

ABOUT THE JOURNAL

"Journal of Community Mobilization and Sustainable Development" is a half yearly Journal of Society for Community Mobilization for Sustainable Development. MOBILIZATION envisages reorienting the young professionals and researchers for imbibing the values of community participation in research, training and extension efforts.

The aims and scope of the journal are:

1. Sharing the relevant experiences and issues related to agriculture and allied fields at the grassroot level and global forum to create the necessary academic and developmental 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

Pluralism in Technology Management System

One of the missing links between farmer-to-farmer extension system is lack of appropriate technological options. There are many evidences when technologies have spread among the farming community with little to nil extension intervention. This probably indicates about the attributes associated with technologies. At the same time, it also give hints for design and delivery of farm technologies which may have goodness of fit with production circumstances and having comparative advantages with essence of sustainability, equity and gender appropriateness. The second dimension for successful technology dissemination is the presence of efficient support system, input delivery system, finance and credit system, market system, etc. The third pillar includes training, capacity building, strengthening farmers' institutions and their interest groups, etc. And, last but most important links are policy support, government initiative, support price, procurement price, EXIM policy, et. It is in the above context, I believe in proposing the operationalization and institutionalization of Technology Management Systems with multi stakeholder and pluralistic intuitional perspective. Objectively, the pluralism of farm enterprises, institutional support, delivery systems, farmers' institutions, etc are the core characteristics if Indian agriculture ought to deliver for sustainable rural livelihood.

Society of Community Mobilization for Sustainable Development (MOBILIZATION) is constantly striving for sensitizing the researchers, extension professionals, community mobilizers, corporate institutions, innovative farmers as well as student researchers through the half yearly research journal of Community Mobilization and Sustainable Development besides other academic activities.

The current issue of the journal is the outcome of the successful completion of five years since its inception in the year 2006. During the last five years, the journal has always put emphasis on quality research papers, case studies, diagnostic investigation, on-farm experiment, experimental studies, etc. Our efforts have consolidated the academic confidence of the contributors of this journal. I feel privileged to announce that the society till date has above 500 life members who with their constant support elevated the status of the journal. Now the journal has become on-line and the website of the society is operational**.**

This issue, at hand, contains twenty research papers from the broad areas of on-farm testing, livestock improvement, watershed management, climatic crises, post harvest handling and value addition, linkages between research and extension, utilization of mass media and folk media, drudgery among farm women, traditional methods for livestock management, capacity building, educational interventions, micro-enterprise promotion, issues related to farm labours, etc. The studies represents all corners of the countries like eastern (Bihar, Orissa), Western (Uttarakhand), Northern (Haryana, Delhi, J&K and Himachal Pradesh)), Southern (Maharashtra) and Central (Madhya Pradesh) region of the country.

I extend my sincere thanks to the members of the editorial team- Drs. Shantanu Kumar Dubey, Nishi Sharma, Rupasi Tiwari and D. K. Sujan who meticulously edited the papers and gave this journal a new and more professional outlook. I equally express my thanks to all the authors for submitting the quality research papers for this issue. The contribution of Sh. A.V. Dubey and Ms. Puja Sah in bringing quality to this issue is praise worthy.

J.P. Sharma
Chief Editor

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True Potato Seed (TPS) vis-a-vis Seed Potato : A Study from the North Eastern Region of India

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ABSTRACT

Considering the unfavourable situation in north-eastern region of India for potato breeder seed production, true potato seed (TPS) may be a viable alternative for meeting the demand for quality seed potato in the regions. This paper examine seed potato demand scenario and the potential of TPS technology in the region. Besides, large number of frontline demonstrations on TPS hybrids were conducted in the region for its popularization. The economics of seedling tuber production was also worked out in both summer and autumn season of Meghalaya. And, finally the extrapolation has been made for benefits of TPS technology in the region.

Key words: TPS technology, north-eastern region, seed demand

INTRODUCTION

Almost 10 percent of the geographical area of the country and about 4.5 percent of its population come under North Eastern (NE) region of India. Also, about 10 percent of the country's total potato area lies in this region. The area under potato as a percentage of the net-cropped area is about four times of the national level. However per unit production of potato in all NE states except Tripura (18.53 t/ha) has been low (4-8 t/ha) as compared to national average yield of 19 t/ha. The reasons attributing low potato yields inadequate availability of crop inputs like healthy seed vis-à-vis poor management practices followed by the potato growers and also prevalence of optimum climatic conditions season in the region favour perpetuation of serious diseases like late blight, brown rot/bacterial wilt, etc. Importantly, the production of breeder seed in this region is not possible owing to several biological and environmental factors like prevalence of virus vectors through out the crop stages followed by late blight and bacterial wilt. The breeder seed, therefore, is transported to NE states from other part of the country, which is often not available in the right physiologically specified stage. The available seed hence in the region is highly degenerated and is mainly responsible for low yield.

As potato is traditionally grown vegetatively through seed tubers, this result in continuous occupation and increase of various tuber borne diseases and consequent reduction in crop yield. Hence, to maintain high yield level, recommended potato varieties to time could be supplied through a well-developed disease free seed production programme. Under this situation, however, the amount of quality seed as well as the cost of seed tubers becomes the limiting factor. Therefore, in order to surmount these problems, a new potato production technology making use of true potato seed (TPS) as planting material for raising crop has been developed (Gaur, 1999).

As reported by Singh (1999), only 100-150 gms TPS costing Rs 3000/- is required for raising the crop in one hectare in comparison to 3-4 tonnes seed tubers costing about Rs. 25,000. In addition to low cost, TPS technology also reduces the problem of storage and transport. Similarly, spread of seed tuber borne and soil borne disease from one place to another is reduced. Besides, good quality and less costly seed tuber could be produced

in the area where rate of degeneration is high and which is away from main seed producing areas like NE region in the country. Though, this technology is labour-intensive but requires less initial capital for raising potato crop. This is the most important combination for small and marginal farmers of this region who have plenty of family labours with less of capital. The above fact supported for the introduction and large scale popularization of TPS technology in NE region which is manifold constrained despite having enormous potential for improving potato production and productivity. Thakur *et a*l (2003) have also reiterated that TPS technology is suitable in the north eastern states on the first priority. Hence, the study was conducted with following specific objectives:

i) To analyze the seed potato demand scenario in the north- eastern region
ii) To analyze the yield gap in potato production using TPS
iii) To assess the impact of Frontline demonstrations on True Potato Seed (TPS) technology across the NE region
iv) To extrapolate the prospects and expected benefits from TPS in the potato economy and environment of NE states

MATERIALS AND METHODS

Study was conducted across the north eastern region of India. The secondary data on area, production and yield were obtained from the official sources to ascertain the relative status of potato cultivation in the region. Accordingly, the requirements for quality, certified and foundation seed was estimated for all the seven states. The on-station and on-farm TPS hybrid assessment trials were conducted in the state of Meghalaya to identify the suitable hybrids. The assessment was done on the parameters of yield-related attribute, yield as well as post harvest behavior of the TPS seedling tuber. Frontline demonstrations of the promising TPS hybrids were done in the states of Assam, Nagaland, Manipur and Meghalaya. Based on the findings, the extrapolation was done for future prospect of TPS technology in the NE region.

RESULTS AND DISCUSSION

Scenario of potato production and seed demand in the north eastern region

Table 1 shows relative status of area, production and yield of potato in different states of NE region. This table indicates the significance of potato in this region.

Table 1. Area, production and yield of Potato in NE region (Av. 2006-2009)

State	Average area ('000 ha)	Production ('000 tones)	Yield (t/ha)	Per capita availability (kg/year)*	Percent area under potato*
Arunachal Pradesh	4.30 (VI)	30.80 (V)	7.17 (V)	43.3	1.82
Assam	77.83 (I)	584.53 (I)	7.57 (III)	26.4	1.98
Manipur	4.83 (V)	24.23 (VII)	5.24 (VI)	8.0	1.78
Meghalaya	18.17 (II)	147.87 (II)	8.13 (II)	97.8	8.56
Mizoram	0.43 (VIII)	2.03 (VIII)	4.22 (VII)	4.5	0.95
Nagaland	3.97 (VII)	32.00 (IV)	7.91 (IV)	20.6	1.81
Sikkim	6.80 (III)	28.00 (VI)	4.12 (VIII)	-	-
Tripura	5.50 (IV)	101.90 (III)	18.53 (I)	28.1	1.10
Percentage of NEH region to all India	**9.50**	**4.05**	**42.60**	**-**	**-**

Figures in parentheses indicate ranks; *As on 2005

True Potato Seed (TPS), hence, could be identified as the potential alternative intervention for this region.

Further, as evident from the Table 2, it is seen that about 122 thousand ha of area is under potato cultivation in NE region. Corresponding to such huge areas, average quantity of breeder seed required is about 0.50 thousand tonnes. Similarly the requirement of certified seed is to the tune of about 100 th. tones. Such a heavy requirement of quality seed in this region, therefore,

gives enough reason for promotion of alternate technology of True Potato Seed (TPS).

Table 2. Requirement of Potato Seed ('000 t) in NE Region

State	Av. area ('000 ha)	Av. BS* unit required**	Av. CS* unit required***
Arunachal Pradesh	4.30 (VI)	0.02	03.9
Assam	77.83 (I)	0.30	63.8
Manipur	4.83 (V)	0.01	02.3
Meghalaya	18.17 (II)	0.08	16.6
Mizoram	0.43 (VIII)	-	00.3
Nagaland	3.97 (VII)	0.02	03.4
Sikkim	6.80 (III)	0.02	04.2
Tripura	5.50 (IV)	0.02	04.5
Total	121.83	0.46	99.0

*BS = Breeder Seed; CS = Certified Seed; **BS to be multiplied 3 times (216 fold multiplication) to produce CS; ***Seed rate 2.5 t/ha; Seed replacement after every three years
Figures in parentheses indicate ranks

Yield gap analysis at farmers' field and research station in Meghalaya

Trials with two TPS hybrids (TPS/C-3 and 92-PT-27) were conducted at Central Potato Research Station, Shillong (Meghalaya) as well as framers' field during the autumn and summer season of year 2000-2001 and 2001-2002. Findings of the study (Table 3) revealed better seedling germination (80-90%), lesser transplants mortality (1-2%) and lesser time taken (30-35days) in making seedling ready for transplanting on research station as compared to the farmers' field where these figures were 60-70 per cent, 2-5 per cent and 35-40 days respectively. It was found that hybrid 92-PT-27 showed relatively better performance as compared to TPS C-3 both at the research farm and farmers' fields for all the identified attributes. The spread of late blight in TPS crop was lesser at farmers' fields in comparison to other prevailing potato varieties as well as that on the research station. However, incidence of late blight was noted more in case of TPS C3 (4 in 1-9 scale) than 92-PT-27 (6 in 1-9 scale). This shows higher resistance for late blight in 92-PT-27 than TPS C3.

Table 3. Comparative performance of two hybrids TPS on research station and farmers field

Parameters	Performance of the hybrids			
	Locations			
	TPS C-3		92-PT-27	
	On station	On farm	On-station	On-farm
Seedling germination (%)	80-90	60-70	90-95	60-70
Transplants mortality (%)	1-2	3-5	1-2	2-3
Incidence of late blight in Seedling crop**	4	3	7	8
Average yield (q/ha)				
Summer crop	53 (47-60)	35(30-40)	59(50-68)	45(42-48)
Autumn crop	134(120-147)	120(100-140)	140(125-150)	130(110-140)
Field rottage (%)	3-5	4-5	2-4	2-3
Store rottage (%)	Nil	Nil	Nil	Nil
Subsequent crop yield from autumn tuberlets (q/ha)	143(KJ= 125)*	193(KJ=146)*	160(KJ=125)*	200(KJ=146)*

Source: Kumar *et al.* (2003); *K. Jyoti (KJ) was taken as control; **1-9 scale for late blight is susceptible and 9 is highly resistant; Figures in parentheses indicate range of yield;

Average total yields obtained for summer crop were 53 q/ha (range: 47-60 q/ha) for TPS C3, and 59 q/ha (range: 50-68 q/ha) for 92-PT-27 at the station. However, at farmers' field these figures were 35 q/ha (range: 30-40 q/ha) and 45 q/ha (range: 42-48 q/ha) for TPS C3 and 92-PT-27, respectively. Whereas in autumn season, the yield figures were better as it is evident from the table. Field rottage in both the cases ranged from 2-5 percent with almost nil rottage in the store. Findings

showed that there was considerable yield gap at the farmers' field for the production of seedling tubers. This may be because of the fact that the farmers in the selected villages used TPS for the first time.

Further, from the obtained seedling tubers, 50 kg was planted in the subsequent summer season at the station farm and farmers' field as per the recommended agronomic practices for the region to assess the performance of tuberlets. Cultivar K. Jyoti was taken as the control in both the cases. The incidence of late blight was again noted to be less in tuberlet crop (8 in 1-9 scale) as compared to K. Jyoti (5 in 1-9 scale) both at the farmers' field and on station. However, tuberlet crop showed lesser late blight incidence at farmers' field (scale value 5 and 4 for 92-PT-27 and TPS C3 respectively) for each selected hybrid.

Average yields obtained were 143 q/ha (K. Jyoti = 125q/ha) and 193 q/ha (K. Jyoti = 146 q/ha) on the research station and farmers field, respectively for TPS C3 tuberlets. Whereas, for 92-PT-27 tuberlets, the corresponding figures were 160 q/ha (K.Jyoti = 125 q/ha) at the station farm and 200 q/ha (K. Jyoti = 146 q/ha) at the farmers field. Therefore, the comparative yield advantages from TPS tuberlet (for TPS C3) were computed to the extent of 12.58 percent and 24.35 percent against K. Jyoti on research station and farmers field respectively. On the other hand, still more yield advantage was recorded for 92-PT-27 (against K. Jyoti) tuberlets both at the station farm (21.87%) and farmers field (27 %). Findings also revealed that farmer's preferred 92-PT-27 to TPS C3 because of the oval shape of its tuber and yellow flesh colour. The higher yields in farmers' fields may be because of higher organic matter contents in their fields as compared to the station farm.

Further, the relative economics of tuberlet production (Table 4) was also found in favour of autumn season wherein the return to investment (Rs) and profit:cost were 4.20 and 3.20 respectively, as compared to the respective figures of 1.77 and 0.77 in the summer season. Thesefore, the tuberlet produced in the autumn season could be utilized as the quality planting material with right physiological specifications in the subsequent summer season. Whereas, summer produced tuberlets can not be utilized in the immediate autumn season and hence, farmers may have to wait for complete one year for its utilization. Singh and Jee (1990) have also shown higher net return for seedling tubers (Rs. 19,552/ha) and seedling transplants (Rs. 19,174/ha) for a variety under Patna condition.

Table 4. Economics of tuberlet/seedling tuber production using TPS 92-PT-27 in Meghalaya

S.No.	Particulars	Summer season	Autumn season	Average
1.	Yield obtained (q/ha.)	59	140	99.50
2.	Total cost of production (Rs/ha.)	16,000	16,000	16,000
3.	Total return obtained* (Rs)	28,320	67,200	47,760
4.	Net profit (Rs/ha.)	12,320	51,200	31,760
5.	Return to investment(Rs)	1.77	4.20	2.36
6.	Profit: cost	0.77	3.20	1.97

*Considering 80% of the yield as the seed grade tuberlets and assumed price of quality seed at the subsidized rate of Rs. 600/q

Frontline demonstrations and trials on True Potato Seed (TPS) technology across the NE region and their impact

Above 250 front line demonstrations on True Potato Seed (TPS) technology were conducted in the states of Meghalaya (155), Assam (20), Nagaland (10), Tripura (05), Manipur (20) and Mizoram (40) in the NE region during the period of 2000 to 2005. TPS hybrids 92-PT-27 and TPS C-3 were utilized in those demonstrations. Total of about 26,000 sq. mtrs area was covered in all these demonstrations.

The average yield of tuberlets was from 30 -50 q/ha in summer season 100-150 q/ha in the autumn season among the farmers in Meghalaya. Whereas, these figures were 250 q/ha, 120 q/ha, 200 q/ha and 150 q/ha from the Assam, Nagaland, Tripura and Manipur respectively. Potato farmers' reaction to TPS technology revealed that majority of the them perceived this technology as labour demanding (more than 55%), requiring more care (45%)

albeit cheaper (60%) in comparison to the crop taken through seed tuber. Similarly, majority of the farmers rated TPS technology as superior (52.50%) (Sah *et al*, 2003). The beneficiary farmers also took the subsequent crop from the obtained tuberlets. The average yield obtained was about180 q/ha, 200 q/ha, 150 q/ha from Meghalaya, Tripura and Manipur respectively. These farmers also expressed that the most commonly perceived constraints in the large-scale adoption of TPS technology were delicate and succulent nature of seedlings (90.00%), intensive care required at seedling stage (82.50%), more labour demand at the time of transplanting (80.00%) and also the irregular tuber shape (82.50%). The less frequently perceived constraints were incidence of late blight at nursery stage (65.00%), intensive care required for 2-3 days of transplanting (65.00%) and more variation in the shape of tuberlets in second generation(70.00%) (Sah *et al.* 2003)

Prospects and expected benefits from TPS in the potato economy and environment of NE states

As a matter of fact, the state of Tripura in the NE region is able to produce TPS on an average of 200 kg per annum. This much quantity, if consumed within the region, will be able to bring only 1% of the total potato area under TPS. However, even such lower proportion of the area under TPS would have manifold positive implications. Firstly, as evident from the Table 5, it is clear that by spending only Rs. 36.50 lakh on the cost of

Table 5. Prospects and expected benefits from TPS in the potato economy and environment of NE states

Name of State	Area ('000 ha) under potato	Av. yield (t/ha)	Proposed 1% of the total area (ha) to be brought under TPS	Requirement of TPS (in kg) for 1% proposed potato area	Cost incurred on TPS (@ Rs 20,000 /kg)	Saving of fungicides (kg) @ 5 kg Mancozeb /ha (for three sprays)	Saving of quality seed potato (ton)	Tuber let production (ton) as per the existing productivity level of respective states	Area (ha) replacement by quality seed (@ 2.5t/ha)
Arunachal	04.30	7.17	043.0	006.45	01,29,000	0215.0	0107.5	0308.30	0123.32
Assam	77.83	7.57	778.3	116.74	23,34,800	3891.5	1945.75	5891.70	2356.70
Manipur	04.83	5.24	048.3	007.24	01,44,800	0241.5	0120.75	0253.10	0101.24
Meghalaya	18.17	8.13	181.7	027.26	05,45,200	0908.5	0454.25	1477.20	0590.90
Mizoram	00.43	4.22	04.3	000.65	0012,900	0021.5	0010.75	0018.15	0007.26
Nagaland	03.97	7.91	039.7	005.96	01,19,200	0198.5	0099.25	0314.00	0125.60
Sikkim	06.80	4.12	068.0	010.20	02,04,000	0340.0	0170.00	0280.20	0112.10
Tripura	05.50	18.53	055.0	008.25	01,65,000	0275.0	0137.50	1019.10	0407.60
Total	**121.83**	**7.86**	**1218.3**	**182.75**	**36,45,900**	**6091.5**	**3045.75**	**9561.75**	**3824.72**

TPS (@ Rs. 20,000/kg for 182.74 kg), there would be corresponding saving of Rs 146.25 lakh (If seed potato cost is kept at the subsidized rate of Rs 600/qt., seed rate 25 q/ha for 1218.30 ha of the potato areas across the region) in the potato economy of NE states. Moreover, the saved potato by this way (approx. 30.46 th. ton) would find their alternative use of either table or processing purpose. Secondly, even at the existing lower potato productivity level of each state, there would be reasonably high quantity (Approx. 10 th. ton) of seedling tubers/tuberlet production that could be utilized as the disease free quality planting material for potato crop for the subsequent 3-4 seasons/years in this region. Thirdly and most importantly, even by bringing as low as 1% of potato area under TPS, there would be corresponding saving of plant protection chemicals like Mencozeb, etc., to the extent of 60 t/annum across the entire NE states, giving thereby a sound environmental sustainability in this region.

From the experiences of these experiments, demonstrations and secondary data based derivations, a workable strategy for the large scale adoption of TPS

technology has been suggested. For the states like Meghalaya, Manipur, Arunachal Pradesh and Nagaland where potato is grown in two seasons, it is recommended for production of tuberlets in one/autumn season and utilization of the same as the disease free quality planting material in the subsequent summer/main-cropping season. However, it is also recommended that there is strong case for the replication of the success story of Tripura in large scale adoption of TPS technology to the other north east states particularly in Assam which is the sleeping giant in potato production in this region. Moreover, there is sufficient justification for the utilization of the entire quantity of TPS produced by Tripura within the NE states. Also, the necessary infrastructure and policy support in this regard by the respective state governments is not ruled out.

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Evaluation of Biocidal Efficacy of Botanicals against Tomato Fruit Borer (*Helicoverpa Armegera* Hubner) at Field Level

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ABSTRACT

Biotic stresses have remain the dominant features in controlling the yield and quality of vegetable crops. Among them insect come first in their importance. Tomato fruits borer is very devastating insect at field level and cause huge economic damage in congenial environment. Synthetic pesticides are very effective but their residual effect on soil, water and food created noticeable problem which found to cause fauna and flora erosion. Several herbs have been identified for their insecticidal potentiality. Their residual effects are nominal and are liable to degrade with short time unlike synthetic pesticides which take long time. An attempt was made to explore the effect of botanicals on tomato fruit borer under field conditions in Jamui district of Bihar. Encouraging results were obtained with botanical pesticides. All the botanicals yielded significant effect in fruit borer management of tomato crop. Plant vigor was also affected by botanicals application. All the botanicals were found to influence significantly the vigor of the plant in comparison to control.

Key words: Botanical Pesticides, Fruit Borer, *Helicoverpa,* NSKE, Tomato

INTRODUCTION

Biotic stresses have remain the dominant features in controlling the yield and quality of vegetable crops. Among them insect come first in their importance. Tomato fruits borer is very devastating insect at field level and cause huge economic damage in congenial environment. Synthetic pesticides are very effective but their residual effect on soil, water and food created noticeable problem which found to cause fauna and flora erosion. Our natural vegetation has immense potential to control these noxious pests. Several herbs have been identified for their insecticidal potentiality. These botanicals may be applied repeatedly without any health hazard over the organisms of the vicinity. These are ecofriendly, economically viable and ease in local availability. In contrast to chemicals, these could effectively used to mange pest population below economic injury level. These may be incorporated as one of the potent tool of integrated pest management which is a need of the day. These have been recognized as vigour promoter being reservoir of essential mineral elements required by the plant. Their residual effects are nominal and are liable to degrade with short time unlike synthetic pesticides which take long time. Vegetables generally consumed in fresh form and after flowering within a week these attain consumable quality. Application of chemicals during this stage is very injurious being lack of time to detoxification of residual effect. Salad vegetables like tomato and chilli which are consumed in raw form the situation is more alarming with synthetic pesticides.

Keeping above facts in view an attempt was made to explore the effect of botanicals on tomato fruit borer under field conditions in Jamui district of Bihar.

MATERIALS AND METHODS

The field experiment was conducted at the Krishi Vigyan Kendra, Jamui experimental farm in the year 2009-2010.

There were 12 treatments including a control replicated thrice in a Randomized Block Design. The cultivar Rupali seedlings of 25 days old having uniform size were used for transplanting at 60 x 60cm in each plot having the size of 3.6 x 6.0m. All the agronomical practices were done as per recommendation. Eleven botanicals viz., Tobacco Leaf extract (TLE), Tea Extract (TE), Neem Leaf Extract (NLE), Neem Seed Kernel Extract (NSKE), Jetropha Leaf Extract (JLE), Jetropha Kernal Extract (JKL), Karanj Leaf Extract (KLE), Karanj Kernal Extract (KKE), Tulsi Leaf Extract (TuLE), Onion-Garlic Bulb Extract (OGBE), and Chilli Fruit Extract (CFE) were taken for the study. Leaf extracts were prepared by crusting fresh leaves with water to make 10% solution. Kernal extracts were prepared by crushing Kernals with water to make 5% solution; Garlic-Onion Bulb Extract was prepared by crushing bulbs of Garlic and Onion taken in the ratio 1:1 each. Ripened Chilli fruits were crushed with water making 5% solution. Manufactured Tea was boiled in water and strained making 5% solution. The pesticides were applied five times at forthrightly interval commencing at one month after transplanting. Plant height was taken at flowering stage with longest stem. Number of braches per plant counted as secondary and tertiary branches available at first flush. Number of flower clusters per plant were counted as cluster available up to last flush (second) of the crop. Number of fruit set per plant were recorded as the size of fruit-let reaches to pea size. Fruit borer infestation percentage was counted as number of larvae appeared per plant. Fruit damage was taken on the weight basis as percentage damage of total yield per plant. Mean yield was calculated in t/ha. Economics of botanicals in tomato protection was worked out.

RESULTS AND DISCUSSION

Encouraging results were obtained with botanical pesticides. All the botanicals yielded significant effect in fruit borer management of tomato crop. Plant vigor was also affected by botanicals application. All the botanicals were found to influence significantly the vigor of the plant in comparison to control. But among the botanicals the effect was insignificant. Maximum plant height (62.54 cm) was recorded in NSKE followed by (62.39 cm) in KKE. Among the botanicals Jatropha leaf extract produced shortest (59.39 cm) plant height. Control was found significantly lower (52.39 cm) in plant height among all the treatments. The range of number of branches per plant (8.44-12.43) were found to vary significantly. The highest number of branches per plant (12.43) were observed in NSKE treatment while lowest value (8.44) was recorded in control. Number of flower cluster and fruit set per plant were also found better with botanicals in comparison to control. Higher number of flower cluster and fruit set per plant (83.45-32.47, 80.85-32.10 and 80.10-32.00) were recorded in NSKE, TuLE and CFE respectively.

Table 1. Effect of botanical pesticides on vigor of tomato plant (Pooled data 2009 and 2010)

Treatment	Plant height (cm)	No. of branches per plant	No. of flower cluster/plant	Number of fruit set per plant
$T_{1=}$Tobaco Leaf Extract	61.43	11.54	73.09	31.09
$T_{2=}$Tea Extract	62.04	10.98	73.83	31.54
$T_{3=}$Neem Leaf Extract	60.33	11.11	75.43	30.08
$T_{4=}$Neem Seed Kernal Extract	62.54	12.43	83.45	32.47
$T_{5=}$Jatropha Leaf Extract	59.39	10.09	72.78	30.43
$T_{6=}$Jatropha Kernal Extract	60.44	11.53	76.54	31.09
$T_{7=}$Karanj Leaf Extract	59.48	10.00	72.09	30.37
$T_{8=}$Karanj Kernal Extract	62.39	10.73	74.44	30.79
$T_{9=}$Tulsi Leaf Extract	60.88	11.08	80.85	32.10
$T_{10=}$Onion Garlic Bulb Extract	60.38	12.33	73.40	31.73
$T_{11=}$Chilli Fruit Extract	61.39	10.88	80.10	32.00
$T_{12=}$Control	52.39	8.44	69.43	20.84
SE (m)±	**8.734**	**3.439**	**29.734**	**8.334**
CD at 5%	**2.947**	**2.094**	**11.432**	**3.213**

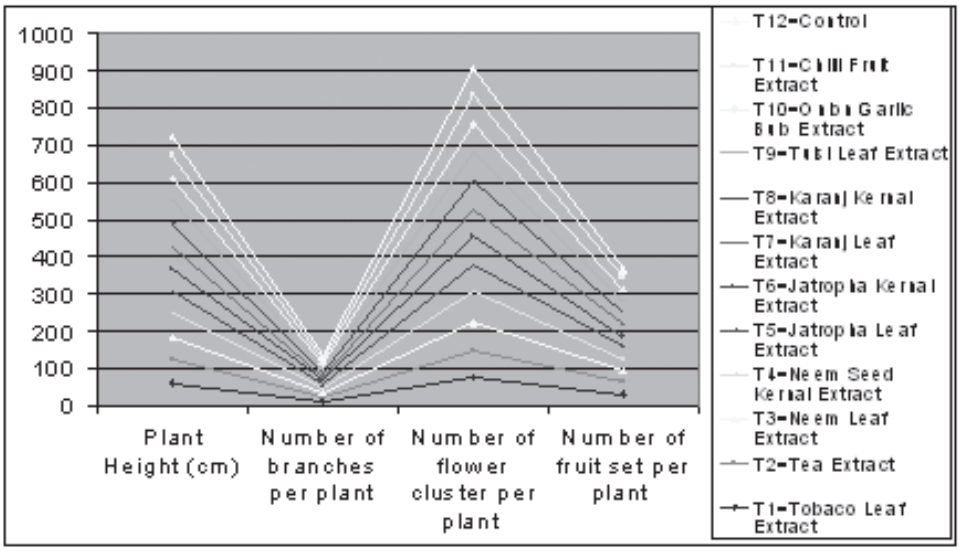

Fig. 1. Effect of botanical pesticides on vigor of tomato plant. (Pooled data 2009 & 2010)

Fruit borer infestation (number basis) was lowest (5.84) in NSKE fallowed by (7.13) NLE and (8.44) TLE respectively. Maximum infestation was (27.49) recorded in control. Fruit damage (weight basis) was also followed the same pattern and minimum fruit damage (7.73) was in NSKE followed by (9.33) NLE and (10.43) TLE respectively. Greatest damage was observed (29.05) in control.

Mean yield was found to influenced significantly. The range was recorded 36.98-21.34 t/ha. NSKE aroused 73.28% more yield over control. Other better results were in NLE, TLE, OGBE and TuLE

Table 2. Effect of Botanical pesticides on tomato fruit borer management (Pooled data 2009 & 2010)

Treatment	Fruit borer infestation (%)		Fruit damage (%)		Yield of tomato		Economic			
	No. basis	Decreased (%) over control	Wt. basis	Decreased (%) over control	Mean yield (t/ha)	Increased (%) over control	Total cost of treatments (Rs./ha) (A)	Value of increased yield over control (B)	Net gain over control C= (B-A)	ICBR (C/A)
$T_{1=}$Tobacco Leaf Extract	8.44	69.29	10.43	64.09	32.89	54.12	1200	57750	56550	1:47
$T_{2=}$Tea Extract	17.53	36.23	19.57	32.63	31.10	45.64	2660	48700	46040	1:17
$T_{3=}$Neem Leaf Extract	7.13	74.06	9.33	67.88	34.34	60.91	1250	65000	63750	1:51
$T_{4=}$Neem Seed Kernal Extract	5.84	78.75	7.37	73.88	36.98	73.28	2350	78200	75850	1:32
$T_{5=}$Jatropha Leaf Extract	14.43	47.50	16.34	73.39	31.09	45.68	1250	48750	47500	1:38
$T_{6=}$Jatropha Kernal Extract	12.13	53.87	14.55	43.75	31.93	49.62	2400	52950	50550	1:21
$T_{7=}$Karanj Leaf Extract	16.35	40.42	18.09	49.81	31.00	45.26	2300	48300	46000	1:20
$T_{8=}$Karanj Kernal Extract	14.94	45.65	16.77	37.72	31.00	45.26	2400	48300	45900	1:19
$T_{9=}$Tulsi Leaf Extract	9.93	63.87	11.75	42.27	32.44	52.01	200	55000	52800	1:24
$T_{10=}$Onion Garlic Bulb Extract	9.08	66.96	11.03	62.99	32.74	53.42	100	57000	55900	1:50
$T_{11=}$Chilli Fruit Extract	10.01	63.58	12.05	62.03	31.95	49.71	100	53050	51950	1:47
$T_{12=}$Control	27.49	-	29.05	58.58	21.34	-	-	-	-	-
SE (m)±	0.13	-	0.83	-	2.93	-	-	-	-	-
CD at 5%	5.79	-	12.11	-	7.43	-	-	-	-	-

respectively. Value of increased yield over control was maximum (Rs. 78200) in NSKE followed by (Rs. 63750) in NLE. Net gain over control is the most striking feature and maximum net gain (Rs. 75850) was observed in NSKE followed by (Rs. 67500) in NLE. All the botanicals yielded more than Rs. 45000/ha net gain over control is the noticeable feature. Incremental cost benefit ratio was greater (1:51, 1:50 and 1:47) in NLE, OGBE, and CFE respectively.

Botanicals had reflected dual theory of action and significantly influenced the plant vigor and fruit borer population of tomato crop. Being organic substances they have plentiful amount of essential plant nutrients and when applied through foliar spray act as fertilizer which increase the vigor of the plant. These botanicals have hormones which also help in growth acceleration. Borer population was significantly managed and damage percentage was minimized. It clearly indicates their biocidal potency. All kind of botanicals used had reflected their pesticidal nature with little difference in their knockout effect.

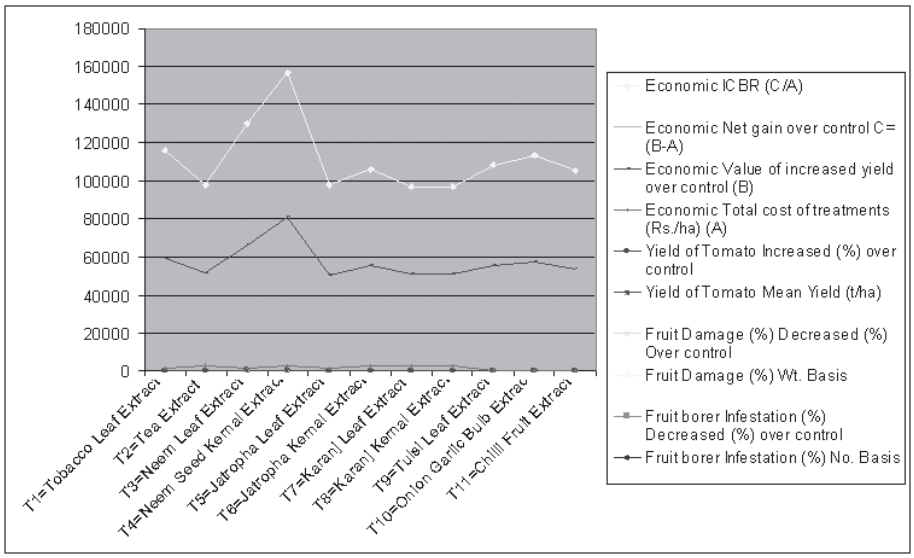

Fig. 2. Effect of Botanical pesticides on tomato fruit borer management. (Pooled data 2009 and 2010)

These findings are in conformity with the findings of Patel *et al.* (1991), Sachan *et al.* (1990), Singh and Narang (1990), Ramesh and Ukey (2006), Singh and Ram (2006). Precisely this may concluded that botanicals may be used efficiently in manage of tomato fruit borer. Among the botanicals tried NSKE @5% fortnightly application from one month after transplanting may be used commercially at field level.

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Facilitating and Hindering Factors for Success of Self Help Groups

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ABSTRACT

Self Help Groups (SHGs) brings out a silent revolution in all aspects of rural women's life. Active participation of women in SHGs leads to their prosperity as well as economic development. In this context, a study was conducted in Madurai district of Tamil Nadu to identify the factors responsible for the success of SHGs. Adopting multi-stage random sampling technique; data were collected from 180 respondents and analyzed by using Garrett ranking technique. The results of the analysis revealed that family support, self satisfaction, accessibility to credit, co-operative approach, social protection were the important factors responsible for the success of SHGs. Whereas, strict rules and regulations, ambiguity in leadership, difficulty in maintaining accounts, intra group conflicts and sub grouping were the major factors which hindered the success of SHG.

Key words: SHG, success of SHG, hindering factors, facilitating factors

INTRODUCTION

SHGs play a seminal role in the rural development of the country. It is an effective strategy for poverty alleviation, human development and social empowerment. They also have the potential to transform themselves into vibrant civil society organisations.The concept of SHGs was originated and successfully implemented in Bangladesh. Consequent of its success it has been introduced in India. Self Help Groups are voluntary associations of people formed to achieve both social and economic goals. Women are an integral part of every economy. All round development and harmonious growth of a nation is possible only when women are empowered.

SHGs are thrift module that operates as an informal bank for rural women. Active participation of women in SHGs leads to their prosperity and overall economic development and their participation solely depends upon the success of group. In this context, a study was conducted in Madurai district of Tamil Nadu to identify the factors responsible for the success of SHGs. Both external and internal factors play an active role in making the groups success and sustainable. The success of a group depends on certain internal and external factors that need to be promoted among all the groups irrespective of the state it exists and those factors, which hinder the success as per the perception of the SHG members.

MATERIALS AND METHODS

The study was conducted in Madurai district of Tamil Nadu. A multi-stage random sampling was followed to select the respondents. The most prominent Non-Governmental Organization, Association of *Sarva Seva* Farms (ASSEFA) which is engaged in agriculture related activities, was selected for the study.

The units of analysis of the study were individual members of exclusive women Self Help Groups formed by ASSEFA. Three taluks were randomly selected from the district and from each taluk, three villages were selected at random. From each village, two SHGs were randomly selected thus constituting eighteen SHGs.

From each self help group, ten members were randomly selected thus constituting the total sample of 180 respondents. Data were collected by personal interview using a pre-tested structured schedule.

Garrett's ranking technique was used to rank the factors responsible for success and factors, which hinder the success of self-help groups. This technique provides the facility to change the orders of factors and advantages into numerical scores. The prime advantage of this technique over simple frequency distribution is that the constraints are arranged based on their importance from the point of view of respondents. Hence the same number of response on two or more factors may have been given different rank. The Garrett's scores given by Garrett and Woodworth (1969) for corresponding percentages are given in Table 1. As per this method, respondents were asked to assign rank for all the factors and outcome of such ranking were converted into score value with help of the following Garrett's formula:

$$\text{Percent position} = 100 \times (R_{ij} - 0.5)/N_j$$

Where, R_{ij} is the rank given for i^{th} factor by j^{th} respondent; N_j is the number of factors ranked by j^{th} respondent.

The per cent position of each rank is converted into scores referring to the table. For each factors, the scores of individual respondents are added together and divided by the total number of the respondents for whom scores are added. These mean scores for all the factors are arranged in descending order, ranks are given and most important factors are identified.

Table 1. Garrett's table

Percent	**Score**	Percent(Contd.,)	**Score**	Percent(Contd.,)	**Score**	Percent(Contd.,)	**Score**
0.09	99	11.03	74	52.02	49	90.88	24
0.20	98	12.04	73	54.03	48	91.67	23
0.32	97	13.14	72	55.03	47	92.45	22
0.45	96	14.25	71	58.03	46	93.19	21
0.61	95	15.44	70	59.99	45	93.86	20
0.76	94	16.65	69	61.94	44	94.03	19
0.97	93	19.01	68	63.85	43	95.08	18
1.20	92	19.20	67	65.75	42	95.62	17
1.42	91	20.33	66	67.43	41	96.11	16
1.63	90	22.32	65	69.39	40	96.57	15
1.90	89	23.63	64	71.14	39	96.99	14
2.03	88	26.43	63	72.85	38	97.37	13
2.63	87	27.16	62	74.52	37	97.72	12
3.01	86	28.66	61	76.12	36	98.04	11
3.43	85	30.61	60	77.68	35	98.32	10
3.89	84	32.42	59	79.17	34	98.68	9
4.38	83	34.25	58	80.61	33	98.82	8
4.92	82	35.15	57	81.99	32	99.03	7
5.51	81	38.06	56	83.31	31	99.22	6
6.14	80	40.01	55	84.56	30	99.39	5
6.81	79	41.97	54	85.75	29	99.55	4
7.55	78	42.97	53	86.89	28	99.68	3
8.33	77	45.97	52	87.95	27	99.80	2
9.17	76	47.98	51	88.97	26	99.91	1
10.06	75	50.00	50	89.94	25	100.00	0

RESULTS AND DISCUSSION

Garrett's ranking technique was used to rank the factors responsible for success of Self Help Group and the results of the analysis are presented in Table 2.

The results from the Table 2 reveal that family support and self satisfaction were the important factors which motivated them to join the group. Without the support of the family members, it is impossible for women to come out of the family and participate in the self-help group. Consequent of being a member of SHG, the illiterate and semi-literate women also have become productive and were given with due respect among the members of the family.

Table 2. Factors responsible for success of self help groups

S. No.	Facilitating factors	Garrett mean score	Rank
1.	Family support	85.65	1
2.	Self satisfaction	85.28	2
3.	Accessibility to credit	52.78	3
4.	Co-operative approach	47.39	4
5.	Social protection	43.94	5
6.	Source of income	36.81	6
7.	Enhancement of motivational level	33.50	7
8.	Employment opportunity	33.13	8
9.	Capacity building opportunity	28.41	9
10.	Accessibility to infrastructure	25.03	10

The results of the analysis indicated that accessibility to credit as the main facilitating factor responsible for the group success. It had high relevance among poor members of the groups who were lacking resources to avail loan from the institutional sources. This is due to the reason that majority of the respondents belong to lower income strata of the society. Almost all the respondents had joined the group expecting financial assistance from the NGO under which the groups were formed. It involves the provision of thrift, credit and other financial services to the poor in rural areas for enabling them to raise their income levels and improve their standard of living. It has become a successful instrument for economic empowerment of the underprivileged sections of the society by improving their access to formal credit system. In general, for a group to be successful, the members are obliged to be dedicated to managing the group and money effectively. This involves developing strong and able methods for making decisions, maintaining records and managing savings and loans.

Co-operative approach and social protection were the other facilitating factors influencing the success of SHG with a mean score of 47.39 and 43.94 respectively. Respondents cited that the sense of belongingness they experienced due to the co-operative and friendly atmosphere of the group facilitated them to remain as the members of that particular group. Since people's initiative and participation are the key elements in the process of development, NGO supported various initiatives in social mobilization and formation of self-help groups to build a collective effort.

Other important factor was the source of income with a mean score of 36.81. Incremental income accrued and regular savings were the main factors accountable for the continuation of the membership, survival of the group and success of the SHGs. The Table 2 also indicated that enhancement of motivation level (33.50) was one of the major factor responsible for the success of SHGs. It was due to both economic and social motives like inculcating savings habit, increase in savings, involvement in entrepreneurial activities, co-operation among members, interaction with others *etc.*

The analysis revealed that desire to be engaged in some income generating activities or employment opportunities facilitated them to join the group and led the SHG to success. ASSEFA led SHGs acted as a tool for micro-enterprises because it offered not only access to working capital but also a network to draw on other resources like access to training and information to members. Entrepreneurship activities that provided regular employment and steady source of livelihood such as dairying, tailoring *etc.*, were being implemented through SHGs.

Other important factors responsible for the success of SHGs were capacity building opportunity (28.41) and accessibility to infrastructure (25.03). Since, provision of small capital, micro infrastructure and capacity buildings were major components of SHG programmes the poor rural women were empowered through structural capacity building process.

Garrett's analysis from the Table 3 indicates that strict rules and regulations was the major hindering factor felt by the respondents for the failure of SHG. Respondents reported that strict attendance was maintained for regular SHG meetings and they were not allowed to go anywhere outside the village on meeting days. However, in case of emergencies like marriage function, funerals *etc.* members were allowed to have their participation. It is evident from the table that ambiguity of leadership role was the hindering factor next to strict rules and regulations as many members were not willing to take leadership role because of burden and lack of control over other members. Maintaining accounts was the next factor responsible for the failure of the group with a mean score of 30.04. This is due to the reason that the members were illiterates and older in age. The Table 3 also indicated that conflicts and subgroups in SHGs hindered the group success. This is due to the reason that some members are more aggressive and jealous about the growth of other members. None of the respondents cited inability to make regular payment, fear of losing savings, doubt about success and male members in family discourage as the hindering factors. The survey revealed that the initial amount of money collected from the members for registration purpose was not a hindering factor as the amount was used for purchasing notebooks, travel charges *etc.*

Table 3. Factors hindering the success of self help groups

S. No.	Facilitating factors	Garrett mean score	Rank
1.	Strict rules and regulations	48.23	1
2.	Any ambiguity of leadership roles in group	34.61	2
3.	Difficulty in maintaining accounts	30.04	3
4.	Conflicts in group	27.55	4
5.	Sub-grouping in SHG	22.59	5

SHGs play a vital role in women empowerment and thereby overall development. Hence, analyzing the factors responsible for the success of SHGs becomes mandatory. In this backdrop, a study was carried out to find the factors responsible for SHG success. The findings of the study revealed that the major factors, which were responsible for the success of SHGs were family support, self satisfaction, and accessibility to credit, co-operative approach, and social protection. These factors need to be promoted to sustain the success of SHGs. Strict rules and regulations, ambiguity in leadership, difficulty in maintaining accounts, intra group conflicts and sub grouping were the major hindering factors and these factors need to be eliminated to make the SHGs successful and sustainable.

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A Study on Utilization of e-*Choupal* Services in Rajasthan

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ABSTRACT

ITC's e-*Choupal* is internet kiosk, village gathering place and e-Commerce hub, all rolled into one. It caters to the information needs of the farmers at their doorstep by bridging the information and service gap of rural India. It also established a low- cost delivery system focused on the needs of rural India, which helps in mitigating rural isolation, create more transparency for farmers, and improve their productivity and income. e-*Choupal* has been running since June 2000 and till now no systematic effort has been made to study the usefulness of e-*Choupal* for rural people. Thus the present research was undertaken to study the utilization of e-*Choupal* services by rural people which will be useful in improving present effort. The present study was conducted in four districts namely Sri Ganga Nagar, Kota, Bharatpur, and Chittorgarh of Rajasthan. Two panchayat *samities* from each district and two villages from each panchayat *samiti* were selected on random basis. The sample consisted of 160 women and 160 men users of e-*Choupal*. Personal interview technique was used for collecting data. The data were analyzed by using frequency, percentage, mean percent score and Z test. The findings of the study clearly indicated that majority of the users were using e-*Choupal* website to access information about market price of agriculture products (74.1%) and weather forecast (67.8%). Findings further revealed that the utilization of *Choupal* Pradarshan Khet and *Choupal* Hub was good. Rural people utilized these services to get high profit on their crops. Thus e-*Choupal* has helped in socio economic development of rural people in terms of increase in agriculture production, adoption of improved technologies, marketing of agriculture produce and timely access to agriculture inputs.

Key word: *Choupal Pradarshan Khet*, e-*Choupal*, Utilization of ICT

INTRODUCTION

Agriculture is economically and socially vital to India. despite, however, Indian agriculture has until recently been regulated in an archaic fashion that limits its productivity. Non optimal farming practices and capricious weather pattern left post-independence India with an under-performing agricultural sector, food shortages, and even sometimes the food imports. To tackle these challenges of Indian agriculture, ITC (Indian Tobacco Company) conceived e-*Choupal* that places computers with internet access in rural farming villages. e-*Choupal* is internet kiosk, village gathering place and e-Commerce hub all rolled into one. e-*Choupal* also established a low- cost fulfillment system focused on the needs of rural India, which helps in mitigating rural isolation, create more transparency for farmers, and improve their productivity and income. e-*Choupal* aims to provide rural people ready access to specific real time information and customized knowledge in their native language. The Coupal is run by an operator called the "*Sanchalak*" who himself is a farmer recruited by ITC, to be interfaced between the computer terminals and the farming community. e-*Choupal* gives information regarding improved agronomical practices, weather forecast, market prices of agriculture products etc. Besides these information they were also exposed to *Choupal Pradarshan Khet* to show the production potentiality of different crops. The concept of e-*Choupal* hub has also been introduced in order to facilitate farmers in marketing of agriculture products as well as key inputs for agriculture. The effectiveness of these services depends upon how well they are being used by rural people. Thus, the present research was designed to study the utilization of e-*Choupal* services by rural people.

MATERIALS AND METHODS

The study was carried out in four purposively selected districts namely Ganga Nagar, Kota, Bharatpur, and Chittorgarh of Rajasthan where e-*Choupal* is in operation. Two panchayat *samities* from each district and two villages from each panchayat *samities* were selected on random basis for the purpose of investigation. The sample consisted of 160 women and 160 men users. Thus, the total sample was 320 rural people. Interview technique was used to collect data from the respondents. The data were analyzed by using frequency (f), percentage (%).

RESULTS AND DISCUSSION

In e-*Choupal*, the agriculture service gives more control over their choices, a higher profit margin on their crops and access to information that improves their productivity.

Utilization of basic information of agriculture by users

Daily weather and market prices of agriculture product is very popular sections on the website of e-*Choupal*. Thus it is necessitated to know the utilization of theses services.

Data in Table 1 clearly show that 91.9 per cent men and 56.3 per cent women respondents were using e-*Choupal* to access the daily ITC (e-*Choupal*) procurement rate and the local *mandi* rates for various agriculture commodities. They stated that they used this information to get high profit on their crops. Most of the men (84.4%) and more than half of the women (51.3%) respondents were using e-*Choupal* to access weather related information.

The table further shows that only 20.3 to 26.6 per cent of respondents were using e-*Choupal* to obtain information about improved agronomical practices (seed rate, improved varieties of seed, appropriate temperature for cultivation of crop, right time of sowing, seed treatment and dose of fertilizers and herbicides), harvesting and safe storage of wheat. As per the discussion with users, it was found that the information provided on e-*Choupal* website regarding farming practices was almost similar to what they were practicing, they thus less referred e-*Choupal* website for this purpose.

Though the respondents were aware that e-*Choupal* is also a channel for soil testing service, but only 25 per cent men users were using this service as Government provides this facility on lower rates (₹ 5/- per sample) than e-*Choupal* (₹ 25/- per sample).

It is encouraging to note that 73.8 per cent men and 37.5 per cent women used to seek solution to their problems related to agriculture by sending emails to scientists who, after careful examination and assessment, provided specific solutions.

Utilization of services of *Choupal Pradarshan Khet* (CPK)

Choupal Pradarshan Khet (CPK) is a front line demonstration unit on the farmer's field to show the production potentiality of different crops. This is an effort to compare the improved agronomical practices of particular crop with that of traditional practices so

Table 1. Utilization of basic information of agriculture by the users

n=320

S. No.	Aspects	Men (n=160) f (%)	Women (n=160) f (%)	Total (N=320) f (%)
1.	Access information about			
	• Market prices of agricultural products	147(91.9)	90(56.3)	237(74.1)
	• Weather forecast	135(84.4)	82(51.3)	217(67.8)
	• Improved agronomical practices of wheat	63(39.4)	22(13.8)	85(26.6)
	• Harvesting of wheat	48(30.0)	19(11.9)	67(20.9)
	• Safe storage of wheat	43(26.9)	22(13.8)	65(20.3)
2.	Get soil tested at e-Choupal Lab	40(25.0)	0(0.0)	40(12.5)
3.	Seek solution to their problems related to agriculture	118(73.8)	60(37.5)	178(55.6)

that by seeing the farmers can be convinced regarding the adoption of improved practices. Through *Choupal Pradarshan Khet* e-*Choupal* brings innovative and modern techniques of farming to small and marginal farmers. *Choupal Pradarshan Khet* of wheat was laid down in three districts namely Kota, Chittorgarh and Ganganagar while soybean's *Choupal Pradarshan Khet* was demonstrated in Kota and Chittorgarh. *Choupal Pradarshan Khet* of bajra was laid down in Bharatpur and Chittorgarh and maize's *Choupal Pradarshan Khet* was demonstrated in Chittorgarh only.

Regarding utilization of this service (CPK) of e-*Choupal* Table 2 reveals that 75 per cent users had seen the *Choupal Pradarshan Khet* of wheat while equal number of users i.e. 50 per cent had seen *Choupal Pradarshan Khet* of soybean and bajra. The table further shows that 25 per cent users had seen *Choupal Pradarshan Khet* of maize.

Table 2. Utilization of services of *Choupal Pradarshan Khet* (CPK) by the users.

n=320

S.No.	Choupal Pradarshan Khet	Men (n = 160) f (%)	Women (n= 160) f (%)	Total (n=320) f (%)
1.	Wheat	120(75.0)	120(75.0)	240(75.0)
2.	Soybean	80(50.0)	80(50.0)	160(50.0)
3.	Bajra	80(50.0)	80(50.0)	160(50.0)
4.	Maize	40(25.0)	40(25.0)	80(25.0)

In an informal discussion with users, it was found that they were also convinced by seeing the result of the improved practices being demonstrated under *Choupal Pradarshan Khet* and have actually adopted practices in their field. They also stated that after utilizing improved practices, their average productivity was increased up to 20 per cent. During discussion with *Sanchalaks*, it was found in those villages where *Choupal Pradarshan Khet* was demonstrated all the users have visited the demonstration site. However in some of the districts where *Choupal Pradarshan Khet* was not demonstrated, the users did not get an opportunity of witnessing the improved agronomical practices of different crops.

Utilization of services of e-*Choupal* hub

A hub is a place where farmers have to come to sell their produce and buy agriculture inputs. Each e-*Choupal* hub caters to about 30-40 e-*Choupal* centers. e-*Choupal* hub could be used for many commodities and inputs. Table 3 depicts that all the respondents sold wheat at hub while 43.8 to 68.8 per cent of them sold mustard and soybean there. Respondents felt that e-*Choupal* had overcome the disadvantages of the *mandi* system. The users reported that the selling of agriculture produce at hub is very beneficial for them as they do not have to bear the cost of transportation of the produce. The transaction was also much faster than at *mandi*, usually taking not more than 3-4 hours. They further said that ITC's electronic weighing scales were accurate and not susceptible to sleight of hand like manual weighing system at *mandi*. The system also did not require produce to be bagged, which avoids the associated loss of produce by intentional spillage. Thus the e-*Choupal* system has logistical and transaction efficiencies. The best thing farmers observed at hub was that they were treated with respect and served as a customer there. Simple provisions such as a shaded seating area where farmers can sit while waiting for their paper work serve as indicator of e-*Choupal*'s (ITC) respect for farmers and their produce. This in turn created self confidence in farmers. Many a times the buying at hub is restricted to some specific crop only, in such conditions they are compelled to sale their produce at *mandi* or to the middlemen.

Table 3. Utilization of services of e-*Choupal* hub by the users

n= 320

S. No.	Component	Men (n=160) f (%)	Women (n=160) f (%)	Total (n=320) f (%)
1.	Sale of agriculture produce at hub			
	• Wheat	160(100.0)	160(100.0)	320(100.0)
	• Mustard	120(75.0)	100(62.5)	220(68.8)
	• Soybean	75(46.9)	65(40.6)	140(43.8)
2.	Procurement of agriculture input from hub			
	• Fertilizer	109(68.1)	98(61.3)	207(64.7)
	• Seeds	104(65.0)	110(68.8)	214(66.9)
	• Herbicides	35(21.9)	18(11.3)	53(16.6)
	• Insecticide	103(64.4)	95(59.4)	198(61.9)

Regarding buying of inputs, Table 3 shows that 61.9 to 66.9 per cent users bought fertilizer, seeds and insecticides from the hub while only 16.6 per cent of them bought herbicides from there. The reason for buying these products from e-Hub might be that e-*Choupal* cost substantially less than other local sources such as village traders. Farmers expressed that they could also save their time as they bought goods when they go for selling of agriculture produce. Around one third of the users expressed that they did not buy anything from hub as there is no system of credit thus they had to do cash payment for their buying.

On the basis of results it could be concluded that utilization of services of e-*Choupal* was good. This indicates that e-*Choupal* has exerted a great impact on rural people. The benefits perceived by the users from utilization of e-*Choupal* services are

- **Better price for their crop:** Farmers got better price for their produce due to the awareness of local and global market rates and market trends and less transportation charges which in turn increases their income and standard of living.
- **Weather:** Farmers got timely and proper information about localized weather along with advisories which helped them in reducing their losses in crops.
- **Best farming practices:** e-*Choupal* established *Choupal* Pradarshan Khet of wheat, soybean, bajra and maize to show production potentialities of improved agricultural technologies to the farmers. After *Choupal Pradarshan Khet* productivity increased upto 20 percent.
- **Transparent Trading:** e-*Choupal* created a direct marketing channel for the farmers' produce, eliminated intermediation and multiple handling, thus they are getting better prices for their crops.
- **Solution of problems:** Farmers got timely solution for their problems related to agriculture through FAQs that helped farmers to improve their agriculture yield.

Thus it can be concluded that e-*Choupal* has helped in socio economic development of rural people in terms of increase in agriculture production, adoption of improved technologies, marketing of agriculture produce and timely access to agriculture inputs.

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Technological Gap in Feeding Practices of Dairy Animals in Jhansi District

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ABSTRACT

The low average milk production by the Indian cattle and buffaloes can be attributed to several reasons. The study was conducted in Jhansi district of Bundelkhand region. Respondents were selected through proportionate random sampling technique. The results of the study showed that the farmers had high technological gap in feeding practices of dairy animals. It was found that respondents had high technological gap on colostrum feeding and quantity of milk to be fed to newborn calves. The findings were justified as farmers were having less knowledge on this aspect. It was observed that small farmers concentrated their mind on care of advanced pregnant animals. Land less and marginal farmers had more technological gap as well as less number of wet animals in their herd.

Key words: Technological gap, feeding practices, dairy animals.

INTRODUCTION

India has emerged as the largest milk producer in the world, but the productivity of dairy animals is still very low. The non-descript cows and buffaloes produce around one litre of milk per day, while the graded cows and buffaloes produce around three liters and crossbred cattle and Murrah buffaloes produce between 8-10 litres of milk per day. The low average milk production by the Indian cattle and buffaloes can be attributed to several reasons. However, inadequate nutrition is the one of the major reasons responsible for low milk production in animals of well-defined breeds. Several sources indicate that there is deficiency of green fodder, dry fodder and commercial concentrates in the country due to which animals do not get adequate feeding for expression of their genetic potential for milk production (Ranjan, 1994).

Bundelkhand, representing low rainfall region is a backward, semi-arid region and productivity of animals is also low (Tyagi, 1997). In rain fed areas like Bundelkhand feeding systems are primarily based on grazing of animals on native pastures of low productivity, which are steadily deteriorating in prevailing dry condition. Ruminants receive part or most of the feed requirements through grazing on natural grasslands.

The role of modern technology in enhancing milk production in the country needs no further emphasis. It has been very well testified in few pockets of the country where there was substantial increase in the milk yield potential of the animals through the application of dairy production technologies. However, there still exists a wide gap between the technology available with the researchers and its adoption at farmers' field in the sphere of livestock feeding. Due to this gap farmers are unable to provide balance diet to their animals that results in low productivity of dairy cattle and buffaloes. Therefore, an effort was made to find out the technological gap in feeding practices of dairy animals in Bundelkhand region.

MATERIALS AND METHODS

The study was conducted in Jhansi district of Bundelkhand region. The district has been divided in to eight strata based on the animal production, milk production and forest cover. From each stratum, one village was selected randomly to represent the strata. 30

respondents from different land holding categories were selected in each village by applying proportionate random sampling technique. The respondents were those who had at least one milch animal at the time of investigation. Data was collected through well structured and pre-tested interview schedule by interviewing 240 farmers from 8 villages.

The technology gap refers to the difference between the recommended package of feeding practices of dairy animals and the extent of adoption of the recommended feeding practices of dairy animals. This was measured with the help of the index developed by Tripathi (1977), as given below:

$$\text{Technological gap (\%)} = \frac{\text{Recommended practices score} - \text{Extent of adoption score}}{\text{Recommended Practices score}} \times 100$$

Path analysis was used with a view to identify the potent variables, which were influencing the technological gap separately and also to study the channeling effects of these variables.

RESULTS AND DISCUSSION

Technological gap regarding feeding practices of dairy animals

It is evident from the Table 1 that about 74.00 percent of the respondents were in medium category of technological gap as against 13.00 percent of farmers in high and equal percentage in low categories. The mean percentage of technological gap of feeding practices of dairy animals for the sample as a whole stood at 58.28 percent and the standard deviation was 7.45. It was observed that about 13 percent respondents were in high technological gap probably because of the inadequate knowledge and unfavorable attitude towards dairy farming in general and feeding practices of dairy animals in particular. The results of the study showed that the farmers had high technological gap in feeding practices of dairy animals.

Table 1. Classification of respondents based on technological gap of dairy animals

n=240

Category	Frequency	%	Mean	S.D.
Low (< 50.50)	32	13.33		
Medium (50.50-66.00)	177	73.75	58.28	7.45
High (> 66.00)	31	12.92		

The results of the study revealed that the technological gap was medium among the respondents. These were akin to the observations made by Kokate (1984) and Bhoite *et.al* (1987).

Technological gap in feeding practices according to various categories of dairy animals

The information collected from the respondents was further analyzed to find out the extent of technological gap in relation to feeding practices of various categories of dairy animals. The gap results are discussed as under:

Feeding practices of calves

It is revealed from the Table 2 that there was 67.37 percent of technological gap in feeding practices of calves. Further, it could be observed that less extent of technological gap existed among the small farmers i.e. 64.58 percent. Whereas 66.00 percent technological gap was observed landless farmers in the calves' feeding practices. It was found that respondents had high technological gap on colostrum feeding and quantity of milk to be fed to newborn calves. The findings were justified as farmers were having less knowledge on this aspect.

Feeding practices of heifers

A quick look at the results presented in Table 2 reveal that farmers of the study area had 51.75 percent of technological gap on the feeding practices of heifers. While as land less and small farmers were having 50.00 and 50.42 percent respectivley extent of technological gap. A higher extent of technological gap (54.08%) was observed among the farmers who had large land holdings.

These findings lead one to conclude that landless, small and marginal farmers were having less technological gap as compared to large and medium farmers. During the investigation it was observed that landless and marginal farmers took heifers from medium and large farmers for due care and after calving 50.00 percent cost of that animal was paid by the owner of the heifer i.e. medium and large farmers' to the caretaker. Due to that fact marginal and landless farmers were having less technological gap.

Table 2. Technological gap among the farmers regarding feeding practices of according to various categories of dairy animals

n=240

S. No.	Farmers'/ Category	Technological gap (%) in feeding practices					
		Calves	Heifer	Pregnant animals	Animals in milk	Dry animals	Pooled
1	Land less	66.00	50.00	61.50	60.92	57.67	59.22
2	Marginal	64.58	51.50	59.83	55.92	50.42	56.45
3	Small	65.58	50.42	55.00	52.08	47.67	54.15
4	Medium	73.17	52.92	59.58	54.33	47.25	57.45
5	Large	67.50	54.08	58.92	48.33	48.17	55.40
	Pooled	**67.37**	**51.78**	**58.97**	**54.32**	**50.24**	**56.53**

Feeding of pregnant animals

A high technological gap was observed in providing concentrate to advanced pregnant animals. Further, the data presented in Table 2 reveal that landless and marginal farmers had 61.50 and 59.83 percent extent of technological gap on feeding of pregnant animals, whereas, small farmers had 55.00 percent technological gap on this aspect. During the data collection it was observed that small farmers took more care of advanced pregnant animals. Mostly stall feeding was adopted for feeding the pregnant animals.

Feeding of wet animals

It was interesting to observe that farmers had optimum technological gap on the feeding of wet animals i.e. 53.33 percent. It is clear from Table 2 that large and small farmers had 48.33 and 52.08 percent extent of technological gap in the feeding practices of animals in milk. It was also observed that land less and marginal farmers had 57.42 and 60.92 percent of technological gap about the feeding of these animals. As it is already explained in the feeding of heifers that after calving wet animals were taken back by the large farmers from the land less and marginal farmers. Hence, it was concluded that land less and marginal farmers had more technological gap as well as less number of wet animals in their herd.

Feeding of dry animals

The results presented in Table 2 reveal that respondents had 50.24 percent extent of technological gap in relation to feeding practices of dry animals. Further, it was revealed that large farmers had lowest technological gap i.e. 45.25 percent whereas, landless farmers had 57.67 percent extent of technological gap in the feeding of dry animals. Findings were justified because during the course of investigation it was observed that farmers offered some how equal amount and type of feeding to their adult (wet and dry) animals.

As a whole it could be stated that there was 56.53 percent extent of technological gap regarding feeding practices of dairy animals. Results indicate that a lowest (54.15%) extent of technological gap existed among the small farmers where as, highest (59.22%) gap was observed among land less farmers in feeding practices of dairy animals.

Path analysis

Path analysis in dependent variables with technological gap on feeding practices of dairy animals. The zero order correlation figures given in Table 3 show that six independent variables namely mass media exposure, localite source of information, cosmopolite source of information, risk orientation, attitude and knowledge were having significant relationship in negative direction with the technological gap. This analysis revealed if the value of selected variables will increase the technological gap will automatically decrease. Further, direct and indirect effect of each variable on technological gap revealed that knowledge was the most potent one as it was found exerting maximum direct effect (-0.8455) in negative direction on the technological gap. Next in order of importance were education, cosmopolite source of information, localite source of information, herd size and attitude towards dairy farming which had negative effects. It is logically true that the increase of knowledge, education, use of information, increased herd size and favourable attitude could minimize the technological gap.

Table 3. Path analysis of selected independent variables with technological gap on feeding practices of dairy animals

n=240

Variables	Variables No.	'r ' value	Direct effect	Indirect effect	Substantial indirect effect through single variable		
					I	II	III
Age	X1	-0.0803	-0.0337	-0.0466	-0.0616(x15)	0.01757 (X7)	0.0169 (X2)
Education	X2	-0.1518	-0.0807	-0.0711	-0.0855 (X15)	0.0240 (X10)	0.0168 (X7)
Family Education Status	X3	-0.0860	-0.0006	-0.0854	-0.0406 (X15)	-0.0380 (X2)	0.0151 (X10)
Family Size	X4	0.0061	0.0231	-0.0170	-0.0331 (X7)	-0.0137 (X5)	-0.0105 (X8)
Social participation	X5	-0.0377	-0.0627	0.0250	0.0403 (X7)	-0.0156 (X2)	0.0156 (X10)
Occupation	X6	-0.0359	-0.0040	-0.0319	-0.0227 (X15)	0.0209 (X7)	-0.0167 (X10)
Land holding	X7	-0.0467	0.1136	-0.1603	-0.0745 (X15)	-0.0440 (X8)	-0.0223 (X5)
Herd size	X8	-0.1586	-0.0749	-0.0837	-0.1389 (X15)	0.0666(X7)	-0.0121 (X12)
Milk production	X9	-0.1498	0.0177	-0.1675	-0.1495 (X15)	-0.0404 (X8)	0.0327 (X10)
Mass media exposure	X10	-0.4275**	0.1283	-0.5558	-0.4634 (X15)	-0.0408 (X11)	-0.0341 (X14)
Localite information source	X11	-0.4994**	-0.0763	-0.4231	-0.4561 (X15)	0.0686 (X10)	-0.0355 (X14)
Cosmopolite information source	X12	-0.2221*	-0.0804	-0.1417	-0.1341 (X15)	0.0262 (X10)	-0.0134 (X11)
Risk orientations	X13	-0.6328**	0.0496	-0.6824	-0.6430X15)	0.0636 (X10)	-0.0446 (X14)
Attitude towards dairy farming	X14	-0.6408**	-0.0638	-0.5770	-0.6165 (X15)	0.0685 (X10)	-0.0424 (X15)
Knowledge	X15	-0.8470**	-0.8455	-0.0015	0.0703 (X10)	-0.0465 (X14)	0.0377 (X13)

* Significant at 5 percent level of probability * *Significant at 1 percent level of probability

The risk orientation variable had highest (-0.6824) total indirect effect on technological gap and it was routing through knowledge, mass media exposure and attitude towards dairy farming. Where as attitude towards dairy farming, mass media exposure and localite source of information were having total indirect effect (-0.5770), (-0.5558) and (-0.4231) on technological gap respectively. Incidentally the knowledge was being used by as many as twelve variables in exercising their indirect influence. Whereas, mass media exposure and land holding were used by ten and six variables, respectively. The results indicated that these variables played significant role in controlling technological gap.

It could be concluded that there was 56.53 percent extent of technological gap regarding feeding practices of dairy animals. Results indicate that lowest (54.15%) extent of technological gap existed among the small farmers where as, highest (59.22%) gap was observed among landless farmers in feeding practices of dairy animals. Path analysis explained that knowledge, education, mass media exposure and land holding were very imperative variables for minimizing technological gap. Thus, the technology dissemination system must be focused on these variables by organizing campaigns, field days, demonstrations, exhibitions, *kisan gosthis, kisan melas*, extension talks, etc. so that farmers can acquire latest knowledge, which will result in reduction in technological cap in relation to feeding practices of dairy animals.

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Determinants of Farmers' Training Needs in Agri-horti Farming System: A Study of J&K State

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ABSTRACT

Fruits occupy a premier position in the country's economy by virtue of their nutritional values and high yields per unit area. To build a viable and sustainable fruit sector, country needs to take a holistic view of the supply chain - from seed to table, improving production and distribution practices. Agri-horti system of farming offers new avenues of commercial agriculture for small fruit growers. The tailored human resource development activities to convert available human resources into functionally more useful, professionally more purposeful, better equipped and more relevant can only be planned if they are conceptualized on proper data. The study conducted in Doda district of J&K state shows that the farmers were economically motivated and moderately innovative. The level of adoption of package of practices of field crops as well as horticultural crops was moderate by majority of the farmers. Most of the respondents reported high level of training needs with slight variation. The variables like family occupation, land holding, economic motivation, innovative proneness and information sources utilization were positively and significantly associated with training needs of respondents. The farmers preferences regarding training programme organisation were also sought which need to taken into consideration while planning and implementation of human resource development activities.

Key words: Agri-horti farming system, farmers' preferences, training needs

INTRODUCTION

Fruits occupy a premier position in the country's economy by virtue of their nutritional values and high yields per unit area. In fact, fruit cultivation is the only cropping system which not only helps in improving biological productivity and nutritional standards but also assists in maintaining ecological sustainability, earning foreign exchange and providing direct and indirect employment opportunities. To build a viable and sustainable fruit sector, FAO says, countries need to take a holistic view of the supply chain - from seed to table - with an eye to opportunities for improving production and distribution practices. Improvements will not only boost supply, but generate extra income for rural producers and other small-scale operators along the chain. While FAO work on horticulture includes large-scale commercial production, it places particular focus on rural household production systems. It is therefore imperative to shift emphasis from traditional agriculture to new avenues of non-traditional commercial agriculture like agri-horti system of farming. Small fruit growers needs to be trained and motivated so that they are more focused, better equipped and more relevant by creating, in depth, newer capabilities, intended to achieve technical and socio-economic progress. The tailored human resource development activities can only be planned if they are conceptualized on proper data. The present study was conducted to generate empirical data on various socio personal and psychological factor associated with farmers training requirements along with the insight in various facets of training programme organisation.

MATERIALS AND METHODS

The Doda district of J&K state was selected because of its importance in temperate fruit production in the state

of J&K both in terms of area and production. Although the major share of area and production of temperate fruit is contributed from Kashmir valley but the Doda district of Jammu province of J&K state with similar agro-climatic condition holds vast potential for production of high value fruit crop. Multistage sampling technique was followed for the purpose of the study. Doda district comprises of eight community development blocks, out of which those four blocks were selected, in which most of the villages had undertaken agri-horti system of farming. These blocks were; Bhaderwah, Thatri, Bhala and Marmath. From each selected block, four villages were selected randomly thereby in all 16 villages. The selection of the respondents in the village was made on population proportionate making a total of 120 respondents from all 16 selected villages. A pretested interview schedule was utilized to collect the data from the sampled farmers.

RESULTS AND DISCUSSION

The results of the study undertaken are presented and discussed below.

Profile of the farmers

Pursual of Table 1 shows that most of the farmers were middle aged, drawing their major portion of livelihood from agriculture, educated up to higher secondary and below, marginal in their land holdings with low social participation. Maximum percentage of farmers was moderately economically motivated (40.9%) and was innovative (47.5%). The level of adoption of package of practices of field crops as well as horticultural crops was moderate of majority (64.2%) of the farmers. In hilly area mostly agriculture farms are formed on the slopes of the hills which also restrains the farmers to have farms of large size for agricultural activity. The study confirms the findings of Gholve *et.al* (1986) and Lal, (2006). Regarding economic motivation, the horticultural crops provide returns for 15 to 20 years after their plantation and thus effect their motivation to take up the horticultural crops as observed by Kumari (2008).Farmers were having medium level of media exposure as radio and T.V. are the cheapest source of mass media and is affordable by most of the respondents for information as well as entertainment. Adoption of agri-horti farming system may have more influence of the State Horticulture department of the J&K, as state has undertaken water shed development programme on a large scale covering a large area where planting material is provided to the farmers free of cost along with barbed wire to fence the orchard. It had attracted a large number of farmers as it fulfills the dual purpose of additional income and soil conservation**.**

Table 1. Distribution of respondents according to their socio personal and psychological characteristics

Variable	Categories and respective scores	Frequency	%
Age	Young (Below 35 yrs)	19	15.8
	Middle(35-50 yrs)	72	60.0
	Old (Above 50 yrs)	29	24.2
Education	Illiterate	11	09.2
	Primary School	35	29.2
	Middle School	25	20.8
	Up to Higher Secondary	32	26.6
	Graduate and above	17	14.2
Occupation	Farming	73	60.8
	Other sources	47	39.1
Land holding	Marginal (Below 2.5 acres)	88	73.4
	Small(2.5 to 5.0 acres)	32	26.6
	Big(Above 5.0 acres)	00	00
Media Exposure	Low (<14.2)	17	14.2
	Medium (14.2-20.6)	68	56.6
	High (>20.6)	35	29.2
Social participation	Low(<1.1)	104	86.7
	Medium(1.1 – 2.3)	16	13.3
	High(>2.3)	0	0.0
Economic motivation	Low (<6.3)	38	31.6
	Medium (6.3 -9)	49	40.9
	High (> 9)	33	27.5
Innovativeness	Low (<11.29)	48	40.0
	Medium (11.29-15.)3	57	47.5
	High (>15.3)	15	12.5
Level of adoption of recommended practices of field crops	Low (<26.72)	32	26.6
	Medium(26.72-46.4)	77	64.2
	High(> 46.4)	11	9.2
Level of adoption of recommendations of fruit crops	Low <28.31	26	21.7
	Medium 28.31-50.48	78	65.0
	High >50.48	16	13.3

Training needs of farmers in agri-horti system

Table 2 indicates that most of the respondents (55.0 %) have shown high training needs whereas 31.6 per cent of the farmers have shown medium training needs and only 13.4 per cent of the farmers have shown low training needs in various sub heads of agri–horti farming system. The low level of productivity might be the reason for the majority of respondents having high level of

training needs. The farmers might have realized the potential of the agri-horti system to satisfy their needs in serving dual purpose of additional income, through food and fruit and controlling soil erosion.

Table 2. Categorization of respondents on the basis of their training needs

S.No.	Category	Frequency	Percentage
1.	Low (<48.2TNI)	16	13.4
2.	Medium (48.2-59.3TNI)	38	31.6
3.	High (>59.3TNI)	66	55.0

'TNI= Training need index

Table 3 indicates the training needs in sub area of agri-horti farming system. Intercultural operation for horticultural crop topped the ranking followed by selection of fruit plants. The sub area lay out plan for horticultural crops has been found to be at the bottom of training need index. Training needs in inter cultural operation like training and pruning of horticultural crop was high and was ranked first in case of training need priority table. This may be due to the fact that most of the temperate and semi temperate fruits require regular pruning and the fruit is formed on previous year's growth. Training of fruit trees also lead to the attainment of favorable structure which is very essential for the proper circulation of air and ample supply of solar rays to each of the leaves for favourable fruit colour development.

The respondents considered the lay out plan of horticultural crop as least important for training .This may be due to limited choice left with the farmer as far as size of land holding is concerned. Other sub areas such as selection of fruit plants, disease management, selection of site for plantation, water management, selection of crops, sowing, nutrient management, harvesting and storage and soil suitability for horticultural crop were ranked at medium level in respect of perceived training needs.

The results in Table 4 indicate that the variables; family occupation, land holding, economic motivation, information sources utilization were positively and significantly associated with training needs of respondents at 5.00 per cent level of significance, whereas the variables like age, social participation, adoption had a non-significant relation with training needs of the respondents. Innovative proneness was positive and significantly related with training needs of respondents at 1.00 per cent level of significance. The results confirm the study of Prakash and Kushwah (1995).

Table 3. Perceived Training needs of farmers in agri-horti farming system

S. No.	Farm activity	Mean training need score	Rank
1	**Soil suitability for horticultural crop**	**1.24**	**XI**
2	**Selection of site for plantation**	**1.63**	**IV**
3	**Selection of crop**	**1.53**	**VI**
I.	Selection of Horticultural crop & its variety	1.66	
II.	Selection of field crop& its variety	1.40	
4	**Layout plan of horticultural crop**	**0.86**	**XII**
5	**Selection of fruit plant to be planted**	**1.81**	**II**
6	**Sowing/planting**	**1.50**	**VII**
I	Method of sowing /planting	1.34	
II	Seed rate/ Number of plants	1.52	
III	Seed treatment/ drenching of pits	1.64	
7	**Intercultural operation**	**1.84**	**I**
I	Training and pruning	2.01	
II	Field sanitation	1.95	
III	Whitewashing of plants	1.49	
IV	Thatching	1.55	
V	Hoeing	1.05	
VI	Weed management	1.80	
VII	Earthing	1.21	
8	**Nutrients management**	**1.47**	**VIII**
I	Doses of nutrient/ fertilizer	1.87	
II	Time of nutrient/ fertilizer application	1.58	
III	Method of application	0.96	
9	**Water management**	**1.54**	**V**
	Number and time of irrigation	1.60	
	Method of irrigation	1.48	
10	**Pest management**	**1.26**	**X**
	Identification of insects	0.92	
	Control of insects	1.60	
11	**Disease management**	**1.73**	**III**
	Identification of diseases	1.50	
	Control of diseases	1.96	
12	**Harvesting, Packaging and Storage**	**1.29**	**IX**

Table 4. Correlation between selected independent variables and training needs of farmers in agri - horti system of farming

Independent Variables	r Value
Age	-0.05
Family occupation	0.223*
Land holding	0.197*
Media exposure	0.311*
Social participation	0.127
Economic motivation	0.351*
Innovativeness	0.454**
Adoption	0.089

**significant at 1 per cent level * Significant at 5 per cent level

Perceived preferences for training programme organisation

It is evident from Table 5 that majority of respondent preferred training up to one week followed by up to fifteen days, this may be due to the facts that the farmers hardly get much time in between two growing seasons, district Doda being a hilly area have long growing season for most of the crops and also winter are severe so a lot of preparations is required before the onset of the winter limiting the time. Regarding theory versus practical it was revealed that 72.5 percent of the respondent preferred 25 per cent, theory and 75 per cent of practical, as being adults and experienced farmers, with practical part they may found more meaningful. Majority of the respondent (39.1%) preferred training to be organized before the start of cropping season so that they can implement on the field what they have learned in the training and during the active cropping time farmers may be more interested in performing the activity in the field rather than attending training session. The respondent (25%) preferred demonstration method for their training and only 4.1 per cent of them preferred lecture method this may be due to the fact that with demonstration, the comparison between two practices can be better understood. Majority of the respondent (72.5%) preferred to undergo training in the group up to 20 persons training to be organized in their own locality (64.2%) that too by state agriculture university / KVK and preferred day boarding type of training and only 4.1 per cent of the respondent liked to undergo self sponsored training as most of the farmers were resource poor and cannot afford to undergo training organized at distant places more over the people attending the training programme in their locality can manage their house hold work as well as farming activities in between.

Table 5. Perceived preferences of farmers regarding organization of training programme

S. No.	Particulars	Frequency	Percentage
1	**Duration of training**		
	Up to 2 days	16	13.3
	Up to 1 week	84	70.0
	Up to 15 days	20	16.6
2	**Theory versus practical**		
	75% theory & 25% practical	12	10.0
	50% theory & 50% practical	21	17.5
	25% theory & 75% practical	87	72.5
3	**Month/ season of training**		
	Before the start of the activity	21	17.5
	Before the start of the season	47	39.1
	Lien period	36	30.0
	With the cropping season	16	13.3
4	**Training methodology**		
	Lecture method	5	4.1
	Practical	36	30.1
	Field visit	23	19.1
	Demonstration	30	25.0
	Combination of two or more	26	21.7
5	**Size of training group**		
	20 people	87	72.5
	30 people	33	27.5
	More than 30 people	0	0.0
6	**Venue of training**		
	In your locality	77	64.2
	At the institute where the experts are available	33	27.50
	Some central place	4	03.3
	District headquarter	6	05.0
7	**Type of training**		
	Vocational	23	19.2
	Day boarding	67	55.8
	No Preference	30	25.0
	Sponsored	8	06.6
	Self sponsored	5	04.2
	No Preference	107	89.2
8	**Organiser**		
	State horticulture department	24	20.0
	Agriculture university	83	69.2
	NGOs	1	00.8
	Input supply agency	12	10.0

Jammu and Kashmir State is blessed by nature with varying agro climatic conditions thus making it suitable

for growing of wide variety of crop plants and fruit crops under sub tropical, intermediate and temperate zones. The average Indian farmer is poor and is unable to invest in high quality planting material and also not fully aware of modern agro-economic practices. The productivity is, therefore, quit poor also farmer is hesitant to take up horticulture which requires high investments, long gestation periods and uncertain returns. High quality planting material is not always available in sufficient quantities. The farmers had shown their concern for human resource development. The subject matter areas with direct bearing on the fruit yield were rated high in the training requirements whereas the subject matter areas where the farmer are left with no choice were ranked as least required. These are sufficient indications that training in agri-horti farming system is urgent need of the hour. The farmers had also provided their preferences regarding training programme organisation which need to taken into sharp focus during planning and implementation of human resource development activities.

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Participatory Analysis of Agri-rural Situation for Research, Development and Policy Interventions

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ABSTRACT

Participatory Rural Appraisal (PRA) is a methodology/approach to ensure active participation of stakeholders in problem identification, determining the need suited to locality, formulation of agri-based projects, their implementation, monitoring and evaluation and developing the further action plan to solve the own problems. PRA was carried out by the multidisciplinary team of scientists to assess agri-rural situations for research, development and policy interventions in Badarpur Said cluster of Faridabad district of Haryana. It was found that farmers of concerned village were very enthusiastic for acceptance of agri-based improved and scientific technology. About 70 per cent of the total cultivated land was covered under vegetable production and only 30 per cent area was under cereals and pulse production. Farmers grew cereals for their livelihood security only. Pulse crops were neglected by the farmers as being less-profitable as compared to vegetables and serious attack of Blue Bull (Nilgai)" *Boselaphus tragocamelus*" at vegetative, flowering and fruiting stage. Based on the findings, the potential on-farm interventions have been developed.

Key words: Agriculture and development, agri-rural situation, participatory rural appraisal (PRA)

INTRODUCTION

The emerging challenges confronting Indian agriculture includes the declining land resources, falling productivity and profitability in agriculture leading to sustainability at stake. This calls for critical assessment of agro-ecological situation, socio-economic condition and available resources and technologies. Proper understanding of farmers and their situation has always been a challenge before the extension scientists and developmental workers. The weaknesses of traditional research techniques for assessing the needs and problems of rural people such as long term base line survey as well as structured and superficial short term studies prompted a research for more cost effective and relevant in relation to farmer's social environment. The major short falls of the earlier research methods / techniques are lack of community participation, lack of utilizing the village knowledge and experiences, lack of cross checking of data and inaccuracy and unreliability of data. So the participation of the local people in present scenario has become one of the crucial elements for planning, formulation and implementation of any agriculture and rural development project by judicious utilization of local available resources. Now participatory action has become indispensible part of the development. The above reasons consolidated the foundation of PRA techniques. This method was developed by Richard Ford at Clark University (Smith *et al.* 1991). According to Dabas *et al.* (2009), it is one of the most effective tools which can be utilized to understand the technologies, extent of adoption, profile of farming community, and first hand information about need, resource available, priorities, problem and prospects of farming community. PRA is a methodology for assessing the problems and needs of rural people by involving

them in the whole process of problem identification, determining the solution, developing the action plan to solve the problem followed by an implementation phase conducted and controlled by development agencies in closed partnership with farmers. It is a research method of empowering the rural people which enable them to share, enhance and analyze their knowledge of life. PRA is flexible and adaptable need assessment technique which can be modified by a researcher according to the local context. PRA can be defined as need assessment process, wherein a team of researchers from various disciplines come together and try to identify the problems and need of rural people and find the solution to overcome these problems (Tiwari *et al.* 2008). It helps to understand the technology dissemination process, rural development activities, existing linkage mechanism among research, training and extension, credit and input supply systems etc. (Jones, 1995). Indian Agricultural Research Institute (IARI), Participatory Rural Appraisal (PRA) exercise was conducted to analyze the agri- rural situation and diagnose the agricultural problems with reference to available resource, potential small scale enterprises, and socio-economic condition of the farmers in the adopted village.

MATERIALS AND METHODS

PRA was carried out by a multidisciplinary team of scientists in Badarpur Said cluster of villages in Faridabad district (Haryana) in 2011. The village is located approximately 30 Kms. away from Indian Agriculture Research Institute (IARI), New Delhi. The team visited in groups to collect the first hand information with participatory mode to generate correct and reliable information. For initializing PRA exercise steps such as the rapport building with the villagers, Identification of the key informants, forming the focus group and orientation with group in view of collecting the information were taken. Following techniques were utilized in this process.

On the spot visualization: It was done on different aspects of the village like resource available, population, crops and cropping pattern, communication facilities and animal husbandry practices etc.

Group interview: Semi structured interview schedule was prepared to collect the information in informal way on general information of the village, rural life, livelihood security, employment status, self employment opportunities, input analysis and institutional linkage.

Time line: It was used for knowing the historical view of the village and to ascertain how different aspects of village life have changed over the year. The historical profile was narrated by elderly villagers in detail with respect to the major changes that have occurred in the village over time and their impact on social well being.

Venn diagram (*chapati diagram*): It was used to analyze the extent of relationship and importance of institutions/ individuals with village people. It also reflected the kind and extent of communication between village people and extent of success or failure of developmental programme launched by the government, non-governmental and private organizations in providing service, information and technology.

Problem- cause analysis: It helped in identifying major farming related problems. The identified problems were ranked on the basis of intensity and extent of impact on the production, productivity, sustainability, and gross returns. It further helped in delineating those causes which can be solved at the local level. Problem tree was constructed after focused group discussion with key informants.

Matrix ranking: It was used to learn from people what they perceive about a particular technology. It helps to develop a better focus on the transfer of technology and ranking helped in working out preferences of individuals regarding number of aspects of crop production etc. It also helped in identifying the major reason for adoption / rejection of the technologies. Matrix of crops and practices adopted in cultivation were ranked according to farmer's responses.

RESULTS AND DISCUSSION

The existing situation of the village was analyzed utilizing PRA methodology with special attention to agri- rural environment, small scale enterprise promotion, technology assessment, adoption, existing farming system, production system, social structure and farmers need.

Table 1. Demographic and economic profile of village Badarpur Said

S.No.	Parameters	Values		
1.	Total population (Number)	2800		
2.	No. of houses	370		
		• 70 SC		
		• 40 OBC		
3.	Education Status	5th (13 %)	8th (20%)	10th (40%)
		12th (17%)	UG (3 %)	PG (.01%)
5.	No. of school	up to 8th (1)		
6.	Aganwadi	2		
7.	Nirmal Gaon Award recipient in 2000			
8.	Electrification, Toilet facilities	100 percent		
9.	Employment status (Numbers)			
	• Government Service	102	Male (90)	Female (12)
	• Private Service	301	Male (270)	Female (31)

Social profile: The total population of Badarpur Said village is 2800. Out of 370 households, 70 belong to Schedule Caste and 40 to backward caste families. The total area is about 300 acres, and all under cultivable land. It was also found that the farmers were engaged in crop production by taking over the land on lease agreement from other villages to take farming as agri business. The main occupation of inhabitants is agriculture and about 70 per cent of the village population is engaged in agriculture. Only 15 per cent are landless and they mostly belonged to Schedule Caste (SC) category. Among the various caste category, *Jat* is dominant. Joint family system is prevalent in majority of the households. This village had received *Nirmal Gram Award* from President of India in 2000. Dairy farming is the subsidiary occupation for most of the farmers. 102 persons are government employee of which, 90 were male and 12 female. One junior high school, one Self Help Group, post office, fish pond, two *Aganwadi* and *panchayat ghar* existed in village. Cent per cent electrification was done of the village houses and all the houses have the toilet facility.

The village has 50 tube wells, 8 Dairy farms, and one fish pond. The literacy level among the male is 90-95 per cent while it is 75 per cent among the female. 40 per cent of the villagers have completed their education up to secondary level, 17 per cent higher secondary, 3 per cent graduation, 20% metric and only 10% are illiterate.

Table 2. Agricultural indicators of the village Badarpur Said

S.No.	Parameters	Values
1.	Total cultivated land	300 acre
2.	Land distribution	
	• Farmer's distribution on the basis of land holding	
		Marginal (60%)
		Small (15%)
	• Average land holding	1 acre/family
3.	Quality of water	Good
4.	Type of soil	Sandy loam
5.	No. of Tube well	50
6.	No. of Tractor	50
7.	Cropping System	
	• Potato/Wheat-Jawar/Chari	
	• Paddy-Wheat/Potato	
	• Wheat-Moong- Bhindi/Kheera/ Tomato/Pumpkin	
8.	Animal Population (Numbers)	2053
	• Buffalo	2000
	• Cross bred	35
	• Bullock	8
	• Donkey	10
9.	Average Milk Production	
	• Buffalo	8 liter/day
	• Cross bred	8 liter/day
10.	Total Dairy farms	8

Table 3. Ecological habitat of Badarpur village ascertained through transect walk

S.No.	Particulars	Direction	
		East-West	*North-South*
1.	Soil type	*Sandy loam*	*Loam, Sandy loam*
2.	Major crops grown	*Rice, Wheat, Cabbage, Cauliflower, Bottleguard, Jawar, Bajara, Berseem*	*Rice, Wheat, Cabbage, Cauliflower, Bottleguard, Arhar, Jawar, Bajara*
3.	Irrigation coverage	*87%*	*91%*
4.	Irrigation sources	*Tube well, Minors canal*	*Tube well, Minors canal*
5.	Major weeds	*Amaranthus, Cyprus spp., cynodo dactylon, Echnichloa spp., Avena fatua, Anagalis spp.*	*Amaranthus, Cyprus spp., cynodon dactylon, Echnichloa spp., Avena fatua Argemone,*
6.	Major Insects-pests	*Catterpillar, Gundhi bug, white fly, Pod borer,*	*Catterpillar, Whitefly,Pod borer,*
7.	Major diseases	*Blight, Blast, Mildew, Rust, BLB, Chlorosis*	*Khaira, Blast, Downey mildew, Wilt*
8.	Major shrubs	*Kaner, Baugevellia*	*Pomgranate, Lamon, Kaner*
9.	Major plants	*Neem, Mango, Sesum, Teak*	*Neem, Sesum, Teak*
10.	Major opportunities	*Processing unit of vegetables and seed, Hey and silage making,*	*Dal milling unit, Vermicomposting, fertilizers supply cooperative*

Ecological profile: For overall development of the village, it is required to have thorough understanding of it. Transect walk provided information about total geographical area, topography, soil type, availability and use of water, micro-environment, trees of economic importance, crop rotation, animal population and their breed, location and distribution of resources, existing enterprise etc. It also allows participants to identify the constraints and opportunities with special attention to agri-rural setting. The findings are contained in Table 3.

Resource information: The resource map of Badarpur Said village was drawn by participatory mode. The village has about 300 acres cultivated land and they also acquuired 300 acres on lease. Rice, Jawar, Bajara, Arhar, Bottle gouard, Okra, Cucumber, Spong guards and Pumpkin are major kharif crops where as Wheat, Oat, Berseem, Cabbage, Cauliflower, tomato and Potato are major Rabi crops. During summer season they grow melon group vegetables. The farm related problems which came out through PRA were attack of *Blue Bull Boselaphus tragocamelus* at vegetative, flowering and fruiting stage of the crops, timely un-availability of good quality seeds, fertilizers, plant protection advisory and scanty electricity supply at the peak farming operation time in that order. Termite infestation was the serious problem in all most all crops grown in Rabi season especially in wheat crop. The major source of irrigation is tube wells. Farm implements like tractors, chaff cutter, leveler, threshers, power tillers, and sprinklers zero till seed drill etc. were available along with traditional equipments. Most of the people reared buffalos, cross breds for milk purpose and bull for light farm operations like leveling etc. Milk is mostly consumed by the family while the surplus milk is sold to meet financial needs. Non-Governmental Organization (NGO) named farmer's India foundation society and Human development society are working for enhancing the use of bio-fertilizers.

Time Line: It provides the historical overview of the community in relation to their socio-economic status, and major changes occurred with time. The time line of different activities in village as projected by the key resource person is given below in Table 4 and is self explanatory.

Table 4. Important mile stones of village Badarpur Said

S. No.	Year	Event
1.	1811	Establishment of village
2.	1925	Establishment of post office
3.	1935	First primary school
4.	1949	first cycle
5.	1955	First 10th pass person (Charan Singh)
6.	1957	First 12th pass person (Charan Singh)
7.	1958	First tractor (Atal Singh)
8.	1959	Graduate (Charan Singh)
9.	1960	First radio
10.	1961	Post Graduate (Charan Singh)
11.	1965	Introduction of electricity
12.	1970	Water supply
13.	1970	Scooter
14.	1973	First TV (Soran Singh)
15.	1981	Car
16.	1990	Bio-Gas Plant
17.	1990	Fisheries pond
18.	1995	Mobile
19.	2006	Vermi compost plant

Venn diagram: Venn diagram revealed the relationship between individuals or between organizations or between individual and organization. Fig. 1 and 2 depict the situation of various social institutions, small scale enterprises and social setting of different caste in the village.

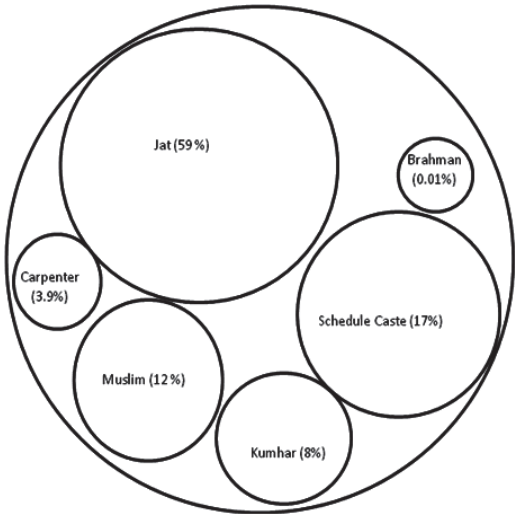

Fig. 1. Social setting of different caste

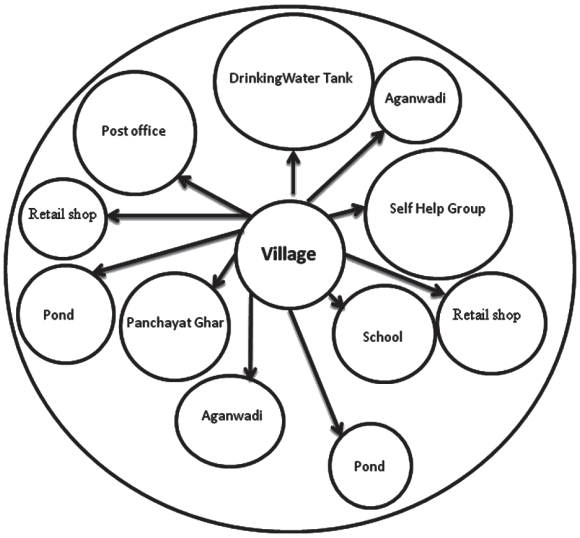

Fig. 2. Social institutions in selected village

Seasonal Calendar: Most of the agricultural activities of rural people depend on the season. Likewise insect-pest and disease infestation also depends on the season. Fig. 3 shows the peak/slack month of work for farmers. In the month of March- April and October-November work load on the farmers is maximum in comparison to other months. In these months, farmers are busy in performing various agricultural activities of *kharif* and *rabi* crops. January, February and December months were recognized as slack month by the farmers. In these months farmers have less work in their fields.

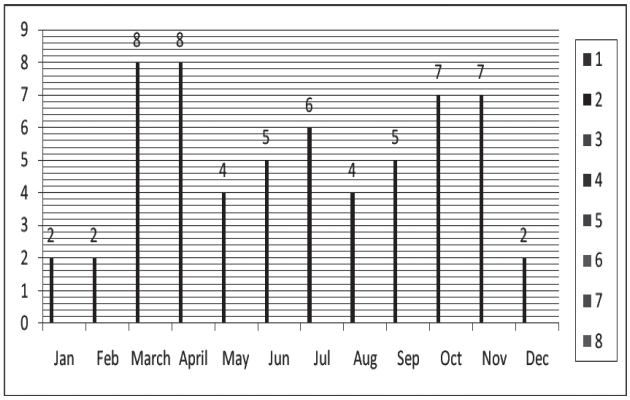

Fig. 3. Work load on Farmers in different months (Peak/Slack Months)

Matrix Ranking: Matrix ranking helps in knowing about the preference of the villagers regarding number of aspects. It can tell about what the villagers prefer most and what they prefer least. The identified parameters were ranked on the basis of suitability and their impact on overall production. Score 5, 4,3,2,1 for "very much important, much important, important, less important, not important" to different parameters respectively and ranks were given on the basis of total score accordingly. The total highest score among the different column indicates the best adopted practices/ parameter and get Ist rank followed by the next highest score which gets IInd and so on. Likewise the total highest score among the different rows indicate best suited criterion for adoption.

Table 5 reflects that in *kharif* season, paddy crop is much popular because of their higher return and production. Although it has some basic problems as revealed by farmers are lack of availability of good quality seed at sowing time for nursery raising, shortage of labour for intercultural operations attack of insect pests and diseases. Jowar is mainly grown to meet out the fodder requirement. Bottle guard is popular among the farmers due to its low cost of cultivation, easy picking, less incidence of insect pests and diseases, low

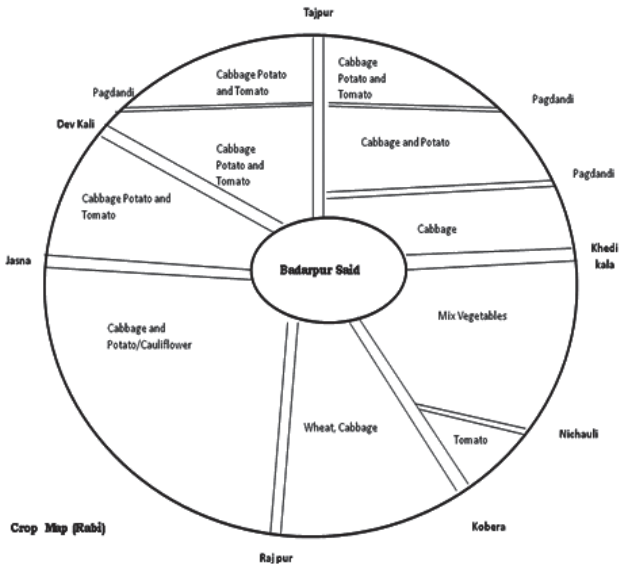

Fig. 5. Crop Map (Rabi season)

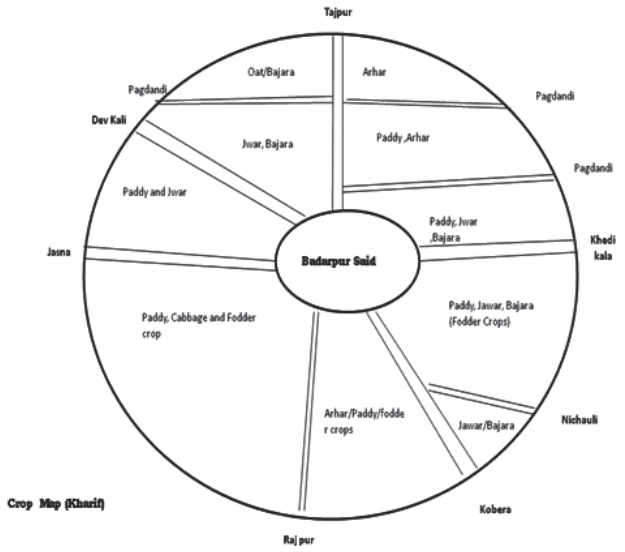

Fig. 6. Crop Map (Kharif season)

risk and higher return followed by okra, cucumber and pumpkin. In case of *rabi* crops, berseem is major crop in this locality and grown mainly for fodder purpose followed by wheat and oat. Wheat is mainly grown for their household consumption. Cauliflower is more promising crop followed by tomato and potato. Seeds and seedlings of cauliflowers are easily available to the farmers. They grow this crop one month earlier so as to get higher return of their produce.

Perusal of data depicted in Table 6 reveals that scented rice variety, Pusa -1121 is popular among the farmers due to its attractive returns, production and less incidence of insect pests and diseases in comparison to other scented variety. Farmers grow wheat variety PBW 343 and covered maximum area under cultivation. K. Pukhraj, Veer-333 and 5005 variety of potato, cabbage and tomato respectively are more popular among the farmers due to their unique quality of being resistant to insect pest and diseases, higher market price of the produce and agro-ecological suitability.

Major Thrust area identified for research: The PRA of village Badarpur said in Faridabad revealed farmers facing various agricultural problems. The most causal problem as indicated by the farmers was attack of *Blue Bull* at vegetative, flowering and fruiting stage in all crops. Due to attack of this, the yield decreases and the quality of marketable surplus of Pigeon pea grain deteriorates which leads to economic loss to the farmers. Poor access to market information is also a problem resulting in less profitability. The key informants opined that it causes loss ranging from 80-90 percent in red gram and owing to this reason farmers were not interested to grow this crop. Termite attack in wheat crop was second most important problems. Seed, fertilizers are not timely available, distress selling of agri-produce especially presumable at very low rates. The analysis of identified problem suggests that the areas which require great caution to the government as well as scientific intervention.

- Management and legal control of *Blue Bull (Nilgai) Boselaphus tragocamelus.*
- Management and control of termite infestation in wheat crop.
- Insect-pests and disease infestation in vegetables crops.
- Marketing intelligence.
- Promotion of small scale micro-enterprises.
- Training on post harvest management of cereals, vegetables, fruit crops.

Major Potential Intervention

Research Intervention: The village produces huge quantity of seasonal vegetables but they could not receive reasonable price of their produce. If post harvest

Table 5. Matrix ranking of *kharif* and *rabi* season crops

***Kharif* season (cereals)**

Parameter → Varieties ↓	Seed availability	Yield	Income	Production	Production cost	Complication	Risk	Net Income	Total	Rank
Paddy	1	4	4	4	4	1	3	4	25	I
Jawar (fodder)	2	3	3	3	3	3	4	3	24	II
Bajara	1	2	2	2	3	4	3	2	19	III
Arhar	2	1	1	3	2	2	2	3	16	IV

***Kharif* season (vegetables)**

Parameter → Varieties ↓	Seed availability	Yield cost	Seed	Income	Picking	Duration	Cost of cultivation	Green manure	Labour cost	Risk	Net income	Total	Rank
Bottle Guard	5	4	2	3	5	4	5	4	5	5	5	47	I
Okra	4	2	3	5	1	3	2	1	1	1	3	26	V
Cucumber	4	3	3	4	3	5	4	5	3	3	3	40	II
Spong guard	4	4	2	2	2	1	2	3	2	2	3	27	IV
Pumpkin	4	5	2	1	4	2	3	2	1	4	4	34	III

***Rabi* season (cereals)**

Parameter → Varieties ↓	Seed availability	Seed cost	Food requirement	Duration	Cost of cultivation	Pests & disease	By-products	Risk	Net income	Total	Rank
Wheat	3	2	3	2	1	2	3	2	2	20	II
Oat	2	3	2	3	1	1	1	2	2	19	III
Berseem	2	3	2	2	3	1	2	3	3	21	I

Rabi Season (Vegetables)

Parameter → Varieties ↓	Seed Availability	Yield cost	Seed	Income	Picking	Duration	Cost of cultivation	Pests & disease	Labour cost	Risk	Net income	Total	Rank
Cabbage	4	3	2	2	4	3	3	2	1	2	3	29	IV
Cauliflower	3	3	3	4	2	3	2	4	3	1	4	32	I
Tomato	3	3	3	3	3	2	3	2	2	3	4	31	II
Potato	3	4	2	3	2	2	2	1	4	3	4	30	III

Table 6. Matrix ranking of varieties of different crops

Paddy

Parameter → Varieties ↓	Seed availability	Tillering	Grain quality	Insect pest & disease problem	Production	Market rate	Risk	Net income	Total	Rank
PB-1	2	2	2	1	1	1	1	1	11	II
P-1121	2	1	1	2	2	2	2	2	14	I

Wheat

Parameter → Varieties ↓	Seed availability	Tillering	Cost of seed	Food quality	Insect pest & disease problem	By product	Production	Risk	Net income	Total	Rank
PBW 343	1	4	2	4	2	4	4	2	3	26	I
WH 711	1	3	2	3	3	3	3	2	3	23	II
DBW 17	1	2	2	3	3	3	2	2	2	20	IV
PBW 502	1	2	2	3	3	3	3	2	2	21	III

Potato

Parameter → Varieties ↓	Seed availability	Cost of seed	Production cost	Insect pest & disease problem	Market rate	Storage	Production	Risk	Net Income	Total	Rank
Pukhraj	2	2	1	3	2	2	3	2	3	20	III
Kufri bahar	2	3	2	4	4	4	4	4	4	31	I
S-1	2	2	2	2	3	3	3	3	3	23	II
Jawahar	2	2	1	1	2	2	3	2	2	17	IV

Cabbage

Parameter → Varieties ↓	Cost of seed	Insect pest & disease problem	Market rate	Production	Production cost	Risk	Net income	Total	Rank
Veer 333	2	2	3	3	3	3	3	19	I
GC 92	2	2	2	2	2	1	2	13	III
Golden 65	2	2	2	2	3	3	3	17	II

Tomato

Parameter → Varieties ↓	Cost of seed	Insect pest & disease problem	Market rate	Production	Production cost	Risk	Net income	Total	Rank
5005	2	4	4	4	3	4	4	25	I
Dev	2	3	3	3	3	3	3	20	II
Novel 5002	1	2	2	2	3	2	2	14	V
Himsona	2	3	2	3	3	3	3	19	III
Priya	2	2	2	2	3	2	2	15	IV

management being done then they really fetch higher prices. The technology regarding post harvest management, improved crop varieties, and new agricultural practices should transfer to ultimate users on priority basis. Blast of paddy is also a serious problem that causes huge losses, so scientists must concentrate to develop a good strategy to manage/control of this particular problem. Training should be imparted to the farmers on post harvest management, marketing and enterprise promotion. Integrated Pest Management (IPM) must be incorporated in crop management system.

Developmental Intervention: Timely information on insect-pest & disease management, availability of quality seed, fertilizers, and regular contact of extension personnel with farmers must be regulated in view of uplifting the farmer's standards.

Policy Intervention: Government should take legal and effective decision for management/controlling of *Blue Bull (Nilgai)* "*Boselaphus tragocamelus"* to overcome heavy loss especially in pulses. Proper monitoring of the availability of production input also consider by the authority.

PRA is a methodology where in a number of techniques are used to assess and analyze the social profile of the village, agro-ecosystem, available resources, major problems in growing of crops. The multi disciplinary team participating in the exercise could efficiently and effectively explore the pinpoint the cause of the problems and thrust areas of research.

Some of the important areas identified for research in Badarpur Said in Faridabad were the management and control of termite infestation in wheat crop, insect-pests and disease infestation in vegetables crops, timely flow of marketing information, promotion of small scale micro-enterprises and training on post harvest management of cereals, vegetables, fruit crops.

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Practices for Safe Storage of Drinking Water among Rural Households of Haryana

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ABTSTACT

Water is one of the most vital natural resources for all life on earth. Safety is more a visual issue, albeit, only a small proportion think of germ-free water as safe. Dipping glasses and fingers into the vessel in which drinking water is stored is common practice. Studies have shown that contamination increases substantially between the source of drinking water and its storage as well as consumption. Present exploratory study was conducted to access the practices for safe storage of drinking water among rural households of Haryana. The study was conducted in four randomly selected villages i.e. Baliali and Chang from Bhiwani District and Mayer and Umra from Hissar District of Haryana state on a sample of 400 rural women hailed from APL and BPL families @50 APL+ 50 BPL from each village. It was found that 66.2 percent of the respondents had always used loose fitted lid to cover stored drinking water. Earthen pot was cleaned daily by a colossal majority of the respondents (76.2%). 42.7 percent of the respondents had cleaned the place of keeping stored water vessel as per their suitability/ whenever needed by them. More than half of the respondents (57.7%) had used a glass to take drinking water out from the vessel.

Key words: Safe storage, Drinking water, Haryana

INTRODUCTION

India has 16 per cent of the world's population and four per cent of its fresh water resources. The availability and quality of water always have played an important part in determining not only where people can live, but also their quality of life. A large proportion of households, particularly in rural areas, draw its drinking water from an unprotected well, hand pump, canal or stream. Dipping glasses and fingers into the vessel in which drinking water is stored is common practice. Studies have shown that contamination increases substantially between the source of drinking water and its storage as well as consumption. One has to improve the ways in which we collect and store water so as to avoid contamination while collection, storage and use. Normally water is often used for domestic purposes especially for drinking. In India where nearly 76% of the population lives in villages, safe drinking water is hardly available within their easy reach.

Protected water supply facility is available to only 31 % household. Chawla *et al.* 2006 and Saxena *et al.* 2011 examined that microbial contamination of collected and stored household water is caused not only by the collection and use but unsanitary and inadequately protected (open, uncovered or poorly covered) water collection and storage containers. Keeping in mind the need of safe water storage practices at home, this study was carried out with the objective to study the practices of safe storage among rural households.

MATERIALS AND METHODS

The study was conducted in two randomly selected districts of Haryana state of Hissar and Bhiwani. Two blocks from each district i.e. Hisar-1 and Hansi-1 from Hisar district and Bawani khera and Bhiwani blocks were selected from Bhiwani district. Further with the help of simple random sampling technique, one village of almost same population from each block was selected i.e. Mayer

village from Hisar-1 block, Umra village from Hansi-1 block, Baliali village from Bawani khera block and Chang village from Bhiwani block. from each selected village, 100 rural women (50 APL + 50 BPL) were sampled randomly. Thus the sample of the study comprised of 400 rural women (200 APL+200 BPL). A well-structured interview schedule was utilized for data collection as per the objectives of the study. The researcher interviewed the respondents personally. The collected data was quantified and interpreted by using suitable statistical tools to draw conclusions.

RESULTS AND DISCUSSION

The results of the study reveal that two-third of the respondents (66.2%) always used loose fitted lid to cover stored drinking water at home followed by more than one-fourth of the respondents (27.0%) who seldom used loose fitted lid to cover stored drinking water. Only 6.7 percent of the respondents never used loose fitted lid to cover stored drinking water. Tightly fitted lid was seldom used by nearly two-third of the respondents (60.5%) followed by the respondents (21.7%) who had always used tight fitted lid to cover stored water. Only 17.7 per cent of the respondents reported that they had never used tight fitted lid to cover stored drinking water (Table 1).

As regards plate as a lid to cover stored water, 35.7 percent of the respondents reported that they had never used plate to cover stored drinking water followed by an equal number of the respondents (35.2%) who had always used plate to cover stored drinking water. Only 28.0 percent of the respondents reported that they seldom used plate to cover stored drinking water as evident from same (Table 1). It is evident that more than half of the respondents (55.2%) always used earthenware lid to cover stored water followed by the respondents (25.7%) who had never used earthenware lid to cover stored drinking water. Only 19.0 percent of the respondents reported that they seldom used earthenware lid to cover stored drinking water. As far as covering stored water with muslin cloth was concerned, it was seen that a huge majority of the respondents had never used muslin cloth to cover stored drinking water followed by the respondents (3.2%) who had seldom used muslin cloth to cover stored drinking water.

Table 1. Kind of lids used to cover stored drinking water

n=400

Sr. no.	Kind of lid	Category	No. of respondents				Total
			Bhiwani		Hisar		
			Baliali	Chang	Mayer	Umra	
1	Loose fitted lid	Always	60(15.0)	71(17.7)	73(18.2)	61(15.2)	265(66.2)
		Seldom	25(6.2)	25(6.2)	27(6.7)	31(7.7)	108(27.0)
		Never	15(3.7)	4(1.0)	0(0.0)	8(2.0)	27(6.7)
2	Tightly fitted lid	Always	29(7.2)	19(4.7)	28(7.0)	11(2.7)	87(21.7)
		Seldom	31(7.7)	81(20.2)	60(15.0)	70(17.5)	242(60.5)
		Never	40(10.0)	0(0.0)	12(3.0)	19(4.7)	71(17.7)
3	By plate	Always	32(8.0)	31(7.7)	41(10.2)	37(9.2)	141(35.2)
		Seldom	40(10.0)	28(7.0)	22(5.5)	22(5.5)	112(28.0)
		Never	28(7.0)	41(10.2)	33(8.2)	41(10.2)	143(35.7)
4	Earthenware lid	Always	55(13.7)	45(11.2)	63(15.7)	58(14.5)	221(55.2)
		Seldom	12(3.0)	24(6.0)	18(4.5)	22(5.5)	76(19.0)
		Never	33(8.2)	31(7.7)	19(4.7)	20(5.0)	103(25.7)
5	Muslin cloth	Always	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
		Seldom	8(2.0)	2(0.5)	0(0.0)	3(0.7)	13(3.2)
		Never	92(23.0)	98(24.5)	100(25.0)	97(24.2)	387(96.7)
6	Wooden piece	Always	0(0.0)	6(1.5)	0(0.0)	25(6.2)	31(7.7)
		Seldom	17(4.2)	8(2.0)	9(2.2)	0(0.0)	34(8.5)
		Never	83(20.7)	86(21.5)	91(22.7)	75(18.7)	335(83.7)

*Multiple responses, Figures in parentheses indicate percentages

Wooden piece had never been used by more than two- third of the respondents (83.7%) cover stored drinking water followed by the respondents (8.5%) that had seldom used wooden piece. It was always used to cover stored drinking water by only 7.7 percent of the respondents.

It can be concluded from the Table 1 that 66.2 percent of the respondents had always used loose fitted lid to cover stored drinking water. 60.5 percent of the respondents had seldom used tightly fitted lid to cover stored drinking water. Plate was never used by 35.7 percent of the respondents to cover stored water followed by an almost equal number of the respondents (35.2%) who had always used plate to cover stored drinking water. More than half of the respondents (55.2%) were those who had always used earthenware lid to cover stored water. A huge majority of the respondents (96.7%) had never used muslin cloth to cover stored drinking water and 83.7 percent of the respondents had never used wooden piece to cover stored drinking water at home.

Cleaning of water storage containers

Data pertaining to cleaning of water storage containers have been presented in Table 2. It was noted that earthen pot was cleaned daily by a huge majority of the respondents (76.2%) followed by the respondents (18.2%) who had cleaned earthen pots at alternate day. Only 5.5 percent of the respondents had cleaned earthen pots as per their requirements.

Regarding aluminum vessel, it was seen that 23.2 percent of the respondents had cleaned aluminum vessel at alternate day followed by the respondents (5.7%) who had cleaned aluminum vessel daily. Whereas 4.2 percent of the respondents had cleaned their aluminum vessel as per their requirement. Only 2.5 percent of the respondents had cleaned their aluminum vessel after three days of filling water in it.

Table 2. Cleaning of water storage containers

n=400

Sr. no.	Container	Duration	No. of respondents				Total
			Bhiwani		Hisar		
			Baliali	Chang	Mayer	Umra	
1	Earthen pot	Daily	82(20.5)	75(18.7)	78(19.5)	70(17.5)	305(76.2)
		Alternate day	18(4.5)	25(6.2)	18(4.5)	12(3.0)	73(18.2)
		After 3 days	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
		As per requirement	0(0.0)	0(0.0)	4(1.0)	18(4.5)	22(5.5)
2	Aluminum vessel	Daily	4(1.0)	2(0.5)	15(3.7)	2(0.5)	23(5.7)
		Alternate day	32(8.0)	28(7.0)	21(5.2)	12(3.0)	93(23.2)
		After 3 days	5(1.2)	2(0.5)	3(0.7)	0(0.0)	10(2.5)
		As per requirement	6(1.5)	1(0.2)	2(0.5)	18(4.5)	17(4.2)
3	Brass vessel	Daily	7(1.7)	12(3.0)	11(2.7)	20(5.0)	50(12.5)
		Alternate day	20(5.0)	14(3.5)	12(3.0)	17(4.2)	63(15.7)
		After 3 days	0(0.0)	6(1.5)	4(1.0)	2(0.5)	12(3.0)
		As per requirement	7(1.7)	18(4.5)	24(6.0)	16(4.0)	65(16.2)
4	Stainless steel vessel	Daily	20(5.0)	24(6.0)	22(5.5)	17(4.2)	83(20.7)
		Alternate day	24(6.0)	9(2.2)	13(3.2)	3(0.7)	49(12.2)
		After 3 days	2(0.5)	0(0.0)	2(0.5)	5(1.5)	9(2.2)
		As per requirement	2(0.5)	6(1.5)	0(0.0)	8(2.0)	16(4.0)
5	Plastic vessel	Daily	4(1.0)	18(4.5)	13(3.2)	10(2.5)	45(11.2)
		Alternate day	12(3.0)	16(4.0)	17(4.2)	18(4.5)	63(15.7)
		After 3 days	15(3.7)	21(5.2)	21(5.2)	17(4.2)	74(18.5)
		As per requirement	23(5.7)	30(7.5)	20(5.0)	18(4.5)	91(22.7)

* Multiple responses, Figures in parentheses indicate percentages

As far as cleaning of brass vessel was concerned it was observed that 16.2 percent of the respondents had cleaned their brass vessel as per their suitability/ requirement followed by the respondents (15.7%) who had cleaned brass vessel at alternate day. Whereas 12.5 percent of the respondents had cleaned their brass vessel daily. Only 3.0 percent of the respondents had cleaned their brass vessel after three days of filling water in it.

Data in Table 2 reveal that more than one fifth of the respondents (20.7%) had cleaned their stainless steel vessel daily followed by the respondents (12.2%) who had cleaned the stainless steel vessel at alternate day. Whereas 4.0 percent of the respondents had cleaned the vessel as per their requirement. Only 2.2 percent of the respondents had cleaned their stainless steel vessel after three days of filling water in the vessel.

It was observed that nearly one- fifth of the respondents (18.5%) had cleaned their plastic vessel after three days of filling water in the vessel followed by the respondents (15.7%) who had cleaned the vessel at alternate day. Only 11.2 percent of the respondents had cleaned the plastic vessel daily.

It can be seen from the Table 2 that earthen pot was cleaned daily by a large majority of the respondents (76.2%). Aluminum vessel was cleaned at alternate day by 23.2 percent of the respondents. 16.2 percent of the respondents had cleaned their brass vessel as per their requirement. 20.7 percent of the respondents had cleaned stainless steel vessel daily. Plastic vessel was cleaned by 18.5 percent of the respondents after three days of filling water in the vessel.

Table 3. Frequency of cleaning water storage place

n=400

Sr.no.	Variable	Category	No. of respondents				Total
			Bhiwani		Hisar		
			Baliali	Chang	Mayer	Umra	
1	Freq to clean	Daily	16(4.0)	16(4.0)	14(3.5)	19(4.7)	65(16.2)
		Alternate day	23(5.7)	20(5.0)	18(4.5)	19(4.7)	80(20.0)
		Once a week	20(5.00	21(5.2)	21(5.2)	22(5.5)	84(21.0)
		Whenever needed	41(10.2)	43(10.7)	47(11.7)	40(10.0)	171(42.7)

Figures in parentheses indicate percentages

Frequency of cleaning water storage place

Results regarding frequency of cleaning water storage place have been presented in Table 3. It is evident from the table that majority of the respondents (42.7%) had cleaned the place of keeping stored water vessel as per their suitability/ whenever needed by them followed by more than one –fifth of the respondents (21.0%) that had cleaned the place of keeping stored water vessel once in a week while one- fifth of the respondents (20.0%) had cleaned the place at alternate day. Only 16.2 percent of the respondents reported that they had cleaned the place of keeping stored water vessel daily.

It is evident from the Table 4 that more than half of the respondents (57.7%) had used a glass to take drinking water out from the vessel followed by the respondents (18.7%) that had used a handled mug to take drinking water out from the vessel. While 17.2 percent of the respondents had used a long handled container to take drinking water out from the vessel. Only 6.2 percent of the respondents had taken drinking water out from the container by a tap fitted on vessel.

Container used to take drinking water from vessel

It can be inferred from the results of the study that two- third of the respondents (66.2%) always used loose fitted lid to cover stored drinking water at home. Earthen pot was cleaned daily by a mammoth majority of the respondents (76.2%). Plastic vessel was cleaned by 18.5 percent of the respondents after three days of filling

Table 4. Container used to take drinking water from vessel

n=400

Sr. no.	Technique	No. of respondents				Total
		Bhiwani		Hisar		
		Baliali	Chang	Mayer	Umra	
1	With a long handled container	15 (3.7)	13(3.2)	22(5.5)	19(4.7)	69(17.2)
2	With a handled mug	23 (5.7)	19 (4.7)	18(4.5)	15(3.7)	75(18.7)
3	With a glass	57(14.2)	60(15.0)	52(13.0)	62(15.5)	231(57.7)
4	Tap fitted on container	5(1.2)	8(2.0)	8(2.0)	4(1.0)	25(6.2)

Figures in parentheses indicate percentages

water in the vessel. majority of the respondents (42.7%) had cleaned the place of keeping stored water vessel as per their suitability/ whenever needed by them followed by more than one –fifth of the respondents (21.0%) that had cleaned the place of keeping stored water vessel once in a week. more than half of the respondents (57.7%) had used a glass to take drinking water out from the vessel followed by the respondents (18.7%) that had used a handled mug to take drinking water out from the vessel.

When it comes to dealing with maintaining water quality, the users and in large the communities have to play a key role in maintaining hygiene near water sources. Water collected for domestic use often becomes re-contaminated by unsafe consumer storage and handling practices. Typically water is gathered and stored in inadequately protected (open or poorly covered) containers. Improving and protecting the microbial quality and reducing the infectious disease risk to consumers of collected water stored in households requires alternatives or interim strategies and approaches that can be implemented effectively, quickly and affordably. It is recommended that to avoid contamination of water at domestic level by followings these simple rules i.e. keeping the water containers covered, using a long handle container to take out water from the storage vessel, not dipping fingers to take out water from the container and cleaning the water containers regularly.

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Farmer's Perception towards Conservation Tillage Practices

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ABSTRACT

The study was conducted in Mirzapur district of Uttar Pradesh in the year 2007. Mirzapur district consists of 12 blocks, out of which, Jamalpur block was purposely selected because this area is seriously affected by low moisture content, scanty rainfall, erodible and ravines land. Six villages were randomly selected from this block for the purpose of the study. A total of 100 farmers were selected by adopting random sampling technique. Majority of the respondents (69%) were having medium level of knowledge, followed low level of knowledge (20%) and only 11% had high level of knowledge. As far as adoption is concerned 53% were having medium level of adoption. Majority of the respondents (90%) had expressed that inadequate credit facility was the main constraint for purchasing improved agricultural implements. Majority of the respondents (71%) perceived that non-availability of specific implement like zero tillage was a serious constraint. Forty-five% of the respondents had expressed their view that while adopting zero-till in wheat, the problem of *Phalaris minor* had reduced but after 4-5 years, the problem of perennial weeds become serious.

Key words: Knowledge, adoption, constraints, conservation tillage practices

INTRODUCTION

Soil erosion has both on-farm and off-farm impacts. The reduction of soil-depth reduces the productive life of the agricultural land. Moreover, the transport of sediments and adhering chemicals can degrade streams, lakes, and estuaries. Many individual conservation practices and in combination can be used to reduce soil erosion. The system used will depend on farm and farmer characteristics and attributes of the practice, economic conditions, government policies, and the value of the environmental resources affected by erosion. "Conservation tillage" is one of the conservation practices that may be considered for minimizing these problems. Conventionally, it is thought that land should be prepared thoroughly with repeated ploughings. Tillage refers to mechanical manipulation of the soil that is used to provide necessary soil conditions favorable for the growth of crops

The modern concepts of tillage emphasizes on minimal cultivation. Considering the time loss for tillage operations, minimum and zero tillage have been advocated and this concept is together known as "conservation tillage". Conservation tillage practices are new strategies to achieve the goal of resource conservation and increasing productivity, maintaining farm level profitability and sustaining the agricultural growth (Khatoon, 2008). The objective of this type of tillage is to reduce loss of soil and water compared to conventional tillage. This concept is generally followed in western countries where large amounts of plant residues are left on the soil surface. The plant residues protect the soil against the beating action of rain drops, keep the surface of the soil open and increase the infiltration of water compared to a bare soil. According to the 1985 and 1990 US farm bill, "conservation tillage" is classified as any practice that leaves a minimum of 30% crop residue on agricultural field. No till, ridge till, mulch till and reduced till fall under this definition (Hill, 1996). On highly erodible land as well as non-highly erodible land, the adoption of "conservation tillage" can

offer substantial benefits to farmers by sustaining productivity and to the public by reducing sediment and chemical loadings in valued water bodies. The benefits to farmers from the use of conservation tillage depend on many site-specific factors. In some circumstances, one technology is more profitable; while, in other situations, another system could be the economic choice for the farmer. Keeping this is view, the study was carried out with the following specific objectives:

1. To analyze the knowledge level of the farmers regarding conservation tillage practices.
2. To ascertain the level of adoption of conservation tillage practices by the farmers.
3. To identify the constraints perceived by the farmers in adoption of conservation tillage practices.

MATERIALS AND METHODS

The study was conducted in Mirzapur district of Uttar Pradesh in the year 2007. Mirzapur district consists of 12 blocks, out of which, Jamalpur block was purposely selected because this area is seriously affected by low moisture content, scanty rainfall and erodible land. On the basis of above said parameters, six villages were selected randomly from this block for the purpose of the study. A total of 100 farmers were selected by adopting random sampling technique. Information was collected with the help of a structured interview schedule. The interview schedule was pre-tested and modified based on suggestions and opinion made by the respondents and finally the data was collected by personal interview method. Adoption was quantified in three-point continuum scale as adopted, partially adopted and non-adopted with scoring pattern 2, 1 and 0 respectively. Accordingly the constraints as perceived by the farmers regarding conservation tillage practices were compiled and analyzed by frequency and percentage.

RESULT AND DISCUSSION

Farmer's knowledge regarding conservation tillage practices

Knowledge may be defined as retained information concerning facts, concept and relationship regarding conservation tillage practices. It plays an important role in the adoption of an innovation or any new idea by the farmers. Knowledge seeking is initiated by an individual and greatly influenced by one's predisposition. Knowledge function is mainly cognitive. An individual's knowledge index was calculated by using the following formula as advocated by Bagdi (2005). After computing the collected information, the farmers were categorized into high, medium and low categories by taking the mean and standard deviation as a measure of check.

Table 1. Distribution of farmers on the basis of knowledge regarding conservation tillage practices

S.N.	Category	Frequency	Percentage
1	High	11	11
2	Medium	69	69
3	Low	20	20
	Total	**100**	**100**

Mean = 40.373 , Standard deviation = 3.117

Table 1 reveals that majority of the respondents (69%) were having medium level of knowledge, followed by those having low level of knowledge (20%) and high level of knowledge (11%). The major cause of the low level of knowledge of respondents about conservation tillage practices might be due to lack of practical training to the respondents. Practical training needs be imparted to the farmers for proper knowledge of conservation tillage practices. This finding is in line with the findings of Sims and Baumann (1983), who reported that the effectiveness of information related to conservation tillage practices is greatly increased if it is reinforced by training, socially and locally.

Relationship between selected variables with knowledge regarding conservation tillage practice

It is evident from the Table 2 that age was negatively and significantly related with the knowledge about conservation tillage, while education, land-holding, social participation, extension contact and mass media exposure were positively and significantly related with the knowledge about conservation tillage. The above observation shows that the selected variables significantly exerted their influence on knowledge level about conservation tillage practices. The remaining independent variables like occupation, home, category,

family size, family type, material possession, irrigation facilities, etc. were not significantly related thereby indicate that these variables do not exert their influence, significantly on the knowledge level of respondents about conservation tillage practices.

Table 2. Relationship between selected variables with knowledge regarding conservation tillage practice

S.No.	Independent variables		'r' value
1.	Age	(X_1)	-0.203*
2.	Occupation	(X_2)	0.133
3.	Home	(X_3)	0.145
4.	Category	(X_4)	0.190
5.	Education	(X_5)	0.677*
6.	Family size	(X_6)	0.190
7.	Family type	(X_7)	0.003
8.	Land-holding	(X_8)	0.298**
9.	Social participation	(X_9)	0.375**
10.	Material possession	(X_{10})	0.103
11.	Irrigation facilities	(X_{11})	0.187
12.	Extension contact	(X_{12})	0.226**
13.	Mass Media exposure	(X_{13})	0.723**

* Significant at 0.05 level of probability, table value 'r' = 0.197
** Significant at 0.01 level of probability, table value 'r' = 0.256

Level of adoption of farmers about conservation tillage practices

Adoption of an innovation is a decision making process composed of learning, deciding, and acting over a period of time. The adoption of a specific practice is not the result of a single decision to act but series of action and thought decisions. Adoption is a decision to make full use of an innovation as best course of action available. Respondent's general adoption level was determined quantitatively by using the adoption index developed by Bagdi (2005).

Table 3. Distribution of farmers on the basis of adoption level to the conservation tillage

S.No.	Category	Frequency	Percentage	Rank
1.	High	27	27	II
2.	Medium	53	53	I
3.	Low	20	20	III

Mean = 78.043 , Standard deviation = 7.502

Table 3 reveals that majority of the respondents were having medium level of adoption (53%), followed by high level of adoption (27%) and low level of adoption (20%). The low level of adoption of respondents about conservation tillage practices might be due to financial problem to purchase new implements and hire implements on rents basis and low level of education.

Relationship between selected variables and level of adoption regarding conservation tillage practices

In order to ascertain the relationship between adoption of the conservation tillage practice and selected variables, the data were subjected to zero-order correlation. The results have been presented in Table 4.

It is evident from Table 4 that age was negatively and significantly related with the adoption of conservation tillage practices. At the same time, it was found that the education, land-holding, material possession, social participation and mass media exposure were positively and significantly related with the adoption of conservation tillage practices. Further, it is also shown that the selected variables significantly exerted their influence on adoption of conservation tillage practices. The results, therefore, confirm that, there is relationship between age, education, land-holding, material possession, social participation and mass media exposure in adoption of conservation tillage practices. Here one interesting fact is that age variable negatively correlated in relation to conservation tillage practices. This means

Table 4. Relationship of selected variables with the adoption level of conservation tillage practices

S.No.	Independent variables		'r' value
1	Age	(X_1)	-0.614*
2	Occupation	(X_2)	0.144
3	Home	(X_3)	0.104
4	Category	(X_4)	0.066
5	Education	(X_5)	0.409*
6	Family size	(X_6)	-0.291
7	Family type	(X_7)	0.141
8	Land-holding	(X_8)	0.362**
9	Social participation	(X_9)	0.223**
10	Material possession	(X_{10})	0.487*
11	Irrigation facilities	(X_{11})	0.145
12	Extension contact	(X_{12})	0.119
13	Mass Media exposure	(X_{13})	0.425**

* Significant at 0.05 level of probability, table value 'r' = 0.197
** Significant at 0.01 level of probability, table value 'r' = 0.256

that it not affected very much in adoption of conservation tillage practices. The remaining independent variables like- occupation, home, category, family size, family type, irrigation facilities and extension contact were not significantly related with the adoption of conservation tillage practices, which mean that these variables do not exert their influence significantly on the adoption of conservation tillage practices.

Constraints in adoption of conservation tillage practices

Constraints are the difficulties faced by the respondents in adoption of conservation tillage practices. Farmers have experienced many problems in adoption of conservation tillage practices. Because of this, farmers have not come up to the level of expected progress in terms of adoption.

It is obvious from Table 5 that inadequate credit facility for purchasing of improved implements is recognized as top most constraint as perceived by the farmers. Most of the farmers prefer to obtain credit from their relatives and money lenders but only twenty five% respondents take credit from bank through Kisan credit card. This might be due to fact that banks require a lot of written formality in disbursing credit to the farmers that ultimately leads to un-timely availability of credit facility. Poor economic status and un-economic land holding recognized as second top most problems in adopting conservation tillage practices. This might be due to the facts that might belong to marginal and small category and they mostly practices subsistence type of farming. Although adoption of conservation tillage is simple and easily accepted by farmers, yet majority of farmers (71%) had expressed their views regarding unavailability of zero-till implement. So, many farmers were bounded to go for cultivation of fields traditionally. Only 'nine' zero till implements were available in six villages. So majority of farmers were dependent on hiring of zero till implements for wheat sowing. Whereas 63% of farmers feel that lack of timely agricultural expert advice also causes hindrance in adoption of this particular technology. Forty-five per cent of the respondents had expressed their view that while adopting zero-till in wheat had reduced the problem of *Phalaris minor* but after 4-5 years, the problem of perennial weeds become serious. Table 5 revealed that majority of the respondents (71%) perceived that non-availability of specific implement like zero tillage was a serious constraint they faced. Akhtar (2006) reported that because of high cost of zero tillage seed drills and limited availability, the zero tillage technology could not be popularized among the farming community despite lot

Table 5. Perceived constraints faced by the farmers in adoption of conservation tillage practices

n=100

S.No.	Category	Percentage		Rank	
		Yes	No	Yes	No
1.	Un-economic land holdings and poor socio-economic status	74	26	3	12
2.	constraints faced				
	(a) Tradition of tilling the soil	2	98	13	2
	(b) Inadequate credit facility to purchase implements.	90	10	1	1
3.	Feel more weed infestation, perennial weeds	45	55	7	8
4.	Feel problem in purchasing specific conservation tillage implements	81	19	2	13
5.	Source of credit to purchase implements				
	(a) Banks	20	80	9	6
	(b) Relatives	55	45	6	9
	(c) Friends	12	88	12	3
	(d) Money lenders	13	87	11	4
6.	Problem of non-availability or repair of bed planter	71	29	4	11
7.	Time consuming practices	1	99	14	1
8.	More weeds in furrows	19	81	10	5
9.	Lack of agriculture expert advice	63	37	5	10
10.	Confusion in adoption	26	74	8	7

of advantages. He further observed that non-availability of the implement at economical cost is major constraint in promotion of bed planting of crops. Likewise, unavailability of machinery for crop residue management is also impeding the acceleration of this practice.

Conventionally, it is thought that land should be prepared thoroughly with repeated ploughings. However, modern concepts of tillage emphasizes on minimal cultivation. Considering the time loss for tillage operations, minimum and zero tillage have been advocated and this concept is together known as "conservation tillage practices". The objective of this type of tillage is to reduce loss of soil, water and eco-friendly resource conservation as compared to conventional tillage. Looking at the knowledge and adoption level of farmers, it was found that farmers had medium level of knowledge and adoption regarding conservation tillage practices. There is a scope to change their theoretical knowledge into operational forms and provide them credit facilities as they need to enhance adoption in reality. Although adoption of conservation tillage is very simple and easily accepted by farmers, yet majority of farmers had expressed their views regarding unavailability of zero-till implement, inadequate credit facility for purchasing of improved implements and absence of extension services. Respondents prefer to take credit from their relatives and moneylender and only 20 percent respondents' take credit from bank through Kisan credit card. To increase the adoption of conservation tillage, a number of policies may be used including education, technical and financial assistance in relation to conservation tillage practices. KVKs could also play a significant role for this work.

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Socio-cultural Traditions and Source of Information used by Yak *Pastoralist* of Eastern Himalayan Region in India

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ABSTRACT

Yak husbandry is a major source of livelihood for the highlanders in extremely harsh climatic condition of the alpine region due to rare existence of other livestock species. Yak contribute immensely in social and economic life of yak herdsmen. Head of villages is the only major and accessible source of information for yak herdsmen. The study was conducted in eastern Himalayan states wherein it was found that yak herdsmen consider yak rearing as a mark of prosperity and lead to higher social status in society. The study reveals that yak rearing communities are closely connected to the yak culturally, socially and is impossible to define their identity without this animal. Newspaper, farm publication and field trip/tour were not accessible to the yak herdsmen in the states because of low literacy among yak herdsmen and poor livestock extension system.

Key words: Eastern Himalaya region, information source, pastoralist

INTRODUCTION

Yak husbandry has social, cultural and economical contribution to the highlander and it is considered as a major sources of livelihood for the sustenance of yak pastoralist in extremely harsh climatic conditions of the alpine region. Olsen (1991) considered the yak so important to the highlanders, particularly, Tibetan people that prior to the Second World War their society could legitimately be referred to as a "yak culture". Yak is a component of the religious practices and manifestations for yak postoralists. It is impossible to define the identity of these pastoralists without mentioning the yaks which they consider it as celestial origin as it appears symbolically in the Buddhist scriptures in different forms and is extant in mythology. Wu (1997b) has reported that pastoralists rely for their subsistence upon yak, the wealth of the nomads is judged by the number of animals owned. Yak pastoralists are rearing the yak from the time immemorial and they seek the information from various sources to get the higher production (milk, meat and wool) from this animals of high altitude. Effective information network, is an important segment for transferring the quick and reliable information to increase the production. Efficiency of any extension programmes can be increased by matching the information sources and channels used in extension system (Israel 1991). Accessing the information and their utilization varied according to the socio-personal and socio-economic status of the farmers. Here effort has been made to study the socio- cultural traditions and source of informations used by Yak Pastoralist.

MATERIALS AND METHODS

Study was conducted in two purposively selected states i.e., Arunachal Pradesh and Sikkim of Eastern Himalayan. West Kameng district was selected from Aruanchal Pradesh, as it possesses considerable number of yak populations, yak herdsmen and existence of National Research Centre on Yak, whereas North Sikkim district was selected from the four districts of Sikkim as it possess 90 per cent of the yak population of the state. Further, a cluster of villages were formed from each of the selected districts. A cluster of three villages (Nykmadung, Chander and Madla Phudung) was selected from West Kameng District of Aruanchal Pradesh and a cluster of two villages (Lachun and Zema)

was selected from North Sikkim district of Sikkim. Thirty respondents, who were rearing the yak, were selected randomly from each of the cluster of the villages to make the total sample size of 60 respondents. To study the socio- cultural traditions and source of informations used by Yak Pastoralist, information were collected about social status in relation to possessing the yak, worshipping of yak, using the yak in gift exchange, presenting the yak in dowry, cultural role of yak during festival, sacrifice of yak at festive occasions, totem in rearing the yak, culturally use of yak skulls and horn and let free the yak for God. Whereas the information sources used by yak herdsmen to educate themselves about yak husbandry like extension agent contact and mass- media sources were also studied. Data were collected using pre-tested and pre-structured interview schedule and participatory observation methods.

RESULTS AND DISCUSSION

The yak herdsmen/rearers of eastern Himalayan region mostly follow the religion of Buddhism. The yak herdsmen of Arunacal Pradesh are *"Monpa"* and *"Shertukpen"* whereas the yak herdsmen of Sikkim belong to *"Lapcha"* and *"Bhutia"* tribe. These two communities of the region are very closely associated with yak husbandry. The yak is, moreover, a component of the religious practices and manifestations for them.

It was found that almost all the yak herdsmen of the region consider yak rearing as a mark of prosperity, thus having a higher status in the society in both the states i.e., Arunachal Pradesh and Sikkim as indicated in Table No.1 and , similar finding was reported by Singh, *et al.,* 1999. Further, Scholz (1981) Huebl (1986) and Wu (1997b) have reported that prestige and social status are not the only reasons for keeping more animals; possession of a large number is to provide extra insurance against death of animals, for the nomads.

Yaks were found to be worshipped by the herdsmen in their social cultural system for its valuable contribution in their life, as indicated in Table 1. Majority of the yak herdsmen used yak as a symbol of value and widely practiced in presenting the dowry to their daughter's marriage, as 60 per cent of the yak herdsman from the state of Arunachal Pradesh and 83.33 percent of yak herdsmen from the state of Sikkim were used to present yak in dowry. The findings are in conformity with the results of Singh *et al.* (1999). Yak are always used as a dowry when a yak herder's girl marries a young herder. This indicate that yak, apart from being indicators of wealth, play an important role in maintaining social and cultural relationships.

Upon asking about which valuable item they would like to gift to their most respectful one, majority has responded that yak is the only previous gift as reported by 73.33 per cent of the herdsmen of Arunachal Pradesh and 86.67 per cent of the herdsmen of Sikkim. Yak rearing communities are closely connected to the yaks culturally and socially and it's impossible to define their identity without this animal species (Saud *et al.* 2003).

Table 1. Socio-cultural and traditional values associated with yak husbandry

Socio-cultural Traditions	Sikkim (n=30)	Arunachal Pradesh (n=30)	Total (n=60)
Buddhism as Religion	30 (100)	30 (100)	60 (100)
Social Status	30 (100)	30 (100)	60 (100)
Worship	30 (100)	30 (100)	60 (100)
Gift exchange	22 (73.33)	26 (86.67)	48 (80)
Dowry	18 (60)	25 (83.33)	43 (71.67)
Festival	30 (100)	30 (100)	60 (100)
Sacrifice	-	12 (40)	12 (40)
Totem	22 (73.33)	25 (83.33)	47 (78.33)
Yak milk's butter in sacred burnt	23 (76.66)	26 (86.67)	49 (81.66)
Yak skulls and horn use culturally	21(70)	26 (86.66)	47 (78.33)
Yak let free for God	14 (46.66)	24 (80)	38 (63.33)
Yak Dance	30 (100)	30 (100)	60 (100)

Figures in parentheses indicate percentage

The phenomenon of yak totem has also been practices by the respondents which is similar to the findings reported by Yang (1989). Data in Table 1 shows that 70.50 per cent of the herdsmen of Arunachal Pradesh and 63.50 per cent of the herdsmen of Sikkim were practicing yak totem.

The yak is slaughter in both the states and its meat is relished in all their major festival like '*Losar'* celebrates in February and '*Losum*' celebrates in November and the meat is shared among the relatives. They offer sacrifices on these special festival to "yak gods" or ancestors. Majority of the respondents (40%) have reported that yaks were used in sacred sacrifices, traditional rites and rituals in Arunachal Pradesh whereas no such sacrifices were carried out in Sikkim. Majority of the herdsmen (85% in Arunachal Pradesh and 90% in Sikkim) were offering the butter, made of yak milk, to the gods, for sacred burnt, in most of the monasteries in the region.

The body part of yak like horns and skulls have their cultural or religious importance , they are often carved with mantras and placed in prominent places of the house of herdsmen and in monastery in order to drive out evil spirit. This was practiced by majority of the yak herdsmen (65% in Arunachal Pradesh and 70.00% in Sikkim) in both the states. Further, Cayla (1976) reported that yak takes its place alongside other animals, both real and mythical, in the history, legends and mythology of the Tibetan region and neighboring territories.

Yak are said to be as "stars" living in heaven and it is always imagined as a safeguarding god. Further, 25 per cent and 35 percent of the respondents of Arunachal Pradesh and Sikkim, respectively, were leaving the domestic yak free to the God with the assumption that environment will sustain their yak based economy. This practice has also reported by Miller (1997). It can be conclude that yak herdsmen of both the states signify the cultural role of yak, played in their society.

Pertaining to the information sources, used as Extension Agent Contact, by the yak pastoralists , it was found that under the most often used categories of information sources, majority of the yak pastoralists (73.33% of Arunachal Pradesh and 60% of Sikkim) seek information from Panchayat Personnel (head of village and locally known as Gao Boodha), since he stayed in their own village and is easily accessible. Next often used information souces were veterinary officers/para-vets and block officials but these were used only by few yak pastoralist (16.67 and 13.33% of Sikkim and 10% each were from Arunachal Pradesh). Further, the scientist at NRC on Yak at Dirang Arunchal Pradesh were contacted most oftenly by the 60 per cent of the yak pastoralists of Arunachal Pradesh, because of its existence in yak rearing areas, easily availability and their confidence on their expertise on yak health and management aspects. By analyzing the Table 2 , it can be conclude that extension agent contact of the yak herdsmen in both the state were very poor since yak herdsmen live in remote areas and majority of their hemlets are not connected by a motorable roads. Bank Officials and NGO's were found completely missing as a source of extension contact for the yak herdsmen in both the state of Arunachal Pradesh and Sikkim. Further, other source of extension contacts were also contacted meagerly by few yak herdsmen due to reasons of wide geographical, harsh climate and remoteness.

Table 2. Extension agent contact of Yak *Pastoralists*

Extension agent	Sikkim				Arunachal Pradesh			
contact	Most often	Often	Rarely	Never	Most often	Often	Rarely	Never
V.O./Para Vets.	4(13.33)	8(26.67)	18(60.00)	-	3(10.00)	2(6.67)	5(16.66)	20(66.67)
Scientist	-	5(16.67)	6(20.00)	29(63.33)	16(60.00)	12(40.00)	-	-
Extension Personnel's	-	-	1(3.33)	29(96.67)	-	2(6.67)	3(10.00)	25(83.33)
Block Officials	5(16.67)	16(33.33)	9(30.00)	-	3(10.00)	13(43.33)	14(46.67)	-
Panchayat Personnel's	18(60.00)	8(26.67)	4(13.33)	-	22(73.33)	4(13.33)	4(13.34)	-
Bank Officials	-	-	-	30(100)	-	-	-	30(100)
NGO	-	-	-	30(100)	-	-	-	30(100)

Figures in the parentheses indicate percentage

Table 3. Mass media exposure of Yak *Pastoralists*

Mass media	Sikkim				Arunachal Pradesh			
exposure	Most Often	Often	Rarely	Never	Most Often	Often	Rarely	Never
Newspaper	2(6.67)	2(6.67)	1(3.33)	25(83.33)	-	5(16.67)	2(6.67)	23(76.66)
Television	7(23.33)	5(16.67)	18(60.00)	-	4(13.33)	6(20.00)	20(66.67)	-
Radio	16(53.33)	8(26.67)	6(20.00)	-	24(80.00)	4(13.33)	2(6.67)	-
Farm Publication	-	-	2(6.67)	28(93.3)	-	2(6.67)	6(20.00)	22 (73.33)
Animal Yak Fair	2(6.67)	15(50.00)	11(36.67)	2(6.665)	22(73.33)	6(20.00)	2(6.67)	-
Filed trip/tour	-	-	-	30(100)	-	3(10.00)	1(3.33)	26(86.67)

Figure in the parentheses indicate percentage

About mass media exposure of yak pastoralists as indicated in Table 3, it can be conclude that utilization of mass media source for the information about yak husbandry was also poor. Majority of the respondents of Sikkim (53.33%) and Arunachal Pradesh (80%) were using radio most oftenly to get the information, since radio was owned by majority of the yak postoralists. Next to radio, television was most oftenly used sources of information for the yak herdsmen (23.33%) of Sikkim, whereas for the yak herdsmen of Arunachal Pradesh yak fair was next mass media source of information. Newspaper, farm publication and field trip/ tour were not accessible to the yak herdsmen in the states because of low literacy among yak herdsmen and poor livestock extension system.

The study revealed that religion, ceremony, social customs and attitudes towards yak as a wealth and using various by-products of yak as cultural symbols are all intertwined with each other in the life of herdsmen. It would be an unplanned step if socio-cultural traditions and values were lost without an understanding of their profound importance, since this act may lead to the disappearance of cultural diversity. Further, the extension system in yak rearing states have to make very strong to diffuse the desired and useful information up to the yak herdsmen for better improvement in their lives and yak husbandry system.

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An Analysis of Seed Potato Marketing in North Eastern States of India

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ABSTRACT

North eastern states constitute substantial share in total national potato production. Due to unfavourable climatic condition for breeder seed production in the region, the prevailing seed potato system in the region is a matter of investigation. The present was conducted among 120 farmers spread across six villages of three potato growing districts of Meghalaya and Assam states of North Eastern Region. Data were collected using semi-structured checklist supported with informal discussion. Collected data were subjected to simple statistics like average, frequency, percentage and rank. The study revealed that 'seed from traders' was the most important potato seed since alerted by 100% of the respondents from Assam state, while 'awn seed' was the source utilized by 100% respondents in Meghalaya state. Further, Bengal Jyoti and Kufri Jyoti were most preferred potato variety in Assam and Meghalaya state, respectively.

Key words: Seed potato, storage, north-eastern state

INTRODUCTION

The North eastern region of India consists of eight states namely Assam, Arunachal Pradesh, Meghalaya, Manipur, Mizoram, Nagaland, Sikkim and Tripura. Potato is an important crop grown in the rainfed conditions in the region with 123 thousand hectares area i.e. about 7 percent of the country's total potato area (Anonymous, 2009). However, the region contributes only 3 percent of the total potato production (893 thousand tones) of the country, reflecting thereby poor productivity figures of the region i.e., 7.2 t/ha against a national average of 18.2 t/ha (Anonymous, 2009).

Seed is a critical input for potato production that alone contributes to 38-40 percent of the total cost of potato production (Upadhya *et al.* 1995; Khatana *et al.* 1997). In North eastern region, among the several limiting factors attributing the poor potato productivity, non- availability of quality seed adequately and at reasonable price is the most important one. The fact that the entire region is unsuitable for production of breeder seed potato due to prevalence of virus vectors almost through out the crop season are responsible for degeneration of available seed stocks (Gupta *et al.* 2006) and non availability and high cost of quality seed that force farmers to use of the same seed stock for many generations are the associated factors for the low productivity figures of potato crop. According to an estimate about 98 percent of the farmers in the region uses own seed (Kadian, 2010). Thus the formal system is suffice to meet the seed requirement for as low as only two percent of the potato area in the region. In additions, the climatic conditions of the north eastern hill region are conducive for many potato diseases like late blight, brown rot, bacterial wilt, thus making the seed production further difficult. Bringing quality seed from a distance of 2000 kms from north India incurs heavy transportation cost for the resource poor farmers of the region.

The situation of low coverage of formal potato seed system amply highlights the importance of informal seed

distribution system in the region. Thus, with an objective to analyze the prevailing informal and formal seed marketing system in the North Eastern region of India, the present study was conducted.

MATERIALS AND METHODS

The study was carried out in the two major potato producing states i.e., Assam and Meghalaya, in the north eastern region of India. The states Assam and Meghalaya were selected purposively as they contribute maximum to the total potato production ie., 56 and 20 percent, as well as total acreage under potato crop i.e., 63 and 15 percent, respectively, as compared to other states in the region. Two major potato producing districts from Assam namely Barpeta and Nagaon and one major potato producing district from Meghalaya i.e., East Khasi Hills district were selected for the study. Further, two major potato producing blocks/circles were randomly sampled from the selected districts. Two villages and 10 farmers from each of the selected village were further selected to constitute the sample for the study. Thus, a total of 120 potato farmers were interviewed for the study. Besides, 20 traders from both the districts of Assam were also selected depending on their availability at the time of investigation to elicit their pattern of utilization of various sources of seed potato for marketing.

The variables included were sources utilized for seed potato, average market rate of seed and varietal preferences as perceived by the potato growers. Data were collected using semi-structured checklist through focused group discussion method. Simple statistics like frequency, percentages, average and rank were utilized to draw meaningful conclusions from the study.

RESULTS AND DISCUSSION

Seed sources utilized

Seed sources utilized by farmers of Assam: Findings presented in the Table 1 show that none of the selected farmers was keeping own produce for use as seed in the subsequent season and they were purchasing seed potato from the traders every year. Seed from state government of Assam was procured by as low as 2.50 percent of the sampled farmers.

In the state of Assam, potato is grown as the winter crop for which the harvesting starts from the month of January to the month of February. The temperature after the harvesting rises up sharply leading to heavy post harvest losses due to rottage as well as shrinkage. This makes on- farm long term storage for seed purpose nearly impossible. The problem is further aggravated in absence of cold storage facility near the production site. This compels farmers to dispose off the produce as early as possible after the harvest for table purpose. Thus for the seed potatoes the farmers purchased new seed every year from the potato traders.

Findings get support from the study by Pandit *et al.* (2006) who also reported that farmers in Barpeta district of Assam state were not using quality seed of improved varieties for potato cultivations.

Seed sources utilized by farmers of Meghalaya: In East Khasi hill district of Meghalaya all the sampled farmers (100%), were observed using own seed for planting potato in the main season. In addition to use of own seed, 27.50 and 25.00 percent were observed procuring seed from fellow farmers from neighboring villages and fellow farmers of same village, respectively for raising potato crop (Table 1). About 15 percent of the farmers procured seed either from the state government directly or from state government registered potato seed growers from adjoining areas. In addition, seed from local traders was also reported to be procured by 12.50 percent of the sampled potato farmers.

The reason for practicing long term storage of seed as well as table potato in Meghalaya could be the prevalence of cooler temperature after the harvest season and farmers preference for potato varieties with a better shelf life.

Procurement of seed potato

Average rate of purchase of seed potato in Assam: Data presented in Table 2 indicate that farmers purchased seed potato between the months of September to November from different available sources. The varieties grown in the selected two district of Assam were Kufri Chandramukhi, Bengal Jyoti, Potatoes from Shillong and Bhutan. Kufri Chandramukhi as Kufri Jyoti, were imported as seed from neighboring West Bengal state while harvest of summer potato crop from Shillong was imported as seed by the farmers of Assam state. In addition, the potato

Table 1. Frequency distribution of seed source utilized by potato farmers in Assam and Meghalaya

S. No.	Source	Assam			Meghalaya		
		Nagoan (n=40)	Barpeta (n=40)	Total (n=80)	Mawphlang (n=20)	Smit (n=20)	Total (n=40)
1.	Own seed	00(00.00)	00(00.00)	00(00.00)	20(100.00)	20(100.00)	40(100.00)
2.	Fellow farmers of same village	-	-	-	04(20.00)	06(30.00)	10(25.00)
3.	Fellow farmers from neighboring villages	-	-	-	09(45.00)	02(10.00)	11(27.50)
4.	Seed from trader	40(100.00)	40(100.00)	80(100.00)	05(25.00)	00(00.00)	05(12.50)
5.	Seed from state govt. or through registered growers	02(05.00)	00(00.00)	02(2.50)	01(05.00)	05(25.00)	06(15.00)

Figures in parentheses indicate percentages

Table 2. Average rate of purchase of seed potato by the sampled households in Assam

(n=120)

District	Potato varieties purchased by farmers	Rate of purchase of seed/qt	Month of purchase	Preferred Seed size
Barpeta	Bengal Jyoti	400-700	Sep-Nov	Small-Medium
	Kufri Chandramukhi	350-600	Sep-Nov	Small-Medium
	Potato from Bhutan	800-950	Sep-Nov	Small-Medium
Nagaon	Kufri Chandramukhi	400-800	Sep-Nov	Small-Medium
	Bengal Jyoti	400-800	Sep-Nov	Small-Medium
	Potato from Shillong	300-700	Sep-Nov	Small-Medium

seed was also imported from neighboring country like Bhutan. Thus majority of the demand for seed potato in the selected districts of Assam state was met through the imports from the neighboring states. Lack of availability of adequate storage infrastructure in the state also promoted the import of seed potatoes from neighbouring states as the country like Bhutan.

The seed potato imported from Bhutan was purchased by farmers at the premium price (Rs 800-950 per quintal) while potato from Shillong fetched lesser price (Rs 300-700 per quintal).

It is further evident form the same table that in Barpeta district of the state, the rate at farmers purchased the seed of Kufri Chandramukhi and Bengal Jyoti varieties was relatively lower as compared to Nagaon district. This could be attributed to the proximity of Barpeta district to the West Bengal state from where these varieties for seed purpose were purchased easily. In addition, potato from Shillong was observed to have a market as seed in both the districts of Assam, while potato from Bhutan was utilized as seed in Barpeta district only. This again could be attributed to the vicinity of the seed source to these districts.

The seed potato market was thus observed to be spread across different states of the region. West Bengal, Assam, Meghalaya were the major states catering to the seed demand of the potatao farmers of Assam.

Average rate of purchase of seed potato in Meghalaya: Potato farmers of East Khasi Hill district of Meghalaya were observed to purchase seed potato during the month of September to October (Table 3) for planting for the summer crop i.e. in the month of February and March. The reason for the delayed purchase which is more than three months after the harvesting of summer crop was mainly because of the prevailing perception among farmers that by this time the diseased seed tubers rots completely which helps to prevent the losses to the farmers.

It could also be observed from the same table that the rate of purchase of seed potato was much higher in Mawphlang block (Rs 600/q to 1000/q) as compared to the Smit block (Rs 450/ q) of the district. This could

Table 3. Sources utilized and average rate of purchase of seed potato in Meghalaya

Sl.no	Seed source	Month of purchase	Size of seed	Rate of purchase (Rs/q)	
				MawphlangBlock	SmitBlock
1.	Fellow farmers from the same village	September-October	Small	600	450
2.	Fellow farmers from the neighboring village	September-October	Small	600	450
3.	Farmers from neighboring districts	September-October	Medium	1000	-
			Small	750	-
4.	Seed from Potato traders	September-October	Small	500	500
5.	Meghalaya potato experimental state farm	October	Medium	550	550

be attributed to the fact that Smit block of East Khasi hill district was covered under "Registered growers scheme' wherein state department of Horticulture multiply the potato seed which is primarily Kufri Jyoti and Kufri Giriraj varieties at farmers' fields and purchased it back for further distribution in the state. The registered potato growers supply the surplus seed potato to the other farmers of the block informally at lower price.

Farmers from Mawphlang block were observed paying a higher seed rate for the seed bought from the fellow farmers from neighboring pockets of west khasi hills district. The reason for this could be the fact that these pockets are regarded as good quality seed source among the farmers. Seeds from traders and from the state potato experimental farm were available to farmers of the district at much lower rates i.e., Rs 500/- and Rs 550 /q, respectively.

Thus in Meghalaya state, the demand of seed potato was primarily met from within the state and major seed source utilized by farmers was fellow farmers.

Varietal preferences

Varietal preferences of potato farmers in Assam state: Bengal Jyoti variety of potato, a local selection from Kufri Jyoti variety by the farmers of West Bengal, was observed to the most preferred and imported seed potato variety by the sampled farmers of Assam (Table 4). Low seed price, satisfactory production (140q/ha), good tuber shape and size were cited as the reasons by the potato growers for their preference for Bengal Jyoti variety and Kufri Chandramukhi variety. It is important to mention here that potato traders were the major source of seed to farmers in the state. Seed potato from Bhutan though was perceived to give higher production, was preferred after Bengal Jyoti and Kufri Chandramukhi in Barpeta district of Assam, mainly because of the high seed price and its late arrival in planting season. Potato arriving from Shillong was least preferred for the seed purpose in both the districts of Assam owing to its low production potential. The reason for this could be the fact that potato arriving from Shillong is generally small sized as well as usually mixture of different varieties of summer potato crop, which fail to give high yields in Assam.

Table 4. Varietal preference of potato farmers in Assam and reasons thereof

District	Variety	Preference	Reasons
Barpeta	Bengal Jyoti	**I**	Low seed price Satisfactory production (140q/ha) Good tuber shape and size
	Bhutia	**II**	Very good production (200q/ha) Highly remunerative seed price
	Chandramukhi	**III**	Satisfactory production (120q/ha)
Nagaon	Chandramukhi	**I**	Uniform shape and size of tuber Higher yield (160q/ha)
	Bengal Jyoti	**I**	More yield (160q/ha)
	Shillong seed potatoes	**II**	Lower yield level (130q/ha)

Varietal preferences of potato farmers in Meghalaya state: The preferences of Meghalaya farmers for potato varieties varied according to their use. Therefore, it was essential to ascertain their varietal preferences separately for commercial and table purposes. For commercial

purpose farmers of East Khasi Hills district of Meghalaya preferred Kufri Jyoti in both the blocks (Table 5). Satisfactory productivity, good tuber shape and size, storability, good market price and better taste were the reasons for its preference. Better storability of Kufri Jyoti was another important determinant for its preference as seed potato in Meghalaya under traditional storage system even for longer periods. This was followed by the preference for Kufri Giriraj and Kufri Megha. The reason for preferring Kufri Giriraj variety was the high production level and larger tuber size that fetched a better market price due to consumer preference. However, the least preferred variety among the farmers for commercial purpose was the local varieties like *Lah Sow, Lah Taret, Lah syntiew, etc.*

In contrast, local varieties were observed to be the most preferred for home consumption, followed by Kufri Megha. Kufri Jyoti followed by Kufri Giriraj was least preferred varieties for home consumption in both the blocks of the districts. The reasons for poor preference for Kufri Giriraj could be its poor keeping quality. On the other hand, Kufri Megha was the preferred owing to its better taste and better storability.

Sources of seed potato utilized by potato traders in Assam

A sample of 20 wholesalers from Assam was also selected for the study to find the different sources of seed potatoes utilized by them. The sampled potato wholesalers of Barpeta and Nagaon districts in Assam

Table 5. Varietal preference of potato as perceived by the farmers in Meghalaya and reasons thereof

Area	Preferred potato variety	Preference for commercial purpose	Preference for home consumption	Reasons for preferences
Mawphlang block	Kufri Jyoti	I	III	Satisfactory production Good tuber shape and size Better storability Good market price
	Kufri Giriraj	II	IV	Higher production Large tuber size Better market price
	Kufri Megha	III	II	Higher yield than local Yield stability Good tuber shape and size Good storability Better cooking quality and taste
	Local varieties	IV	I	Better in taste Low yielder
Smit block	Kufri Jyoti	I	III	Satisfactory production Good tuber shape and size Better storability Good market price
	Kufri Giriraj	II	IV	Higher yield level Better market price
	Kufri Megha	III	II	Yield higher than local Late blight resistance Good tuber shape and size Good storability Better cooking quality and taste
	Local varieties	IV	I	Better taste and cooking quality Low yielder

Table 6. Sources of seed potato utilized by potato traders in Assam and rate of purchase and sale

(n=20)

S. No.	Source	Barpeta (N=10)			Nagaon (N=10)		
		Freq. (%)	Rate of purchase (Rs/q)	Rate of sale (Rs/q)	Freq. (%)	Rate of purchase (Rs/q)	Rate of sale (Rs/q)
1.	West Bengal markets	10(100.00)	300-350	350-400(50)	10(100.00)	300-450	400-500(50-100)
2	traders from Guwahati	10(100.00)	275-350	300-400(25-50)	10(100.00)	275-350	300-400(25-50)
3	Local potato from Assam	10(100.00)	230-300	260-400(30-100)	10(100.00)	300-450	350-500(50)
4	Shillong , Meghalaya	04(37.50)	300-375	360-425(50-60)	03(25.00)	250-300	300-360(50-60)

Figures in parentheses indicate profit margin (Rs/q)

were observed importing potato from potato markets of adjoining states like West Bengal and Meghalaya, as well as the neighboring country, Bhutan for meeting the potato seed demand in Assam (Table 6). In addition, traders from Guwahati, capital city of Assam imported seed from different states like, Uttar Pradesh, Bihar, Punjab for further sale in North eastern states. Though many sources were utilized by traders for purchase of potato, the quantity of potato purchased from a particular source was determined by the prevailing market price.

It could be seen that (Table 6) the average rate of purchase and sale of seed was higher for Kufri Chandramukhi and Bengal Jyoti in Nagaon district as compared to the Barpeta district of Assam, while it was samel in case the potato was imported from Shillong. The reason for this could be the low transportation cost involved in importing seed potatoes from West Bengal which is adjoining to Barpeta district as compared to Nagaon. It was also observed that traders from Nagaon district of Assam did not prefer to sell Kufri Jyoti and potato from Bhutan for seed purpose. In addition, these were to be purchased as well as sold at a higher rate as compared to other varieties.

The findings as elaborated in the above paragraphs clearly indicated that the informal system of seed potato marketing was primarily prevalent for meeting the seed demand of the potato farmers of north eastern region. Assam despite having a large area under potato immensely depends on the potato traders for supply of the seeds from neighboring states. The lack of adequate cold storage structures or low cost improvised on-farm storage structures for potato storage is the reasons for dependency of farmers on the traders. The situation demands suitable interventions related to setting up of seed multiplication farms and appropriate storage structures in the state. Similalrly, in Meghalaya, the limited operation of formal seed potato distribution system further needs to be strengthened for a larger coverage of potato farmers.

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Association between Socio-personal Characteristics and Knowledge, Attitude of Farmers towards Wheat Cultivation

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ABSTRACT

A survey was carried out to study the socio- personal characteristics, knowledge and attitude of wheat cultivating farmers among 300 respondents of Aligarh district Uttar Pradesh. Majority of the farmers were of low socio-economic belong to 31 to 45 years age group, educated upto middle to intermediate, living in nuclear type of family system. A significant and positive correlation was found between education, income, size of holding, social participation, farm power, urban contact and socio- economic status with knowledge and attitude of the farmers.

Key word: Wheat cultivation, correlates of knowledge and attitutde

INTRODUCTION

The green revolution gave a boost to the production and productivity of the major cereals like rice and wheat in India. About 91 per cent of the Indian wheat production confined in six states such as Uttar Pradesh, Punjab, Haryana, Madhya Pradesh, Rajasthan and Bihar. Uttar Pradesh with (25.6 mt.) in 2003- 2004 continues to be the highest producer of wheat followed by Punjab (14.9 mt.) and Haryana (9.30 mt.) while much of the contribution from Haryana and Punjab is due to their high productivity (4.0 to 4.3 tonnes/ha.). The contribution of other states such as Uttar Pradesh, Madhya Pradesh and Rajasthan (24.50 mt.) is also appreciable. (The Hindu Survey of Indian Agriculture, 2007)

MATERIALS AND METHODS

The study was conducted in the purposively selected district Aligarh. Out of 17 blocks, three (3) blocks were selected randomly, from which ten (10) villages were selected by simple random sampling method for the purpose. Thirty (30) respondents selected from each village, thus in all 300 wheat producer small farmers were selected for study as respondents. The data was collected with structured interview schedule and analyzed with the help of average, percentage and correlation coefficient.

RESULTS AND DISCUSSION

It is evident from the Table 1 that the majorities (45.67%) of the respondents were of 31 to 45 age group and belong to higher caste (40.33%). Half of the respondents were middle to intermediate educated. Majority (94.66%) of the respondents living in single type of family system and majority of them was not the member of any organization.

The data presented in same table also indicate that 76.99% respondent's annual income was in the range of Rs.10, 000- 20,000. Most of them were living in pucca house and engaged in agriculture. Saraswat (1991), Khan *et al.* (2004), Tsutsui (1994) and Sharma *et al.* (2005) also lending support to the present findings.

The data presented in Table 2 show that (50.00%) respondents belong to low socio- economic status and rest 31.33 & 18.67 % respondents belong to medium and high socio-economic status respectively.

Table 1. Socio- economic features of small farmers

Variables	Group/Categories	No. of respondents	Per cent
Age	Upto 30 years	125	41.66
	31 to 45 years	137	45.67
	Above 45 years	38	12.66
	Total	300	100.00
Caste	High Caste	121	40.33
	Backward Caste	109	36.33
	Schedule Caste	53	17.66
	Others	17	5.66
	Total	300	100.00
Education	Illiterate	11	3.66
	Can read only	46	15.33
	Primary	52	17.33
	Middle	77	25.66
	High School/ Intermediate	77	25.66
	Graduate	37	12.33
	Total	300	100.00
Family type	Single	256	85.33
	Joint	44	14.67
	Total	300	100.00
Social participation	No Participation	194	64.66
	One organization	58	19.33
	More than one origination	18	6.00
	Office holder	16	5.33
	Public leader	14	4.66
	Total	300	100.00
Urban contact	Not even once	77	25.67
	Thrice a week	0	0
	Weekly	78	30.00
	Fortnightly	69	19.33
	Monthly	42	12.00
	Quarterly	28	9.66
	Half yearly	19	2.00
	Yearly	8	1.33
	Total	300	100.00
Size of holding	Below 2 acres	65	18.33
	2- 3 acres	172	57.33
	3- 4 acres	69	23.00
	4- 5 acres	4	1.33
	Total	300	100.00
Income	Upto Rs. 5000	11	3.66
	5,000- 10,000	14	4.67
	10,000- 15,000	79	26.33
	15,000- 20,000	152	50.66
	20,000- 25,000	28	9.33
	25,000- 30,000	9	3.00
	Above Rs. 30,000	7	2.33
	Total	300	100.00
House pattern	*Kaccha*	76	25.33
	Pucca	182	60.66
	Mixed	42	14.00
	Total	300	100.00
Occupation	Labour	23	7.66
	Caste occupation	38	12.66
	Business	52	17.33
	Cultivation	176	58.67
	Service	11	3.66
	Total	300	100.00
Farm power	Bullock cart	17	5.66
	Tube well	122	40.67
	Diesel pump	77	25.66
	Chaff cutter	103	34.33
	Tractor	62	20.66
Farm implements	Deshi plough	42	14.00
	M.B.Plough	28	9.33
	Disc harrow	21	7.00
	Cultivator	29	9.67
	Sprayer	25	8.33
	Seedrill	51	17.00

Note: More than one farm power and farm implements have been possessed by the respondents, hence total percentage exceeds to 100

Table 2. Overall socio- economic status of the farmers

S.No.	Socio- economic status	No. of respondents	per cent
1.	High status	56	18.67
2.	Medium status	94	31.33
3.	Low status	150	50.00
	Total	**300**	**100.00**

The data presented in Table 3 show that there was significant and positive correlation between family type, education, income, size of holding, social participation and farm power change agent linkage, urban contact and socio- economic with knowledge of the small farmers regarding the new technology. A negative correlation was also found in the age, caste and family size with knowledge of the small farmers. However, significant correlation was observed between age, education, size of family, income, social participation, farm power and urban contact with attitude of small farmers towards wheat technology.

Thus, from the foregoing discussion, it was concluded that except age, caste, family size with knowledge and family type and change agent linkage with attitude all the other variables had significant correlation with knowledge, attitude and socio-economic components of the respondents. Singh (1981) and Khan *et al.* (2004) also observed similar types of results in their studies.

The data presented in Table 4 reveal that very highly significant and positive correlation between seed, nitrogen fertilizers, plant protection, use of weedicide and irrigation technology with the knowledge of small farmers regarding the new technology of wheat. The study also revealed that phosphatic and potassic fertilizer have been found non significant with the knowledge of new technology.

Table 4. Correlation coefficient between knowledge, attitude and adoption behaviour of new technology

S. No.	Adoption variables	Knowledge (r value)	Attitude (r value)
1	Seed technology	0.226**	0.202
	Fertilizer technology		
2	(a) Nitrogenous technology	0.305**	0.234**
3	(b) Phosphatic technology	0.053^{NS}	0.186**
4	(c) Pottassic technology	0.020^{NS}	0.044^{NS}
5	Plant protection technology	0.196**	0.244**
6	Weedicide technology	0.276**	0.048^{NS}
7	Irrigation technology	0.188**	0.236**

** P <0.01; NS = not significant

Findings helped to conclude that there is very highly significant correlation between seed, nitrogenous and phosphatic fertilizer, plant protection and irrigation technology with the attitude of small farmers, weedicide and pottassic fertilizer technology is found significant with the attitude of small farmers towards wheat technology. Besides, there were several socio-physiological correlates to it.

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Impact Assessment of Resource Conservation Technologies (RCTs) in Irrigated Areas of Pratapgarh District of Uttar Pradesh

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ABSTRACT

One of the major cropping systems of Pratapgarh is rice-wheat grown on the Indo-Gangetic Plains (IGP). It is a major system for food security in the region and provides livelihoods and income to farmers and workers. Continuously, need is being felt to explore the possibilities of saving critical inputs by adopting alternative resources conservative technologies as zero tillage. Main aim of this case study was to see the impact of zero tillage technology in rice-wheat system. Economic analysis of the data presented in this paper shows that zero tillage method for wheat cultivation is the most economical and attractive option for farming community. The high yield grain and less cost of production per hectare were noted on zero tillage farms as compared with conventional farms. Finally, the adoption of zero tillage technology and direct seeded rice improves farmer's profit, improves his livelihood and eventually reduces poverty.

Key words: RTC, wheat cultivation, indo-gangetic plains

INTRODUCTION

After independence Indian Agriculture has witnessed many changes. The green revolution has encouraged the farmer to invest on the inputs but reduced factor productivity and increasing cost of cultivation. Rising prices of diesel, tractor, and fertilizer, seeds and farm machinery has worsened the situations. Therefore, serious efforts are urgently required to reduce the cost of cultivation, boost the production to maintain the sustainability and increase the profit margin of the farmers. Conversation of natural resources through resource conservation technology is the need of hour. Studies have shown that a large gap exists between the potential and yields actually realized by the wheat growers of the area (Byerlee *et al.,* 1984, Hobbs, 1985, Sheikh *et al.,* 2000). Farmers' practices regarding land preparation for paddy, wheat planting time, and other conflicts endogenous to the rice-wheat based cropping system were identified as the major factors limiting wheat yield in the area.

The conservation of resources (land, water, energy) saves cost of water, energy and protects environment while leading to improved productivity on sustainable basis. Targeting the resource conserving technologies offers newer opportunities of better livelihood for the source poor small and marginal farmers. The above factors facilitated the present study.

MATERIALS AND METHODS

The study was conducted in Pratapgarh district of Uttar Pradesh during the year 2008-09. Krishi Vigyan Kendra has started the demonstration on zero tillage technology for wheat during *rabi* 2001-02 which has registered a phenomenal growth in district. The first demonstration was conducted in village Alapur with farmer, similar demonstrations were laid at KVK farm in comparison with conventional tillage wheat. The initial results were encouraging and since then Krishi Vigyan Kendra have been trying to disseminate such farm worthy technology in the soil of Pratapgarh. The data needed for the study

were collected from resource conservation technology adopter and non-adopter farmers by personal interview using pre-tested structured interview schedule. Data were obtained systematically on the entire gamut of operations in production.

This study is based on a primary data set collected through a formal survey of 150 farmers from the rice-wheat zone of the Pratapgarh district. The sample includes randomly selected 75 wheat growers who adopted zero-tillage technology (fully or partially) and 75 neighbouring farmers using conventional (non-adopted) wheat sowing methods.

The study makes use of descriptive statistics and partial budgeting to determine the profitability and investigate if sufficient evidence is available from farmers' fields that the zero-tillage technology leads to higher wheat yields, lower production costs, and greater fertilizer and irrigation water use efficiency etc. Total costs, gross margins, crop yield and Benefit cost ratio, Fertilizer use efficiency were calculated both for zero tillage and conventional methods of sowing.

RESULTS AND DISCUSSION

In the rice-wheat zone, the level of moisture in the soil at the time of tillage after paddy harvest, soil texture, and the rice crop residue situation mainly affect farmers' choice of tillage methods. The farmers mostly apply one irrigation and 2-3 ploughing with common cultivators making the field. These time consuming and costly conventional tillage practices of wheat planting are the important factors that may induce a rapid adoption of resource conserving zero tillage technology.

Table 1. Horizontal spread of zero tillage wheat in Pratapgarh

Year	Number of farmer	Area	No. of village
2001	4	0.81	01
2002	82	680.16	112
2003	517	2364.37	248
2004	772	3481.78	475
2005	1097	4502.02	698
2006	2980	7902.83	878
2007	3885	8805.67	1445
2008	5256	14170.04	1892

Extension of resource conservation technology

The data in Table 1 show the adoption of the resource conservation technology in district was spread at very fast rate, because farmers did not get good yield. The results show a convincing as far as economic superiority of zero tillage over conventional tillage method of sowing. It started from 0.81 ha area in 2001 and reached upto 14170.04 ha. in year 2008.

Reasons for adoption

It was observed that zero tillage leads to higher yield with saving in tillage in terms of cost because of less tractor use, diesel consumption and tractor charges is required for zero tillage drill than conventional tillage of wheat.

Table 2. Energy saving and production

Technology	Tractor hrs/ha	Diesel consu-mption lt./ha	Tractor charge Rs./ha	Yield
Zero tillage wheat	1:54	6.38	380	30.22
Conventional method wheat	9:30	33.25	1900	28.16

It was observed that zero tillage leads to low weed density particular in the case of *Phalaris minor,* less time is required to irrigate crop planted with the zero tillage drill than conventional tillage wheat (Table 3). However, over the time the weed control cost in zero-tillage is expected to decline as observed by (Malik *et al.,* 2002 and Yadav *et al.,* 2002) in case of India.

The yield recorded was significantly higher than conventional tillage (3272.00 kg/ha as compared to 3054.15 kg/ha).Total cost were Rs. 13061.70 in zero-tillage, significantly lower than that of Rs. 16758.32/ha in conventional tillage. Gross margins were Rs. 16815.15 in zero tillage, significantly higher than that of Rs. 13731.34/ha in conservation technology. Benefit : Cost ratio shows that zero tillage 2.28 as compared to 1.81 in conventional tillage (Table 4).

Of the break-up of total cost of production (Table 5) in rupees per hectare, farmers were investing significantly less on land preparation and on irrigation cost per hectare, which is major source of reduced

Table 3. Comparative study of irrigation and weed control

Treatment	Irrigation time (hour/ha)	Weed density (Nos/m²)		Crop color 7 days after irrigation
		Phalaris Minor	Other weeds	
Zero tillage wheat	10	35	12	Green
Conventional method wheat	15	87	8	Yellow

Table 4. Benefit cost analysis of wheat with various techniques

Particulars	Techniques	
	Traditional mean	Zero tillage mean
Yield in kg per hectare	3054.15	3272.00
Total cost of production in Rs. per hectare	16758.32	13061.70
Gross Margins in Rs./hectare	13731.34	16815.15
Benefit cost ratio	1.81	2.28

Table 5. Break-up of total cost of production (wheat) (Rs/ha)

Particulars	Techniques	
	Traditional mean	Zero tillage mean
Seed Cost (Rs/ha)	1129.24	1126.78
Cost of Ploughings (Rs/ha)	2755.16	812.96
Cost of Irrigation water (Rs/ha)	2090.46	1529.54
Fertilizer Cost (Rs/ha)	4435.44	4516.99
Chemical cost (Rs/ha)	756.12	857.43
Harvesting cost (Rs/ha)	2928.13	2789.75
Threshing cost (Rs/ha)	1932.32	1425.76

working cost in zero tillage as compared to conventional sowing of wheat.

Farmer perception of the reason for zero tillage to become successful

Participatory farmers

- Less tractor uses
- Saving of irrigation water
- Early maturity
- Optimum plant population
- Good yield
- Economic
- Line sowing facilitate tillering
- Good crop emergence
- Easy harvesting
- Weed is major threat

Visiting farmers

1. Good crop stand.
2. Longer ear heads, less chaffy grains & high crop yield.
3. Zero tillage wheat means easy economical and eco friendly technology.
4. Most of the farmers were convinced it and agreed to adopt it in coming season.

Change in the attitude of farmers

Initially farmers were having a lot of doubts regarding this technology and they had their own myths. They were of the view that the zero tillage wheat will not germinate or if it will germinate it will not produce good wheat crop. But slowly their attitude starts changing after seeing initial performance of the demonstration and now they are coming up for such a technology, which may become regular practice in years to come.

The study assessed the status of zero-tillage technology in the rice-wheat system of Pratapgarh. Such assessment was required not only to understand the current status of technology but was also needed to provide feed back from farmers' field regarding its impact on wheat yield and farm incomes.

The new technology reduces costs of production with comparable wheat yields to that obtained using other methods and thus results in higher net farm returns. The farmers of the area have started appreciating the reduced tillage cost aspect of the technology.

The wheat acreage sown with zero-tillage technology is expected to expand rapidly in the rice-wheat zone. The study confirms that the zero-tillage technology enhances water and fertilizer use efficiency. However, sufficient evidence was not available to prove any positive or adverse affect of the technology on incidence of weeds in wheat crop. It is suggest that this aspect of

zero-tillage technology be focused more in future research.

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Impact of Age and Gender on Musculo-skeletal Problems of the Dairy Workers

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ABSTRACT

Work related musculo-skeletal disorders are one of the greatest occupational health concern today. The Dairy farming which supports the livelihood of nearly two hundred million poors , also exposes the dairy workers to various risk factors that have been associated with musculo-skeletal disorders. Dairy farming in India involves heterogeneous groups of dairy workers in terms of both age and gender. Thus, in present study an attempt has been made to find out the impact of age and gender on musculo-skeletal problems of dairy workers engaged in milking and preparing food for cattle. Musculo-skeletal problems among dairy workers were studied by assessing intensity of body pain in upper and lower extremity of dairy workers through five point scale. Findings of study reveal that females in comparison to male workers are more susceptible to risks factors responsible for various musculo-skeletal problems. Further, females of the higher age groups are more prone to musculo-skeletal disorders than the females of lower age group. On the basis of above findings, it can be concluded that age and gender of dairy workers have a significant impact on development of various musculo-skeletal problems.

Key words: Age, gender, milking, musculo-skeletal problems, preparing food for cattle

INTRODUCTION

Work related musculo-skeletal disorders are one of the greatest occupational health concern today. Similar to communicable diseases, occupational diseases can be regarded as traditional, emerging and re-emerging. Decades of research has identified the risk for various musculo-skeletal disorders. Problems of work related musculo-skeletal disorders is global in scope and wide-spread in many industries. The Dairy farming which supports the livelihood of nearly two hundred million poors (Ahuja *et al.*, 2000), also exposes the dairy workers to various risk factors that have been associated with musculo-skeletal disorders. Dairy farming involve manual material handling with heavy lifting, pushing and pulling awkward postures for a long period, whole body vibration as well as repetitive motion. All these have been recognized as risk factors for occupational health. Dairy farming in India involve heterogeneous groups of dairy workers in terms of both age and gender, women have anatomical and physiological differences with men that may place them at risk for work related injuries (Engberg, 1993). On an average upper body strength is 40.75 per cent less in females than in males while lower body strength is 5.30 per cent less in females (Falkel *et al.* 1986). Age is an another limiting factor on the part of dairy workers because as the age increases, various physiological changes take place in human body which reduces their working capacity. Thus in present study an attempt has been made to find out the impact of age and gender on musculo-skeletal problems of dairy workers engaged in preparing food for cattle, so through proper ergonomics intervention keeping these factors in consideration, mechanization and automation of dairy sectors can be done which will minimize the prevailing risks factors of dairy sectors and improves working efficiency, health and comfort of the dairy workers.

MATERIALS AND METHODS

District Kanpur (U.P.) was selected purposively for the present study with the assumption that the rural

population of district were intensively engaged in dairy farming activities. Out of 10 blocks of Kanpur, Kalayanpur block was selected as an area of study.Further three villages namely Hirdaypur Ishwariganj and Dharmpur were selected randomly from the list of village of the selected block through lottery system. Forty male and thirty female respondents of two age group (30-40 years and 40 – 50 years) were selected purposively on the basis of physical fitness. Thirty male and twenty two female respondents of 30–40 years and ten male and eight female respondents of 40–50 years were found physically fit from the selected samples of phase – I. Physical fitness was assessed through body mass index, body temperature, blood pressure and heart rate.

The subjects who met the following conditions were selected for the experiments –

Physical fitness	:	BMI index, Garrow (1981)
Body temperature	:	Not above 99^0F
Blood pressure	:	$120/80^{+—10}$
Heart rate	:	70-90 beats/min

Two dairy farming activities namely milking and preparing food for cattle were chosen purposively because of almost equal involvement of both males and females in these activities.Musculo-skeletal disorder can be described as condition affecting the musculo-skeletal system including peripheral nerves and vascular system that can be triggered or aggravated by movements or activities associated with work. When imposing load exceeds the internal tolerance of tissues, tissues damage may occur and results in an outcome of discomfort, pain, impairment or disability. When these mechanical stresses are repetitive, prolonged or forceful, will result in onset of musculo-skeletal disorders.

Musculo-skeletal problems among dairy workers were studied by assessing intensity of body pain in upper and lower extremity of dairy workers. To study the resultant chronic effect of selected dairy farming activities, a suitable body map along with 5 point scale was developed by Varghese *et al.* (1996).

Scores of intensity of body pain:– Very severe-5, Severe-4, Moderate-3, light-2, Very light -1.

Mean and standard deviation were used as statistical measures of the data of the study.

RESULTS AND DISCUSSION

Musculo-skeletal problems caused due to milking operation

Musculo-skeletal problems among male and female dairy workers was studied in terms of feeling of discomfort in different body parts of upper and lower extremity. Findings of the study has been presented with the help of following tables and graphs.

From the Table 1, it is clear that in milking activity, females and males of lower age group (A_1B_1 and A_1B_2) were perceived severe to very severe body pain in wrist/hand and in lower arms of upper extremity. On the other hand, females and males of higher age- group (A_1B_1 and A_1B_2) were perceived severe to very severe body pain in upper arm along with wrist/hand and lower arm of the upper extremity.

Body parts of lower extremity in which severe to very severe body pain was perceived by dairy workers of all the four groups, were calf muscles, ankles/feet and sole of the leg.

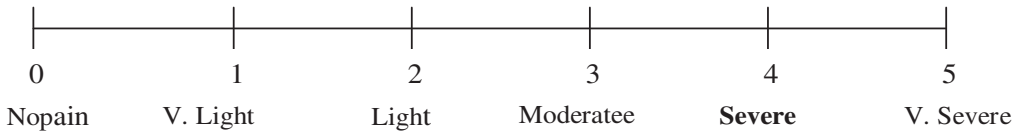
On the basis of above findings, it can be said that in milking, body parts of both the upper and lower extremity were equally stressed and degree of severity of pain was greater in females (B_1) than males (B_2). Moreover females of higher age-group (A_2B_1) perceived more severe body pain in various body parts as compared to females of lower age-group (A_1B_1).

After performing milking, body pain perceived in upper body parts may be due to continuous prolonged forceful movements of both left and right arm, awkward posture of wrist (deviation from normal position). According to Newton's third law "for every action there is an equal and opposite reaction" hence external load or force was imposed on the upper extremity as a result of gravity acting on udder of cattle being manipulated by the dairy workers. Hence, this external load is counteracted by internal load that is supplied by the muscles of the body parts of upper extremity. It is typically the internal loading that contributes most to cumulative trauma of musculo-skeletal system during work. Cumulative trauma initiate slow process of various

Table 1. Mean ± S.D. of intensity of body pain in upper and lower extremity of daily workers during split-up stages of milking

Milking	Intensity of body pain (Mean ± S.D.)												
	Body Parts												
	Upper extremity							Lower extremity					
	Neck	Shoulder	Chest	Upper Arm	Lower Arm	Wrist/ Hand	Upper Back	Low back	But-tock	Thigh	Knee	Calf muscles	Ankles/ Feet
A_1B_1	1.0±	1.0±	-	3.8±	4.7±	5±	1.7±	0.9±	-	1±	-	4.5±	4.2±
	0.652	0		0	1.25	0.28	1.820	0.285		1		0.2	1.0
A_1B_2	1.10±	1.9±	-	3.2±	4.26±	4.20±	1.2±	0.5±	-	-	-	4.13±	4.23±
	1.25	2.20		1.58	2.05	0.55	1.825	3.05				0.82	2.0
A_2B_1	2±	1.0±	-	4.7±	4.9±	4.9±	3.0±	1.9±	1.0±	1.87±	0.8±	4.87±	5.0±
	0.55	0		2	0.26	0.85	2.226	0.335	0.25	0.665	0.62	3.0	0
A_2B_2	1.200±	2.1±	-	4.5±	4.70±	4.79±	2.0±	1.1±	-	-	-	4.20±	4.50±
	1.820	1.556		0.150	0.88	1.05	2.062	2.055				1.250	1.0

$A_1B_{1=}$ Females of lower age group, $A_1B_{2=}$ males of lower age group, $A_2B_{1=}$ Females of higher age group, $A_2B_{2=}$ males of higher age



biological and physiological disturbances in inner body system, outcome of which is experienced by the worker in the form of pain at the initial stage. Further, body pain in lower body parts may be due to static load of upper body parts carried by lower body parts of worker during milking operation because of squatting posture adopted by the dairy workers during milking. Except it, pooling of blood in lower extremities may also be responsible for severe to very severe body pain in lower body parts. Thus wrist, lower arm, upper arm, finger of upper extremity as well as calf muscles, ankles/feet, and sole of the leg of lower extremity are the most vulnerable body parts of all the dairy workers involved in milking for various musculo-skeletal disorders. However, intensity of body pain was higher in females as compared to males dairy worker. Gustafsson *et al.* (1994) also found similar results among Swedish dairy farmers. Nordstrom *et al.* (1996) and Stal *et al.* (1996) reported that women who work in dairy farming, especially female milker had a greater risk of developing hand and wrist $WMSD_S$ as compared to agricultural workers that were non-milkers in shoulder joints, upper leg and ankle feet after performing milking operation.

Hagberg and Wegman (1982) found that prolonged elevation of the arms above the shoulder caused painful levels of fatigue and in some cases resulted in tendonitis. It may also be a reason of pain experienced in wrist, lower, upper arm and finger by dairy worker after milking. Meyer *et al.* (1995) also found body vibration as a occupational risk factors. Anonymous (1997) identified association between exposure to a combination of repetition and forceful exertion and increased risk for hand/wrist tendonitis. Except it, Pachal and Sastri (2000) found that sitting without supports caused maximum spine load acompared to standing and sitting with supports. Thus,working in sitting without support (squatting) posture and in confined space were the important factors in causing such back pains other than musculo-skeletal disorders among welders in steel industry.

Musculo-skeletal problems caused due to preparing food for cattle

In case of preparing food for cattle, females of lower age group (A_1B_1) perceived severe to very severe body pain in shoulder, chest, upper arm, upper back, calf muscles and ankles/feet whereas males of lower age group A_1B_2 perceived severe to very severe pain in upper arm, elbow, upper back, low back, calf muscles and ankles/feet (Table 2).

Table 2. Mean ± S.D. of intensity of body pain in upper and lower extremity of dairy workers during split-up stages of preparing food for cattle

Milking	Intensity of body pain (Mean ± S.D.)												
	Body Parts												
	Upper extremity							Lower extremity					
	Neck	Shoulder	Chest	Upper Arm	Lower Arm	Wrist/ Hand	Upper Back	Low back	But-tock	Thigh	Knee	Calf muscles	Ankles/ Feet
A_1B_1	2.59± 1	4.3± 1.025	4.0± 0.25	5± 0.7	5± 1.228	2± 0	4.6± 1	5± 0.226	1.68± 1	3.2± 1	3.4± 1	5± 0	4.77± 1
A_1B_2	1.7± 3	2.6± 2	3.96± 1	4.5± 2.720	3.8± 2	0.83± 1	4.0± 0	4.8± 1	0.8± 2	1.9± 2	3.0± 1	4± 0.775	4.0± 1.825
A_2B_1	3.12± 1	4.75± 2.62	4.6± 1	5± 0	5± 0.262	2.75± 1	5± 0	5± 0.129	2± 2	1.9± 2	4.98± 0.129	5± 2.25	5± 1.275
A_2B_2	2± 2	3.9± 2	4.0± 0.252	4.7± 3	4.0± 1.082	0.7± 1	4.5± 0.894	5± 0	1.0± 0	3± 0	4.28± 4	4.2± 2	4.0± 2.25

A_1 B_1= Females of lower age group, A_1B_2 = Males of lower age group, A_2B_1= Females of higher age group, $A_2B_{2=}$ Males of higher age.

On the other hand females of higher age group (A_2B_1) reported sever to very severe body pain in chest and knee whereas very severe body pain in upper arm, shoulder, upper back, low back calf muscles and ankles/ feet while males of higher age group (A_2B_2) perceived severe to very severe pain in shoulder, chest, upper arm, lower arm, upper back, knee, calf muscles, ankles/feet and sole of the leg. The most stressed food parts of dairy workers were shoulder, chest, upper arm, upper back, low back, knee, calf muscles and ankle/feet during the activity. It may be due various tasks of preparing food for cattle involve bend/ kneeling posture (during fodder cutting, preparing bundle and chaffing) and lifting and carrying of heavy load on head, forceful movements (during fodder cutting and chaffing) causing whole body vibration, mechanical stress caused by handling of in appropriate tools during work. Furthermore, frequency of postural changes was also higher in preparing food for cattle.

The adverse effect of all these factors on the body parts of dairy workers was identified in neck, shoulders upper arm, elbow and low back. Heavy load carried on head is transmitted through biomechanical forces of the body, specifically the limbs and trunk, to create internal load on tissues and anatomical structure. Tissue damage may occur when the imposing load exceeds the internal tolerance of tissue and results in an outcome of discomfort, pain, impairment or disability. Gandhi *et al.* (2001) reported high incidences of musculo-skeletal problems in both cervical and lumber region of farm women engaged in fodder cutting. A task that induces hand and arm vibration cause on involuntary increases in power grip through a reflex of the strength receptors. Vibration also cause protein linkage from the blood vessels in the nerve trunk and result in edema and increased pressure in the nerve trunk, and, therefore, can also result in edema and increased pressure in the nerve (Lundbosrg *et al.* 1990). The vibration syndrome which is characterized by intermittent numbers and blanching of the fingers with reduced sensitivity of heat, cold and pain affect up to 90 per cent workers in occupation such as shipping, grinding and chain sawing (Taylor and Pelmear, 1976).

Thus findings of both the tables reveal that females in comparison to male workers are more susceptible to risks factors responsible for various musculo-skeletal problems. Further, females of the higher age groups are more prone to MSDS than the females of lower age group. On the basis of above findings , it can be concluded that age and gender of dairy workers have significant impact on development of various musculo-skeletal problems.

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Entrepreneurial Behaviour of Mango Growers

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ABSTRACT

The study was conducted in Ratnagiri district of Konkan region of Maharashtra state. This district has been declared as Horticultural district by the State Government and area under mango is higher compared to other districts. Entrepreneurial behaviour of the mango growers was assessed on six dimensions namely innovativeness, decision making, achievement motivation, knowledge level, information seeking and risk taking ability by using Nandapurkar scale. It was observed that that majority of the respondents had 'medium' innovativeness (64.00 per cent), decision making ability (53.00 per cent), achievement motivation (59.00 per cent), information seeking behaviour (74.00 per cent) and risk taking ability (47.00 per cent), while the knowledge level was high (47.00 per cent). The findings regarding overall entrepreneurial behaviour revealed that majority (69.00 per cent) of the respondents had 'medium' entrepreneurial behaviour. The other were found equally distributed in 'low' (15.00 per cent) and 'high'(16.00 per cent) categories. The average score of the respondents was 103.70. It can be discerned from these results that, by and large, the mango growers had fairly good entrepreneurial behaviour. The regression coefficient of annual income was positive and significant at 0.05 level of probability. The value of coefficient of multiple regression (R^2) in this case was 0.5625 indicating thereby, that 56.25 per cent variation in the entrepreneurial behaviour of the mango growers was explained by the eight independent variables selected for the study.

Key words: Mango growers, entrepreneurship, Maharashtra.

INTRODUCTION

Development of economy of any nation depends primarily on the important role played by the entrepreneurs. The part played by such entrepreneurs is of vital importance in a developing country like India where there are ample opportunities for using innovations to exploit the available resources. Thus, in all economic development activities, more and more focus is being centered on entrepreneurship of the people. Entrepreneurship has now been recognized as a concept not only vital for starting an industry, but also in the other land based activities.

Mango (*Mangifera indica linn*) is the most popular fruit among the people of the world, particularly in India where, it is rightly known as 'King of fruits'. Mango occupies a unique importance in tropics, as that of apple in temperate zones In Maharashtra, the total area under mango production is 3,81,466 ha and the production is 8,10,384 tonnes. Konkan is the main mango producing region with an area of 1,47,206 ha. Sindhudurg and Ratnagiri are the major mango producing districts in Maharashtra. Ratnagiri and Sindhudurg are mango baskets of Maharashtra, contributing 62.50 per cent area under mango cultivation in Konkan. The nearness to metropolis like Mumbai, Pune provides good opportunities for marketing of mango within and outside the country. Warm and humid climate, high and well spread assured rainfall and well drained soil could produce huge quantities of mango. This is only possible with the help of entrepreneurship development among mango growers. The Government agencies and voluntary agencies and organizations, operating in this region are implementing many schemes / projects to develop entrepreneurship. It is presumed that the entrepreneurs might have achieved higher entrepreneurship in mango cultivation. However, this presumption has not yet been tested scientifically. So present study was conducted in Ratnagiri district with the following objectives.

1. To analyze the entrepreneurial behaviour of the mango growers.
2. To find out the personal and socio-economic characteristics of the mango growers associated with their entrepreneurial behaviour.

MATERIALS AND METHODS

The study was conducted in Ratnagiri district of Konkan region of Maharashtra state. This district has been declared as Horticultural district by the Stage Government and area under this crop is higher in this district. Two tahsils viz. Ratnagiri and Rajapur having maximum area under mango plantation i.e. 12631 ha and 6650 ha, respectively were selected for study. From each selected tahsil, five villages were randomly selected. Thus, ten villages were selected from the selected tahsils. From each village, ten mango growers were randomly selected for the study. Thus, in all, 100 mango growers were selected for the study. Mango growers having minimum 20 mango trees in bearing stage were considered for the study. A schedule was specially developed to collect the information on this aspect. For measuring the entrepreneurial behavior scale developed by Nandapurkar (1982) was used with necessary modification to suit the requirement of present study. The overall entrepreneurial behaviour was measured by the measuring the innovativeness, decision making, achievement motivation, knowledge level, information seeking and risk taking ability. The data were collected by personally interviewing the respondents with the help of specially designed schedule.

RESULTS AND DISCUSSION

The findings of the present study are presented under the following heads.

Entrepreneurial behaviour of the mango growers

Entrepreneurial behavour of the mango growers was assessed on six dimensions namely innovativeness, decision making, achievement motivation, knowledge level, information seeking and risk taking ability. Considering the score for each dimension, the respondents were classified in suitable categories. So, also overall entrepreneurial behavior score of the respondents was worked out by summing up the scores obtained by them on each of these six dimensions. The results in respect of the overall entrepreneurial behaviour of the mango growers are presented in Table 1.

Table 1. Distribution of respondents according to entrepreneurial behaviour

S. No.	Dimensions	Category	Respondents (n=100) number	percentage	Mean Score
1.	Innovative ness	No	08	08.00	7.86
		Low	13	13.00	
		Medium	64	64.00	
		High	15	15.00	
2.	Decision making ability	Low	20	20.00	15.14
		Medium	53	53.00	
		High	27	27.00	
3.	Achievement motivation	Low	19	19.00	25.34
		Medium	59	59.00	
		High	22	22.00	
4.	Knowledge level	Low	22	22.00	10.13
		Medium	31	31.00	
		High	47	47.00	
5.	Information Seeking behaviour	Low	12	12.00	29.35
		Medium	74	74.00	
		High	14	14.00	
6.	Risk taking ability	Low	23	23.00	15.88
		Medium	47	47.00	
		High	30	30.00	
7.	Overall entre-preneurial behaviour	Low	15	15.00	103.70
		Medium	69	69.00	
		High	16	16.00	

It is observed from Table 1 that, majority (64.00%) of the mango growers had 'medium' level of innovativeness while less than one sixth (15.00%) of the respondents had 'high' innovativeness and 13.00 per cent of respondents had 'low' innovativeness and only 8.00 per cent respondents had 'no' innovativeness. The average innovative score was score 7.86 indicated that the respondents were prone to accept new technology earlier and as such they could be called as early adopters. These findings confirm with findings of Kokate and Hiranand (1991), Patil (1998) and Jadhav (1999).

With regards to decision making, more than one-half (53.00%) of the respondents had 'medium' decision making ability, while one-fifth (20.00%) of the respondents had 'low' decision making ability and more

than one-fourth (27.00%) of the respondents had 'high' decision making ability. The average decision making score was 15.14. The findings on this dimension making it clear that a large number of the respondents had higher decision making ability. This might have helped them in implementing their own ideas in the way they liked and to improve their enterprise. The findings regarding decision making are similar to findings of Anonymous (1998), Patil (1998) and Jadhav (1999). However the findings are in contrast with those reported by Kokate and Hiranand (1991).

With respect to achievement motivation, majority (59.00%) of the respondents had 'medium' achievement motivation, slightly less than one-fifth (19.00%) respondents had 'high' achievement motivation. The average achievement motivation score was 25.34. It can be concluded that the respondents had fairly good achievement motivation. It must resulted into better risk taking and motivation for higher production and productivity form their farm enterprises. The findings are dissimilar with the findings of Anonymous (1998).

With regards to knowledge level, about half (47.00%) of the respondents had 'high' knowledge level, while more than one-fifth (22.00%) of the respondents had 'low' knowledge level and less than one-third (31.00%) of the respondents had 'medium' knowledge level. The average knowledge level score was 10.13. Better knowledge is a pre-requisite for any enterprise. Thus, the respondents had substantial knowledge about the mango cultivation practices. The findings are in agreement of the findings of Mehta (1983) and dissimilar with the findings of Kokate and Hiranand (1991).

With regards to information seeking behaviour majority (74.00%) of the respondents had 'medium' information seeking behaviour, while 12.00 per cent of the respondents had 'low' information seeking behaviour and 14.00 per cent of the respondents had 'high' information seeking behaviour. The average score was 29.35. This clearly indicated the inclination of the respondents for getting higher information of the farm enterprises, which might have helped indirectly in getting better knowledge of mango cultivation practices. The findings are in the line with the findings of Anonymous (1998).

With regards to risk taking ability, about half (47.00%) of the respondents had 'medium' risk taking ability, while less than one-fourth (23.00%) of the respondents had 'low' risk taking ability and less than one-third (30.00%) respondents had 'high' risk taking ability respectively. The average risk taking ability score was 15.88. It can be concluded from these findings that, majority of respondents were prone to take risk. Greater risk taking ability of the farmers might have stimulated them to take up new ventures and might have given them more profit. Reverse might have been the case of the farmers who had lower risk orientation. The findings are supported by the findings of Kokate and Hiranand (1991), Anonymous (1998), Patil (1998) and Jadhav (1999).

The findings regarding overall entrepreneurial behaviour revealed that majority (69.00 per cent) of the respondents had 'medium' entrepreneurial behaviour. The other were found equally distributed in 'low' and 'high' categories. The average score of the respondents was 103.70. It can be discerned from these results that, by and large, the mango growers had fairly good entrepreneurial behaviour. This might be due to their better scoring on almost all the parameters selected to measure the entrepreneurial behaviour. Secondly, such better entrepreneurial behaviour of the mango growers might have helped them in managing their enterprise more efficiently and profitably. These findings lead to conclude that the mango cultivator might have been efficiently managing the operation related to cultivation and marketing of the crop. The findings are in conformity with the finding of Anonymous (1998) and Jadhav (1999).

Personal and socio-economic characteristics of the mango growers associated with their entrepreneurial behaviour

Correlation analysis

The relationship between the personal and socio-economic characteristics of the mango growers and their entrepreneurial behaviour was tested by the computing the correlation coefficient (r). The result in this regard are presented in Table 2.

Table 2. Correlation between personal and socio-economic characteristics of the mango growers and entrepreneurial behaviour

S. No.	Characteristics	Correlation coefficient
1.	Age	0.19107^{NS}
2	Family education status	0.04301^{NS}
3.	Annual income	0.21951*
4.	Size of land holding	-0.02821^{NS}
5.	Orchard size	0.15755^{NS}
6.	Mass media exposure	0.55420**
7.	Extension contact	0.49235**
8.	Yield	0.13178^{NS}

*Significant at 0.05 level **Significant at 0.01 level, NS=Non significant

The study revealed that the personal and socio-economic characteristics of the respondents namely annual income, mass media exposure and extension contact were positively and significantly related with their entrepreneurial behaviour. It means increase in above characteristics had increased the entrepreneurial behaviour of the mango growers. It is true that, with high income and economic status, farmers can take risk and adopt modern technology to get higher production, productivity, and profit from the enterprise. The exposure to mass media might have helped them in getting higher knowledge about technologies, marketing system etc. which is required for better decision and better management of enterprise. In case of extension contact respondents might have taken moderate risk and better decisions under the guidance of extension workers which ultimately must have helped them to run their enterprise properly and on commercial basis. The finding are in conformity with the findings of Kokate and Hiran and (1991) and Jadhav (1999).

Further, the relationship between age, family education status, orchard size, yield, size of land holding and entrepreneurial behaviour of the respondents was non-significant. This means other this factors and some other factors play important role in entrepreneurial behaviour of the mango growers.

The findings are supported by the results of Patil (1998) and dissimilar with findings of Kokate and Hiranand (1991).

Multiple linear regression analysis

The findings of the multiple linear analysis of the independent and dependent variables are presented in Table 3.

Table 3. Multiple relationship between personal and socio-economic characteristics of the mango growers and entrepreneurial behaviour

S.No.	Characteristics	Regression coefficient
1.	Age	0.07621
2	Family education status	-1.06259
3.	Annual income	2.02381*
4.	Size of land holding	-1.83075**
5.	Orchard size	0.02544
6.	Mass media exposure	3.17723**
7.	Extension contact	0.36600**
8.	Yield	-0.03844

*Significant at 0.05 level **Significant at 0.01 level, $R^2 = 0.5625$ 'f' value = 14.6287

It is revealed that from the table that regression coefficients of two variable namely mass media exposure and extension contact were positive and significant, while that of size of land holding was negative and significant at 0.01 level of probability. The regression coefficient of annual income was positive and significant at 0.05 level of probability.

The value of coefficient of multiple regression (R^2) in this case was 0.5625 indicating thereby, that 56.25 per cent variation in the entrepreneurial behaviour of the mango growers was explained by the eight independent variables selected for the study. The calculated F value (14.6287) was found to be highly significant at 0.01 level of probability. It means firstly, the selection of independent variables was appropriate. Secondly, annual income, mass media exposure and extension contact played a vital and positive role in improving the entrepreneurial behaviour of the mango growers. Further, the variable 'size of land holding' had significant contribution but in negative direction in entrepreneurial behaviour of the mango growers, meaning thereby that entrepreneurial behaviour of the smaller mango growers was better than the bigger mango growers.

From the above study, it was inferred that, seven out of every ten mango growers had 'medium' entrepreneurial behaviour. Also, performance of the

majority of mango growers on various components of entrepreneurial behaviour namely, innovativeness, decision making, achievement motivation, information seeking behaviour and risk taking ability was moderate. This implies that there is scope for improving the entrepreneurial behaviour of the mango growers. This can be done by imparting entrepreneurship development training to the mango growers.

It was noticed that the mango growers having higher annual income, higher mass media exposure and higher extension contact had better entrepreneurial behaviour and vice versa. The mango growers from different categories of age, family education status, orchard size, yield and size of land holding had more or less same entrepreneurial behaviour. These findings suggest that, special efforts need to be made for entrepreneurial development among the mango growers having low annual income, mass media exposure and extension contact.

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Process Development for Dyeing Linen Fabric with *Mangifera Indica* Leaves

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ABSTRACT

The present study was undertaken to judge the colourfastness properties of linen fabric dyed with *Mangifera indica* leaves, mordanted with natural mordants- *Terminalia chebula*, *Terminalia belerica* and *Phyllanthus emblica*. The dyeing process was carried out according to the optimized conditions. The samples were evaluated for their colourfastness. The fastness properties of linen fabric dyed with Mangifera indica exhibited good colourfastness towards light, washing, rubbing and perspiration.

Key words: Process development, linea fabric, dyeing

INTRODUCTION

The art and science of dyes was practiced in the ancient civilization of G0reece, Egypt, Rome and India among others. Progress of science and technology led to the invention of synthetic dyes. Synthetic dyes were invented in 1856 and before that coloring matters obtained from natural sources were used (Encyclopedia Britannica, 1971). Even though India has a very rich tradition of using natural dyes, the art and craft of producing naturally dyed textiles is being practiced by only a handful of expert craftsmen in the country.

For the last two decades, lots of research works are being carried out to popularize natural dyes at the industrial level in a more systematic and scientific manner. Study was therefore, taken up for process standardization for dying linen with following specific objectives:

- To optimize the conditions of dyeing with *Mangifera indica* dye using three natural mordants- *Terminalia chebula*, *Terminalia belerica* and *Phyllanthus emblica* at various concentration levels.
- To compare the colourfastness properties of dyed samples towards light, washing, rubbing and perspiration.

MATERIALS AND METHODS

Dye: *Mangifera indica* leaves were taken, dried in shade and ground to powder form.

Fabric: Linen fabric was used.

Mordants: Mordanting was done according to the mordanting methods recommended by Anderson (1971). Following three natural mordants were used

Harda (*Terminalia chebula*)
Bahera (*Terminalia belerica*)
Amla (*Phyllanthus emblica*)

Preparation of fabric for dyeing

Samples of Linen fabric weighing 1g were made before optimization of different variables.

Optimum conditions for dyeing with *Mangifera indica leaves dye*

Dyeing medium: Aqueous
Dye extraction time: 30 minutes
Dye material concentration: 5g dye/ 1g of Linen fabric (sample)
Dyeing time: 30 minutes
Mordanting time: 30 minutes

Evaluation of dyed samples for colourfastness

The dyed samples were evaluated for light, washing, rubbing and perspiration fastness according to standards laid down by Bureau of Indian Standards. These are as follows:

Test for washing fastness IS-687:1979

Test for rubbing fastness IS-766:1988

Test for perspiration fastness IS-971:1983

Test for pH value IS-1390:1983

RESULTS AND DISCUSSION

On visual evaluation dyeing time of 30 minutes was evaluated best for dyeing. All the three methods of mordanting were tried out. Each method of mordanting gave different colours at same concentration of dye, mordant and at the same dyeing process (Table 1). Pre mordanting gave dull colours in comparison to simultaneous and post mordanting. Simultaneous mordanting and dyeing method gave bright colours in comparison to pre and post mordanting. Post mordanting also gave medium colour on the dyed material.

Colour fastness to light of Linen samples was fair to fairly good (3-4) using *Terminalia chebula;* fairly good to good (4-5) in case of *Terminalia belerica*; *Phyllanthus emblica* gave good rating (3-4); unmordanted samples have poor light fastness (Table 3).

Rating for washing fastness of *Terminalia chebula* and *Terminalia belerica* with respect to change in colour was very poor to poor (1-2). Linen was slightly stained (4) and wool was slightly to negligibly stained (4-5). Rating for washing fastness of *Phyllanthus emblica* with change in colour was very poor (1) and Linen was slightly stained (4) and wool was slightly to negligibly stained (4-5). Blank sample rating for washing fastness and change of colour was very poor (1) and staining on Linen was slightly stained (4) and wool was slightly to negligibly stained (4-5) (Table 4).

Rating for rubbing fastness of samples mordanted with *Terminalia chebula* with respect to staining with cotton was slightly stained (4) in dry condition and noticeable to slightly stained (3-4) in wet condition on warp wise direction. In case of samples mordanted with *Terminalia belerica*, staining was noticeable to slightly stained (3-4) on cotton fabric in dry and wet condition. In weft wise

Table 1. Colours obtained with *Mangifera indica* leaf dye

S.No.	Mordant	Pre mordanting	Simultaneous mordanting	Post mordanting
1.	*Terminalia chebula*	Light yellow	Greenish yellow	Slightly dark yellow
2.	*Terminalia belerica*	Light green	Slightly dark greenish yellow	Light greenish yellow
3.	*Phyllanthus emblica*	Light green	Slightly dark yellow	Light blakish yellow

Table 2. Dyeing parameters

S.No.	Dye	Mordants	Medium	pH	Temp. (^{0}C)	Time (min.)	Dye (g)	M:L
1.	*Mangifera indica*	Unmordanted	Aqueous	7.1	27.2	30	5	1:20
2.	*Mangifera indica*	*Terminalia chebula*	Aqueous	5.9	27.4	30	5	1:20
3.	*Mangifera indica*	*Terminalia belerica*	Aqueous	6.5	27.1	30	5	1:20
4.	*Mangifera indica*	*Phyllanthus emblica*	Aqueous	4.3	27.2	30	5	1:20

Table 3. Colourfastness to light of linen samples dyed with *Mangifera indica*

S.No.	Sample	Mordant	Rating for light fastness
1.	Linen	Without mordant	2
2.	Linen	*Terminalia chebula* (Simultaneous mordanting)	3-4
3.	Linen	*Terminalia belerica* (Simultaneous mordanting)	4-5
4.	Linen	*Phyllanthus emblica* (Simultaneous mordanting)	3-4

Table 4. Colourfastness to washing of linen sample dyed with *Mangifera indica*

S.No.	Dye stuff	Mordant	Rating for washing		
			Change in colour	Staining	
				Linen	Wool
1.	*Mangifera indica*	Unmordanted	1	4-5	5
2.	*Mangifera indica*	*Terminalia chebula*	1-2	4	4-5
3.	*Mangifera indica*	*Terminalia belerica*	1-2	4	4-5
4.	*Mangifera indica*	*Phyllanthus emblica*	1	4	4-5

Table 5. Colourfastness to rubbing of linen samples dyed with *Mangifera indica*

S.No.	Dye stuff	Mordants	Staining (on cotton)			
			Dry		Wet	
			Warp	Weft	Warp	Weft
1.	*Mangifera indica*	Unmordanted	4	4	3-4	3-4
2.	*Mangifera indica*	*Terminalia chebula*	4	4	3-4	3-4
3.	*Mangifera indica*	*Terminalia belerica*	3-4	3-4	3	3
4.	*Mangifera indica*	*Phyllanthus emblica*	3-4	3-4	3-4	3-4

direction, in dry condition, samples mordanted with *Terminalia belerica* and *Phyllanthus emblica* were noticeable to slightly stained (3-4) and samples mordanted with *Terminalia chebula* were slightly stained (4). In wet condition, samples mordanted with *Terminalia chebula* and *Phyllanthus emblica* were noticeable to slightly stained (3-4). Samples mordanted with *Terminalia belerica* was noticeably stained (4). In all rubbing fastness of dry samples was better than samples in wet condition. In case of fabric direction, rubbing fastness of fabric cut in warp direction was better than fabric cut in weft direction.

Results emphasized that samples mordanted with *Terminalia chebula* and *Phyllanthus emblica* exhibited better rubbing fastness properties than samples mordanted with *Terminalia belerica* (Table 5).

Rating of perspiration fastness of samples mordanted with *Terminalia chebula* with respect to change in colour was slightly stained (4) on Linen and slightly to noticeably stained (4-5) on wool in acidic medium. Samples mordanted with *Terminalia belerica* showed noticeable to slightly staining (3-4) on Linen and slightly staining (4) on wool in acidic medium. In alkaline medium, *Terminalia chebula, Terminalia belerica* and *Phyllanthus emblica* gave noticeable to slight staining (3-4) on Linen. *Terminalia chebula* and *Phyllanthus emblica* gave slight staining (4) on wool. The result for perspiration fastness shows that all the three mordants gave similar ratings with *Terminalia belerica* mordant scoring slightly more than others in case of staining on linen and wool fabrics (Table 6).

Table 6. Colourfastness to perspiration of linen sample dyed with *Mangifera indica*

S.No.	Dye stuff	Mordant	Medium					
			Acidic			Alkaline		
			Change in colour	Staining on		Change in colour	Staining on	
				Linen	Wool		Linen	Wool
1	*Mangifera indica.*	Unmordanted	1-2	4	4-5	2-3	4	4
2.	*Mangifera indica.*	*Terminalia chebula*	2-3	4	4-5	2-3	3-4	4
3.	*Mangifera indica.*	*Terminalia belerica*	3	3-4	4	3-4	3-4	3-4
4.	*Mangifera indica.*	*Phyllanthus emblica*	3	3	3	3-4	3-4	4

The fastness properties of linen samples dyed with *Mangifera indica* leaves were satisfactory. A comparison of all the three mordants showed that dyed samples mordanted with *Terminalia belerica* showed good colour fastness to light and washing followed by *Terminalia chebula* and *Phyllanthus emblica*.

Terminalia belerica mordant on linen fabric when simultaneously mordanted and dyed with *Mangifera indica* leaf dye gave better fastness properties and ensure brightness, luster and increased wear life of fabric. The fabric dyeing is economic and it will remain new for longer period. Different colours can be obtained by *Mangifera indica* leaf dye by using different mordants.

It is concluded from the present study that *Mangifera indica* dye produced wide range of soft, lustrous and bright colours on linen fabric. The fastness properties of linen dyed with *Mangifera indica* leaves were all round satisfactory. *Terminalia belerica* was found to be the most suitable mordant to dye as it gave good colour fastness to light as well as to washing, rubbing and perspiration. *Mangifera indica* leaves are abundantly available throughout the year. Since natural dye and mordants have been used in the present study, the dye is not only eco-friendly and biodegradable but also non allergic to the skin.

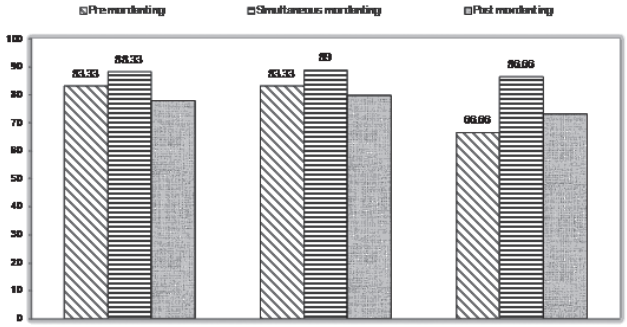

Fig. 1. Visual rating for different mordents with different methods

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Participatory Evaluation of Selected Interventions of IVLP Programme

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ABSTRACT

The study was conducted to analyse the performance of selected interventions of IVLP programme by the farmers as a part of the National Agricultural Technology project (NATP) on technology Assessment and Refinement through institution village linkage programme (IVLP). The technological interventions which produced best results at the farmers level (without any major constraint) were evaluated irrespective of their resourcefulness. It was observed during the study that there was a substantial increase in area as well as in the number of farmers adopted IVLP interventions. Among the participating farmers high level of adoption was found in the case of H.Y.V.s. of different crops and vegetables.

Key words: Assessment, participatory evaluation, IVLP

INTRODUCTION

The assessment of location specific technologies in irrigated agro-ecosystem can ensure higher productivity and profitability in well defined farm production systems whereas the resource poor farmers can look forward to technological options through participatory technology development assessment and adoption process (Singh and Singh, 1999). It is the farmers who hold the keys for developing, evaluating and validating the technologies in a system context. Therefore the strategy should emphasize that the extension agenda should be explicitly defined as per farmers needs through an understanding of the existing farming systems rather than its perception by the scientists (Singh and Prakash, 1995). An evaluation study was therefore conducted on the performance of the selected interventions implemented through IVLP programme.

MATERIALS AND METHODS

Technology Assessment and Refinement through institution village linkage programme under National Agricultural Technology project was implemented in the two villages viz. Damani Nevada and Sen Paschimpara of blocks vidhnu and Kalyanpur respectively, Kanpur Nagar District (UP) from 1998-2003. A study was conducted in these villages during Jan.-Feb. 2005 to analyse the performance of selected technological interventions of IVLP programme by the participating and non-participating farmers who were selected purposively. A total of 16 interventions were taken to analyze their impact on the farming community. A well structured interview schedule was prepared to collect the data from the respondents.

RESULTS AND DISCUSSION

Evaluation of some technological interventions of IVLP programme with respect to area and number of farmers involved.

Since the IVLP has been implemented in the villages Senpashimpara and Damani nivada of blocks Vidhnu and Shivraijpur respectively from 1998 providing an ideal platform through which appropriate technology is disseminated to stakeholders.

Agriculture data (e.g. area under different crops) before the commencement of the project (i.e. 1995-1998, period I) and after the 5 years of implementation (2003-2004) period II) was collected from the land revenue

Table 1. Impact analysis of crop-based technological interventions

Intervention	Farmers growing this crop (no.)			Area (ha)		
	Period I	Period II	Difference	Period I	Period II	Difference
1. H.Y.Vs of paddy	10(3.0%)	78(11.92%)	+ 68	1.50(1.20)	14.30(21.52)	+ 13.80
2. Testing of H.Y.Vs of brinjal	14(4.20%)	85(12.91%0	+ 69	0.60(1.90)	1.20(1.80)	+ 0.6
3. Local varieties of Paddy	262(78.67%)	115(17.58%)	- 147	26.80(87.01)	11.40(17.16)	- 15.4
4. H.Y.Vs of Pea	12(3.60%)	72(11.0%)	+ 60	0.85(2.75)	2.70(2.65)	+ 0.85
5. Nutrient management in tomato	8(2.40%)	54(8.25%)	+ 46	0.10(0.32)	0.65(0.97)	+ 0.55
6. H.Y.Vs of mustard.	18(5.40%)	65(9.93%)	+ 47	40(4.54)	12.72(19.14)	+ 11.32
7. Introduction of mushroom cultivation for marginal & landless farmers	Nil	15(2.29%)	+ 15	-	-	-
8. Introduction of aonla in salt affected soils	2(0.60)	10(1.52%)	+ 8	0.20(0.64)	1.64(2.46)	+ 1.44
9. Use of bio-fertilizer for enhancing yield of paddy	7(2.10%)	85(12.99%)	+ 78	0.35(1.13)	13.45(20.24)	+ 13.10
10. IPM of paddy	Nil	41(6.26%)	+ 41	Nil	6.75(10.16)	+ 6.75
11. Zero tillage in wheat	Nil	34(5.91%)	+ 34	Nil	2.62(3.94)	+ 2.62
Total	**333**	**654**	**+ 321**	**30.80(100)**	**66.43(100)**	**+ 35.63**

Figures in parenthesis indicate percentage to total

office of the concerned villages and from the multidisciplinary team of scientists responsible for the implementation of IVLP programme (Table 1).

During period I, The total area planted to different field and vegetable crops was 30.80 ha.Out of this 87.10% was occupied by local varieties of paddy followed by H.Y.Vs of mustard (4.54%), H.Y.Vs of pea (2.75%), H.Y.Vs. of Brinjal (91.94%), H.Y.Vs of paddy (1.62%), use of bio-fertilizer in paddy (1.13%), Introduction of Aonla in salt affected soils (0.64%) and nutrient management in tomato (0.32%).

During period II, the area under cultivation of above mentioned technological interventions increased by 35.63 hectares as the area under each crop expanded except for local varieties of paddy which showed declining trend by over 70%. The area under H.Y.Vs of paddy increased by (21.52%) followed by use of bio fertilizer in paddy crop (20.24%), area under H.Y.Vs of mustard (19.14%), IPM of paddy (10.16%), Zero tillage in wheat (3.74%) H.Y.Vs of pea (2.55%), introduction of Aonla in salt effected soils (2.46%) H.Y.Vs of brinjal (1.80%)

During period I, the number of farmers involved were 333, which was increased by 654. A total number of farmers growing local varieties of paddy were 262 which was reduced to a considerable extent i.e. 115.

The farmers involved in growing of H.Y.Vs of paddy increased from just 10 to 78 in the IVLP villages the farmers involved in cultivation of H.Y.Vs of brinjal increased from 14 to 85 followed by cultivation of H.Y.Vs of pea from 12 to 72, nutrient management in tomato from 8 to 54, H.Y.Vs of mustard 18 to 65, introduction of Aonla in salt affected soils by 2 to 10.

However in case of mushroom cultivation, IPM of paddy and zero tillage practice in wheat no one was found to involve in these practices during the period I but during period II, the no. of farmers involved were increased by 15, 14 and 31 respectively.

Thus because of the IVLP activities in the villages senpashim pura and Damani nivada there was a significant increase in the area under different technological interventions of IVLP programme. And also there was a significant increase in the farmers number to adopt IVLP intervention during period II.

Agricultural data (i.e. area under different crops) before the commencement of the IVLP programme (i.e. 1996-98 period I) and after the five years of implementation (2003-2004 period II) was collected from the respective village revenue office and from the IVLP team which was responsible for the implementation of the IVLP programme, besides area

Table 2. Impact analysis of vegetable based interventions

Intervention	Farmers growing this crop (no.)			Area (ha)		
	Period I	Period II	Difference	Period I	Period II	Difference
1 Introduction of H.Y.Vs of onion	3(5.08)	34(13.12)	+ 31	0.70(3.80)	1.45(2.90)	+ 0.75
2. Introduction of H.Y.Vs of Chilli.	6(10.16)	38(14.67)	+ 32	1.75(9.51)	4.60(9.20)	+ 2.85
3. Introduction of H.Y.Vs of wheat	23(38.98)	65(25.09)	+ 42	13.20(71.73)	35.91(71.82)	+ 22.71
4. Introduction of H.Y.Vs of sponge gourd.	9(15.25)	46(17.76)	+ 37	0.85(4.61)	1.32(2.64)	+ 0.47
5. Introduction of H.Y.Vs of Moong & Urd.	18(30.50)	76(29.34)	+ 58	1.90(10.32)	6.72(13.44)	+ 4.82
Total	**59(100)**	**259(100)**	**+ 200**	**18.40(100)**	**50.00(100)**	**31.60**

Figures in parenthesis indicates percentage to total

the data about the no. of farmers involved in the above mentioned technologies were got by the researcher from IVLP team members who had collected the same during PRA method of the same villages just before the commencement of the project.

During period I, the total area under the above mentioned crops was 18.40 ha, the area under H.Y.Vs of wheat was 13.20 ha. (17.73%), followed by area under H.Y.Vs of Moong and Urd (10.32%) During the same period the area under H.Y.Vs of chilli was 1.75 ha. Followed by H.Y.Vs of sponge gourd and H.Y.Vs of onion (Table 2).

During period II, The area under the same crops has raised to a considerable extent by 31.60 ha. The area under each crop expanded to a great extent as shown in above mentioned table. The area under H.Y.Vs of wheat increased by 35.91 ha. followed by areas under H.Y.Vs of Moong and Urd crop is by 6.72 hectares. Findings get support from those reported by Singh and Ansari (2005).

The area under the H.Y.Vs of chilli crop also increased by 4.60 ha. followed by area under H.Y.Vs of onion and sponge gourd.

During period I, the no. of farmers involved in the above mentioned technologies were just 59 which was increased to a great extent as the number increased by 259 during period II. The farmers involved in H.Y.Vs of wheat increased from 23 to 65 and the number of farmers growing H.Y.Vs of chilli increased from just 6 to 38 similarly the no. of farmers involved in cultivation of H.Y.Vs of onion increased from mere 3 to 34, the number of farmers cultivating H.Y.Vs of sponge gourd had risen from 9 to 46 and the number of farmers involved in cultivation of H.Y.Vs of Moong and Urd also showed an increasing trend from 18 to 76 number of farmers.

Hence in the IVLP villages named Senpaschimpara and Damani nivada. The area under the H.Y.Vs of above mentioned crops had increased to a great extent besides a considerable increase in the no. of farmers involved. Therefore it may be concluded that the IVLP programme made significant impact in the project area.

The technological interventions of IVLP programme made a significant impact on the farming community in terms of area and no. of farmers involved. The high yielding varieties of different field crops and vegetables introduced through IVLP programme created a greater impact among the participating and non-participating farmers. It was found that after the implementation of intervention on integrated nutrient management it results reduction in the application of excess quantity of urea and other fertilizers. Similarly the introduction of mushroom cultivation for marginal and landless laborers created a significant impact on the beneficiaries of IVLP programme.

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Change in Attitude as a Factor Affecting ICT Competence of Teachers

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ABSTRACT

Globalization and technological change processes that have accelerated *in tandem* over the past fifteen years have created a new global economy "powered by technology, fueled by information and driven by knowledge". The emergence of this new global economy has serious implications for the nature and purpose of educational institutions. Information systems are necessary in today's fast global economy. Yet, the human factor is important in the implementation of any information system and attitude is an important factor predicting human behavior. Many psychologists have theorized attitude as a significant personal attribute that tends to predict behaviour. Furthermore, we must expect the teachers attitudes towards using ICT can be influenced by the information they have about the value of ICT, their previous experiences in using ICT, their expertise in using ICT and the expectations that it will contribute to their pupils learning. It is widely agreed by attitude theorists that the concept of attitude can be broken into cognitive, affective and behavioural components. This study aims to find out the relationship of attitude with ICT competence.

Key words: Attitude, competence, factor, ICT

INTRODUCTION

In information system, literature reveals interest in attitude generally and specifically to certain technologies such as Automatic Teller Machines (Hone *et al*., 1998). Interest in the concept of attitude was initiated by Hovland, Janis and Kelly's publication of Communications and Persuasion in 1953 (Insko, 1967).

Attitude is an important concept that is often used to understand and predict people's reaction to an object or change and how their behaviour can be influenced (Fishbein and Ajzen, 1975, Allport, 1966). Many psychologist theorized attitude as a significant personal attribute that tends to predict behaviour. For instance, Ajzen and Fishbein (1980) concluded in their study that provided attitudes are appropriately measured, they are sufficient to predict intentions (behaviour).

Thurstone (1946) defines attitude as the degree of positive or negative affect associated with some psychological object. By a psychological object, Thurston means any symbol, phrase, slogan, person, institution, ideal or idea towards which people can differ with respect to positive or negative affect.

Even though attitudes in general have been accepted to impact skills and achievement (Lin *et al*., 2001, Wilson, *et al*., 2000), research results bordering on relationship of attitude with ICT competence are very scanty and have yielded conflicting results. For e.g. Hernes *et al.* (2001) reported that attitude does not bear strong relationship with ICT competence. Zhang and Espinosa (1997) have earlier reported that attitude predicts the need for learning computing skills which will in turn enhance ICT or computing skills. While attitude studies have been conducted generally on computer use and specifically on some aspects of information and communication technology, no study has been conducted on teacher's ICT competence. The research question is therefore, "Is there any relationship between teachers' attitude towards ICT and their ICT competence?"

Data was also collected on the socio-personal and professional factors of age, designation, education, work experience and training received in ICT and their relationship with attitude towards ICT.

MATERIALS AND METHODS

Two research instruments were employed; these include ICT competence index and attitude towards ICT scale. ICT competence index developed by investigator consisted of eleven major ICT areas along with their sub-areas. The respondents were asked to indicate ICT knowledge and skills which they had. For each positive response a score of 1 was given. Attitude towards ICT is a seven point Likert scale developed by Kay (1990). The modified cognitive and affective subscales were adapted from the ones developed by Kay. Cognitive attitude refers to knowledge about ICT and its capabilities. Cognitive attitude scale consisted of positive and negative statements which were administered to the respondents on a seven point continuum ranging from 'strongly agree' to 'strongly disagree'. Affective attitude refers to respondents' general feelings about ICT. The scale consisted of ten items related to their general feelings about ICT while using ICT in teaching. The respondents were asked to score them from 1 to 7 in terms of their feelings associated with ICT.

Questionnaires were distributed to 577 teachers of four universities of north India. The researcher explored the possibilities of using the official website of GBPUAT, Pantnagar and the respondents were contacted through e-mail identity. The response rate was not satisfactory. Then the hard copy of the questionnaire was also sent by post. There was not satisfactory response. Thereafter, the researcher individually contacted the respondents and collected the response. The response was received from 157 respondents from only one State Agricultural University of north India.

RESULTS AND DISCUSSION

Findings are presented on attitude and its cognitive and affective component. The relationship between ICT competence and attitude towards ICT was found to be significant. Attitude was measured using the cognitive and affective component (Table 1).

Table 1. Relationship between attitude towards ICT and ICT competence

Factors	Cognitive attitude	Affective attitude	Attitude
ICT competence	0.182*	0.284**	0.284**

**Significant at 0.01 level of significance
*Significant at 0.05 level of significance

Cognitive attitude: Cognitive attitude (knowledge), as a component of attitude, exhibits a positive and significant relationship with ICT competence (r =0.182) at five per cent level of significance. The findings get support from the results of other studies that propose that cognition should be positively related to behaviour (Vickers, 1997). To measure cognitive attitude, respondents had to indicate their awareness how ICT could help in teaching–learning process. The significant relationship suggests that the ICT fit the knowledge expectation of teachers.

Affective attitude: The relationship between affective component and ICT competence was significant with r = 0.284 at one per cent level of significance.

A major finding of this study was that attitude bears significant relationship with ICT competence. This is supportive of the findings of Zhang and Espinosa (1997).

Correlates of attitude

The rest of the factors exhibit little and non-significant relationship with attitude towards ICT. Age exhibits a negative though significant relationship (r = -0.188) with cognitive attitude at one per cent level of significance where as found to be non-significantly related with affective attitude Table 2. Designation, education, work experience and training received in ICT were found to be non-significantly related with cognitive and affective attitude. In general, age was found to be negatively but significantly related with attitude towards ICT at one per cent level of significance. The non-significance of designation, education, work experience and training received in ICT with attitude towards ICT suggests that the form of education obtained by teachers were not relevant to their use of ICT in teaching-learning. The lack of significant relationship between experience and

Table 2. Socio-personal and professional factors affecting attitude towards ICT

Factors	Cognitive attitude	Affective attitude	Attitude
Age	-0.188**	-0.152^{NS}	-0.208**
Designation	-0.102^{NS}	-0.124^{NS}	-0.141^{NS}
Education	-0.003^{NS}	-0.011^{NS}	-0.007^{NS}
Work experience	-0.133^{NS}	-0.106^{NS}	-0.148^{NS}
raining received in ICT	0.091^{NS}	0.148^{NS}	0.140^{NS}

** Significant at 0.01 level of significance, NS= non-significant

attitude towards ICT was not consistent with the studies by Walters and Necessary (1996) and Igbaria and Chakrabarti (1990). An explanation is that these studies were examining experience in computer use rather than experience with the job.

This study investigates the relationship between attitude towards ICT and ICT competence of teachers of State Agricultural Universities. The study revealed a significant relationship between attitude towards ICT and ICT competence. The two components of attitude i.e. cognitive and affective attitude were found to be significantly correlated with ICT competence. It was further observed that designation, education, work experience and training received in ICT were non significantly correlated with ICT competence. However, age was significantly but negatively related with age.

A further study should examine how and for what purpose teachers' make use of ICT in teaching and learning and how to give teachers the relevant education and experience on the use of this technology. Similar kind of study can also be conducted on students and on a larger scale.

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Extent of Adoption of Best Practices by Award Winning Agripreneurs of Tamil Nadu

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ABSTRACT

Agripreneurship is required to create opportunities of improving the yield potential and net income of the farmers. Many factors play a vital role in their success. Farming practices adopted varies with farmer and region to region. Certain practices which enable farmers to get higher yields utilizing sustainable and optimal methods are known as best practices or best farming practices. The study explored extent of adoption of best practices as listed by FAO. It was aimed to explore whether adoption of these best practices was a contributor to the success of agrienterprises of achiever farmers. The list of awardee farmers were obtained from TNAU and KVKs. Analysing the response given by thirty award winning farmers, these practices were studied in respect of their extent of adoption with their success in agripreneurship. The study revealed a positive and significant relationship between agripreneurial success and extent of adoption of best farming practices.

Key words: Adoption, best practices, KVKs, TNAU

INTRODUCTION

In earlier times, a farmer who produced more was considered a successful farmer. However, post globalization and liberalization, many more competencies and skills are needed to become successful. He not only has to acquire higher productivity from his fields, utilize available resources in an optimum sustainable manner, market his produce efficiently, possess the acumen to assess demand in market and maintains quality as per national and international standards. Economic viability, environmental sustainability, social acceptability and food safety and quality are the four major parameters considered significant for success in contemporary times. Entrepreneurial farmers incorporate technological innovative methods and practices responsibly and judiciously for optimum value creation. The benefit cost ratio is not viewed by them only in terms of money but also in terms of ecological and health considerations.

The term *'Best Practices'* has been popularized by Food and Agricultural Organization (FAO, November 2005), when it listed some of the best practices in agriculture. The crux is to use resources optimally to gain higher profits from the same piece of land and also contribute towards ecological balance. Certain strategies which diminish costs as well as environmental protection comprise the best practices. These measurers and recommendations are given by FAO especially for developing countries which usually contain more population dependent on agriculture. They have been adopted successfully in more than one region and are interdisciplinary, reflecting the complex nature of the problems addressed.

Variables like education, farm size, and contact with extension agency positively and significantly influenced the innovativeness of farmers (Singh, 1966). Further, the knowledge of innovation creates motivation for their adoption (Rogers and Shoemaker, 1971). Entrepreneurial success does not imply only the monetary benefits or profits but also the enhancement social prestige and recognition by significant others.

Adoption of Best Practices at all stages of production and marketing of their produce may play an important role in success of their endeavours. The farm

entrepreneurs have to reform and revolutionize production pattern and adoption of good agricultural practices to succeed.

All these measures are aimed to increase the production of agricultural crops on sustained basis and to increase the net income of the farmer through conservation of natural resources and their efficient utilization, crop production systems management and pest management etc.

In view of the above, the present study aimed at finding out the extent of adoption of best practices as listed by FAO and its relationship if any with agripreneurial success.

MATERIALS AND METHODS

A total of thirty award winning agripreneurs from Tamil Nadu constituted the sample of respondents for the study. The respondents were located in over twelve districts in Tamil Nadu. Appropriate schedule was developed for interviews. Checklist questions were also prepared for case study method to collect data from awardee farmers. The data was collected in 2009-10. It was then analysed using frequency, percentage and rank values.

Based on the list given by FAO, relevant exhaustive list of best farming practices were prepared and given to farmers to express their extent of adoption of those practices. The details are listed below with their scores (Table 1).

Table 1. Best Farming Practices (FAO, 2005) and their scores

S. No.	Best farming practices	Fully adopted	Partially adopted	Not adopted
1.	Advanced crop production techniques/package of practices	2	1	0
2.	Conservation agriculture	2	1	0
3.	Appropriate use of plant nutrients/fertilizers/plant protection chemicals	2	1	0
4.	Identifying and reducing the negative consequences for the environment	2	1	0
5.	Biological pest control	2	1	0
6.	Strategic resource allocation	2	1	0
7.	Modernization of irrigation schemes	2	1	0
8.	Recycling the resources	2	1	0
9.	Organic farming practices	2	1	0
10.	Readiness to get innovative agricultural information	2	1	0
11.	Improving the efficiency of the post harvest system	2	1	0
12.	Value addition and others	2	1	0

Out of this list, practices and their extent of adoption followed by respondents were scored and analysed with the following procedure along with scores.

Category	Status	Code
Fully adopted	High (16.1-24)	2
Partially adopted	Medium (8.1-16)	1
Not adopted	Low (0-8)	0

RESULTS AND DISCUSSION

The responses were obtained and analysed using mean, frequency and correlation analysis which gave the following results. Table 2 shows the frequency of the extent of adoption of the best practices by award winning farmers.

Table 2. Distribution of respondents as per the extent of adoption of the best practices

Adoption of best practices	Frequency	Percentage	Cumulative percentage
Partially Adopted	22	73.3	73.7
Fully Adopted	8	26.7	100.0
Total	**30**	**100.0**	

Table 2 showed that many farmers were practicing (73.3%) the standard best practices listed by FAO. But, not all the farmers practicing all the best practices listed down by FAO. One more thing is none of the farmer was practiced all the best farming practices listed by FAO. Because of so many other independent factors plays a role in adoption of those practices such as level of resource he has, constraints in getting recent innovation agricultural innovation because of level of education and media availability, not easy availability of biological pest control products like *Trichoderma* and *Pseudomonas*. Likewise there are many more factors related to their level of adoption.

But generally, the respondents who had been selected for the study showed moderate results and approximately three-fourth of the respondents had been fallen in partially adopted category (Medium : 8.1-16) in their adoption behaviour to the best farming practices.

Correlation analysis of agripreneurial success with adoption of best farming practices

Since agripreneurial success is the dependent variable based on their income level to their investment level in

their business, the adoption of best farming practices may be correlated with agripreneurial success (Table 3) to know about their relationship in ventures using Spearman's correlation co-efficient.

Table 3. Correlation between best farming practices and agripreneurial success

Independent variable	Correlation co-efficient (r)
	Agripreneurial success
Best farming practices	0.466**

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

Table 3 showed that there is a positive and significant relationship between the agripreneurial success and extent of adoption of best farming practices. This is also clear from the frequency of responses of the respondents. It also showed that whenever their adoption behaviour increases along with some other positive factors; it may lead to high agripreneurial success of the farmers.

Regression analysis of agripreneurial success with adoption of best farming practices

The relationship between these two variables showed the following result in regression analysis.

As shown in the Table 4, best practices itself explained 22.7% variation in the agripreneurial success of award winning farmers. This indicated that adoption behaviour towards some selected and standard performance is essential to the extent of one- fifth level in their enterprise may lead to higher production as well as net income of the farmers.

In any enterprise adoption of some standard prescribed production practices would always lead to success. Because of seasonal and technological interventions success rate is always low compared to industrial ventures. So it needs to be changed according to the factors play and keeping this in mind FAO, Rome prepared the standard list of best farming practices to achieve maximum production in farming and with due consideration to quality of the produce, reducing environmental consequences due to more use of chemicals in agriculture for various purpose and conservation of natural resources. The study showed that many farmers belonged to middle category. Three fourth of the farmers only partially adopted the best farming practices. This shows there is a gap in getting upto date information and utilising recent package of practices. There is a need to make farmers aware of advantages of adopting these technologies. If these were followed carefully, it would give some positive result to efficient food production and protecting the environment in which we live.

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Employment and Income Generation in Paddy Cultivation through Sri in Tripura

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ABSTRACT

A study on the impact of Paddy cultivation through SRI (System of Rice Intensification) was conducted in West Tripura district of Tripura state during the season 2010-11for both the crop *Aman* and *Boro* along with the traditional line sowing method. It was found that the paddy cultivation through SRI method was highly remunerative. It was observed that it generated an additional income of Rs. 1441 over the traditional line sowing method of paddy cultivation (Rs. 4319) for an operational area of 0.2 hectare (an unit of cultivated area followed in the state) resulting an increase of 33.36 per cent more income from SRI method. The inequalities of income distribution among different categories of farm size was found to be maximum in traditional line sowing method as compared to the SRI practicing size groups. The Gini coefficient was observed to be more than 0.5 to indicate higher degrees of disparities in income distribution within the groups of traditional line sowing method and less than 0.25 in case of farm size practicing SRI method to indicate lower degrees of disparities in income distribution with in the different size groups. It may be due to the perfectness in following the suggested package and practices for paddy cultivation through SRI method. The employment generated in SRI method of paddy cultivation was observed to be providing more employment than the traditional line sowing method. It is found to be 20.05 per cent more as compared to the traditional line sowing method. The total investment requirement was found to be Rs.1203 more on labour in SRI method of paddy cultivation to generate an additional income of Rs. 1441.

Key words: Paddy cultivation, SRI method, Tripura.

INTRODUCTION

Though System of Rice Intensification (SRI) was discovered in the year 1983, it took same years to gain confidence that these method could consistently increase rice production, that too substantially. SRI is considered as a system rather than a technology, because it is not only a fixed set of practices, it involves a number of specific techniques that are always to be tested and adopted according to local conditions, not simply be adopted. By maintaining good uses of practices, it is possible to increase rice yield by 50-70%. It needs only 5 kg of seed/ha instead of 50 kg/ha as recommended for normal traditional methods. The rice seedlings lose much of their growth potential when transplanted beyond about 15 days of age, the potential is preserved by early transplanting at 8-12 days of seedling.

Tripura is one of the seven sisters in the north eastern region. It is in the farthest corner of the country and three fourth of its boundary has continuous run with Bangladesh. The poverty and un-employment have coexisted with the farmers of the state. For eradication of poverty, the state necessitates, execution of special action plan in phased manner to reduce the magnitude of poverty, unemployment and dependence for food to the other state of the country. The under developed agriculture has accentuated the situation further on its dependence for food to other states.

Ninety per cent of the cultivators in the state are small and marginal farmers. The main crop remains paddy in the state as a result of its consumption as staple food. To reduce the dependence for food to other states the state government initiated a 10 year plan to make the state self sufficient in food grain production known

as perspective plan in year 2000-10, giving main thrust on paddy cultivation. Further after 5 years of this plan, it was reviewed that all other means have been saturated to increase the production through introduction of HYV's and bringing more areas under the paddy cultivation through improved technological know-how to boost the production further. Keeping this objectives in mind the government under the Department of Agriculture innovated the technology known as System of Rice Intensification or SRI.

It is therefore in the fitness of above situations, desired necessary to make an in-depth study on the socio-economic status of the farmer practicing paddy cultivation through SRI method with a particular reference to their level of employment and income for increasing living standard and bring out certain policy issues pertaining to investments decision of the government. Thus the study aims at following objectives:

1. To estimate the level of income among the paddy cultivator adopting SRI method.
2. To quantify the level of employment among the paddy cultivator in SRI method.
3. To ascestain the marginal propensity to consume and extent of saving among the paddy cultivator adopting SRI method.

MATERIALS AND METHODS

West Tripura district of the state was purposively selected for the study as there is scattered size of holding for paddy cultivation through SRI. Bishalgarh block was also selected purposively for the study as it has maximum coverage of paddy cultivation in comparison to other block of the district through SRI.

Stratified two stage random sampling method was adopted for selecting ultimate respondents. A list of *Gram Panchayat* having concentration of paddy cultivator through SRI method was prepared taking areas under *Aman* paddy cultivation from the block office of Bishalgarh. Out of a total 53 numbers of *gram panchayats* in the block, five Gram Panchayats namely, Ganiamara, Dayarampara, Laxmibil, Ramcherra and Sesrimai was selected at random as primary sample. All the paddy cultivator practiced paddy cultivation through SRI method was listed along with their areas contributed for paddy cultivation through SRI method during *Aman* 2006-07 and with a total size of operational holding.

From the list of cultivators, 10 per cent of the respondents were selected randomly. Thus in all 69 respondents comprising 30 from more than 0.5 ha, 13 from 0.2-0.5 ha and 12 from less than 0.1 ha area respectively doing paddy cultivation through SRI method were selected.

A family or household was adopted as the unit of investigation in this study. The cultivator of the household was interviewed in two or three sittings during their leisure hours. Cross examination and verification with the data available from other sources were felt necessary since the rural households do not generally maintain any record and we had to depend solely on their memory. The data pertained to the agricultural year 2006-07.

In the present study, household income from the paddy cultivation through SRI methods is obtained by adding all the incomes from the cultivation of paddy through SRI methods which includes value of crops and its products, wages, etc.

Levels and concentration of income from paddy cultivation

The pattern of distribution of income from SRI methods of cultivation have been proposed in the economics literatures can be measured by various measures, but in the present study inequality of income in paddy cultivation during the period under the study were measured in terms of Gini co-efficient and compared with the Lorenz curve obtained for the distribution of income the paddy cultivation.

Gini co-efficient

It is defined as the area between the Lorenz curve and the diagonal to the total area under the diagonal. It is an increasing function of inequality and equal to zero when the distribution is perfectly equal.

$$G= 1+1/N – 2/N\ 2Z\ (N+1-i)\ Yi$$

Where:

G = Gini co-efficient of the income distribution of all the cultivator

N = Population size

Z = Mean income

Yi = income from the i^{th} person

Employment function

In order to make a quantitative estimation of the relative factors influencing employment generation, the functional analysis was carried out. Linear function was used for regression analysis. The equation developed for the present analysis was as follows:

$$Y = a+b_1 x_1 + b_2 x_2 +b_3 x_3 + b_4 x_4$$

Where:

Y = Total family employment (in man-day)

x_1 = Farm size (in Ha)

x_2 = Quantity of seed (in kg)

x_3 = Days of Seedlings.

x_4 = Quantity of NPK used (kg of fertilizer nutrient in total)

a= Constant

The above analysis was carried out for 4 numbers of different farm size practiced paddy cultivation through SRI method. Zero order co-relation matrices were worked out to test multicolinarity early.

RESULTS AND DISCUSSION

Distribution of sample household into different groups based on the size of the operational holding for paddy cultivation through SRI and traditional ways is represented in Table 1. The table reveals that in all the four group income has increased substantially in SRI method over the traditional method. The increase in income was observed to be 33% over the traditional line sowing method in terms of money after the sale of harvested paddy. No specific relationship was observed between the size of operational holding. In all the cases the net income was found to be increased from the traditional line sowing one., but the highest increase in income was observed in the farm size having more than 0.5 ha of Group–IV followed by Group–II, Group–I and Group–III respectively. The level and concentration of income was measured with a view to examine the pattern of income distribution, Lorenze curve were drawn to illustrate the inequalities of income distribution among different categories of farm size. The degree of income concentration was also examined by calculating Gini concentration ratio (Gini co-efficient.).

The drawn Lorenze curve and the Table 2, shows that the inequalities were maximum in case of traditional line sowing paddy cultivators. The Income in all the farm size groups as compare to the SRI practicing cultivators of the same group were studied. In case of the entire size group practicing traditional line of sowing, the Gini co-efficient was found to the more than 0.5 indicating higher degree of disparity in income distribution within the groups. But Gini co-efficient for all the farm size group practicing SRI method was found to be less than 0.25 indicating lower degree of disparities in income distribution within the groups. It may be due to the accuracy in following the package and practicing suggested by the Agronomist of the state.

Table 1. Income received from paddy cultivation (Rs)

Item	Farm size group				
	Group-I	Group-II	Group-III	Group-IV	Pooled
Method of paddy cultivation	Upto 0.1 ha	>0.1-0.2 ha	>0.2-0.5 ha	(0.5 ha	0.2 ha
Traditional line sowing	2610	3840	13920	16619	4319
SRI Method	3212(23.06)	5012(30.52)	16612919.34)	22211(33.64)	5760(33.36)

Table 2. Gini concentration Ration for different size of forms

Item	Farm size group				
	Group-I	Group-II	Group-III	Group-IV	Pooled
GCR for traditional line sowing	0.64	0.58	0.61	0.54	0.53
GCR for SRI	0.26	0.21	0.23	0.18	0.24

Employment function

The tabular analysis in contained Table 3 reveals only static effect of various factors on employment generation. To know the effect of different factors influencing the level of employment at a time, the functional approach was adopted. To analysis was carried out for individual farm sizes separately and pooled together for 0.2 ha. Zero order correlation matrices indicate absence of multicollinearity. Results of regression analysis from the table showed that variation in dependent variable expressed jointly by the four independent variables were to the extent of 76 to 82%.

The regression co-efficient associated with the farm size era positive and significant for all group of holdings, which indicate that the employment would increase 116.2528 days for every unit increase in the size of operational; area of paddy cultivation through SRI.

The increase in employment for every unit increase in the operation area found to be highest in largest farm size i.e. in group-I followed by group IV, II and III respectively. In all the cases size groups the regression coefficient was found to be positive but quantity of NPK used was found to be significant at 5 per cent level of significance for Gr-I, Group –III and Group IV respectively. The equation further reveals that quantity of organic manure used is observed to be significant at 5 per cent level of significance for Group- II and group-IV respectively.

The regression coefficient of pooled analysis for form size of 0.2 ha reveals that all the independent variable are positive but only quantity of organic manure used was found to be significant at 5 per cent level of significance.

The tabular analysis given in Table 4 reveals only static effects of various factors on employment generation in traditional line sowing paddy cultivation. And to know the effect of different factors influencing the level of employment at a time, the same functional approach was adapted the result of regression analysis from the table showed variations in dependent variable expressed jointly by the four different independent variables were to the extent of 78 to 84 per cent.

The regression coefficient anaciated with the form size were found to be positive and significant for all the size groups and indicated that the employment would increase 96.8346 days for every unit increase in the size of operational area of paddy cultivation through traditional line sowing.

In all the size groups, the regression co-efficient was observed to be positive and quantity of NPK used was found to be significant at 5 per cent level of significance. The quantity of seed used was found to be significant at 5 per cent level for size groups belonging to Group – II and Group –IV only. And the quantity of organic manure used in this traditional ways of paddy cultivation have no significant effect on employment generation.

Table 3. Regression co-efficient and other related statistics regarding employment of farmers practicing paddy cultivation through SRI SRI method

S.No.	Categories of farms	Estimated equations
1.	Group-I	Y=39.3538 + 129.8252X1* + 0.8146 x 2+12.6246X3**+0.6845X4
		2R = 0.76
2.	Group-II	Y= 51.3126+118.4265X1+0.7624X2**+11.5672X3+0.7234X42
		R = 0.82
3.	Group-III	Y= 48.1468+111.5729X1*+0.4124X2+9.1683X3+0.5894X4*
		2R = 0.78
4.	Group-IV	Y= 58.3812+118.5836X1+0.5123X2**+9.3826X3+0.3121X4
		2R = 0.76
5.	Pooled	Y= 49.3254+116.2528X1*+0.6124X2+9.3826X3**+0.4214X42
		R = 0.77

Y= Dependent variable represents total farm employment form SRI methods and X1,X2,X3 & X4 independent variable
* Significant at 5 percent level; ** Significant at 1 percent level.

Table 4. Regression co-efficient and other related statistics regarding employment of farmers practicing paddy cultivation through traditional line sowing method

S.No.	Categories of farms	Estimated equations
1.	Group-I	Y= 37.5328+101.8671X1+10.6415X2+0.9864X3**+12.613X4
		2R = 0.78
2.	Group-II	Y=42.6123+99.7642X1+12.5314X2*+0.8434X3+15.5323X4
		2R = 0.81
3.	Group-III	Y= 46.5246+98.8932X1+11.6147X2+0.9432X3+13.6246X4
		2R = 0.84
4.	Group-IV	Y= 49.2341+96.2463X1+9.8632X2+0.9536X3*+11.5123X4
		2R = 0.80
5.	Pooled	Y=48.5472+96.8346X1*+11.4236X2+0.9216X3+13.9242X4**
		2R =0.82

Y= Dependent variable represents total farm employment form SRI methods and X1,X2,X3 & X4 independent variable
* Significant at 5 percent level; ** Significant at 1 percent level

The study has concluded that paddy cultivation through SRI method is highly profitable. It generates an additional income of Rs. 1441 over the traditional line sowing method of paddy cultivation from Rs.4319 for an operational area of 0.2 ha. Resulting an increase of 33.36 per cent more income in SRI method. The inequalities of income distribution among different categories of farm size was found to be maximum in traditional line sowing method as compared to the SRI practicing size groups. the Gini coefficient of more than 0.5 indicates higher degree of disparities in income distribution with in the groups for traditional line sowing method and less than 0.25 in case of farm size practicing Sri method indicates lower degree of disparities in income distribution with in the different size groups. It is due to the perfectness in following the suggested package and practices for paddy cultivation through SRI method.

Regarding employment generation it is concluded that SRI method of paddy cultivation generates more employment than the traditional line sowing method. It is found to be 20.05 per cent more as compared to the traditional line sowing method. An in terms of capital investment it needs Rs.1203 more investment on labour in SRI method of paddy cultivation which generates an additional income of Rs. 1441. Thus it is concluded from the study that SRI method is not only profitable but generates additional income and employment for farm house holds.

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