Print ISSN 2230 – 9047
Online ISSN 2231 – 6736
Vol. 14, No. 2, May-August, 2019

Journal of Community Mobilization and Sustainable Development

Society for Community Mobilization for Sustainable Development
New Delhi - 110 012

Peer Reviewed Journal

Journal of Community Mobilization and Sustainable Development

Registration No.: 268Ag. 33221; Print ISSN : 2230 - 9047; Online ISSN : 2231-6736

Biannual Journal of Society for Community Mobilization for Sustainable Development, New Delhi -110012

MEMBERSHIP

Life Membership	:	**₹ 5,000**	**Institutional Membership**	:	**₹ 5,000**
Annual Membership	:	**₹ 1,500**	**Foreign Membership**	:	**USD 500**
Online Indian Subscription :			Individual/Institutional	:	**₹ 600**
Online and Print Indian Subscription :			Individual/Institutional	:	**₹ 900**
Online for Foreign Subscription :			Individual/Institutional	:	**USD 60**
Online and Print for Foreign Subscription :			Individual/Institutional	:	**USD 90**

Corporate Membership : ₹ 50,000

All correspondence may be made at the following address:

Chief Editor

Journal of Community Mobilization and Sustainable Development

Office of Joint Director (Extension), Indian Agricultural Research Institute, New Delhi-12 (India)

E-mail: journalmobilization@yahoo.com

Website: www.mobilization.co.in

Available online: www.indianjournals.com

(Indexed in : Indian Science Abstract, EBSCO Discovery, Agricola and Google Scholar)

ABOUT THE SOCIETY

MOBILIZATION Society was established in 2003 as a non-profit professional society aimed at sensitizing and mobilizing development partners and community for sustainable development. The Society, during these ensuing years has successfully mobilized researchers, academicians, planners, grass root mobilizers and student and created conducive intellectual atmosphere for introspective deliberations and conducted National seminars/ workshop to address the emerging problems experienced by the agrarian mass. Presently the Society has more than 1100 Life Members. The recognition of the Society in the efforts for strengthening the forum for scientific communication is growing among the related professionals and concerned agricultural stakeholders rapidly. The Society works on following objectives-

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

ABOUT THE JOURNAL

Journal of Community Mobilization and Sustainable Development (print ISSN 2230 – 9047; online ISSN 2231 – 6736) is published by Society for Community Mobilization for Sustainable Development twice a year. The Journal of Community Mobilization and Sustainable Development has NAAS rating 5.30. The Journal of Community Mobilization and Sustainable Development, is also available on our website www.mobilization.co.in and it has been registered with www.indianjournal.com for national and global abstracting and indexing. MOBILIZATION envisages reorienting the young professionals and researches for imbibing the values of community participation in research, training and extension efforts.

The aim and scope of the journal are:

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

Editorial

Indian agriculture is on the track of its constant strides to give an eternally glorified status for more than 600 million people who engaged in agriculture, through income augmenting entrepreneurship development programmes, alternative and complementary livelihood options and efficient implementation of different supporting schemes through its governance system. This is a high time to delve into the approaches which the country has followed in its extension system which is being blamed as a collapsed system for many fallacies. It has witnessed numerous diverse approaches adopted in its pursuit to overcome the shortfalls highlighted from time to time. Frontline extension, T&V system, commodity-based approaches, Farming system-based approach, ATMA, KVK etc are some of the prominent forms among them. The call for convergence and the pluralism is the latest addition to it. Newer areas of scientific enquiry like social capital led rural development, collaborative multidisciplinary research for concert solutions of field problems, bionomics with the integration of socio-economic and biological aspects in scarce natural resource management, creation of inclusive technology development and dissemination models, research to hold the line against climatic abrasions, skill development and creation of entrepreneurial ecosystem etc are some among this.

The Society for Community Mobilization for Sustainable Development (MOBILIZATION), commenced its adorable journey with the objectives of creation of a platform for community mobilization and knowledge sharing among the professional groups has made dedicated efforts to bring transformation among farming and scientific communities. With growing strength, it has diversified its activities to provide its members an effective platform to discuss about emerging challenges and to brainstorm its solutions mainly through national and international seminars it organised, book and periodicals its published.

With immense pleaser I place before you the May-August, 2019 issue of the MOBILIZATION journal. The integration of the research output from diversified areas like Educational Technology, knowledge assessment of different technological interventions, adoption and diffusion research done by KVK, economic impact analysis, Socio-psycho-behavioural assessments, gender studies, ICT based knowledge management, Stakeholder Linkage, Sustainability Indicator etc. shows the richness of the knowledge content in this issue. As the fruit of our constant effort to upgrade and uphold the quality, we are happy to inform you that we have e-published the journal at ***epubs*** website of ICAR with following link: http://epubs.icar.org.in/ejournal/index.php/JCMSD .

The commitment showed and the contribution made by the editorial team members Drs. Souvik Ghosh, S. K. Dubey, R. Roy Burman, Nishi Sharma, S.R.K. Singh, Reshma Gills, Sudipta Paul and Sujit Sarkar are worth mentioning. I am indebted to them, the devotion they showed at each and every point for the timely publication of journal. I express my sincere thanks to Ms. Subhashree Sahu and Dr. Hema Baliwada for their efficient management and timely support in shaping this issue of the journal as on-line editors. Finally, I would like to thank you, the contributors and readers of Mobilization Journal, for your interest in the journal and I encourage you to continue to send us your precious research findings, ideas and feedbacks for further improvement of our journal.

J.P. Sharma
Chief Editor

Journal of Community Mobilization and Sustainable Development Vol. 14(2), 213-218, May-August, 2019

Integration of Educational Technology in Classroom Instruction in Higher Agricultural Education: Instructors' Attitude and Associated Factors

Shantanu Rakshit[1]* and Gyanendra Sharma[2]
[1]Ph.D. Scholar, Division of Agricultural Extension, ICAR-Indian Agricultural Research Institute, New Delhi
[2]Professor, Department of Agricultural Communication, GBPUA&T, Pantnagar, Uttarakhand

ABSTRACT

With the rapid advancement in the field of educational technology efficient integration of it into the classroom environment became necessary for providing an optimum and pleasant learning experience to the learners. In Indian education system, the instructors largely control the learning experience as well learners thus, their attitude largely affect the process of integration or utilization of educational technology (ET). So, a study was undertaken in Govind Ballabh Pant University of Agriculture and Technology, Pantnagar to assess the determining factors of attitude of agricultural instructors towards integration of educational technology in classroom instruction, which often played an important role in deciding the actual application of technology. A comprehensive and detailed pre-tested questionnaire was used for collecting information. Fifty percent of teachers from each constituent college were selected randomly in the sample. The results revealed that job satisfaction, technology self-efficacy and organisational commitment were positively and significantly associated with teachers' attitude towards use of educational technology. Other variables like age, teaching experience and gender did not have a statistically significant effect on instructors' attitude towards the use of educational technology.

Keyword: Attitude, Gender, Job satisfaction, Ordinal logistic regression, Organisational commitment, Technology self-efficacy

INTRODUCTION

Over the past decades, advances in technology, especially in information communication technology have changed practices in teaching and learning by making the classroom instruction more student-centered. Students' roles have changed from passive learner to collaborator and occasional expert. Educational goals changed from memorization of facts to inquiry, invention, and investigation (Jurist, 1999). It is important for educators, as well as learners to keep up with the current trends and innovations as judicious use of technology in classroom instruction, could be an important step in bridging the gap between student's interest and teacher's knowledge. Technology changes the way teachers teach, offering teachers effective ways to reach different types of learners and assess students' understanding through several means (Grant and Basye, 2014). The concept and meaning of educational technology (ET) have evolved over the years. When the term was first coined, it referred to "technology in education", implying the use of a variety of audio-visual aids for teaching purposes (Hegde, 2014). As the advances in technology continued, the scope of ET widened as the teaching-learning process and the term "technology of education" came into vogue. The arrival of digitally convergent media encouraged interactivity and interconnectivity and added a new dimension to ET (NCERT, 2006). While this field continues to evolve rapidly, the problem of how to change the attitude and action of instructors in Indian classroom instruction within the prerogative of agricultural higher education system towards efficient integration of ET become more prominent one. Integration of educational technology is advantageous for both learners and teachers. It motivates students by gaining more attention and make learning more interactive. It gives support for new instructional approaches, such as cooperative learning, shared intelligence, problem solving and higher level skills. On the other hand, ET also increased teachers' productivity by

*Corresponding author email id: rakshitshantanu90@gmail.com

providing more accurate information quickly and allowing teachers to produce better looking "student friendly" materials swiftly. Ultimately it increases students' as well as teachers' performance and creates a better interactive instructional environment. But, integrating technology in classroom instruction is a complex process. It includes learning the technology, using technology in the teaching and learning process and integrating technology to enhance student learning (Dockstader, 1999, Singh, 2013). Teacher's' attitude is a determining factor in utilization of technology in classroom teaching, which in turns affected by various internal and external factors associated with an instructor in social and professional environment. Significance of integration of ET in the Higher Agricultural Education System is greater as it required practical orientation and aimed to develop entrepreneurial ability. Importance of ET and attitude towards different form of ET in higher agricultural education system have been well recognized (Singh and Prasad, 2017). For extension of agricultural technology competency in selection, use and handling of extension teaching methods and audio-visual aids are very imperative (Choudhary *et al.*, 2013). Thus, the present study was undertaken to analyze the teacher's attitude towards use of educational technologies with special reference to agricultural higher education system and also to ascertain the influence of socio-personal and psychological characteristics on teacher's attitude towards use of educational technology.

MATERIALS AND METHODS

This study was conducted among the trainers and instructors of Govind Ballabh Pant University of Agriculture and Technology, Pantnagar. A Pre-tested questionnaire carefully crafted based on the output from instructors of multiple agricultural universities across India was used as a tool for data collection. From among several colleges for agriculture and allied subject within the university, 50 per cent of teachers from each college were selected randomly in the sample by using random number table. The questionnaire was either e-mailed or presented personally to the teacher respondents. Total of 85 complete questionnaires were finally retained after careful scrutiny for final inclusion into analysis from among received.

In this study age has been operationalized as the chronological age of the respondents at the time of interview, expressed in number of years (rounded off). The teaching Experience has been operationalized as years of service completed as teacher at the time of investigation. The teaching experience has been operationalized as years of service completed as teacher at the time of investigation. Job satisfaction has been operationalized as degree of satisfaction or dissatisfaction of teacher with various factors of his or her job, which they perform in teaching institution. For measuring this aspect, scale developed by Gautam *et al.* (2006) was adopted. Technology Self-efficacy has been defined as the individual's perceived ability to use technology for instructional purposes (lesson preparation, lesson delivery, evaluation, communication and administrative record keeping). For measuring this aspect, scale developed by Oniya and Oniya (2011) was adopted. Organizational commitment is an attitude reflecting an employee's loyalty to the organization, and an ongoing process through which organization members express their concern for the organization and its continued success and wellbeing. For measuring this aspect, scale developed by Porter *et al.* (1974) was adopted.

The attitude towards use of educational technology refers to the mental state of readiness, organized through experience, exerting a directive and dynamic influence upon the individual's response towards the use of educational technology. For measuring this aspect, a Likert scale was developed and the responses were collected on five point continuum *viz.* strongly agree, agree, undecided, disagree and strongly disagree by giving scores of 5, 4, 3, 2 and 1 for positive statements and 1, 2, 3, 4 and 5 for negative statements respectively. The scale was developed based on the steps suggested by Edward (1957). As many as 28 statements having the 't' values equal to or greater than 1.75 were chosen in order to form the final scale. This has as many as 15 favourable and 13 unfavourable statements.

Pearson product moment correlation was utilized to find out association between socio-personal factors and attitude. Independent sample t-test and ordinal logistic regression model was utilized to find out magnitude of effect of socio-personal factors on attitude of instructors.

RESULTS AND DISCUSSION

Attitude of instructors towards use of educational technology: Based on their summated score on attitude scale agricultural instructors were classified into three broad categories by using the cumulative square root method as presented in Table 1. It was found that most of the present instructors had medium to highly favourable attitude towards using latest educational technologies in delivering instruction to the learners as evident from about 73 per cent of total respondents belonged to last two categories.

Table 1: Distribution of respondents on the basis of the attitude towards use of educational technology (n=85)

	Categories	Frequency	Percentage
Attitude	Less favourable (≤107)	23	27.06
	Medium Favourable (108 - 115)	35	41.18
	Highly favourable (≤116)	27	31.76

Association of socio-personal variables on attitude of instructors towards use of educational technology: The association of selected socio personal variables was visualized primarily by employing the Pearson correlation coefficient and later the magnitude of effect was determined by using ordinal logit model of regression analysis. Data regarding correlation between attitude and other selected profile variables have been presented in Table 2. Age and teaching experience of instructor had no significant correlation with attitude towards use of educational technology. On the contrary to this finding Cavas *et al.* (2009) found that young Turkish science teachers (age group: 20-35) had more positive attitudes and significantly different than the teachers in other groups. Rana (2012) reported significant difference in teacher educators' attitude towards technology integration in classrooms with respect to age of teacher. Younger age group scored lower than the middle age group. Elsaadani (2012) reported a moderate and positive relationship between teaching staff's age and their attitude. But present study confirmed job satisfaction, technology self-efficacy and organizational commitment had positive and significant relationship (r=0.261, 0.541 and 0.370, respectively) with attitude towards use of educational technology that implied with the increase in job satisfaction, technology self-efficacy and organizational commitment, attitude get more favourable towards use of educational technology in classroom instruction. Rakshit and Sharma (2015) reported that teachers experienced several constraints in utilization of educational technology like lack of technical support and advice, lack of maintenance for the upkeep of instructional technologies, lack of supporting hardware and software, lack of training in handling latest technology, lack of knowledge in instructional technology, lack of understanding related to technology integration, inadequate knowledge of technology-supported pedagogy. These constraints may also primarily negatively affect job satisfaction and technology self-efficacy and ultimately generate an unfavourable attitude towards integration of educational technology in classroom instruction. Abbitt and Klett (2007) and Ling (2011) found a strongly positive relationship between technology self-efficacy and attitude towards integration of educational technology in their study among pre-service educators which is in agreement with result of the present study.

Table 2: Correlation between attitude and other profile variables (n=85)

Variables	r-value	p value
Age	-0.128	0.244
Teaching Experience	0.011	0.922
Job satisfaction	0.261*	0.016
Technology Self-efficacy	0.541**	<0.001
Organizational commitment	0.370**	<0.001

**Correlation is significant at the 0.01 level of significance (2-tailed)

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

For finding out the gender differences in attitude towards use of education technology an independent-samples t-test was performed. The results of attitude according to gender are shown in Table 3 and 4. The t-test for equality of means (Table 4) reveals that there was no significant difference between male and female teachers' attitude towards use of educational technology.

There exists significant disagreement over gender differences in attitude toward use of modern educational technology and its application. Wong and Hanafi (2007); Cavas *et al.* (2009); Alkan and Erdem (2010); Kulkarni (2012); Rana (2012) studied gender differences in attitude towards integration of different educational technologies and found no significant difference in attitude toward integration of educational technology in terms of gender. On the other hand, Ozdamli *et al.* (2009) and Zhou *et al.* (2010) reported that male teacher candidates had more

Table 3: Attitude according to gender

Group Statistics					
	Gender	n	Mean	Std. Deviation	Std. Error Mean
Attitude	Male	55	113.509	11.536	1.555
	Female	30	110.500	13.848	2.528

Table 4: Independent Samples Test

Attitude	Levene's Test for Equality of Variances		t-test for Equality of Means				
	F	p-value	t-value	df	p-value	Mean Difference	Std. Error Difference
Equal variances assumed	0.853	0.358	1.070	83	0.288	3.009	2.813

positive attitudes than female teacher candidates. Adams (2002) in a study 'educational computing concerns of postsecondary faculty' studied full and part-time faculty members teaching at a higher education institution and indicated that females display a greater integration average than do males. So, majority of the study reported no difference in attitude in terms of gender but few studies reported superiority of one against another.

Table 5: Summary of the regression model

Model	Model Fitting Information			
	-2 Log Likelihood	Chi-Square	df	p-value
Intercept Only	184.168			
Final	138.697	45.471	7	<0.001
Link function: Logit.				
Goodness-of-Fit				
Pearson	156.621	115	0.006	
Deviance	138.697	115	0.066	
Link function: Logit.				
Pseudo R-Square				
Cox and Snell	0.414			
Nagelkerke	0.468			
McFadden	0.247			

Link function: Logit.

An ordinal logistic regression model was used to find out the determinants of teachers' attitudes towards the use of educational technologies in classroom instructions (Table 6). The model fitting information showed that the chi-square statistic ($p<0.001$) was statistically significant which indicates that the final model gives a significant improvement over the baseline intercept-only model (Table 5). So, it can be inferred that the model gives better predictions than if we just guessed based on the marginal probabilities for the outcome categories (Elamir and Sadeq, 2010). As for ordinal logistic regression models, it is not possible to compute the R^2 statistic (the coefficient of determination) like linear regression so three approximations are computed instead. Here, the pseudo R^2 values (*e.g.* Nagelkerke R^2= 46.8 %) indicates model can account for 46.8 per cent of the variance in teachers' attitude towards use of educational technology.

The Parameter estimates table revealed specifically about the relationship between explanatory variables and the outcome (Table 6). The parameter estimates table

Table 6: Determinants of teachers' attitude towards the use of educational technology (n = 85)

Parameter Estimates		Estimate	Std. Error	Wald	df	p-value
Threshold	[Attitude = 1.00]	14.368	4.682	9.417	1	0.002
	[Attitude = 2.00]	17.033	4.809	12.548	1	<0.001
Location	Age	-0.027	0.059	0.210	1	0.647
	Teaching Experience	0.044	0.058	0.562	1	0.453
	Job Satisfaction	0.009	0.046	0.037	1	0.847
	Technology Self-Efficacy	**0.112**	0.026	18.072	1	<0.001
	Organisational Commitment	**0.217**	0.065	11.058	1	0.001
	Gender (Female =0.00)	0.068	0.512	0.018	1	0.894
	Gender (Male =1.00]	0[a]	.	.	0	.
	Training (No training received =0.00]	**1.115**	.488	5.226	1	0.022
	Training (Training received =1.00]	0[a]	.	.	0	.

Link function: Logit.

a. This parameter is set to zero because it is redundant.

shown that technology self-efficacy ($p<0.001$), organisational commitment ($p=0.001$) and training received ($p=0.022$) were positively and significantly associated with teachers' attitude towards use of educational technology. Other variables like age, teaching experience, job satisfaction and gender did not have statistically significant effect on teachers' attitude towards use of educational technology.

CONCLUSION

Educators may have a positive attitude toward integration of educational technology irrespective of age group and gender. But level of job satisfaction, technology self-efficacy, organizational commitment and training can positively influence the strength of that attitude towards use of educational technology in the time of classroom instruction. Administration of educational institute should remain more careful about the teacher's level of job satisfaction, technology self-efficacy and organizational commitment. Sufficient initiatives should be taken to monitor and improve the level of job satisfaction, technology self-efficacy and organizational commitment along with actual efficient utilization of educational technology. There is need to identify the other major factors which influence teacher's attitude as well as actual use of educational technology in classroom instruction.

REFERENCES

Abbitt, J.T. and M.D. Klett. 2007. Identifying influences on attitudes and self-efficacy beliefs towards technology integration among pre-service educators. *Electronic Journal for the Integration of Technology in Education,* 6: 28-42.

Adams, N. 2002. Educational computing concerns of postsecondary faculty. *Journal of Research on Technology*, 34(3): 285–303.

Alkan, F. and E. Erdem. 2010. The attitudes of student teachers towards educational technologies according to their status of receiving teaching application lessons. *Procedia Social and Behavioral Sciences,* 2(2): 2523–2527.

Cavas, B.; P. Cavas; B. Karaoglan and T. Kisla. 2009. A Study on Science Teachers' Attitudes toward Information and Communications Technologies in Education. *Online Submission*, 8(2): 20-32.

Choudhary, L.R.; N.K. Sharma; K.L. Dangi and P.S. Chauhan. 2013. Study on Training Needs of Agricultural Supervisors in Jaipur District of Rajasthan. *Journal of Community Mobilization and Sustainable Development*, 8(2): 270-275.

Dockstader, J. 1999. Teachers of the 21st century know the what, why, and how of technology integration. *T H E Journal*, 26(6): 73-75.

Edwards L.A. 1957. Techniques of Attitude Scale Construction. Vakils, Feffer and Simons Pvt. Ltd. Mumbai.

Elamir, E. and H. Sadeq. 2010. Ordinal Regression to Analyze Employees' Attitudes towards the Application of Total Quality Management. *Journal of Applied Quantitative Methods*, 5(4): 647- 658.

Elsaadani, M. 2012. Teaching staff' attitude toward ICT: Is Gender a Factor? *International Women Online Journal of Distance Education*, 1(2): 21-30.

Gautam, Mandal, M.K. and R.S. Dalal. 2006. Job satisfaction of faculty members of veterinary sciences: an analysis. *Livestock Research for Rural Development,* 18(6).

Grant, P. and D. Basye. 2014. Personalized learning: A guide for engaging students with technology. International Society for Technology in Education.

Hegde, A.K. 2014. Development and Validation of Computer Based Multimedia Packages for Teaching Biological Science and its Effect on Learning among Secondary School Students. Thesis, Post-Graduate Department of Studies in Education, Karnatak University, Dharwad.

Jurist, R. 1999. The promise of technology. Implications for business teacher education. *The 21" century: Meeting the challenges to business education,* (pp. 59-71). Reston, VA: National Business Education Association.

Kulkarni, M.V. 2012. A study on secondary school teachers' attitude towards using new technologies in education. *Indian Streams Research Journal*, 2(8): 1-6.

Ling Koh, J.H. 2011. Computer skills instruction for pre-service teachers: A comparison of three instructional approaches. *Computers in Human Behavior,* 27(6): 2392–2400.

NCERT. 2006. Position paper 2.6 of National focus group on educational technology. New Delhi, India, p-35

Oniya, R.C. and M. Oniya. 2011. Faculty Perception for Technology Integration in Nigeria University System: implication for faculty quality curriculum design. *International Journal of Business and Social Science*, 2: 1.

Ozdamli, F.; C. Hürsen and Z. Özcinar.2009. Teacher candidates' attitudes towards the instructional technologies. *Procedia Social and Behavioral Sciences*, 1: 455-463.

Porter, L.W.; R.M. Steers; R.T. Mowday and P.V. Boulian. 1974. Organizational commitment, job satisfaction, and turnover among psychiatric technicians. *Journal of Applied Psychology,* 59: 603-609.

Rakshit, S. and G. Sharma. 2015. Constraints Experienced by Teachers in Utilization of Educational Technology: A Study in State Agricultural University. *Indian Journal of Extension Education,* 51(3 and 4): 71-74.

Rana, N. 2012. A study to assess teacher educators' attitude towards technology integration in classrooms. *Journal of Educational Studies, Trends and Practices*, 2(2): 190-205.

Singh, O.P. and A. Prasad. 2017. Attitude towards Audio Cassette Technology among the Students of Post Graduate Agricultural Colleges. *Journal of Community Mobilization and Sustainable Development*, 12(2): 306-310.

Singh, U. 2013. Factors relating to technology integration in education by the pre-service and the in-service teachers. *IOSR Journal of Humanities and Social Science*, 11(3): 3-12.

Wong, S.L. and A. Hanafi. 2007. Gender Differences in Attitudes towards Information Technology among Malaysian Student Teachers: A Case Study at University Putra Malaysia. *Educational Technology and Society*, 10 (2): 158-169.

Zhou, Q.; J. Hu and S. Gao. 2010. Chemistry Teachers' Attitude towards ICT in Xi'an. *Procedia Social and Behavioral Sciences,* 2 (2): 4629–4637.

Received on February, 2019, Revised on June 2019

Journal of Community Mobilization and Sustainable Development Vol. 14(2), 219-223, May-August, 2019

Assessing the Level of Knowledge of Agro-ecological Bases of Contemporary Water Management Innovations (CWMI) in Dryland Agro-Ecosystem and Analysis of their Correlates

Sanjay Kumar Gupta*, D.U.M. Rao, R.R. Burman, Reshma Gills, Dinesh Kumar Sharma and Arpana Bhowmik
Division of Agricultural Extension, ICAR-Indian Agricultural Research Institute, New Delhi-110012

ABSTRACT

CWMI are those belonging to or occurring in the present living times or occurring at the same time as new integrated technology and practices developed by farmers and few researchers like water harvesting, water sharing, water saving or protective irrigation and community mobilization, etc. Farmers need to understand the scientific problem solving approaches behind the contemporary water management innovations that they have evolved during agro-ecological crises. Some of the technological innovations and institutional innovations developed by few research institutes supporting farmers at the time of crisis. So even under this distressed condition, farmers will be able to survive although at a subsistence level. The efficacy of these CWMI were assessed and analysed. The major finding were: All the farmers shared the agro-ecological principles and rationale behind the community participation and community management of common property resources of rain water, through rain water harvesting, saving, sharing and using judiciously through micro-irrigation systems. All the farmers have comprehensively understood the agro-ecology behind hydrological cycle of water harvesting and water saving for future contingencies. As the farmers have had undergone great stress periods during times of agro-ecological crisis, they were all appreciating the value of scarce water resources for their livelihood security.

Keywords: Agro-ecological bases, Level of knowledge, Contemporary water management innovations (CWMI) and dryland agro-ecosystem

INTRODUCTION

CWMI are those belonging to or occurring in the present living times or occurring at the same time as new integrated technology and practices developed by farmers and few researchers. The importance of these CWMI is great for those farmers, who have survived in a specific agro-ecosystem, faced several crises and evolved new indigenous innovations. These innovations are culturally compatible, environmentally friendly and in harmony with nature. The Farmers, who innovated, have amply understood comprehensively the rationale behind these water management innovations in their specific agro-ecosystems. Now in order that these contemporary innovations get diffused to other farmers living in similar dryland agro-ecosystems, the farmers of those agro-ecosystems need to first understand comprehensively the agro ecological bases or rationale of the CWMI to accept, adopt and continue their sustained use. The scientific explanations behind the agro-ecological components of contemporary water management innovations need to be understood thoroughly by the farmers. Agro-ecological principles associated with any of the sustainable farming practices and reasons and rationale behind the science of agro-ecology have great significance for sustainable agriculture. A thorough analysis of all these different alternative solutions to agrarian crisis has revealed that agro-ecology is at the heart of all these alternative farming systems. Hence, farmers need to understand the science of agro-ecological bases of sustainable agricultural practices. Agro-ecology is therefore increasingly recognized as the way forward for sustainable agriculture, capable of delivering productivity goals without depleting the environment and disempowering communities.

Agro-ecology is "the application of ecological science to the study, design, and management of sustainable agriculture" (Altieri, 1995). Agro ecology, which uses

*Corresponding author email id: sanjay.gupta526@gmail.com

ecological concepts and principles for the design and management of sustainable agricultural systems, has consistently proven capable of sustainably increasing the total output of diversified farms, and has far greater potential for fighting hunger, particularly during economically and climatically uncertain times. The scientific basis to sustainably enhance productivity, agro-ecology emphasizes the capability of local communities to innovate, evaluate and adapt themselves through farmer-to-farmer research and grassroots extension approaches. Agro-ecological approaches emphasize diversity, synergy, recycling and integration, and social processes that value community involvement, with human resource development as the cornerstone of any strategy aimed at increasing options for rural people and especially resource-poor farmers (Altieri, 2002).

Therefore, the present study was conducted for comprehensive understanding of the agro-ecological bases of different contemporary water management innovations being practiced by farmers of dryland agro-ecosystem and the knowledge of the agro-ecological rationale of the farmers is presented.

MATERIAL AND METHODS

The study was conducted in dryland agro-ecosystem of Andhra Pradesh. District Ananthapur (Rayalaseema region) was purposively selected as large number of farmers were facing very grave situation in Ananthapur due to agro-ecological crises (The Hindu, 2017). A pilot study was conducted before the actual start of research work to check the availability and time taken by the farmers in this areas. The level of knowledge (Barua, 2015) was defined as level of awareness and accuracy of information possessed by the farmers on the agro ecological bases (roots / principles) of selected five water management practices of dryland agriculture. The responses of farmers were taken in the form of close ended questions and coded as 1 for correct answer and zero for wrong answer given by the respondent. A total of 26 items were developed in which maximum possible scores was 26. The knowledge index was developed by dividing obtained scores over obtainable scores multiplied by hundred for all five water management innovations separately and for the whole knowledge test. The logistic regression model was used for regression analysis with its correlates. Data collected from 120 farmers were analysed with the help of SPSS 20.0 and Excel Stat software to draw valid conclusion.

RESULTS AND DISCUSSION

It can be seen from the results in the Table 1, mean knowledge index score of farmer respondents was 90.67. This means that the farmers on an average had very high level of knowledge on water sharing processes. The standard deviation was 3.06 indicating very high consistency among the sample of farmers. The scores ranged from 80.77 to 96.15 out of a total of 100. Majority (68.33%) of farmers found to possess high level of knowledge about the agro-ecological reasons behind the contemporary water management innovations. The frequency distribution of farmers on their level of knowledge appeared to be highly skewed towards higher scores of knowledge on agro-ecological bases of water management innovations.

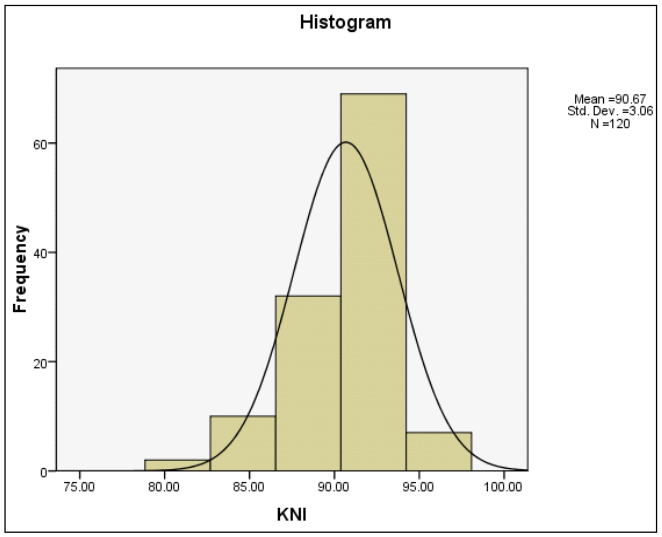
Table 1: Distribution of farmer respondents on knowledge index of respondents on water management innovations

Knowledge Index of Respondents	**n=120**	
Mean	90.67	
Standard Deviation	3.06	
Range	80.77 – 96.15	
Frequency Distribution	**Frequency**	**Percent**
Low (<87.61)	17	19.40
Medium (87.61 -93.73)	15	12.27
High (>93.73)	88	68.33
Total	**120**	**100.00**

The graph of normal distribution shown below clearly represented the high level of knowledge among farmers. Majority of farmers, being the members of water sharing groups had been well exposed to all the details of the agro-ecological rationale behind water management innovations. It also appears that all of them had imbibed and learnt thoroughly the key agro-ecological concepts and principles behind rain water harvesting, water sharing and water management innovations.

Having seen the overall score of knowledge on all the five water management innovations, an attempt was made to assess the level of knowledge separately for all the five water management innovations, *viz.,* rain water harvesting innovations, water saving innovations, micro-irrigation innovations, conservation agronomic innovations and water sharing institutional innovations.

***Level of knowledge of rain water harvesting*:** The level of knowledge of rain water harvesting practices can



be measured as level and accuracy of information on the agro ecological bases of rain water harvesting practices including percolation pits, soaking pits, de-silting of water reservoirs, farm ponds, etc. As can be explained from the results, the mean of knowledge level of farmer respondents on water harvesting was 12.78. The standard deviation was 0.61.Out of 14 items on knowledge test about 65.8 percent farmers were having high level of knowledge about 13 of the knowledge items of water harvesting practices.

Table 2: Distribution of farmer respondents on level of knowledge of rain water harvesting (WH)

Knowledge of Water Harvesting innovations	**N=120**	
Mean	12.78	
Standard Deviation	0.61	
Range	11-14	
Knowledge items	**Frequency**	**Percent**
11 out of 14 items	3	2.52
12 out of 14 items	29	4.26
13 out of 14 items	79	5.8
14 out of 14 items	9	7.5
Total	**120**	**100.00**

Majority of farmers were found to possess more knowledge on what benefits would accrue if the rainfall run off is showed down, let it percolate and rainwater harvested.

Level of knowledge of water saving practices: The level of knowledge on water saving practices can be measured as level of and accuracy of information on the agro ecological bases of water saving practices of dryland sustainable agriculture for example they were having decent knowledge about water saving by forming water sharing groups, they used to plan cropping system for whole year for proper water budgeting.

All the farmers know fully well: "*for judicious use of ground water resources, all the farmers used to form jointly a society of water users group. Farmers' need to choose only such crops that need very few irrigations. They need to conserve water. They need to formulate an agreement for providing conservation irrigation only when it is necessary to save the crop. All the farmers need to discuss and decide by consensus a few terms and conditions for running the water user group. All farmers need to adhere to these terms and conditions compulsorily without any fail. They need to make plans for cropping for the whole year through proper water budgeting procedures.*"

Farmers were found to express their understanding of the meaning and usefulness of joint ground water management, water sharing groups, water budgeting and contingent crop planning for water conservation.

Level of knowledge of micro-irrigation practices: The level of knowledge micro-irrigation can be measured as level of and accuracy of information on the agro-ecological bases of micro-irrigation of dryland sustainable agriculture. They were fully knowledgeable about water saving through micro-irrigation systems of sprinklers and drip and water use efficiency range from 85 to 98 percent. They also understand the worth of precious ground water and not to waste it anymore.

Level of knowledge of agronomic practices: The level of knowledge agronomic practices can be measured as level of and accuracy of information on the agro-ecological bases of agronomic practices of dryland sustainable agriculture. The various practices include giving life-saving irrigation at critical stages of crop growth, spacing, inter cropping, mulching thereby reducing soil moisture loss, contingent crop planning.

Farmers exhibited full levels of knowledge of agro-ecological bases of agronomic practices for soil moisture conservation and enhancing soil fertility.

Correlates of Level of Knowledge of Water Management Innovations

An attempt is made to know the correlates of level of knowledge of agro-ecological bases of contemporary water management innovations was done For this, some

selected relevant factors were studied and their possible association with the level of knowledge of the contemporary water management innovations were put to empirical testing. In this section, an effort has been made to find out the possible association between socio-personal, socio-psychological and communication variables concerning the perception level of knowledge of the contemporary water management innovations.

Table 3 shows the association between the socio-personal, socio-psychological and communication variables with their level of knowledge. As can be seen from the table, only two variables, namely, goal commitment and frequency of use of cosmopolite channels were found to be positively and significantly associated with the extent level of knowledge. They were significant at 0.01 level of probability. Frequency of contact with NGO activists has helped increase their level of knowledge. One's own goal commitment too was associated positively and significantly with one's level of knowledge of these innovations.

Table 3: Correlation coefficients of Level of knowledge of agro-ecological bases of water management innovations

Independent variable	Correlation coefficients
Age	-0.078
Education	-0.107
Farming experience	-0.071
Land size	-0.203*
Total income	-0.364**
Goal commitment	0.449**
Social norms	0.002
Social capital	-0.152
Contact with cosmopolite channels	0.238**

**Significant at 0.01 level of probability

But land size and total annual income were negatively associated with level of knowledge of water management innovations. Thus it can be concluded that poor farmers with smaller land holdings possessed higher level of knowledge. The rich and large farmers in study area were not concerned about the social institutional innovation viz. water sharing groups and social regulation programmes. The large and rich farmers just used to get involve with the poor farmers to enjoy the benefit of community managed system of water sharing groups.

Other socio-personal variable like, age, educational status (Rajeshwar, 2016), farming experience (Thakor, 1992) and social capital (Sharma, 2005) were negatively associated with extent of adoption of water management innovations. However, the social norms were not significantly associated with level of knowledge correlated.

Prediction of level of knowledge of some selected water management practices

The correlation analysis would merely give an idea about the association of independent variables with the dependent variable. In order to assess the contribution of each independent variable to the prediction of dependent variable, the data were adopted for regression analysis. In this study, ten independent variables were fitted in the multiple regression equation. The findings are presented in the Table 4.

It may be seen from the Table 4 that all selected variables explained significantly to the extent of only 38.5 percent of variation in the level of knowledge of selected water management innovation by farmers. 'F" ratio was found to be significant at 11, 108 degree of freedom. The statistical analysis thus indicated that all the selected variables taken together explained a moderately significant amount of variation in the level of knowledge of farmers on water management innovations.

Table 4: Multiple Regression Analysis of Level of knowledge of water management innovations

Socio-personal characteristics of farmers	Unstandardized Coefficients Partial 'b'	t-value	Sig.
(Constant)	103.544	16.656	.000
Age	-.050	-1.017	.311
Education status	-.024	-.440	.661
Farming experience	.035	.818	.415
Land size	-.285	-1.539	.127
Total income	-1.953E-5	-2.570**	.012
Goal commitment	1.184	4.400**	.000
Social Norms	-.463	-3.026*	.003
Social Capital	-.062	-1.391	.167
Contact with personal localite channels	.363	.343	.732
Contact with extension personnel cosmopolite channels	-.706	-.904	.368
Contact with Mass communication channels	.659	.644	.521

* Significant at 0.05 level of probability; ** Significant at 0.05 level of probability

R^2 =0.385; F Ratio at 11 and 108 degrees of freedom = 6.141**

Out of all the selected variables fitted in the multiple regression analysis three variables: total annual income, goal commitment, and social norms contributed significantly to the prediction of level of knowledge of farmers on water management innovations. As farmers' goal commitment (Singh, 1998) was found to be contributing significantly with high level of knowledge. As the farmers had high goal commitment towards ensuring their livelihood security through water harvesting, saving and sharing among themselves, their knowledge levels too increased. Adherence to social norms was another major contributor to the prediction of level of knowledge of water management innovations. This finding was quite apt here as social regulation and adhering social norms is at the core of water sharing innovation.

CONCLUSION

From the above result it can be concluded that all the farmers shared the agro-ecological principles and rationale behind the community participation and community management of common property resources of rain water, through rain water harvesting, saving, sharing and using judiciously through micro-irrigation systems. All the farmers have comprehensively understood the agro-ecology behind hydrological cycle of water harvesting and water saving for future contingencies. The knowledge levels of agro-ecological principles and hydrological cycle were very high among the majority of farmers.

REFERENCES

Altieri, M.A. 2002 Agroecology: the science of natural resource management for poor Farmers in marginal environments. In: *Agriculture, Ecosystems and Environment,* Elsevier Publishers, pp 1-24.

Altieri, M.A. and C.I. Nicholls. 2012. Agro-ecology scaling up for food sovereignty and resiliency. In Sustainable agriculture reviews (pp. 1-29). Springer Netherlands.

Anonymous. 2017. Anantapur farmers leaving agriculture in droves. http://www.thehindu.com/news/national/andhra-pradesh/anantapurfarmers-leaving-agriculture-in-droves/article19333276.ece.

Barua, S. 2015. Impact Assessment of IARI Technologies on Farming Community in Uttar Pradesh (Doctoral Dissertation, Division of Agricultural Extension Indian Agricultural Research Institute New Delhi).

Rajeshwar, J.S. 2016. A study on Scenario and Roadmap ahead of Indian Agricultural Education (Doctoral dissertation, MPUAT, Udaipur).

Sharma, A. 2005. Entrepreneurial value and social capital among the vegetable growers of Solan districts: *A critical analysis. M.Sc. thesis Choudhary Charan Singh Meerut University.*

Singh, L. 1998. Doonghatjalagampariyojnameiensaha bahagitakeghatyatmakpaksh-ekadhyan. Ph.D. thesis, ICAR-IARI-New Delhi.

Thakor, R.F. 1992. A Critical Study on Role of Farm Women in Mixed Farming Productivlty with Special Reference to Kheda District of Gujarat State (Doctoral dissertation, AAU, Anand).

Received on April, 2019, Revised on July 2019

Journal of Community Mobilization and Sustainable Development Vol. 14(2), 224-228, May-August, 2019

Assessment of Work Triangle in Rural Kitchens of Kanpur Nagar (U.P.)

Poonam Singh[1] and Nimisha Awasthi[2]

[1]Scientist (Home Science), [2]Programme Assistant (Home Science), C.S.A. University of Agriculture and Technology, Kanpur, U.P.

ABSTRACT

The present study was planned to assess the work triangle in rural kitchens of Kanpur Nagar. The Kitchen Work Triangle is a concept used to determine efficient kitchen layouts by adopting recommended relationship between cook top, sink and refrigerator .Two villages i.e. Hindupur and Dharampur villages from Kalyanpur block and Hridaypur and Kishunpur villages from Chaubepur block were selected randomly for the purpose of study. Purposive sampling was done to select 60 respondents from each village having compact kitchens, either separately or in form of enclosed verandah. The data were gathered personally by using interview, measurement and observation schedule. Results of the study reveal that 37.10 per cent kitchen's volume of space was less than recommended value. Size of doors, windows and ventilators were also less than recommended value for 88.75, 75.79 and 40.91 per cent kitchens respectively. Volume of built in shelf was less than 50 ft^3 for 78.57 percent kitchens. Preparation and washing area was almost not available in all the kitchens. The mean distance between three main work center i.e. cooking- washing area was measured 20.29 ft, washing-storage area 21.91 ft. and cooking- storage area 8.30ft. Kitchen work triangle of 85.00 percent kitchens was measured to be beyond the recommended range i.e. 22ft. Fire wood, heavy utensils and water bucket were stored outside the kitchen by most of the respondents. Almost all pre- cooking and post- cooking activities were observed to be performed outside the kitchen.

Keywords: Work triangle, Rural kitchen, Cook top, Sink, Refrigerator

INTRODUCTION

The concept of work triangle was developed in the 1940's, a time when kitchens were very small and appliances were generally very large. The kitchen was looked at as a space where only cooking and cleaning took place. But today's kitchens become hub of home, and become more multifunctional than ever. Now it becomes important to decide upon functions we want our kitchen to serve and plan the work triangle accordingly. Studies of Varghese (1990) indicated that the Indian women spend about 5-7 hours a day in a kitchen for cooking and related activities, which amount to be about 1/4th of their life period but scenario of kitchen's are still alarming in India and specifically in rural India. According to NSSO 65th round (July 2008- June 2009) about half of the households in the country did not have a separate kitchen and proportion of households without a separate kitchen in rural area is above the all India level i.e. 54.7 per cent. Lack of adequate resources prevents women from NSSO 68th round (July 2011- June 2012) also reported that 44.00 per cent of households were having hand pump facility away from the premises and major proportion of rural households i.e. 48.1 per cent had drinking water source within a distance of 200 m. from their dwellings. Oberoi *et al.* (1996) in her study also reported that the storage and work counters in kitchens were not within the normal reaches of home maker and that was one of the major reasons for discomfort. On an average rural women and children were travelling every week at least 3-6 km per trip and devote 4-6 hours for collecting fuel wood for cooking purpose Mamgai and Singh (2014).

Efficiency is the kitchen work triangle's main goal. The kitchen work triangle connects the three main work areas in the kitchen-the sink, the range and the refrigerator. The idea behind kitchen work triangle is that when these three elements are in close proximity to one other, the kitchen will be easy and efficient to use and helps keep traffic in the workplace to a minimum. The distance between the three work areas the sink, the range and the refrigerator should not be less than 4 feet and not more than 9 feet. The sum of all three sides of the triangle should be between 13 feet to 26 feet. If the distance is too small, it can make a kitchen feel cramped and blocked. If it's too large, it makes cooking a hassle. The shape of your work triangle

also differs depending on the shape of kitchen. Efficiently designing the path connecting your sink, range and refrigerator can save time and energy in the kitchen. Besides the recommended distance between the points of the work triangle, the most important thing to keep in mind is to make sure that the lines of the triangle aren't blocked by anything. The kitchen work triangle often referred to as "the kitchen triangle" is a basic but time honored principle for designing ergonomic functional kitchen. Training in the area of income generation activities and drudgery reduction technologies is utmost essential among the rural women for the improved home management practices Tripathi and Selvan (2016). Hence the Study on "Assessment of work triangle in rural kitchen in Kanpur Nagar" was planned to enhance the efficiency of women in rural kitchen by minimizing her effort through proper space organization.

MATERIALS AND METHODS

Multi-stage purposive random sampling design was used in the present study. Two blocks of Kanpur Nagar i.e. Kalyanpur and Chaubepur were selected randomly. For selection of villages, list of villages under each block was procured from the block development offices, out of which two villages from each block were selected randomly. From Kalyanpur block Hindupur and Dharampur villages and from Chaubepur block, Hridaypur and Kishunpur villages were selected for the study. Total number of households in each selected village was obtained from the family register maintained by gram pradhan of each of gram sabha. It provided the most up to date record of the number of families in villages. Purposive sampling was done to select all those respondents having compact kitchens, either separately or in form of enclosed verandah as a unit of inquiry. Thus total sample size comprises of 240 households. Having decided upon the composition of sample, a visit was made to each of the selected villages prior to data collection in order to establish a rapport with villagers and to ensure full confidence and co-operation from the respondent as study was related to very personal part of house. The data were gathered personally by using interview cum observation schedule. Homemakers were the key informant for the investigation. Respondents were interviewed in Hindi to maintain consistency while interviewing. In the course of the interview, if needed, further explanations were given to the respondents. Many times cross questioning technique was used for a particular response to get qualitative data. Dimensions of the kitchen elements i.e. its area, volume, size of doors, windows, ventilators, shelves, different work centers, distance between the work centers, storage of items in kitchen, places for different kitchen activities and work triangle was studied by using a metallic tape measuring 200 cm.

RESULTS AND DISCUSSION

From data pertinent to volume of kitchen are summarized in Table 1. It is clear that 34.17 per cent households had volume of space in their kitchen lower to recommended value. Only 29.58% kitchens had volume equal to recommended value and 36.25 higher to it.

It is clear from data in Table 2 that rural families were not aware of kitchen design standards and dimension of majority of their kitchen elements were less than the recommended values. More than half of the rural kitchens were in the form of enclosed veranda so; only 121 kitchens doors had structures to close them. For the purpose of study all 240 doors were taken into account. Analysis of data reveals that 88.75 per cent of the doors had lower and 7.92 per cent had dimensions higher than the recommended value. Only 3.33 per cent kitchens were as per the recommendation for the size of door.

Air circulation is vital part of kitchen design. Fresh and filtered air is the best way to battle bad air flow in any kitchen. Of course windows and ventilators may help achieve freshness of air in kitchen. Data in table above further reveals that only 129 rural kitchens had windows and the size of windows showed that majority 75.97 per

Table 1: Distribution of rural kitchens by its volume (N=240)

Volume of kitchen (ft^3)	Separate kitchen		Enclosed varanadah		Total	
	Frequency	Per cent	Frequency	Per cent	Frequency	Per cent
Less than recommended value	29	27.10	53	39.85	82	34.17
Equal to recommended value	33	30.84	38	28.57	71	29.58
More than recommended value	45	42.06	42	31.58	87	36.25
Total	**107**	**100.00**	**133**	**100.00**	**240**	**100.00**

Recommended value for volume of kitchen is 360 to 540 ft^3 Deshpande (1965), Soundaraj (1982)

Table 2: Distribution of rural kitchens by dimension of their elements (N=240)

Elements of Kitchen	Frequency	Per cent
Dimension of Doors (ft.^{2})		
Less than recommended value	213	88.75
Equal to recommended value	8	3.33
More than recommended value	19	7.92
Total	**240**	**100.00**
Dimension of windows(ft^2)		
Less than recommended value	98	75.97
Equal to recommended value	6	4.65
More than recommended value	25	19.38
Total	**129**	**100.00**
Dimension of ventilators (ft^2)		
Less than 1.5 feet^2	36	40.91
1.5 to 3.0 feet^2	33	37.5
More than 3 feet^2	19	21.59
Total	**88**	**100.00**
Volume of built-in -shelf (ft.^{3})		
Less than 50	88	78.57
51 to 100	13	11.61
101 to 150	06	5.36
151 to 200	03	2.68
Above 200	02	1.78
Total	**112**	**100.00**

Recommended size of door 210 x 90 cm Oberoi (1995-96)
Recommended size of the window is 120x90 cm Oberoi (1995-96)

cent of the kitchens had window dimensions lower and 19.38 per cent higher to recommended value. Only 4.65 per cent kitchens had windows of recommended dimensions. Ventilators in rural kitchens were a rarity, found only in 36.67 per cent of them. Ventilator dimensions are categorized in three groups based on their area. Analysis of data reveals that area of ventilators in most (40.91 per cent) of the cases was less than 1.5 sq. ft. followed by 37.5 per cent kitchens with ventilators of 1.5-3.0 sq.ft. dimension. Only 21.59 per cent of the kitchen had ventilators of above 3 sq.ft. dimension.

Data pertinent to volume of built-in shelves in applicable cases of 112 kitchens were analyzed and found that the volume of storage space ranged between 1.4 to 206.35 ft^3 with mean volume of 30.53 ft^3. Majority of the kitchens (78.57 per cent) had volume of storage shelves lesser than 50 ft.^{3}, 11.61 per cent between 51 to 100 ft.^{3}, 5.36 per cent between 101 to 150 ft^3 and 2.68 per cent between 151-200 ft^3. Only 1.78 per cent kitchens had storage shelves with volume of space above 200 ft.^{3}

Table 3: Distribution of kitchens by the availability of work centers (N=240)

Work centers	Frequency	Per cent
Cooking area	240	100.00
Preparation and mixing area	8	3.33
Storage area	193	80.42
washing area	0	0.00
Total	**441**	**183.77**

Total exceeds due to multiple responses

It is evident from the Table 3 that all the household surveyed had facility of cooking area inside the kitchen where as only 3.33 per cent had preparation and mixing area too within the kitchen. As many as 80.42 per cent kitchens had storage area in one or the other form inside the kitchen. None of the kitchens had washing area situated inside the kitchen.

Table 4: Mean distance between different work centers of kitchen (N=240)

Work centers	Mean distance (ft.)
Cooking- washing area	20.29
Washing -preparation area	15.67
Preparation -storage area	13.99
Washing-storage area	21.91
Cooking- storage area	8.30
Preparation- cooking area	9.23
Total	**89.39**

Distances between different work centers in the kitchens were measured and mean was computed Table 4. Farthest mean distance of 21.91 feet was measured between storage and washing area followed by 20.29 feet between cooking and washing area. Distance between preparation and washing area was 15.67 feet followed by 13.99 feet between preparation and storage area. Mean distance between cooking to preparation area was 9.23 feet and cooking to storage area 8.30 feet. Summing up the mean distance between different work centers, it is clear that 89.39 feet was covered by the rural women in a day to complete all her kitchen activities which is contrary to the recommendation that work triangle should not exceed 22 ft. Mullick (1997).

Tale 5 Distribution of kitchens by the work triangle (N=240)

Work triangle	Frequency	Per cent
Within recommended range	36	15.00
Beyond recommended range	204	85.00
Total	**240**	**100.00**

Recommended distance of the work triangle is 22ft. Mullick (1997)

It is clear Table 5 that the work triangle in the kitchens of 85.00 per cent rural families was beyond the recommended range. Only in the 15.00 per cent kitchens work triangle layout was as per recommendation.

It is evident Table 6 that out of respondents storing kitchen useable inside, majority, i.e., 70.42, 65.42 and 75.83 per cent respondents stored condiments and spices, grocery and cooked food respectively, inside the kitchen whereas out of kitchen usable stored outside, 61.25, .64.16 and 78.75 per cent respondents stored firewood, heavy utensils and water buckets, respectively, outside. Daily used utensils and fruits/vegetables, were stocked in almost equal frequency (about 50 per cent) both inside and outside of the kitchen.

As far as mean distance from cooking area is concerned firewood was stored farthest (20.96 feet) from cooking area followed by (13.07 feet) water bucket. Cooked food was stored nearest (5.59 feet) to the cooking area followed by daily used condiments (6.71 feet), grocery (6.96 feet)

Table 6: Distribution of kitchens based on storage of kitchen items (N=240)

Items	Outside kitchen		Inside kitchen		Mean Distancefrom
	Frequency	Per cent	Frequency	Per cent	cooking area (ft.)
Firewood	147	61.25	83	34.58	20.96
Daily used condiments and spices	71	29.58	169	70.42	6.71
Daily used utensils	124	51.67	116	48.33	9.42
Heavy utensils	154	64.17	86	35.83	10.93
Grocery	83	34.58	157	65.42	6.96
Water bucket	189	78.75	51	21.25	13.07
Vegetables/fruits	119	49.58	121	50.42	7.95
Cooked food	58	24.17	182	75.83	5.59

Table 7: Distribution of kitchens by place for different kitchen activities (N=240)

Activities	Outside kitchen		Inside kitchen		Mean distance from
	Frequency	Per cent	Frequency	Per cent	cooking area (ft.)
Pre-cooking					
Collection of firewood	136	56.67	88	36.67	19.54
Fetching water	211	87.92	29	12.08	19.35
Washing vegetables	230	95.83	10	4.17	14.25
Peeling and chopping vegetables	195	81.25	45	18.75	9.14
Grinding masala	203	84.58	37	15.42	10.92
Sieving flour	206	85.83	34	14.17	10.02
Kneading dough	44	18.33	196	81.67	3.45
Cooking					
Rolling and puffing chapatti	0	0.00	240	100.00	0.00
Frying vegetables	0	0.00	240	100.00	0.00
Cooking vegetables	0	0.00	240	100.00	0.00
Post-cooking					
Serving meal	166	69.17	74	30.83	8.43
Sweeping	0	0.00	240	100.00	N.A.
Mopping	0	0.00	240	100.00	N.A.
Dishwashing	238	99.17	02	0.83	20.90

and vegetables and fruits (7.95 feet). Heavy utensils (10.93 feet) were placed a little farther (1.51 feet) than daily used utensils (9.42 feet). It is evident from the Table 7 that rural respondents prefer to perform most of the pre-cooking (excepting kneading dough) and after-cooking activities out of their kitchens. For actual cooking they were bound to work inside due to placement of chulha inside the kitchen. Hence all the respondents perform actual cooking inside kitchen. For pre-cooking activities it is seen that 56.67 per cent respondents keep firewood out of their kitchens with only 36.67 per cent storing it within the kitchen. Water was fetched by 87.92 per cent respondents from outside house as they did not have tap water or hand pumps within their kitchen. Above 80 per cent of the respondents' sieved flour, washed peeled and chopped vegetables and ground masala outside their kitchens. Kneading dough was exceptional 81.67 per cent respondents did it within the kitchens.

About 70 per cent respondents preferred to eat outside of their kitchens. Only 30.83 per cent had their meals inside. Dishwashing was done almost universally (99.17 per cent) outside the kitchen as respondents did not have water facility inside the kitchen. Activities performed at the farthest mean distance from the cooking area were dishwashing (20.90 feet) followed by collection of firewood (19.54 feet) and fetching water (19.35 feet). Sieving flour, washing vegetables, peeling and chopping these, grinding masala and serving meals were done at mean distances of 10.02, 14.25, 9.14, 10.92 and 8.43 feet, respectively. Kneading dough was found to be performed at the least distance of 3.45 feet, may be due to storage of flour bin inside kitchen.

CONCLUSION

It can be concluded from the study that with the change in time the state of rural kitchens are not changing and circumstances of women working in them are still pitiable. More than half of the families were not having separate kitchens and those having; their volume of kitchen space was less than recommended value. Size of door, windows and ventilators were also not at par with recommendations. Storage space in the form of built- in -shelf was also not appropriate and most of the kitchens were lacking preparation and washing area inside the kitchen. The mean distance between the work centers were more than the recommendations. Fire wood, heavy utensils and water bucket were stored outside the kitchen by most of the respondents. Almost all pre-cooking and post-cooking activities were performed outside the kitchen. Thus all these situations make the kitchen work triangle beyond the recommended range. Through efficient planning of three main work centers of kitchen to minimize the distance of work triangle, the time and energy load on rural women can be reduced.

REFERENCES

Deshpande, R.S. 1965. Grouping and Synthesis of a home. Modern Ideal Houses for India. Puja Pustak corporation, Agra, pp. 44-47.

Mamgai P. and J.P. Singh. 2014. Resources and use pattern of Bio-fuels by rural women of Bikaner district in Rajasthan. *Journal of community mobilization and Sustainable Development,* 9(2): 186-191.

Mullick, P. 1997. Handbook of Homemakers. Kalyani Publishers, New Delhi, pp. 12-16.

NSSO 65th round (July 2008- June 2009). Housing Condition Survey, National Sample Survey Office, M/o Statistics and programme implementation (MOSPI), Government of India.

NSSO 68th round (July 2011- June 2012). Nutritional intake in India, National Sample Survey Office, M/o Statistics and programme implementation (MOSPI), Government of India.

Oberoi, K. 1995-1996. Annual Report of All India co-ordinated research project in Home Science. Department of Home management, Punjab Agriculture University, Ludhiana, pp. 48-50.

Oberoi, K.; V.K. Sharma and S. Saxena. 1996. Ergonomic study of Kitchen Activities in Ludhiana district. Progress report of the ICAR Ad, Hoc research Scheme, Punjab Agricultural University, Ludhiana.

Soundaraja, S. 1982. Home, sweet homes- A text book of Household arts. Orient Longman limited, Madras, pp. 1-9.

Tripathi, K. and T. Selvan. 2016. Identification of training needs of rural females in improved home and farm managerial practices in western Uttar Pradesh. *Journal of community mobilization and Sustainable Development*, 11(1): 24-28.

Varghese, M.A.; N. Atreyua and A. Bhatnager. 1990. A study on energy balance among full time house wives in urban area. *Current Research in Home Science,* 2(1): 6-8.

Received on March, 2019, Revised on May 2019

Journal of Community Mobilization and Sustainable Development Vol. 14(2), 229-236, May-August, 2019

Constraints Experienced by the KVKs Scientists and Beneficiaries for Improvement of KVKs Performance: A Study in Uttarakhand, India

R. Ranjan[1], M.A. Ansari[2], S. Shekhar[1], C.V. Singh[3] and R.K. Singh[4]

[1]Krishi Vigyan Kendra, Jainagar, Koderma, Jharkhand

[2]Department of Agriculture Communication, G.B. Pant University of Agriculture & Technology, Pantnagar

[3]Central upland Rice Research Station, Jharkhand

[4]Krishi Vigyan Kendra, Hazaribag, Jharkhand

ABSTRACT

Krishi Vigyan Kendra's (KVKs) are grass root level institution imparting agricultural extension activities for the rural people. Undoubtedly agricultural extension activities helping in improving the knowledge and changing in skill. Constraints refer to the item of difficulties faced by trainers and trainees. The present study explored the constraints and suggestions perceived by the KVK scientists and beneficiaries' for Improvement of KVKs Performance. The study was conducted in the state of Uttarakhand, with two purposively selected KVKs Dhakrani representing the plains region of Garhwal division and Bageshwarre presenting the hill region of Kumaon division. A simple random sampling technique was used to select 8 respondents from scientific staff from the both KVKs and 160 respondents from eight villages from both KVK. It was revealed that the lack of transport facilities for scientists and farmers (I rank) in organizing effective training programme, difficulties in selection of demonstration plots in the hills (I rank) in organizing effective front line demonstrations (FLDs), lack of trust by farmers about the potential of the on farm trial (OFT) technologies (I rank) in organizing effective on farm trial (OFTs), Non availability of adequate manpower (I rank) in organizing effective other extension activity are the major constraints perceived by KVKs scientists in organizing agricultural extension activities. All these constraints can be overcome by implementing suggestions by scientists like Recruitment staff with multidisciplinary knowledge (I rank) in organizing effective training programme, training Subject Matter Specialist (SMSs) to understand what is FLD first, then conducting demonstration (I rank) in organizing effective FLDs, correct procedure of conducting OFT must be followed (I rank) in organizing effective OFTs, delegation of more financial and administrative power to programme coordinators (I rank) in organizing effective other extension activity. Lack of practical exercise during training programmes (I rank), needs not assessed before training (II rank), lack of transport facilities for field visit (III rank) are major constraints perceived by the KVKs beneficiaries. The results of the study will provide direction which may be of significant for extension agencies, to design appropriate strategies and to back up future planning and enhance the pace of adoption of farm technologies.

Keywords: Constraints and strategies, Krishi vigyan kendra, Performance, Agricultural extension

INTRODUCTION

The India is predominantly an agrarian economy with more than 72 percent of population in villages depending on agriculture, animal husbandry and allied activities for their livehood. Agriculture and allied sectors are undoubtedly the largest livelihood provider in India, especially in the rural areas. India is basically an agrarian economy and agriculture is a critical sector of the economy but still farmers are among the poorest in the world. The impending challenge of ever-increasing population and decreasing land under cultivation has added urgency to explore the ways and means for increasing agriculture productivity and production efficiency. By the year 2020, we will need to reach a food grain production level of about 296.6 MT from the present level of 264.38 MT (2013-14). Hence, there is an immediate need of vibrant, dynamic and innovative approach to be adopted for agricultural extension in order to achieve targeted growth rate and serve the farmers better.

Responding to the challenge Indian Council of Agricultural Research (ICAR) established a new and innovative sub-system in the existing national extension system to provide back-up support to rationalizing technology transfer activities in the country. Thus, Krishi

Vigyan Kendras (KVKs) were initially established as grassroots level vocational training centre to improve the knowledge and skills of practicing farmers through need based and demand driven agro-advisory services besides making quality agri-inputs available to the farmers. Accordingly, the KVK network has increased in number as well as coverage and became the focal point of transfer of technology (TOT) activities through its diverse and varied profile of activities in meeting the expectations of the farming community. KVK are mandated to promote agriculture and rural development through its diverse activities like OFT, FLD, capacity building, updating knowledge & skills of extension personnel and farmers.

Since the establishment of the first KVK at Pondicherry in 1974, the number of KVKs has grown to more than 650. ICAR has emphasized that "KVKs are grassroots level organizations meant for application of technology through assessment, refinement and demonstration of proven technologies under different 'micro farming' situations in a district " (Das, 2007). A number of research studies have indicated limited success of KVKs in terms of impact on the intended beneficiaries. As the number of KVKs continues to grow, the quality of performance becomes prime concern to understand factors which contribute to the success or failure of KVKs. At one of the national gatherings of KVKs, it was emphasized that we are far from realizing the ideals of KVK except in a few of them (Prasad 1989).

Training is an instrument to induce change in behaviour of individuals for personnel social or organizational effectiveness (Kumar and Hansra, 2000). Therefore, training is organized for updating the knowledge and acquiring new skill for improving the working efficiency of the participants. Shetay and Mahurkar (1991) reported that constraints at training institute includes lack of infrastructure facilities, lack of proper management which result in creating discontent among the trainers, Inadequate lodging and boarding arrangement, lack of interest among trainer, lack of provision of facility for field visit etc.

The objective of testing developed technologies, identifying constraints and formulating recommendations by conducting OFTs were not being achieved fully by KVKs. Consequently, there was no mechanism in ICAR to ensure that the information on latest crop varieties released and technologies developed by ICAR and other organizations were disseminated to KVKs for conducting FLDs. Kaur and Kaur (2013) indicate that participatory technology generation and participatory conduct, monitoring and evaluation of research and extension activities should be used to enhance the research-extension-farmer linkages.

There are a number of problems and constrains responsible for not adoption of scientific and new management practices (Kumar *et. al.,* 2017). Pandey *et al.* (2014) reported that farmers perceive extension related constraints as a major obstacle in the way of transfer of technology. The study identified some of the constraints the lack of visits, lack of farmer friendly literature, lack of training and capacity building as inadequate financial support, poor implementation of schemes, high wages and labour cost. Gaikwad and Gunjal (2000) stated that constraints faced by KVKs were grouped under three categories i.e. Technical, Administrative and Policy matter.

Further, impact evaluation of the trainings, OFTs and FLDs organized by the KVKs should be conducted periodically and identify the problems and constraints. The beneficiaries faced many problems and difficulties in taking benefits under the KVK training, OFTs and FLDs programme. Constraints refer to the factors or conditions, which limit or restrict the use of an improved practice or innovation resulting in to low production or inefficient use of resources. The present paper attempts to identify the problems and constraints along with their severity. The results may helps in strengthening the KVK training, OFTs and FLDs programme. So the present study entitled "constraints Experienced by the KVKs scientists and beneficiaries : A Study in Uttarakhand, India" was undertaken with the prime objective of identifying the major problems and constraints faced by KVKs scientists and beneficiaries during taking training, OFTs and FLDs programme in the KVKs. It will also help the workers determine how far their plans have progressed and to what extent the objectives have been achieved. Besides, it also makes an attempt to assess how far KVKs have been effective in their mandate to increase productivity among the targeted beneficiaries.

MATERIALS AND METHODS

According to Kothari (2007) research methodology is a way to systematically solve the research problem. It may be understood as a science of studying how research is done systematically. The study was conducted in the state of Uttarakhand. Thirteen KVKs have been set up at each of the district headquarters in Uttarakhand. Out of thirteen

established KVKs, nine are under GBPUAT, Pantnagar and two are under the Uttarakhand University of Horticulture & Forestry, Bharsar, and the remaining two are under an ICAR-VPKAS, Almora**.** Out of 13 krishi vigyan kendra, two KVKs - KVK Dhakrani, of Dehradun district (Garhwal division) under administrative control of GBPUAT, Pantnagar and KVK Sinduri Baskhola of Bageshwar district (Kumaon division) under administrative control of ICAR-VPKAS, Almora were selected purposively for the present study because major problems and constraints faced by KVKs scientists and beneficiaries during training, OFTs and FLDs programme in the KVKs, only those KVKs can be done which have been in existence for a reasonable period of time (5 years for the present study). Eight villages were selected from each KVKs - four villages within the radius of 05km and the other four beyond radius of 05km for each KVK. Thus total 16 villages and 10 respondents were randomly selected from each of the selected villages. Thus total 160 respondents and eight scientists were selected. For Measurement of the constraints and suggested areas for improvement of KVKs was measured with the help of scientists were asked to mention five constraints (in order of priority) that they felt as problems in organizing effective training programme, front line demonstration, on farm trial , other extension activity and the overall working of KVK. They were also asked to mention five suggestions for the same also. For the quantification of the responses, 5, 4, 3, 2 and 1 scores were assigned for I st, II nd, III rd, IV th and V th problem and their frequency were calculated. On the basis of scores obtained, the first five problems with higher frequency were included. The same procedure was followed for the suggestions also received from the scientists.

To find out the constraints experienced by the KVKs beneficiaries, a list of 20 possible statements, representing constraints experienced by KVK beneficiaries was prepared for beneficiaries. Their responses regarding each constraint were recorded on a four point continuum *viz*., 'up to high extent', 'medium extent', 'low extent' and 'not at all' with a scoring of 3, 2, 1 and 0, respectively as suggested by the experts. Weighted mean score was calculated for meaningful interpretation of results. Based on the score assigned to the both of respondents, the mean and weighted mean score were calculated and categorized into ranks. Structured and pre-tested interview schedule was personally administered to collect primary data for the study. Appropriate statistical tools like frequency and weighted mean score were used to draw the meaningful interpretation.

RESULTS AND DISCUSSION

A. Opinion of KVKs Scientists about Constraints and Areas Suggested for Improvement of KVKs Performance. In order to improve the performance of KVKs, it is necessary to study various constraints experienced by scientists during various programmes organized by the KVKs. It helps in making useful suggestions for bringing the desirable changes. That is why an attempt was made in the present study to identify the constraints faced by scientists during various programme.

1. Constraints and Suggestions perceived by scientists in organizing effective training programme and working. One of the important duties of the KVK scientists is to communicate the research findings, new innovations and technologies to the farmers and needy people. Therefore,

Table 1: Constraints and Suggestions faced by scientists in organizing effective training programme and working (n= 8)

Constraints		Frequency	Ranks
1.	Lack of transport facilities for scientists and farmers	8	I
2.	Insufficient funds for the activities execution	8	I
3.	Lack of freedom of work	7	II
4.	Unavailability of timely input	6	III
5.	Under staffing	5	IV
Suggestions			
1.	Recruitment staff with multidisciplinary knowledge	8	I
2.	Mandatory to conduct evaluation before and after training	7	II
3.	Training to SMSs to update the training method	6	III
4.	Alternative arrangement of driver and vehicle for transportation facilities	6	III
5.	Sufficient budget provided to KVKs	5	IV

training is an essential component for the successful dissemination and adoption of latest agricultural technologies. The constraints and suggestions encountered by the scientists are given in Table 1.

It is evident from the above table that the constraints which the majority of scientist in KVKs perceived were: lack of transport facilities for scientists and farmers (I rank), followed by 'insufficient funds for execution of activities' (II rank), 'lack of Freedom of work' in Krishi Vigyan Kendra (III rank). The above table reveals that the suggestions to improve the problems being faced by the scientists were: recruitment staff with multidisciplinary knowledge (I rank) for conducting effective performance in KVKs followed by mandatory to conduct evaluation before and after training (II rank). The similar findings also reported by Pandey (1992), Srivastava *et al.* (1996), Pal *et al.* (1997), Ahmad (1998), Tiwari and Pathak (2011), and Chauhan and Chauhan (2012).

From the above discussion, it may inferred that if the administrators are able to create congenial atmosphere in the organization and supervise the training institutions from time to time along with providing adequate physical infrastructural and technical facilities by adequate making budget provision. The findings of the study reveals a necessity to appoint young, talented, well qualified, dedicated, enthusiastic staff to reinforce role of KVKs in agriculture and livestock development. The result further clarifies that staff with rural background would be more active and commanding in managing various extension activities.

2. Constraints and Suggestions perceived by scientists in organizing effective front line demonstration (FLDs) and working

FLD is one of the regular activities of a KVK through which latest agriculture technology is demonstrated to the farmers' fields. The constraints encountered by the KVK scientists are given in Table2.

A careful perusal of the above table reveals that lack of transportation facilities was perceived as the most serious problem (I rank) followed by difficulties in selection of demonstration plots in the hills (II ranked), lack of proper mechanism to assess the rate of adoption of demonstrated varieties by farmers (III ranked). The above findings shown in table 2 also reveals that the suggestions to overcome the constraints being faced by the scientists. Suggestion offered by were: majority of scientists training SMSs to understand what FLD is first, and then conducting demonstration (I rank) and providing more transport allowance/vehicles in hills (II rank) followed by provision of more inputs for hills along with timely availability (III rank). These findings are accordance to Pandey (1992), Dhingra (1992) and Rajan *et al.* (2015). Hence, it can be concluded that mechanism should be developed in ICAR/SAU to ensure that the information on latest crop varieties released and technologies developed organizations were disseminated to KVKs for conducting FLDs. Besides, it should also ensure reduction in cost of cultivation, lead to enhancement in productivity and higher rate of adoption of the demonstrated varieties by farmers. It should also develop a suitable mechanism to assess the rate of adoption of demonstrated varieties by farmers.

3. Constraints and Suggestions perceived by scientists in organizing effective on farm trial (OFTs) and working

An On-Farm Trial aims at testing a new technology or an idea in farmer's fields, under farmers' conditions

Table 2: Constraints faced by scientists in organizing effective front line demonstration and working (n= 8)

Constraints		Frequency	Ranks
1.	Difficulties in selection of demonstration plots in the hills	8	I
2.	Lack of transportation facilities in hills/plain	7	II
3.	Lack of proper mechanism to assess the rate of adoption of demonstrated varieties by farmers	6	III
4.	Lack of proper knowledge by SMSs in conducting FLDs	4	IV
5.	Lack of availability of input in time	4	IV
Suggestions			
1.	Training SMSs to understand what is FLD first, then conducting demonstration	6	I
2.	Providing more transport allowance/vehicles in hills	6	I
3.	Provision of more inputs for hills along with timely availability	5	II
4.	FLD area to be reduce in hills	4	III
5.	Proper mechanism to assess the rate of adoption of demonstrated varieties by farmers.	3	IV

and management, by using farmer's own practice as control. It should help to develop innovations consistent with farmer's circumstances, compatible with the actual farming system and corresponding to farmer's goals and preferences. The constraints encountered by the KVK scientists are given in Table 3.

The above findings given in Table 3 reveals that the constraints, which the majority of scientist in KVKs perceived were lack of trust by farmers about the potential of the OFT technologies (I rank) followed by unavailability of technological input on time(II rank). The findings presented shown in Table 3 reveals the suggestions to ameliorate the problems being faced by the scientists. Majority of scientists suggested that correct procedure of conducting OFT must be followed(I rank), conducting relevant OFT which will really help the farming community (II rank) followed by proper convince to farmers about the potentialities of the OFT technologies(III rank). These findings are accordance to earlier workers Dhingra (1992), Ojha & Singh (2013) and Kaur & Kaur (2013).

From the above discussion, it can be recommended that KVK personnel should visit the fields more frequently and educate the farmers about various activities carried out by KVK for farmers' benefit. A correct procedure of conducting OFTs should be followed so that farmers are not confused and learn about the latest agriculture technology.

4. Constraints and Suggestions perceived by scientists in organizing effective other extension activity and working

The main objective of other extension activities such as Advisory service, field demonstration, field days, farmers' fairs, exhibitions, radio / television talks, film show, publication of farm leaflets, etc. were also carried out for creating awareness and to disseminate the agricultural technology and to fulfilling the prescribed mandate of the KVKs. The constraints encountered by the KVK scientists are given in Table 4.

The study findings given in above Table 4, reveals that the constraints, which the majority of scientist in KVKs perceived were non availability of adequate manpower (I rank) followed by, freedom of work (II rank), unavailability of funds & vehicles (III rank). A careful perusal of table 4 reveals that the suggestions to ameliorate the problems being faced by the scientists. Delegation of more financial and administrative power to Programme coordinator was ranked first by KVK scientists, availability of adequate manpower followed (ranked second). Similar constraints were also reported in earlier Studies by Gaikwad & Gunjal (2000), Sharma & Singh (2001) and Chauhan and Chauhan (2012).

From the above discussion, it may inferred that if more financial and administration power to is delegated to Programme coordinator, it may create more create congenial atmosphere in the KVK to organized other extension activities. Supportive supervise the adequate physical and technical facilities. It was also suggested that Recruitment staff, Freedom of work, proper incentives like promotional opportunity, rewards etc. should be provided for better performance of staff in the field.

All possible constraints which KVK beneficiaries could face were listed (20 statements). These constraints were identified through a rigorous research review. The responses

Table 3: Constraints faced by scientists in organizing effective on farm trial and working (n= 8)

Constraints		Frequency	Ranks
1.	Lack of trust by farmers about the potential of the OFT technologies	6	I
2.	Unavailability of technological input on time	5	II
3.	Unavailability of fund, vehicles & staff	4	III
4.	Not knowing Procedure of conducting OFT	3	IV
5.	No assessment of beneficiaries whether this OFT is needed or not	2	V
Suggestions			
1.	correct procedure of conducting OFT must be followed	8	I
2.	Conducting relevant OFT which will really helps the farming community	6	II
3.	proper convince to farmers about the potentialities of the OFT technologies	5	III
4.	Provision of required input on time	5	III
5.	Monitory frequently OFT field	4	IV

Table 4: Constraints faced by scientists in organizing effective other extension activity and working (n= 8)

Constraints		Frequency	Ranks
1.	Non availability of adequate manpower	8	I
2.	Freedom of work	8	I
3.	Unavailability of fund and vehicles	6	II
4.	Lack of financial and administration power to Programme coordinator	4	III
5.	KVKs should not be opened where the basic amenities like market, schools and hospital are available.	3	IV
Suggestions			
1.	Delegation of more financial and administrative power to Programme coordinator	8	I
2.	Availability of adequate manpower		
3.	Freedom of work	5	II
4.	Availability of adequate funds & vehicles	4	III
5.	KVKs should be opened where the basic amenities like market, schools and hospital are available.	3	IV

Table 5: Perceived Constraints faced by the KVKs beneficiaries (n= 160)

S.No.	Statement	Weighted mean score	Ranks
1.	Lack of practical exercise during training programmes	2.687	I
2.	Needs not assessed before training	2.637	II
3.	Lack of transport facilities for field visit	2.475	III
4.	More emphasis on the theoretical work	2.387	IV
5.	Lack of wide publicity of training programmes	2.35	V
6.	Lack of sincerity during training	2.252	VI
7.	Lack of trained, field oriented and experienced staff	2.168	VII
8.	Lack of conducive teaching learning environment	2.043	VIII
9.	Lack of relevant literature	1.993	IX
10.	Lack of physical facilities	1.868	X
11.	Non-availability of required input	1.706	XI
12.	Course content provided by the training institution are not satisfactory	1.693	XII
13.	Non-suitability of time and duration of training programmes	1.675	XIII
14.	Behavior of trainer is not good	1.593	XIV
15.	Lack of sincerity in trainees	1.572	XV
16.	Languages of trainers were not understandable	1.462	XVI
17.	Lack of crop museum at KVK farms	1.217	XVIII
18.	Inadequate demonstrations facilities	1.182	XIX
19.	No-provision of refreshment	1.168	XX
20.	Inadequate boarding and lodging facilities	1.025	XXI

regarding each constraint were recorded on a four point continuum. The constraints identified by the respondents were then tabulated and ranked on the basis of weighted mean score. The various constraints identified by the respondents are listed in the above table. A careful perusal of the above table reveals that lack of practical exercise during training programmes (ranked I by beneficiaries) indicates a major lacuna at the level of KVK trainings. This clearly shows that KVK trainers will have to develop such competency to make training meaningful & impactful.

Other constraints identified by the respondents are listed in the above table 5. The present findings are supported by the findings of Tiwari and Pathak (2011), Sahu (2013) and Ojha & Singh (2013).

A good and efficient KVK has first analyse the situation and then identify the areas which needs correction and plan relevant strategies for creating interest and opportunities. Through its broad and diverse activities, a KVK can make a lasting impact and bring about transformation if it scans the surrounding environment and learn about what is required (in terms of knowledge, skill and attitude) and then develop the strategic plan and elaborate strategy for effectively meeting the people's expectation. Designing and implementing the appropriate extension programmes and activities is an art as well as science. The science (of extension) deals with identifying need-based and demand-driven and location specific technology and the art (of extension) deals with persuading and motivating the farmers to adopt the latest technology. Consequently extensionist will be able to achieve their mandate and farmers will be able to enhance productivity and production efficiency leading to all-round development.

CONCLUSION

The findings of the study will throw light on the performance status of KVKs in Uttarakhand under different systems and highlight the constraints and problems as well as the necessary steps required to improve the overall functioning of the KVKs. The study will give an insight into the working of KVKs and the reactions of the KVK functionaries and beneficiaries. It is also important to examine how trainers perform their assigned duties and responsibilities and how the clients perceive the effectiveness of extension programmes organized by KVKs. Hence, the study shall be helpful to the planners, administrators and policy makers in making required modifications in the functioning of the KVKs and implement properly the mandate of KVKs through different institutes. The opinion of beneficiaries shall also be helpful for improving the quality of trainings organized by KVKs. This shall also help the trainers of the KVKs in working out their strategy of conducting trainings for enhancing the skill of trainers in better way. The information's gathered by this study shall also be helpful in planning the future researches of KVKs. It is hoped that the findings of this study will enrich the activities of the Kendra.

REFERENCES

Ahmad, N. 1998. Functioning and effectiveness of Krishi Vigyan Kendra- A study in Uttar Pradesh. Thesis, Ph.D. G.B. Pant University of Agriculture & Technology, Pantnagar, Uttarakhand, India.

Chauhan, N.M. and N.B. Chauhan. 2012. Managerial Ability of the Programme Coordinators of Krishi Vigyan Kendras of India. *Indian Res. J. Ext. Edu.*, 12(3): 42-47.

Das, P. 2007. As quoted from: 'Proceedings of the Meeting of DDG (AE), ICAR, with Officials of State Departments, ICAR Institutes and Agricultural Universities, NRC Mithun, Jharnapani on 5th October 2007,' Zonal Coordinating Unit, Zone – III, Barapani, Meghalaya, India.

Dhingra, D. 1992. Trainees' perceptions and preferences: A study of Krishi Vigyan Kendra Ranichauri. Thesis, M.Sc. G.B. Pant University of Agriculture & Technology, Pantnagar, Uttarakhand, India.

Gaikwad, B.H. and S.S. Gunjal. 2000. Constraints faced and suggestions made to improve activities of the Krishi Vigyan Kendra in Maharashtra. *Ind. Farm,* 49(2): 34-35.

Kaur, M. and R. Kaur. 2013. Research-Extension-Farmer linkage system in Punjab agriculture. *International Journal of Advanced Research*, 1(10): 699-710.

Kumar, S., S. Subash; R. Jangir and D. Prasad. 2017. Constraints Faced by Farmers in Adoption of Indigenous Technical Knowledge Associated with Indigenous Cattle Dairy Farming in Rajasthan. *Journal of Community Mobilization and Sustainable Development,* 12(2): 249-252.

Ojha, M.D. and H. Singh. 2013. Evaluation of Technology Dissemination through Demonstration on the yield of *Kharif* Onion. *Indian Res. J. Ext. Edu.*, 13(1): 129-131.

Pal, S.; B. Kumar and Keshawa. 1997. Problems in organizing monthly workshop. *Agric. Extn. Rev.,* 9(5): 26-27.

Pandey, D.K.; H.K. De and B. Hijam. 2014. Fish Farmers' perceived constraints in transfer of aquaculture technology in district of Manipur, India. *International Journal of Fisheries and Aquatic Studies,* 2(1): 01-04.

Pandey, R.K. 1992. Need assessment of KVK trainers of Uttar Pradesh in training management. Thesis, M.Sc. G.B. Pant University of Agriculture & Technology. Pantnagar, Uttarakhand, India.

Rajan, P.; N. Khare and S.R.K. Singh. 2015. Factors affecting the Income generation of tribal farmers in Madhya Pradesh State. *India. Journal of Community Mobilization and Sustainable Development*, 10(2): 147-151.

Sahu, R.P.; V.K. Sachan and R.J. Singh. 2013. Constraints in Adoption of Vegetables Production Technology in Uttarakhand Hills. *TECHNOFAME- A Journal of Multidisciplinary Advance Research,* 2(2): 31-34.

Sharma, N. and S.P. Singh. 2001. Job satisfaction among the extension personnel of Rajasthan. *Ind. J. Ext. Edu.,* 37(3&4): 206-208.

Shetay, S.G. and D.R. Mahurkar. 1991. Inhibiting factors in training and measures to improve quality. Paper presented in seminar on training for rural development, Dapoli, Maharashtra.

Srivastava, K.K.; L.S. Bareth and J.D. Sarkar. 1996. Impact of farmers training on farming community. *Agril. Ext. Rev.,* pp. 22-24.

Tiwari, A.K. and J. Pathak. 2011. Constraints Faced by Rice-Wheat Growers in Training Imparted by KVKs. *Indian Journal of Extension Education,* 47(3&4): 82-85.

Received on February, 2019, Revised on May 2019

Journal of Community Mobilization and Sustainable Development Vol. 14(2), 237-244, May-August, 2019

A Study of Factors Influencing the Growth of Vegetable Seed Industries in India

Sakthi Parthiban R.*, Rashmi Singh, M.S. Nain and J.P. Sharma
Division of Agricultural Extension, ICAR-Indian Agricultural Research Institute, New Delhi-110012

ABSTRACT

Improved seeds of high-quality and high yielding varieties among other key agricultural inputs are credited for revolutionizing the agricultural sector. Ensuring the availability of quality seeds to farmers is an essential to achieve higher agricultural production and productivity. It is estimated that the contribution of seeds in the productivity is about to be 20-25 per cent. The organized seed sector comprising of both private and public sector companies, accounts for about 30-35 per cent of the total seeds distributed in the country. The national seed policy envisages a 10 per cent share in global seed export market in the coming decade. At present, India's share of global seed market is less than 2 per cent. Private sector has started to play a significant role in the production and distribution of seeds in India over a period of time. To identify the factors influencing the growth of vegetable seed industries, the present study was conducted in the state of Karnataka, India. The respondents comprised of hybrid vegetable seed producers and seed company personnel. Factor analysis was used to identify the determinants of growth of vegetable seed industries. It was found that the policy factors, geographical factors, market factors and farmer oriented factors were the major determinants influencing the growth of hybrid vegetable seed industry in India. Seed production of high value low volume crops provides employment and remunerative price for the farmers. Involvement of public sector institutions would result in income generation for the institution and makes availability of quality seeds to the farming community. As a policy suggestion, hybrid vegetable seed production involving farmers would be one of the best bet to achieve the objective of doubling the income of farmers by 2022.

Keywords: Quality seeds, Vegetable seed production, Private sector, Influencing factors, Exploratory factor analysis

INTRODUCTION

Among all the inputs in the agricultural production process, seed is the most critical input for achieving higher production and productivity. India is one among the major countries where the seed sector is already reasonably advanced. Although the organized seed industry in India is fifty years old, its growth has been phenomenal in recent times. The private seed industry is not only confined to just production and marketing of seed, rather it has acquired technological strength to cater to the varietal needs of tomorrow (Gadwal, 2003). The seed industry in India evolved from a single government-owned company, paving way to decentralized state or provincial-owned company, and finally to a mixed private-public system, where the public sector predominantly supplies self-pollinated varieties (SPVs), and the private sector dominates in supply of hybrids and specialized varieties. In addition to state seed corporations, there are now over 500 private seed companies, 24 of them linked to multinational seed companies, and many of them are having their own breeding programme. The Indian seed industry now stretches all the way from genetic research, through varietal development, bulking up, seed certification, registration and production to marketing (FAO, 2010).

There is a huge scope in developing small and medium-scale entrepreneurs in seed business as seed replacement rate (SRR) in India continues to be one of the lowest in the world largely due to inadequate supply of certified seed/quality seed. There is a need for development of suitable business models to guide the potential entrepreneurs on the basis of learning drawn through critical study of existing firms in the industry. The whole entrepreneurial process, in general and in agriculture specifically is complex, subtle, situational, and full of paradoxes. The complete journey from an idea to establishing a high potential enterprise is elusive,

*Corresponding author email id: sakthi.parthi05@gmail.com

contradictory and perilous (Timmons, 2003). Indian agriculture is facing problems like fragmented land holdings, decreasing groundwater level, labour shortage, etc., engaging the small and marginal farmers in hybrid vegetable seed production and developing skilled labour resource gains immense importance. In this context, farming based on prior agreements or contracts could be the great solution that would enable the Indian farmers to compete with the very rich and indirectly subsidized western farmers in the world market. This kind of arrangement can indeed serve as a tool to bring about a perspective of market focus to farming as well as for the modernization of agriculture.

MATERIALS AND METHODS

The study was conducted purposively in the state of Karnataka, which is said to be the seed hub of India. Corporate sector has introduced the contract farming of vegetable for seed purpose in Northern Karnataka during 1985-86. Stratified random sampling procedure was followed for the present study. In Karnataka, the districts namely Haveri and Koppal were purposively selected based on the presence of hybrid vegetable seed producers and vegetable seed companies. From each district, two blocks were selected purposively. Four villages from each block were selected randomly. Fifteen hybrid vegetable seed producers from each village (120 seed producers each from the purposively selected districts), fifty seed organizers (25 each from the purposively selected districts), and fifty personnel's from seed companies (25 each from the purposively selected districts) were selected. Thus, a total of 340 respondents were comprised the sample for the study. Primary data was collected with personal interviews and secondary data were also collected from official records. Data was analyzed with SPSS package.

Factors influencing the growth of vegetable seed industries were identified and analyzed using the factor reduction technique using Exploratory Factor Analysis. Factor analysis operates on the notion that measurable and observable variables can be reduced to fewer latent variables that share a common variance and are unobservable, which is known as reducing dimensionality (Bartholomew *et al.,* 2011). Exploratory Factor Analysis is used when a researcher wants to discover the number of factors influencing variables and to analyze which variables 'go together' (DeCoster, 1998). A basic hypothesis of EFA is that there are *m* common 'latent' factors to be discovered in the dataset, and the goal is to find the smallest number of common factors that will account for the correlations (McDonald, 1985). Another way to look at factor analysis is to call the dependent variables 'surface attributes' and the underlying structures (factors) 'internal attributes'. Common factors are those that affect more than one of the surface attributes and specific factors are those which only affect a particular variable (Tucker and MacCallum, 1997).

Mathematical model: In mathematical model for 'classical factor analysis', *p* denotes the number of variables (*X1, X2,…,Xp*) and *m* denotes the number of underlying factors (*F1, F2,…,Fm*). *Xj* is the variable represented in latent factors. Hence, this model assumes that there are *m* underlying factors whereby each observed variables is a linear function of these factors together with a residual variate. This model intends to reproduce the maximum correlations.

$$X_j = a_{j1}F_1 + a_{j2}F_2 + \ldots\ldots a_{jm}F_m + e_j \ldots\ldots\ldots\ldots (1)$$

Where, $j = 1,2,\ldots\ldots,p$

The factor loadings are a_{j1}, a_{j2},…. a_{jm} which denotes that *aj1* is the factor loading of j^{th} variable on the 1st factor. The specific or unique factor is denoted by e_j. The factor loadings give us an idea about how much the variable has contributed to the factor; the larger the factor loading the more the variable has contributed to that factor (Harman, 1976). Factor loadings are very similar to weights in multiple regression analysis, and they represent the strength of the correlation between the variable and the factor (Kline, 1994). Factor analysis uses matrix algebra when computing its calculations. The basic statistic used in factor analysis is the correlation coefficient which determines the relationship between two variables. Researchers cannot run a factor analysis until 'every possible correlation' among the variables has been computed (Cattell, 1973). The researcher examines if variables have some features in common and then computes a correlation or covariance matrix (Rummel, 1970). Generally, a factor analysis performed using a correlation matrix produces standardized data, thus it is recommended for variables that are not meaningfully comparable (e.g., items from different scales). On the other hand, factor analysis performed using a covariance matrix is conducted on variables that are similar (e.g., items from the same scales). The correlation matrix is often used because it is easier to interpret compared to the covariance tables, although there is not a strict requirement for which matrix to use (Fung, 1995).

RESULTS AND DISCUSSION

The common influencing determinants/parameters of factors were formed as statements, based on literature review and pilot study, and given to the judges for their ratings. Based on the relevancy of the statements, out of the thirty five statements administered twenty three statements were found to be relevant. The determinants were further put into Likert scale to find out the common influencing determinants/ parameters which will be reduced into common factor responsible for the growth of vegetable seed industry in India with the Exploratory Factor Analysis (EFA) technique. The different statistical tools used in the study were Descriptive Statistics, Kaiser-Meyer – Olkin measure of sampling adequacy, Bartlett's test of sphericity, Scree plot and pattern matrix.

The below Table 1 shows the output of factor analysis, which includes the mean of variables used, standard deviation of the variables used as well as the number of cases chosen for the present study. From the Table 1 it is clear that there are no missing values in the responses for the statements administered in identifying the influencing factors for the growth of vegetable seed industries. Further, it was observed that the determinants like presence of MNCs and private companies having the highest mean value of 4.48, followed by profit and assured income (mean value = 4.39) and skilled labour availability (mean value = 4.21) were said to be the most influencing and common variables for the growth of vegetable seed industries in India. Apart from the aforementioned variables, the increased demand for vegetable crops, entry of private players in seed sector, favorable climatic conditions and farm advisory were also said to be the influencing variables in the growth of vegetable seed enterprises.

Kaiser- Meyer- Olkin measure of sampling adequacy and Bartlett's test of sphericity, both these tests were the minimum standards which was met before conducting the factor analysis. In Kaiser-Meyer-Olkin Measure of Sampling Adequacy, which determines whether the responses given by the respondents are adequate or not, the KMO value varies between 0 and 1, and values closer to 1 are better. A value of 0.6 is a suggested minimum. Table 2 clearly shows that the KMO value of variables for the present study is 0.708, which is above the suggested minimum value and considered as better value because of the closeness to the value 1. So the study involved the adequate sampling size for identification of the common factors influencing the growth of vegetable seed industries. Bartlett's Test of Sphericity indicates the strength of relationship among the variables.

Table 1: Descriptive Statistics for the determinants/ parameters (N=340)

Determinants/parameters	Descriptive Statistics		
	Mean	Std. Deviation	N
Entry of private sector	4.16	.697	340
Increased Demand	4.17	.791	340
Favorable climate	4.12	.643	340
Policy reforms in Seed Sector	3.45	.869	340
Farmers participation	3.86	.543	340
Technical Knowledge	3.61	.836	340
Profit & income	4.39	.648	340
Huge private investment	3.94	.720	340
Skilled labour	4.21	.850	340
Infrastructure	3.44	.748	340
Market availability	3.90	.566	340
Input and financial assistance	4.07	.634	340
Introduction of Transgenic	3.58	.846	340
Strong R&D units	3.88	.922	340
Willingness and attitude	3.44	.816	340
Awareness	3.84	.767	340
Suitable land	3.72	.606	340
Competition among enterprises	3.89	.981	340
Agri Department assistance	3.31	.967	340
Irrigation & rainfall	3.59	.879	340
Increased adoption of vegetable seeds	3.85	.762	340
Presence of MNCs & National companies	4.48	.540	340
Farm Advisory	4.19	.703	340

From the Table 2, it was evident that the Bartlett's test of Sphericity is significant (.000). It means there exists a significant correlation among the variables administered

Table 2: Kaiser- Meyer- Olkin and Bartlett's test for sampling adequacy

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.708
Bartlett's Test of Sphericity	Approx. χ^2	2558.497
	df	253
	Sig.	.000

for the identification of common influencing factor for the growth of vegetable seed industries. It is also clear from the results shown in the below Table 2 that the variables used in factor analysis were significant at one per cent level.

Communalities indicates the proportion of each variable's variance that can be explained by the factors. It is also noted as h^2 and can be defined as the sum of squared factor loadings for the variables. The communality value for the determinants with more than 0.5 were selected for further analysis. The values in the column named Extraction indicates the proportion of each variable's variance that can be explained by the retained factors. Variables with high values are well represented in the common factor space, while variables with low values are not well represented. These are the reproduced variances from the factors extracted.

From the Table 3, it was observed that the determinants like entry of private players in the seed industry, increased demand for high value vegetable crops, policy reforms in seed sector, technical knowledge on vegetable seed production, availability of skilled labour, market availability for vegetable seeds, input and financial assistance to the seed producers, strong presence of Research and Development units, willingness and favorable attitude of farmers, awareness, competition among enterprises, state department assistance, proper irrigation facility and adequate rainfall with communality value of more than 0.5 were taken up for further analysis. With these determinants, the common factors influencing the vegetable seed industries were identified.

The following Table 4 shows the total variance explained by the variables in the factor analysis. Table.4has been divided into three sub-sections, i.e. containing the Initial Eigen Values, Extracted Sums of Squared Loadings and Rotation of Sums of Squared Loadings. For analysis and interpretation purpose Extracted Sums of Squared Loadings were considered.

In the Table 4, the initial Eigen values column contains the sub-column named Total, which contains the Eigen values. The first variable will always account for the most variance and hence have the highest Eigenvalue, and the next factor will account for as much of the left over variance as it can, and so on. Hence, each successive factor will account for less and less variance. The factor having Eigen value of 1 and more than one were selected as the variables

Table 3: Variance explained by determinants/ parameters

	Communalities	
Determinants	**Initial**	**Extraction**
Entry of private sector	0.434	0.571
Increased Demand	0.565	0.844
Favorable climate	0.387	0.397
Policy reforms in Seed Sector	0.394	0.518
Farmers participation	0.441	0.460
Technical Knowledge	0.436	0.511
Profit & income	0.383	0.471
Huge private investment	0.366	0.372
Skilled labour	0.540	0.636
Infrastructure	0.444	0.482
Market availability	0.413	0.589
Input & financial assistance	0.486	0.573
Introduction of Transgenic & Hybrids	0.388	0.402
Strong R&D units	0.617	0.673
Willingness and attitude	0.498	0.570
Awareness	0.605	0.719
Suitable land	0.326	0.297
Competition among enterprises	0.451	0.527
Agricultural Department assistance	0.475	0.497
Irrigation & rainfall	0.489	0.491
Increased adoption of vegetable seeds	0.349	0.488
Presence of MNCs and National companies	0.305	0.391
Farm Advisory	0.302	0.273

Extraction Method: Principal Axis Factoring.

explained by the chosen determinants /parameters. The interest of study will be the column containing the Extracted Sums of Squared Loadings. In Table 4, the first factor accounts for 19.121 per cent of the variance explained, the second factor 8.43 per cent, the third factor 5.90 per cent, the fourth factor 5.20 per cent, the fifth factor 3.77 per cent, the sixth factor accounts for 3.46 per cent, the seventh and eighth factors accounts for 2.80 per cent and 2.37 per cent respectively. These eight factors together accounts for the 51.08 per cent of the total variance explained and were found to be significant.

Figure 1 the scree plot, which graphs the Eigen value against the factor number. The values in the scree plot graphs are based on the values in the first two columns of the Table 4 above. From the eighth variable onwards, it is clearly seen the line is almost flat, meaning that the each

Table 4: Total Variance explained in factor analysis

Total Variance Explained							
Factor	**Initial Eigenvalues**			**Extraction Sums of Squared Loadings**			**Rotation Sums of Squared Loadings[a]**
	Total	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**	**Total**
1	4.845	21.064	21.064	4.398	19.121	19.121	3.100
2	2.368	10.296	31.361	1.940	8.436	27.558	2.832
3	1.882	8.182	39.543	1.357	5.900	33.457	2.484
4	1.693	7.363	46.906	1.198	5.208	38.665	2.611
5	1.333	5.796	52.702	0.868	3.775	42.440	1.394
6	1.248	5.425	58.127	0.798	3.468	45.908	1.774
7	1.164	5.059	63.186	0.644	2.801	48.709	2.577
8	1.057	4.596	67.782	0.546	2.375	51.084	1.061
9	0.893	3.882	71.664				
10	0.819	3.562	75.226				
11	0.745	3.241	78.467				
12	0.718	3.120	81.587				
13	0.654	2.844	84.431				
14	0.564	2.453	86.883				
15	0.478	2.076	88.959				
16	0.458	1.991	90.951				
17	0.374	1.628	92.579				
18	0.359	1.561	94.139				
19	0.321	1.394	95.533				
20	0.294	1.280	96.813				
21	0.263	1.145	97.958				
22	0.243	1.056	99.014				
23	0.227	0.986	100.000				

Extraction Method: Principal Axis Factoring.

a. When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.

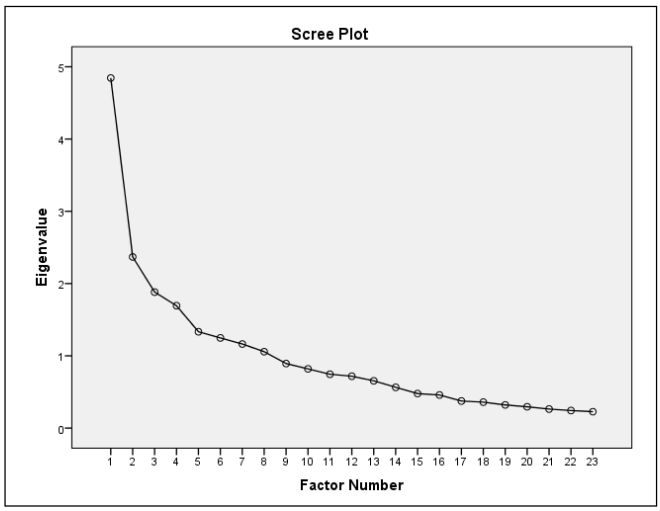


Figure 1: Scree Plot diagram depicting extracted factors

successive factor is accounting for smaller and smaller amounts of the total variance. Scree plot diagram (Figure 1) confirms that there are 8 common influencing factors which were extracted from Exploratory Factor Analysis (EFA).

Table 5 below shows the pattern matrix, which is the result of conducting factor analysis with a promax rotation. An oblique rotation, such as a promax rotation, the factors are permitted to be correlated with one another. Also the promax rotation produces both factor pattern and factor structure matrices. The factor structure matrix represents the correlations between the variables and the factors. The factor pattern matrix contains the coefficients for the linear combination of the variables.

From the Table 5, it is inferred that the parameters like State departmental assistance to vegetable seed producers, strong presence of Research and Development Units, Irrigation facilities and adequate rainfall contribute as a single prime factor named as Technological factor. Parameters like technical knowledge of stakeholders in vegetable seed production, availability of skilled labour, perceived profit and assured income from vegetable seed production together taken as Farmer-oriented factor. Increased demand for vegetable crops, and farmer's participation were found to be the parameters coming under third factor. Entry of private sector in seed production, farm advisory by company personnel, competition among seed enterprises and input & financial assistance services provided by companies were found falling under the fourth factor, which was termed as Market factor. Parameters like Policy reforms and Infrastructure like seed processing units were fall under Policy factors. Availability of huge market for vegetable seeds, increased adoption of vegetable seeds and suitable land availability for vegetable seed production and presence of MNCs and private sector companies were also found to be the common influencing factors for the growth of vegetable seed industries in India.

Based on the results obtained by doing exploratory factor analysis and from the above Table 5, it is clear that 8 factors are extracted by factor reduction technique. Each factors were explained by a set of variable statements administered in this study (Table 6).

Table 5: Pattern matrix of determinants for the growth of vegetable seed industries

Pattern Matrix[a]								
Determinants	**Factor**							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Agri Department assistance	.799							
Strong R&D units	.714							
Irrigation & rainfall	.614							
Introduction of Transgenic & hybrids	.464	.352						
Awareness	.377							-.345
Technical Knowledge		.661						
Skilled labour		.646						
Profit & income		.627				.302		
Increased Demand			.891					
Farmers participation			.569					
Entryof private sector				.799				
Farm Advisory				-.513				
Competition among enterprises		.441		.486				
Input & financial assistance				.425		.398		
Policy reforms in Seed Sector					.791			
Infrastructure					.419	.376		
Willingness and attitude				.343	.387			
Market availability						.800		
Hugeprivate investment								
Increased adoption of vegetable seeds							.842	
Suitableland							.458	
Favorable climate								
Presenceof MNCs & National companies								.688

Extraction Method: Principal Axis Factoring. Rotation Method: Promax with Kaiser Normalization.[a]
a. Rotation converged in 12 iterations.

Table 6: Common factors influencing the growth of vegetable seed industries in India

Factor categories	Parameters	Pattern matrix value
Technological factors	Introduction of transgenic and hybrids	0.464
	Presence of strong R&D section in private firms	0.714
	Continued support from public sector institutions	0.799
Policy factors	Enabling government policy reforms	0.791
	Presence of adequate infrastructure for seed production, certification and quality control	0.419
Farmer oriented factors	Assured profit and enhanced income for farmers	0.627
	Scientific know-how of hybrid vegetable seed production	0.661
	Availability of skilled and semi-skilled manpower	0.646
	Increased adoption of hybrid vegetable crops by the Indian farmers	0.842
Market oriented factors	Rise in demand for good quality high value low volume crops	0.891
	Participation and willingness of cultivators	0.569
	Competition among enterprises for capturing the profit assured market	0.486
	Emergence of active role of private sector organizations post globalization period	0.799
	Availability of farm advisory at door steps	0.513
	Availability of inputs and financial assistance to farmers	0.425
	Presence of huge and potential market for hybrid vegetable seed market	0.800
	Presence of MNCs and national, state seed producing units in the region	0.688

CONCLUSION

Exploratory factor Analysis (EFA) method applied to determine the common factors influencing the growth of vegetable seed industry in India, resulted in extracting eight factors with seventeen parameters. These parameters were grouped into factors namely technological factors, farmers-oriented factors, policy factors, market oriented factors with the help of pattern matrix values. The parameters like presence of strong R&D section in private firms, continued support from public sector institutions, enabling Govt. policy reforms, Assured profit and enhanced income for farmers, scientific know-how of hybrid vegetable seed production, availability of skilled and semi-skilled manpower, increased adoption of hybrid vegetable crops by the Indian farmers and rise in demand for good quality high value low volume crops, were found to be significant in influencing the growth of vegetable seed industries.

The high-value low volume crops seed industry possess huge untapped opportunities, which can be taken up by the public sector through Seed Village Programme, in which farmers get employment as well as remunerative price for the quality seed produced. Government of India, "Sub Mission on Seed and Planting Material" (SMSP) under the central scheme "National Mission on Agricultural Extension and Technology" (NMAET), which was in effect from 1 April 2014, committed to develop and strengthen the seed sector of the country. The sub mission also envisages to enhance the production and multiplication of high yielding certified/quality seeds of all agricultural crops. Involvement of public sector institutions like ICAR, SAUs and State departments in large scale vegetable seed production would result in income generation for institutions as well as availability of quality seeds for the farming community. The Government of India has been implementing schemes on seed sector for the enhanced production of high yielding quality/ certified seeds. Seed production of high value low volume crops. Hybrid seed production provides the opportunity for employment generation, entrepreneurship development, as well as a remunerative venture for small and marginal farmers. As a policy suggestion, hybrid vegetable seed production involving farmers through formation of dedicated "seed villages" would be the best bet to achieve the objective of doubling the income of farmers by 2022. Training of farmers on various aspects of seed production and motivating them to taking up seed production would not only ensure availability of quality seed for farmers but also fetches foreign exchange for the nation.

REFERENCES

Bartholomew, D.; M. Knotts and I. Moustaki. 2011. Latentvariable models and factor analysis: A unified approach. (3rd ed.). West Sussex, UK: John Wiley & Sons.

Cattell, R.B. 1973. Factor analysis. Westport, CT: Greenwood Press.

Child, D. 2006. The essentials of factor analysis. (3rd ed.). New York, NY: Continuum International Publishing Group.

Comrey, L.A. and H.B. Lee. 1992. A first course in factor analysis (2nd ed.). Hillside, NJ: Lawrence Erlbaum Associates.

Costello, A.B. and J.W. Osborne. 2005. Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research and Evaluation,* 10(7): 1-9.

DeCoster, J. 1998. Overview of factor analysis. Retrieved March 22, 2012 from http://www.stat-help.com/notes.html

FAO. 2010. FAOSTAT database, FAO, Rome. http://faostat.fao.org.

Field, A. 2009. Discovering Statistics Using SPSS: Introducing Statistical Method (3rd ed.). Thousand Oaks, CA: Sage Publications.

Fung, D. K. (1995). Sensitivity analysis in factor analysis: Difference between using covariance and correlation matrices. *Psychometrika,* 60(4): 607-617.

Gadwal, V.R. 2003. The Indian Seed Industry: Its History, Current Status and Future. *Current Science,* 84(3).

Gorsuch, R.L. 1983. Factor analysis (2nd ed.). Hillside, NJ: Lawrence Erlbaum Associates.

Govindan, A. 2003. India: Planting Seeds: Indian Seed Industry under Transition, 2003. GAIN Report No. IN3125. U.S. Department of Agriculture, Foreign Agricultural Service, December 29, 2003.

Harman, H.H. 1976. Modern factor analysis (3rd ed. revised).Chicago, IL: University of Chicago Press.

http://agricoop.nic.in/

http://dacnet.nic.in/seednet/seeds/

Kaiser, H. F. 1960. The application of electronic computers to factor analysis. *Educational and Psychological Measurement,* 20: 141-151.

Kline, P. 1994. An easy guide to factor analysis. New York, NY: Routledge.

McDonald, R.P. 1985. Factor analysis and related methods. Hillside, NJ: Lawrence Erlbaum Associates, Inc.

Rummel, R.J. 1970. Applied factor analysis. Evanston, IL: Northwestern University Press.

Sandeep Kumar Lal *et al.* 2015. Entrepreneurial Prospects and Inclusive Growth through Organized Seed production. Pusa Krishi Vigyan Mela Souvenir, pp. 61-64.

Shanmugasundaram, S. 2005. Proceedings of Vegetable Soybeans-Research Needs for Production and Quality Improvement Workshop. Asian Vegetable Research and Development Center, Taiwan. pp. 92-102.

Sharma, H.K. 2004. Cash crops farming in the Himalayas: the importance of pollinators and pollination in vegetable seed production in Kullu valley of Himachal Pradesh, India. FAO Case Study submitted for Rapid Assessment of Pollinators' Status Report. http://www.fao.org/ag/AGP/AGPS/Default.htm.

State of Indian Agriculture. 2016. pp. 67-77.

Stevens, J.P. 2002. Applied multivariate statistics for the social sciences (4th ed.). Hillsdale, NS: Erlbaum.

Tabachnick, B.G. and L.S. Fidell. 2007. Using multivariate statistics (5th ed.). Boston, MA: Allyn & Bacon.

Timmons, J.A. and S. Spinelli. 2003. New Venture Creation: Entrepreneurship for the 21st Century. McGraw- Hill College, 2003.

Tucker, L.R. and R.C. MacCallum. 1997. Exploratory factor analysis. Retrieved fromhttp://www.unc.edu/~rcm/book/ch7.pdf

---

Received on February, 2019, Revised on May 2019

Journal of Community Mobilization and Sustainable Development Vol. 14(2), 245-250, May-August, 2019

Economic Impact of Bacterial Disease Caused by Motile *Aeromonas* (MAS) in Carp Culture Practices of Assam, India: An Analysis

Pabitra Kumar Saharia[1]*, B. Kalita[1], Sonmoina Bhuyan[2], I.A. Hussain[1], H. Pokhral[1], S.K. Bhagabati[1], R. Dutta[1], A. Borah[3], G. Bora[3] and R. Sharma[3]

[1]College of Fisheries, Assam Agricultural University, Raha-782103, Assam

[2]KVK Nalbari, AAU, Sariahtoli, Nalbari-781337, Assam

[3]M.F.Sc. Student, College of Fisheries, AAU, Raha-782103, Assam

ABSTRACT

The study was carried out in three districts of Assam namely Nagaon, Morigaon and Sonitpur to estimate the economic loss in carp culture due to Motile Aeromonas septicemia (MAS) during 2016-18. A total of 91 small, medium and large farms were found to be affected by MAS out of 293 farms surveyed on the basis of information on occurrence of disease. The result revealed that highest mortality and maximum loss in income was observed in small pond category (<0.2 ha) where mean mortality 9.22 per cent was recorded in Nagaon district followed by Morigaon 9.14 per cent and Sonitpur 4.00 per cent. Similarly, mean loss in income (Rs/ha/yr) was highest in Nagaon district Rs.23304.24 followed by Morigaon Rs.19532.14 and Sonitpur Rs. 11304.56. The overall mean economic loss for the district under studies due to MAS was recorded to be Rs. 16031.32 ha/yr with a mean loss in weight 158.92 kg/ha/yr. This clearly depicts that mean financial loss of Rs. 16031.32 kg/ha/yr has been reported due to MAS in the three district under study. Thus it was found that MAS has significant impact in carp culture practices of Assam.

Keywords: Motile *Aeromonas,* MAS, Mortality, Production, Economic loss

INTRODUCTION

While talking about doubling farmers' income, it is obvious that farmers are the key participant who will have to do the farming involving his time, labour, inputs and intellects. For fulfilling the dream of doubling farmers' income by 2022 the farmers will have to work for higher productivity and increased income (Bora *et al*., 2018). The agriculture sector which comprise of lot of activities ranging from crops, livestock to fisheries is still seen as one of the sector which expected to offer many job opportunities (Som *et al*., 2018). Aquaculture has been growing actively in the last 30 years and always has been an important source of food, nutrition, income and livelihood (HLPE, 2014). Currently, India ranks second in the world in total fish production with the total annual fish production of about 10.75 MT which comprises 3.59, 1.46 and 5.7 MT from Marine capture, inland capture and freshwater aquaculture respectively (SOFIA, 2018). About 95 percent of aquaculture production is being contributed by freshwater aquaculture in the country and it encompasses the culture of the carps, catfishes, freshwater prawn and more recently culture of Pangus (*Pangusias* spp.), Pacu (*Piaracthus brachipomus*) and Tilapia. Amongst the landings, the three Indian major carps, namely Catla (*Catla catla*), Rohu (*Labeo rohita*) and Mrigal (*Cirrhinus mrigala)* contribute to the bulk of production to the extent of 70-75 per cent of the freshwater fish production. Hence, carp culture is the major aquaculture backbone of fish production in the country. Assam is an inland state of India and semi intensive carp culture in ponds and tanks are getting popularity in recent decade as the landing of fish from natural sources is decreasing.

Like other farming sector, carp culture practices also facing emergence of diseases may be due to poor health management. Carp culture is facing some deadly diseases caused by bacterial infection viz.; *Aeromoniasis, Edwardsiellosis* and fungal disease like EUS along with the different parasitic diseases specially Argulosis and they are resulting in substantial financial losses annually. Though the economic loss due to disease is not properly understood, diseases accounts for 10-15 per cent towards the production cost world-wide. In one instance in India, a loss to the tune of

*Corresponding author email id: saharia_p@yahoo.com

Rs. 29524/ha/yr was estimated reported by Mahapatra *et al.* during 2012 due to Argulosis from semi-intensive carp culture ponds. In semi intensive carp culture disease caused by bacteria was attributed to high stocking density by Grisez, L. & Ollevier, F. during 1995. Among bacterial pathogens *Aeromonas hydrophila, Pseudomonas fluorescens* and *Edward siellatarda* are found common and were reported by different scientist from all over the world (Altinok, *et al.*, 2006; Klesius *et al.*, 2000). There are no records of proper documentation of prevailing fish diseases in Assam and so far no studies have been conducted in connection with pathogenic *Aeromonas* species that causes MAS in fish culture system of Assam. Thus keeping in view the above point, the present work has been undertaken to study the prevalence of important fish diseases and determine the actual significance of MAS outbreaks and economic loss incurred in aquaculture systems for the first time in Assam.

MATERIALS AND METHODS

The study was conducted in three districts of Assam *viz.* Nagaon, Morigaon and Sonitpur. The districts were purposively selected based on their significant contribution to the total state fish production and easy accessibility to laboratory situated at College of Fisheries, Raha of Nagaon district of Assam. Random sampling procedure was adopted for selection of fish farmers based on phone call received directly from the farmers, information received on occurrence of disease in these district from Krishi Vigyan Kendras, Department of Fisheries and Social media (Whatsapp group and Facebook). The primary data were collected by survey method with the help of pre-tested schedules through personal interview from the owner of the infected ponds. After confirmation of MAS through series of biochemical and molecular technique the ponds infected with MAS were categories and calculated parameters like total loss in weight (kg) and total loss in income (Rs) of the infected ponds. Owing to lack of secondary data on the sizes of aquaculture ponds in the state of Assam, ponds were categorized into three categories *viz.*; small (<0.2 ha), medium (0.2-0.4 ha) and large (>0.4 ha) for our study as per the classification of (Faruk *et al.,* 2004).

RESULTS AND DISCUSSION

The details of area, mortality, stocking density, total loss in weight and loss in income (Rs/ha/yr) for entire district under study for each category of ponds has been presented in Table 1. The total area infected due to *Aeromonas* spp has been calculated for each district. The overall average stocking density, average mortality (%), average number of infected fishes, average loss (kg/ha) and average loss in income (Rs/ha/yr) has been calculated according to the equation by Atallah and El-Banna, 2005 for each category of ponds in entire districts and result has been illustrated in Table 2. It has been observed that in Nagaon district, a total of 16.89 water spread area comprising 36 numbers of ponds under each category had been infected due MAS. Affected area due to MAS were 2.03 ha, 1.58 ha and 13.28 ha for small, medium and large categories of ponds respectively. Per hectare average stocking density under each category of ponds were also calculated as 9573, 9682 and 11395 for small, medium and large ponds respectively based on data collected during survey. It has been observed that stocking density was found to be higher in all categories of pond. Mortality was recorded and calculated as 9, 6 and 3 per cent for small, medium and large ponds respectively. Interestingly it has been observed that mortality was found to be higher in small ponds followed by medium and large ponds. Same way loss in income (Rs/ha/yr) in each category of ponds were evaluated and revealed that small ponds suffered a highest loss in income (Rs/ha) compared to medium and large ponds. Loss in income (Rs/ha) for small, medium and large ponds were Rs. 23304.24, Rs. 19299.89 and Rs. 15335.54 respectively. In Morigaon district, a total of 9.16 ha had been affected due to MAS. Per hectare average stocking density for small, medium and large ponds were 9744, 8254 and 8600 respectively. Mortality was recorded as 9, 5 and 2 per cent for small, medium and large ponds respectively and result revealed that small ponds suffered highest mortality. Similarly, loss in income (Rs/ha/yr) was Rs. 19532.14, Rs. 16951.80 and Rs. 9166.00 respectively for small, medium and large ponds. In the Sonitpur district 6.5 ha area irrespective of size of ponds was infected due to MAS. Stocking density was found to higher in all the category of ponds. Similarly, mortality were recorded as 4, 3 and 2 per cent for small, medium and large ponds respectively with a record of highest mortality in small pond followed by medium and large ponds. Loss in income (Rs/ha) was recorded as Rs. 11304.56, Rs. 9128.31 and Rs. 6593.66 for Sonitpur district and the results revealed that in Sonitpur district also highest loss in income was observed in small sized pond followed by medium and large ponds. The result on economic loss due to MAS clearly revealed that there occurs a significant financial loss in the district under studies. Average loss in income (Rs/ha/yr) were 19870.50,

Table 1: Summary of district wise details of economic loss due to MAS

District	Area (ha)	N	Statistics	Area (ha)	Stocking density/ ha	Mortality (%)	No. of Infected fishes	Wt. of infected fishes	Average loss (kg)	Loss (kg/ha)	Loss in income (Rs.)
Morigaon	<0.2 ha	14	Mean	0.12	9744.14	9.14	105.86	269.29	26	195.21	19532.14
(n=30)			SD	0.04	1683.86	2.28	52.21	75.8	10.41	78.9	7900.52
	0.2-0.4	11	Mean	0.29	8254.64	5.18	117.64	413.64	47.73	169.64	16951.91
			SD	0.08	1450.58	1.17	30.67	89.7	13.4	32.54	3248.29
	>0.4 ha	5	Mean	0.88	10044.2	2.6	204.6	410	72.2	91.6	9166.60
			SD	0.55	1893.12	0.55	166.66	108.4	38.93	17.39	1740.35
	Total	30	Mean	0.31	9248	6.6	126.63	345.67	41.67	168.57	16858.47
			SD	0.34	1758.8	3.08	81.64	110.69	24.75	67.54	6759.58
Nagaon	<0.2 ha	18	Mean	0.11	9573.28	9.22	99.44	290.56	26.5	232.22	23304.28
(n=36)			SD	0.03	3122.29	1.96	46.06	80.03	10.02	39	4036.47
	0.2-0.4	5	Mean	0.32	9682.6	6.2	178	335	59	192.6	19299.80
			SD	0.07	1228.6	2.05	27.35	60.21	10.15	50.23	5035.84
	>0.4 ha	13	Mean	0.97	11395.54	2.62	291.15	487.69	142.85	150.69	15335.54
			SD	0.69	579.33	0.51	124.32	63.79	66.57	29.22	3248.12
	Total	36	Mean	0.45	10246.5	6.42	179.58	367.92	73.03	197.28	19870.50
			SD	0.57	2406.57	3.44	119.76	116.11	67.32	52.51	5308.33
Sonitpur	<0.2 ha	9	Mean	0.13	8505.22	4	35.22	332.22	11.78	110.33	11034.56
(n=25)			SD	0.05	824.54	1.22	15.02	92.17	6.48	39.12	3911.84
	0.2-0.4	13	Mean	0.28	8403.69	3.31	70.69	348.08	23.54	91.23	9128.31
			SD	0.08	1559.22	1.11	27.67	101.27	8.69	34.85	3467.41
	>0.4 ha	3	Mean	0.6	10708	2	118.33	333.33	61	41.33	6593.00
			SD	0.27	2352.32	1	52.04	104.08	13.53	19.09	797.78
	Total	25	Mean	0.26	8716.76	3.4	63.64	340.6	23.8	92.12	9510.32
			SD	0.18	1571.25	1.26	37.25	94.48	17.15	39.93	3630.35
	District		*P-value*	0.185	0.012	<.001	<.001	0.568	<.001	<.001	<.001

Rs. 16858.47. and Rs. 9510.33 for Nagaon, Morigaon and Sonitpur district respectively with highest loss in Nagaon district followed by Morigaon and Sonitpur district.

The result of the study indicated that in Nagaon district all the categories of ponds suffered an average mortality due to *Aeromonas* infection was found to be 6 % followed by Morigaon (5.6 per cent) and Sonitpur district (3 per cent). The average total loss kg/ha was found to be highest in Nagaon district (207.84 kg) followed by Morigaon district (189.79 kg) and Sonitpur district (89.84 kg). In the present study it was indicated that in all categories of ponds the stocking density was found to be higher that might be one of the predisposing factor leading to stress which ultimately made fish susceptible to disease. Faruk *et al.* (2004) stated that the loss due to fish disease varied with different parts of country as well as with different size of the farm. He found that the average overall loss was Tk. 20,615/ha/year.

Roberts *et al.* (1982) and Lio-Po *et al.* (1983) found mortality between 10 and 70 per cent among cultured tilapia (*O. nilotica*) due to *Aeromonas* infection in Phillipines. Noga (1996) was found that mortality among high thermal stressed fish was reported as high as 80% due to *Aeromonas*. Ruth Francis (1999) inferred that *Aeromonas* infections are probably the most common bacterial disease diagnosed in cultured warm water fishes. Usually mortality rates are low (10% or less) and losses may occur over a period of (2 or three weeks or longer). Stress has caused fish to

Table 2: Summary of overall economic loss in 3 districts

Area (ha)	n	Statistics	Area (ha)	Stocking density/ ha	Mortality (%)	No. of Infected Fishes	Wt. of infected fishes	Average loss (kg)	Loss (kg/ha)	Loss in income (Rs.)
<0.2 ha	41	Mean	0.12	9397.17	8.05	87.54	292.44	23.1	192.83	19322.88
		SD	0.04	2331.48	2.89	51.28	82.67	11.1	72.16	7271.60
0.2-0.4	29	Mean	0.29	8567.66	4.52	107	370.69	38.83	138.45	13849.59
		SD	0.08	1510.64	1.72	48.25	94.74	17.99	56.57	5654.95
>0.4 ha	21	Mean	0.90	10975.57	2.52	245.86	447.14	114.33	121	12617.81
		SD	0.61	1346.75	0.6	138.92	96.08	66.18	48.48	4497.00
Total	91	Mean	0.35	9497.07	5.65	130.27	353.08	49.16	158.92	16031.32
		SD	0.42	2078.91	3.17	101.51	108.26	49.63	69.47	6865.25

•Price of per kilo of fish is considered @ Rs. 100/=

become more susceptible to bacteria. To him common source of stress are poor water quality, rough handling and overcrowding.

Basheer *et al.* (2012) studied haemorrhagic septicaemia disease outbreak due to A*eromonas hydrophila* in a fresh water carps pond. The clinical signs included anorexia, slow movement in water surface, chronic rubbing of body due to irritation with a mortality of 16 per cent. In our present study the average mortality in three districts were 6, 5.6 and 3 per cent, respectively for Nagaon, Morigaon and Sonitpur district which is slightly lower in the present study compared to the findings of Basheer *et al.* (2012). Small scale farm (<0.2 ha) suffered from highest economic loss than medium sized ponds (0.2-0.4ha) and large ponds (>0.4 ha). In virtual terms, this suggests that small- scale farmers are more vulnerable to disease shock as the loss of income due to disease is higher amongst the small farm holders in the entire three districts under study. Small-scale farmers have little knowledge in fish culture and found to hesitate to use any prophylactic measures in their ponds may be due to poor economic condition or lack of awareness. The same findings were also reported by Faruk *et al.* (2004) where overall average loss was found to be Tk. 20,615/ha/yr that supports our present study. Assessing the impact of disease in aquaculture practices is not easy, as only acute losses are recognized and computed. Poor growth due to disease and chronic mortalities are not recognized or totally ignored. In order to quantify disease losses, farmers should be in a position to identify disease as the reason for crop loss, retarded growth or poor harvest (Mohan and Bhatta, 2002). Therefore, it is important to train farmers to carry out on-farm level

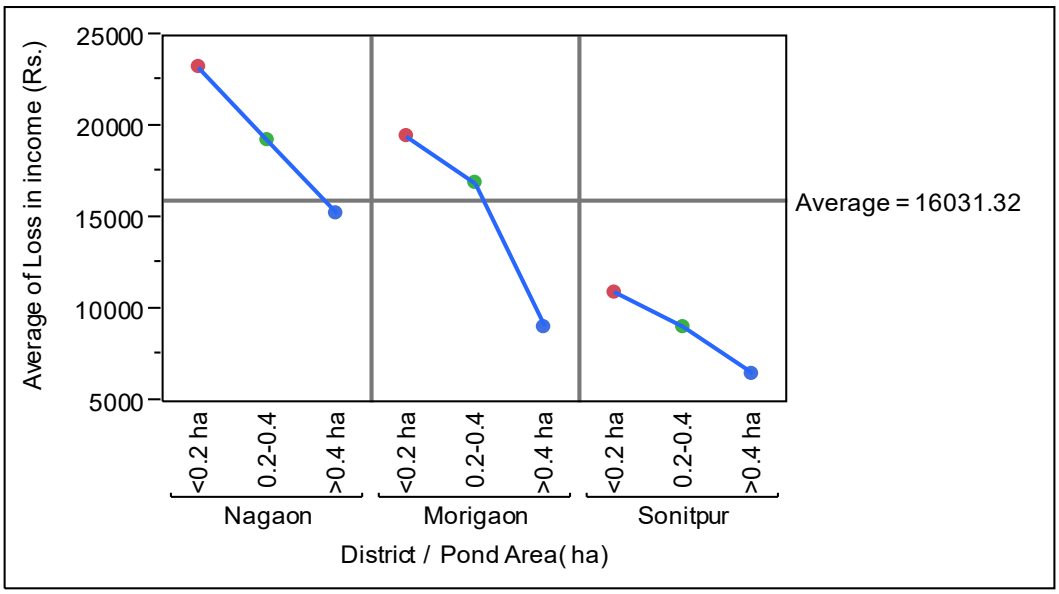


Figure 1: Average economic loss in the districts under studies due to MAS

diagnosis and evaluate the likely impact of disease. Several indicators may be used to assess health related losses in aquaculture practices such as weight of dead fish, number of dead fish, mortality percentage and prevailing market price (Atallah *et al.,* 2005). Although farmers spent quite a lot of money as prophylactic measures against disease as well as during treating diseased fish, the cost incurred due to prophylactic and treatment were not considered in the present study. Moreover, the traditional fish farmers are very poor in keeping the proper records and accounts of their fisheries operations. Hence it was not possible to get the actual data and therefore had to trust mostly on the memory of the respondents. Mostly rural fish farmers were resource poor with very little knowledge or no knowledge of health management and therefore have little chance to improve management skill and as a result the rural fish farmers face a huge financial loss due to outbreak of disease. These losses have a serious impact on the livelihood of the fish farmers, their dependents and the community through reduced food availability, loss of income and employment and other social consequences. The result on economic loss due to MAS clearly revealed that there occurs a significant financial loss in the district under study with a mean loss in income for three districts Rs. 16031.32 (Figure 1). The analysis of p-value reveals that there were significant differences (<0.001) in mortality, average loss and loss in income in the three districts under studies.

CONCLUSION

From the findings of the study it can be concluded that prevalence of MAS has great significance in the aquaculture system of Assam. The development and growth of aquaculture industry demands the need to develop tools to monitor the health status of fish under various stressed conditions. Evaluation of different stress parameters will help by facilitating early detection of infectious diseases and thus help to improve the health status of fish and reduces susceptibility to fish disease on MAS in fish culture ponds in Assam. Therefore, it is advisable to apply a good management practice and adoption of suitable preventive strategy to overcome the outbreak of MAS in the districts under study. The present work constitutes a comprehensive study to fulfil some of the gaps existing in this direction. Further work on investigation and significance of MAS in other parts of the state may be carried out along with in depth study on isolation and characterization of other pathogenic bacterial pathogens in fresh water aquaculture of Assam. The present study will open a new area of research in the field of fisheries and will help to develop simple approaches to monitor and improve fish health.

ACKNOWLEDGEMENT

The author is highly grateful to the Dean, College of Fisheries, AAU Raha for his encouragement in taking up the research programme. Support received from National Surveillance Programme for Aquatic Animal Disease (NSPAAD) in utilizing all sort of laboratory facilities during the entire research programme is gratefully acknowledged.

REFERENCE

Altinok, I.; S. Kayis and E. Capkin. 2006. *Pseudomonas putida* infection in rainbow trout. *Aquaculture,* 261: 850-855.

Atallah, S.T. and S.A. El-Banna. 2005. Effect of fish diseases on economic and productive efficiency of fish farms under Egyptian conditions. 4th Int. Sci. Conf. Fac. of Vet. Med. Mansoura University, 5-6 April.

Basheer, A.D.; N. Punniamurthy; S. Kumar; S. Malmarugan; R. Suresh; V. Ranganathan and V. Purushothamam. 2012. Outbreak of bacterial haemorrhagic septicaemia in fresh water carps in Thanjavur region of Tamil Nadu. Proceeding of the National Seminar on Current Perspectives in Biological Sciences (NSOCPIBS-2012) 11th -12th Oct 2012.

Bora, M.; M. Deka; M. Bharali; S. Bhuyan; M. Chakravarty; A. Ali and H.S. Dutta. 2018. Attitude and Economic Motivation of Farmers towards Farming for Doubling Farm Income. *Journal of Community Mobilization and Sustainable Development,* 13(3): 426-430.

Faruk, M.A.R.; M.J.A. Sarkar and M.B. Kabir. 2004. Economic loss from fish diseases on rural freshwater aquaculture of Bangladesh. *Pakistan Journal of Biological Sciences,* 7(12): 2086-2091.

Grisez, L. and F. Ollevier. 1995. *Vibrio* (Listonella) *anguillarum* infection in marine fish larviculture. In: Lavens, P., Jaspers, E., Roelande, I., editors. 91-Fish and Crustacean Larviculture Symposium, European Aquaculture Society, Gent, Special Publication. pp 497.

HLPE. 2014. Sustainable fisheries and aquaculture for food security and nutrition. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome.

Klesius, P.H.; C.A. Shoemaker and J.J. Evans. 2000. Vaccination. A health management practice for preventing diseases in tilapia and other cultured fish. 5th Int. Symposium on tilapia aquaculture in the 21st century. *Brazil,* 2: 558-564.

Mahapatra, K.D.; P. Routray; N.K. Barik and P. Jayasankar. 2012. Quality seed production through brood stock management in SAAARC countries. SAARC training programme, 1-10 Oct, 2012. Central Institute of Freshwater Aquaculture, Bhubaneswar, India. 200p.

Mohan, C.V. and R. Bhatta. 2002. Social and Economic impacts of Aquatic Animal health Problems on Aquaculture in India. In: Arthur, J.R., M.J. Philips, R.P. Suda Singhe, M.B. Reantaso and I.H. Macrae (Eds.). Primary Aquatic Animal Health Care in Rural, small-scale Aquaculture Development. FAO Fsh. Tech., 406: 63-75.

Som, S.; R.R. Burman; J.P. Sharma; R.N. Padaria; S. Paul and A.K. Singh. 2018. Attracting and Retaining Youth in Agriculture: Challenges and Prospects. *Journal of Community Mobilization and Sustainable Development,* 13(3): 385-395.

Received on February, 2019, Revised on May 2019

Journal of Community Mobilization and Sustainable Development Vol. 14(2), 251-256, May-August, 2019

What the Parents Think About the Future of their Young Sons in Farming: A Case of Haryana

Hema Tripathi[1]*, Vishwa Bharati Dixit[2], Sajjan Singh[1], Rekha Yadav[3] and Ramesh Nukala[3]

[1]Principal Scientist, [2]Principal Scientists & Incharge, Transfer of Technology and Entrepreneurship Unit, ICAR-Central Institute for Research on Buffaloes, Hisar-125001, Haryana

[3]Doctoral Student, Veterinary Extension, ICAR-IVRI, Izatnagar

ABSTRACT

The present study was carried out by using exploratory research design in the Hisar district of Haryana comprising nine blocks. Two villages from each block (18 villages) and from each village, five households were selected purposively having living father and his own young son between age of 15-29 yrs engaged in farming making a total of 180 respondents (90 son and 90 parents from 90 households). They were personally interviewed through two different interview schedules. The study revealed that majority of the parents as respondents belonged to low socio economic status. Respondents (parents and son) were classified as per their educational, occupational, economic, social and career aspiration for their children. Post graduation was the highest aspirations of 61.1 per cent parents followed by professional degree revealed by 21.1 per cent parents. On the contrary 48.89 per cent youth aspired for graduation as highest qualification followed by post graduation. Parents and sons had high aspirations for getting high income jobs and did not vary in their economic aspirations. Social aspirations were also found almost same of parents towards their children and sons towards themselves, both wished to be respectable as their major social aspiration. For sons, economic aspirations were at the top followed by educational and social aspirations whereas parents wished that their children should complete the highest education first and then should go for earn money. 52.20 per cent respondents (parents) did not desire to continue to remain their children in farming activities and more than 80 per cent sons wanted to be migrated from the village first to fulfil their aspirations by living in the urban areas. High and significant correlation was found between the attitude of parents towards their children in farming and attitude of sons towards farming and revealed moderately favourable attitude towards farming.

Keywords: Parents, Youth, Aspirations, Rural farming, Haryana

INTRODUCTION

Parents are the first teacher of a child. He/she is influenced from infancy to teens to adults by the parents and later by teacher and peer. The role of parents is the single biggest influence on social, psychological, emotional and intellectual development that shapes the child's attitude, aspirations and overall behaviour. Parents play a key role in modifying the childhood aspiration and also in the attitude formation (Berk, 2000). The same is true for the perception of parents to continue their children in farming as an occupation inspite of the fact that parents themselves losing confidence in farming and developing less favourable attitude towards farming. So, they wanted their child out of it, they also look for better return from non-farming occupation and support their children in such endeavours. On the other side of the coin, ample evidence shows that rural youth are also losing their interests in farming due to number of reasons right from reduce in farm profitability, degradation of natural resources, reduced size of holdings and lack of interest of youth in traditional agriculture. There are evidences from several sources for growing youth disinterest in farming that justifies their moving out of agriculture. What is needed immediately to resolve this conflict is to rebrand and reform agriculture by making a composite plan of action to model agriculture as per the need and demands of youth (Som *et al.,* 2018).

Researches carried out even in other countries emphasize that young people increasingly getting less interested in staying in the countryside (White, 2012), this leaves rural areas with less people to work the land because

*Corresponding author email id: hematripathi1@gmail.com

working age group consisting of the youth would have migrated to the urban areas or elsewhere (Juma, 2007). Some scholars have attributed the absence of the youth in the rural areas as the main reason behind lower production yields in smallholder farming (Lipton, 1980). Relatively little research has been done to capture attitude, aspirations and views of the parents toward farming in India and life in rural areas for their children despite worrying accounts about youth's lack of interest in rural and agrarian futures. The study attempted to explore and unfolding vital information on aspirations and attitude between parents' attitude towards farming for their sons and thinking about the future of their children in farming.

MATERIALS AND METHODS

The present study was carried out by following exploratory research design in the Hisar district of Haryana. Hisar falls in the Agro Climatic Zone-VI, which is called "Trans-Gangetic Plains Region". Hisar, one of the important cities of North India, is located at 2905'53 north latitude and 75045'55" east longitudes. It is situated one hundred sixty four kilometres west to Delhi on the National Highway number ten. The district is under control of Hisar division and administratively divided into nine community development blocks and all were covered under study by randomly selected two villages from each block. Thus study carried out in 18 villages. From each village, five households were selected purposively with the condition that these households should have living father having his own son between age of 15-29 years with education up to 12th standard and both should have engaged in farming activities. Thus five parents and five rural youth (son) were personally interviewed through two different interview schedule from each of the selected village, making a total of 180 respondents (90 rural youth and 90 parents from 90 households). One young son and his father from one family were considered as unit of data collection.

Aspirations were measured under five sub heads including the educational, occupational, economic, and social and career related with various parameters. Each parent respondent was asked to mention their response in one of the parameters under each aspiration group that they feel most significant for the lives of their children. Young sons as respondent also responded on each aspiration most suiting to them for themselves. Attitude of parents towards farming for their children comprising 11 statements and attitude of rural youth towards farming for themselves comprising 21 statements both developed by Hari (2014) were used to measure their attitude. Each respondent was asked to mention his opinion against each statement on 5 point continuum. For each positive statement, the scores ranged from 1 to 5 with scores assigned as 1 for least agreeing, 2 for less agreeing, 3 for moderately agreeing, 4 for highly agreeing and 5 for most

Table 1: Classification of respondents (parents) as per their socio economic characteristics

Socio-personal characteristics	Percentage
Age categories (years)	
44 -50	35.6
51 - 57	46.7
58 -64	17.8
Education status	
Illiterate	25.5
Primary	13.3
Middle	11.1
High School	16.7
Intermediate	17.8
Graduation	6.7
Post Graduation	8.9
Family main occupation	
Agriculture	63.3
Animal Husbandry	6.7
Agriculture + Animal Husbandry	14.4
Government	5.6
Private	2.2
Self employed	3.3
Labour	4.4
Land Holding	
Landless	4.4
<1 ha	20.0
1-2 ha	41.1
>2 ha	34.4
Livestock holding (Bovine) (average herd size 4.8)	
<= 4.00	50.0
5.00 - 8.00	38.9
9.00+	11.1
Gross family income/ Monthly	
<= 30000.00	81.1
30001.00 - 60000.00	16.7
> 60001.00	2.2
Parents in any leadership position	
Yes	16.7
No	83.3

agreeing, attitude. Scoring was reversed for negative statements. The attitude scores of each respondent were calculated by adding the scores of all statements. Based on the scores, the respondents' attitude was categorized into 3 classes, viz. less favourable, moderately favourable and highly favourable attitude based on the score achieved by them.

RESULTS AND DISCUSSION

Socio economic characteristics: Table 1 shows that majority of the parents (46.7%) as respondents belonged between 51-57 years age category with majority had poor education status including 25 per cent illiterate. Only 8.9 per cent were post graduated. Rest was almost equally distributed under high school and intermediate category. About 63per cent respondents (parents) had Agriculture as their main occupation followed by Agriculture and animal husbandry (14.4%). About 41 per cent respondents fell under 1-2 ha land category (Small farmers) followed by 34.4 per cent owned more than 2 ha of land. Average herd size mainly bovines was 4.8 animal heads. More than 80per cent of the families had less than Rs.30000 as Gross family income in a month. About 83 per cent of the respondents (parents) had no leadership position and the rest were mainly the member of the dairy cooperatives and associations.

As far as information source utilization was concerned, veterinary doctor and veterinary field assistants were the major sources for receiving animal husbandry information and got highest mean score followed by bank personnel and village extension officer. Television was the major mass media source being utilized by majority of the parents based on their mean score (2.60) followed by newspaper and radio. Internet use came on 4th position according to the use (Table 2). Nain *et al.* (2015) also reported television as major source of information of the farmers.

Aspirations of parents about the future of their children in farming and of sons for themselves: Respondents (parents and son) were classified as per their educational, occupational, economic, social and career aspiration for their children (Table 3). Post graduation was the highest aspirations of 61.1 per cent parents followed by professional degree revealed by 21.1 per cent parents. On the contrary 48.89 per cent youth aspired for graduation as highest qualification followed by post graduation. Aspirations of parents and their son did not differ significantly for their occupational aspirations as both aspired for Government Job followed by own business. Parents and sons had high aspirations for getting high income jobs and did not vary in their economic aspirations. Social aspirations were also found almost same of parents towards their children and youth towards themselves, both wished to be respectable as their major social aspiration. Career aspirations revealed by parents towards their children were different than their children for themselves. 26.6 per cent youth wanted to be an entrepreneur followed to be a soldier in army and then teacher whereas parents wished that their son should go in teaching line followed by soldier in army as a career. About 14 per cent parents wanted that their children should opt for entrepreneur as a career.

According to Hari (2014) parental perception was one of the most important factors influencing the occupation aspirations of the respondents. About 69.25 per cent respondents perceived parental perception of the job as very highly influencing factor. Income and prestige too

Table 2: Classification of respondents (parents) as per their formal and mass media sources of information utilization

Formal sources of information utilization	Mean Score	Rank	Mass media utilization	Mean Score	Rank
Village extension official	1.41	III	Radio	1.90	III
Veterinary doctor	1.91	I	Television	2.60	I
Veterinary field assistant	1.91	I	Poster	1.67	V
Bank personnel	1.42	II	Educational films	1.53	VII
NGO	1.04	VI	Exhibition	1.60	VI
BDO	1.36	V	Demonstration	1.50	IX
Scientist	1.39	IV	Farm publication	1.51	VIII
-			News paper	2.30	II
-			Internet	1.69	IV

Table 3 : Classification of respondents (parents) as per the their educational, occupational, economic, social and career aspiration for their children and of sons for themselves

Types of Aspirations	% Youth (N=90)	% Parents (N=90)
Educational aspiration		
Intermediate	6.67	4.5
Graduation	48.89 (I)	13.3
Post graduation	34.81 (II)	61.1 (I)
Professional	9.63	21.1 (II)
Occupational aspiration		
Farming /Agriculture	18.52 (III)	14.4
Animal husbandry	17.78	16.7(III)
Fisheries	6.30	2.2
Horticulture	7.78	6.7
Government Job	24.07(I)	27.8 (I)
Private Job	4.81	7.8
Casual labour	0.00	0.00
Own business	20.74 (II)	24.4 (II)
Economic aspiration		
High income jobs	67.03 (I)	74.4 0(I)
High standard of living	17.41	16.70
High material possession	15.56	8.90
Social aspirations		
Socially recognized by all	30.00	31.1
Known in the society by few	25.93	21.1
Respectable	35.19(I)	35.6 (I)
Leader	8.89	12.2
Career aspiration		
Teacher	17.04 (III)	32.2 (I)
Soldier in army	25.19 (II)	24.4 (II)
Veterinarians	9.63	3.3
Doctor	4.81	6.7
Engineer	6.30	10.0
Police officer	3.33	8.9
Motor mechanic	0.74	0.0
Architect	2.22	0.0
Carpenter	0.00	0.0
Accountant	2.22	0.0
Plumber	0.00	0.0
Contractor	1.85	0.0
Entrepreneur	26.67(I)	14.4(III)

were highly influencing factors with 54.75 per cent and 48.5 per cent of the respondents respectively, agreeing that these factors had very high influence on their occupational aspirations. Peer group had very high influence with 45.75 per cent respondents agreeing for occupational aspirations. Only 16.25 per cent respondents agreed that easiness to do the job had very high influence on their occupational aspirations. (Benhenke *et al*., 2004) through a qualitative case study with 10 rural families showed that both children and parents aspired for jobs better than the parents do. A study done by Tafere and Woldehanna (2012) found that, less than one percent of the parents want their children to inherit farming. Parents had strong desire for their children to have higher aspiration. Similar studies had also been reported from Greece; where in Greek mothers engaged in agriculture in the country side didn't want their children to do farming activities, since they do not view their role as satisfactory (Gidarakou *et al.,* 1997).

The results of comparison with respect to parental aspirations towards their children and of sons towards themselves (Table 4) showed difference in terms of the ranks assigned by them based on mean score. For sons, economic aspirations were at the top followed by educational and social aspirations whereas parents wished that their children should complete the highest education first and then should go to earn money. Youths whose

Table 4: Comparison between parental aspirations towards their sons and of son's towards themselves

Group of aspirations	Rank revealed by sons	Rank revealed by parents
Educational aspirations	II	I
Occupational aspirations	V	IV
Economic aspirations	I	II
Social aspirations	III	V
Career aspirations	IV	III

Table 5: Classification of respondents (parents) as per their desire to continue to remain their children in farming activities and liking of son for migration from rural areas

Do you wish that your children should continue to assist you in farming	Percentage
No	52.20
Yes	47.80
Liking of migration of sons	
No	19.26
Yes	80.7

Table 6: Attitude of parents towards their young children in farming and attitude of sons towards farming for themselves

Sons		Parents	
Levels of attitude	**Percentage**	**Levels of attitude**	**Percentage**
Less favourable (21.00- 49.00)	7.0	Less favourable (11.00- 25.66)	12.2
Moderately favourable (50.00 - 77.00)	77.0	Moderately Favourable (25.67 - 40.32)	75.6
Highly favourable (78.00-105.00)	15.9	Highly favourable (40.33-55.00)	12.2

Correlation coefficient between parents attitude towards their children for farming and youth attitude towards farming : 0.42** denotes high degree of correlation between parents and child's attitude towards farming
**significant at 1% level of significance

parents have an intrinsic interest in crop farming and on whom they depend for their production needs, shelter, clothing, schooling and feeding may be influenced to participate more in crop farming than those youths whose parents had no interest in farming (Torimiro and Oluborode, 2006). When the parents are from well to do and are primarily farmers, the attitude of the child to farming increases significantly (Houghton, 1995). Similarly, studies from Iceland have found that parents who work in the fishing industry in Iceland emphasized the importance of fisheries in national economy, but discouraged the children from getting involved in it. Parental education was found associated with increased migration intention of the child, but it played along with many other factors (Bjarnason and Thorlindsson, 2006).

Table 5 reveals that 52.20 per cent respondents (parents) did not desire to continue to remain their children in farming activities and rest still desired that their son should go for farming as an occupation. In contrast, more than 80 per cent youth wanted to be migrated from the village first to fulfil their aspirations by living in the urban areas. In India, Hari (2014) projected the resentment of the educated youth from UP, Rajasthan, Kerala and Assam to participate in farming and considered farming as a profession which denigrated their status. Tripathi *et al.* (2017) found that better job availability in urban areas (Rank I), better educational opportunities (Rank II) and better opportunities for more income (Rank III) were the major pull reasons for migration revealed by 91.74 per cent and 87.61 per cent by youth from Haryana respectively not only youth but parents also had the same feelings and many were reluctant to continue to keep their children in farming.

Table 6 shows the high and significant correlation between the attitude of parents towards their children in farming and attitude of youth towards farming. Both had moderately favourable attitude as majority of the parents as well as their young son's fell under this category. Bora *et al.* (2018 also found that majority of farmers had moderately favourable attitude towards farming)

CONCLUSION

The study interestingly found moderately favourable attitude and almost similar aspirations of the parents and sons towards farming. Parents had strong desire for their children to have higher educational followed by economic aspiration. Thus profitable agriculture is crucial for attracting and retaining youth in agriculture only after receiving higher education. After that, there is a need to generate entrepreneurship models that would help to retain youth in rural areas to get them involved in agriculture and to improve the overall rural situation. Young sons having an aptitude for agriculture can be encouraged to undertake commercial farming on their own or leased land and/or to establish animal based units, agro processing units, small scale industries and agri-services from which they can earn for higher income than in private salaried employment. Here the role of the parents is important to retain their sons in farming by shaping their attitude and aspirations, improving/promoting their confidence levels and encouraging them to pursue farming as profession.

REFERENCES

Bora, M.; M. Deka; M. Bharali; S. Bhuyan; M. Chakravarty; A. Ali and H.S. Datta. 2018. Attitude and economic motivation of farmers towards farming for doubling farm income. *Journal of Community Mobilization and Sustainable Development*, 13(3): 426-430.

Benhenke, A.; K. Piercy and M. Diversi. 2004. Educational and occupational aspirations of the Latino Youth and their Parents. *Hispanic Journal of Behavioural Sciences*, 26(1): 16-35.

Bjarnason, T. and T. Thorlindsson. 2006. Should I stay or should I go? migration expectation among young icelandic fishing and farming community. *Journal of Rural Studies*, 22: 290-300.

Gidarakou, I.; A. Xenon; E. Kazazis and K. Theofilidou. 1997. The Challenges of Women's New Role in Rural Greece. In: Local Response to Global Integration, August, 25-28, XII Congress of the European Society for Rural Sociology, Crete, Greece.

Gidarakou, I. 1999. Young Women's Attitude towards Agriculture and Women's New Relation in Greek Country Side. *Journal of Rural Studies*, 15(2): 147-158.

Hari, R. 2014. Determinants of rural youth participation in farming. PhD Thesis (Unpublished) Deemed University Indian Veterinary Research Institute, Izatnagar.

Houghton, D. 1995. Reasonable doubts choice in Philosophy. *The Journal of Royal Institute of Philosophy*, 32(2): 45-56.

Nain, M.S.; R. Singh; J.R. Mishra and J.P. Sharma. 2015. Utilization and Linkage with Agricultural Information Sources: A Study of Palwal District of Haryana State. *Journal of Community Mobilization and Sustainable Development*, 10(2): 152-156.

Som, S.; R.R. Burman; J.P. Sharma; R.N. Padaria; S. Paul and A.K. Singh. 2018. Attracting and Retaining Youth in Agriculture: Challenges and Prospects. *Journal of Community Mobilization and Sustainable Development*, 13(3): 385-395.

Tafere, Y. and T. Woldehanna. 2012. Rural Youth aspiring to occupations beyond agriculture: Evidence from young life study from Ethiopia. In: Young people Farming and Food Conference. March, 19-21. International Conference on the Future of the Agrifood Sector in Africa, Accra, Ghana. Pp. 36-41.

Torimiro, D.O. and A.A. Oluborode. 2006. Exploring Socio economic correlates of the Production Needs for enhancing Food security through farm youth in South west. *Journal of Applied Science Research*, 2(5): 248-255.

Tripathi, H.; V.B. Dixit and S. Singh. 2017. Factors influencing participation of rural youth: an exploratory study of Haryana. Annual Report, 2017-18; ICAR-CIRB, Hisar.

White, B. 2012. Agriculture and the Generation Problem: Rural Youth Employment and the Future of Farming. *IDS Bulletin*, 46(6): 11-19.

Received on March, 2019, Revised on May 2019

Journal of Community Mobilization and Sustainable Development Vol. 14(2), 257-261, May-August, 2019

CFLD an Effective tool for Enhancement of Area, Production and Productivity of Lentil in District Shajahanpur

K.M. Singh[1], L.B. Singh[2] and U.S. Gautam[3]*

[1]Krishi Vigyan Kendra, Shahjahanpur, SVPUAT, Meerut (U.P.)

[2]Professor (Agriculture Extension) SVPUAT, Meerut

[3]Director, ICAR-ATARI, Kanpur, Present Posted VC, BAU, Banda

ABSTRACT

The country's area under Lentil was 13.90 lakh hectares with a production of 10.93 lakh tonnes. Madhya Pradesh is on first ranked with respect to acreage 39.59 per cent (5.50 lakh ha) followed by UP 33.95 per cent and Bihar 11.29 per cent respectively. While in terms of production UP is on first ranked 34.36 per cent (3.76 lakh tonnes) followed by Madhya Pradesh (30.73 per cent) and Bihar (17.35 per cent). The study clearly revealed that Cluster front line demonstration at farmer's field resulted in more knowledge of improved package of practices by farmers and more number of farmers can be benefited. The average yield under recommended practice (CFLD) was obtained 22.19 q ha^{-1} as compared to farmers' practice 12.50 kg ha^{-1}, which was 77.52 per cent higher. The three years average data of CFLD lentil on technology index II was higher (43.67 per cent) than the farmers' practice. The average yield of district every year increase (9.42 to 13.70 q ha^{-1}). The average net returns 127.12 per cent higher than that of farmers' practice. The B: C ratio exhibited the same trend as in gross and net return which was found 2.99 – 6.31 in CFLD demo and 2.11 – 3.44 in farmers' practice. Technology dissemination on advanced technology of lentil through CFLD on lentil crop growth area, production and productivity 283.04, 461.29 & 46.54 per cent in 2016-17, and 24.75, 52.06 & 21.89 per cent in 2017-18, respectively.

Keywords: Lentil, Production, Productivity and Area

INTRODUCTION

In India major five pulses chick pea, pigeon pea, green gram, black gram and lentil occupied 35, 16, 13, 12 and 7 per cent of total legumes area contributing 48, 16, 9, 7 and 6 percent pulses production while the other minor pulses contributed only 17 percent in legumes area and 14 percent in pulses production (Anonymous 2018).

India ranked first in the Lentil area and second in the Lentil production with 43 per cent and 37 per cent of world area and production, respectively. The highest lentil productivity is recorded in New Zealand (2667 kg/ha) followed by China (2239 kg/ha). Canada ranked first in lentil production (38 per cent) due to very high level of productivity (1971 kg/ha) as compared to India (600 kg/ha) (Tiwari and Shivhare, 2016).

The country's area under Lentil was 13.90 lakh hectares with a production of 10.93 lakh tonnes. Madhya Pradesh is on first ranked with respect to average 39.59 per cent (5.50 lakh ha) followed by UP 33.95 per cent and Bihar 11.29 per cent respectively. While in terms of production UP is on first ranked 34.36 per cent (3.76 lakh tonnes) followed by Madhya Pradesh (30.73 per cent) and Bihar (17.35 per cent). The highest yield was recorded by the state of Bihar (1209 kg/ha) followed by Rajasthan (962 kg/ha) and W.B. (960 kg/ha). The National yield average was (786 kg/ha). The lowest yield was observed in the state of C.G. (327 kg/ha) followed by Maharashtra (400 kg/ha) and M.P. (610 kg/ha) (Tiwari and Shivhare 2016).

Lentil is a valuable human food, mostly consumed as dry seeds (whole decorticated, seed and split). In Indian sub continent it is mostly consumed as 'Dal' by removal of outer skin and separation of cotyledons, snacks and soup preparation etc. It is easy to cook and easily digestible with high biological value, hence also referred to patient. Dry leaves, stems, empty and broken pods are used as valuable cattle feed. Bold seeded, attractive shaped grains have high demand for export at premium prices

*Corresponding author email id: dhakrekms@rediffmail.com

With the unabated population increase, Pulses production also have to be paralleled for the vegetarian Indian Society, as these are the prime source of balanced diet and protein particularly for the rural mass. Thus there is need to increase production and productivity of pulse by more intensive interventions. Lentil grain yield can be increased by demonstrating improved agro techniques at farmers' fields with active participation of farmers with technical experts. Keeping the importance of lentil (Masoor) in Shahjahanpur, KVK, Shahjahnpur conducted Cluster front line demonstration (CFLD) improved agro technologies of lentil crop in scientific manner at farmers' fields during *rabi* season in the year 2015-16, 2016-17 and 2017-18.

MATERIALS AND METHODS

Farmers' operational area of Krishi Vigyan Kendra, Shahjahanpur was selected as per guide line of Cluster Front Line Demonstration to KVK by ICAR-ATARI, Kanpur Zone –III. Accordingly CFLDs under Lentil (Masoor) crop laid out in villages; namely Babauri, Prahladpur, Painakhurd, Jeba, Gulamkhera, Pingra Pingari, Seharamau Daxini, Sunderpur, Khera Bajhera, Barapur, Akhityarpur, Murchha, Benipur,Sainjana and Niyamatpur. The knowledge level of the farmers in these villages was also evaluated by random sample of 20 farmers each village. Thereby sample included 300 numbers of farmers in the study. The farmers were asked to reply questions about the improved agro techniques including the high yielding varieties of lentil (Masoor). The score so obtained under various questions were summed up. On the basis of the total score obtained, respondents were categorized on to three classes' i.e. low, medium and high level of knowledge.

The soil samples were taken and analyses before sowing of CFLDs demonstration. The soils of CFLDs field were found sandy loam to clay loams having 0.4 to 0.6 per cent available organic carbon, 250 to 300 kg/ha nitrogen, 31 to 53 kg/ha available P_2O_5 and 60 to 120 kg/ha available potassium with pH range from 7.5 to 8.1. CFLDs on lentil (Masoor) were cultivated during *rabi* season and sown first fortnight of November. Lentil crop was sown in line and fertilize with a common dose of N: P: K: S @ 20:60:40:25 kg/ha. Full Nitrogen, Phosphorus, Potash and Sulphur applied at sowing time. Nitrogen was use as a starter dose of crop. Seed treatment done by using carbendazim @ 2 g/kg seed 2 to 3 days before sowing. Soil treatments of CFLDs Demonstration fields were taken by using trichoderma @ 4 kg/ha and plant protection measures adopted during crop.

The participating farmers were provided with all advance technical know how about advanced cultivation of lentil crop. KVK scientist also visited regularly to the demonstrations fields and continuously guides the farmers. The varieties (PL 08 and HUL 57) were also utilized for collection of feedback information for more improvements in technology transfer programme. Field days and group meeting were also organised at demonstration sites to provide the opportunities for other farmers to witness the benefits of demonstrated technologies. The data on lentil productivity (q/ha) were collected from the demonstration and control plots (Farmers Practice) for further analysis. The critical inputs were duly supplied to the farmers by KVK. Data were collected from the field of FLDs farmers and analysed to compare the yield of farmers' field and CFLDs field. The Technology gap, extension gap and technology index I and technology index II were estimated by formulae provided by Samui *et.al.* 2000.

1ogy gap = Potential yield – demonstration yield

Extension gap = demonstration yield – farmers practice yield (control)

$$\text{Technology index - I (\%)} = \frac{\text{Potential yield} - \text{Demo yield}}{\text{Potential yield}} \times 100$$

$$\text{Technology index – II (\%)} = \frac{\text{Demo yield} - \text{Check yield}}{\text{Demo yield}} \times 100$$

Data on District production, productivity and area were taken from agriculture department. Data were interpreted on three years average basis.

RESULT AND DISCUSSION

Knowledge level of advanced agronomic practices of Lentil (Masoor): To know the need of the technological intervention the knowledge level of the farmers in 15 villages were estimated from 300 farmers 20 farmers each village. Over all maximum number of farmers fall in category of medium level knowledge, while very few were with high knowledge level (Table 1). Thus need was felt to introduce latest varieties and nutrient management in CFLDs programme in the fifteen villages. CFLDs are good extension tool to demonstrate the impact of new agro technique to the farmers.

Yield and Technological index I & II: Implementation of improved production technology remarkably increased

Table 1: Overall knowledge level of farmers in respect of cultivation of Lentil (Masoor) N= 300

Category of knowledge level	Score range	Number of farmers	Percentage of respondents
Low	30-35	102	34
Medium	36-54	153	51
High	55-75	45	15

the yield (71.88 – 87.20) over farmers' practice during the three years of CFLD demonstration. The average yields under recommended practice (CFLD) were obtained 22.19 q/ha as compared to farmers' practice 12.50 q/ha, which was 77.52 per cent higher (Table 2). Although, yield obtained under CFLD demonstration higher than potential yield of varieties. It may be due to cumulative effect of several biotic and a biotic factors in micro climatic conditions that varying year to year.

Yield enhancement under recommended practice might be due to balance nutrition as per soil test value, integrated approach, involving fertilizers and bio-fertilizers which play a vital role in making availability of plant nutrient. Similar results were observed by Tomar *et al.* (2003), Tiwari and Saxena (2001) and tiwari *et al.* (2003).

Table 3 showed that by adopting advance production technology under CFLD demonstrations produced higher yield than the potential yield of varieties and it reflected technology index I (1.64–3.05). The three years average yield of CFLD demonstration technology index I was found – 0.86 per cent. The technology index II of CFLD lentil was found higher (41.82 – 46.58) over the farmers' practice. The three years average data of CFLD lentil on technology index II was higher (43.67 per cent) than the farmers' practice. The average yield of district every year increase (9.42 to 13.70 q /ha).

Data presented in Table 3 revealed that demonstration technology had impact over farmers' practices. It might be due to cumulative effect on average yield of district, technology index I and technology index II due to good management of CFLD and technological spread among the farmers of the district. The average yield increased in CFLD demo field due to technological intervention may happen in other similar situation. The results are in agreement with the finding as reported by Tomar *et al.* (2003)

Economical Assessment: The cost of cultivation in CFLD demonstration comparatively higher (Rs. 29700 - 30800) as compared to farmers' practice (Rs 24650 – 25300) because of additional input applied in CFLD demo. The gross return (Rs 133920) and net return (Rs 103787) in CFLD demo were found higher than the gross return (Rs 69578) and net return (Rs 44578). The average net returns 127.12 per cent higher than that of farmers' practice. It showed that the adoption of demonstration technology

Table 2: Performance of technological intervention (CFLD) on Yield (q/ha) of Lentil

Year	Yield Potential (q/ha)	Yield obtained (q/ha)						Yield increase (%)
		Check			Demo			
		Maximum	Mininum	Average	Maximum	Mininum	Average	
2015-16	22.00	16.70	10.30	12.11	26.75	18.50	22.67	87.20
2016-17	22.00	14.30	7.50	12.81	26.75	18.30	22.28	73.92
2017-18	22.00	15.20	9.30	12.59	25.30	16.40	21.64	71.88
Average	22.00	15.40	9.03	12.50	26.27	17.73	22.19	77.52

Table 3: Performance of technological intervention (CFLD) on technology index I & II of Lentil

Name of the crop	year	Area (ha)	Demos (No.)	Variety		National average yield (q/ha)	State average yield (q/ha)	District average yield (q/ha)	Potential yield of the demo variety (q/ha)	Tech-nology index-I (%)	Tech-nology Index-II (%)
				Check	Demo						
Lentil	2015-16	20	50	IPL 81	PL 08	7.86	7.96	9.42	22.00	-3.05	46.58
Lentil	2016-17	45	112	IPL 81	HUL 57	7.86	7.96	12.68	22.00	- 1.27	42.50
Lentil	2017-18	50	125	IPL 81	PL 08	7.86	7.96	13.70	22.00	1.64	41.82
Avrage	-	38.33	95.67	-	-	7.86	7.96	11.93	22.00	- 0.86	43.67

Table 4: Economical comparison between CFLD demo and farmers' practice

Year	Sale Price (Rs q^{-1})	Expenditure and returns (Rs./ha)								Net returns increase (%)
		Check				Demo				
		Gross cost (Rs/ha)	Gross return (Rs/ha)	Net return (Rs/ha)	B:C ratio	Gross cost (Rs/ha)	Gross return (Rs/ha)	Net return (Rs/ha)	B:C ratio	
2015-16	7000	24650	84770	60120	3.44	29700	187250	157550	6.31	162.05
2016-17	5500	24700	70455	45755	2.85	29900	122540	92640	4.10	102.47
2017-18	4250	25300	53508	28208	2.11	30800	91970	61170	2.99	116.85
Average	5583	24883	69578	44694	2.80	30133	133920	103787	4.47	127.12

Table 5: District growth on Area (ha), production (Mt) and productivity (q/ha) of lentil

Year	Area		Production		Productivity	
	(ha)	per cent over the last year	(mt)	per cent over the last year	(q/ha)	per cent over the last year
2015-16	6203	-	4758	-	7.67	-
2016-17	23760	283.04	26706	461.29	11.24	46.54
2017-18	29642	24.75	40609	52.06	13.70	21.89

Source: *JDA Statistics, Krishi Bhawan Lucknow*

by farmers would be higher economically and gainful proposition.

The B:C ratio exhibited the same trend as in gross and net return which was found 2.99 – 6.31 in CFLD demo and 2.11 – 3.44 in farmers' practice (Table 4). Years to year ups in cost of cultivation and decrease in sale price of lentil grains, which consequently reflect the benefit cost ratio in decreasing trends in both the demonstration and farmers' practice. Results suggested economics viability and agronomic feasibility of technology for lentil cultivation as reported Deshmukh *et al.* (2005) and Pathak (2005).

Impact of CFLD on technology dissemination in the Districts: 4758 to 40609 mt and 7.67 to 13.7 q/ha, respectively. Technology dissemination on advance technology of lentil through CFLD on lentil crop, growth area, production and productivity 283.04, 461.29 & 46.54 per cent in 2016-17, and 24.75, 52.06 & 21.89 per cent in 2017-18, respectively. In Second year found higher dissemination rate due to acceptability of technology and un-saturation of area under lentil crop, it also might be sale price (Figure 1-3).

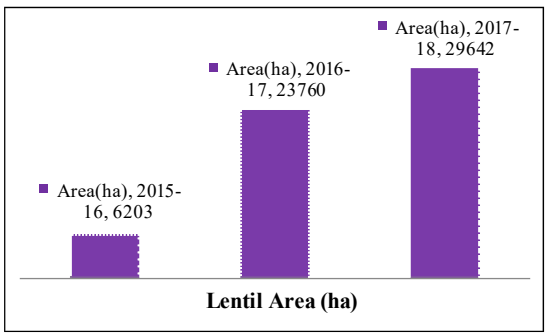


Figure 1: Lentil Area in District Shahjahanpur

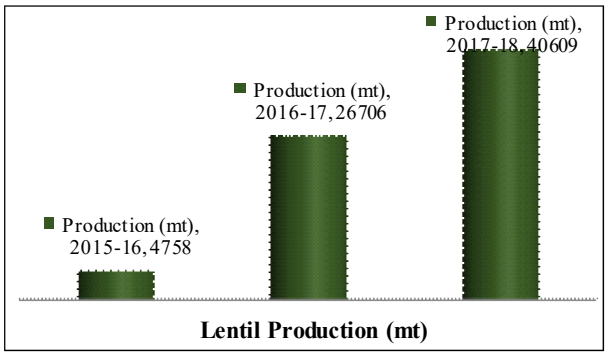


Figure 2: Lentil Production in District Shahjahanpur

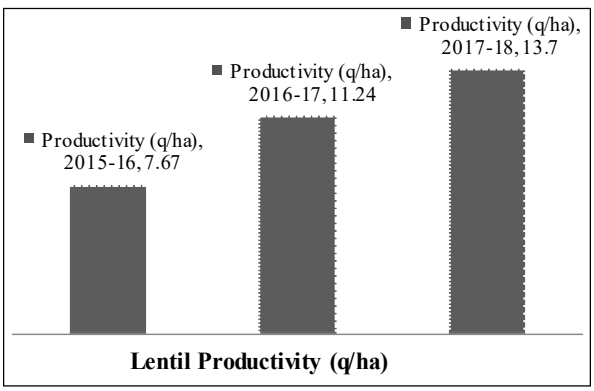


Figure 3: Lentil Productivity in District Shahjahanpur

CONCLUSION

Very few farmers had the knowledge of improved practice of lentil cultivation and CFLDs are good extension tool to demonstrate the impact of new agro technique to the farmers. The farmers need to be made aware about the improved package of practices including high yielding varieties. Demonstration technology had impact over farmers' practices. It might be due to cumulative effect on average yield of district, technology index I and technology index II due to good management of CFLD and technological spread among the farmers of the district. The average yield increased in CFLD demo field due to technological intervention may happen in other similar situation. Years to year ups in cost of cultivation and decrease in sale price of lentil grains, which consequently reflect the benefit cost ratio in decreasing trends in both the demonstration and farmers' practice. Results suggested economics viability and agronomic feasibility of technology for lentil cultivation. Cluster Front Line Demonstration increased remarkable the production, productivity and area of lentil in district Shahjahanpur and Second year found higher dissemination rate due to acceptability of technology and un-saturation of area under lentil crop, it also might be sale price.

REFERENCE

Anonymous. 2018. *Changing Scenario of Pulses in India - An.* https://www.researchgate.net/publication/280596310_Changing_Scenario_of_Pulses_in_India_-_An_Analytical_View [accessed May 04 2018].

Deshmukh, K.K.; A.B. Saraiya and D.P. Dubey. 2005. Effect of integrated nutrient management on productivity trends, economics and soil fertility in soyabean-chick cropping system. *JNKVV Research Journal,* 39(2): 29-32.

Pathak, J. 2017. Evaluation of yield performance of gram (*Cicer arietinum* L.) through front line demonstration. *The Journal of Rural and Agricultural Research,* 17(2): 6-10.

Samui, S.K.; S. Maitra; D.K. Roy; A.K. Mandal and D. Saha. 2000. Evaluation on front line demonstration on groundnut. *Journal of the Indian Society Castal Agriculture Research,* 18(2): 180-183.

Tiwari, A.K. and A.K. Shivhare. 2016. Lentil (Masur). *Pulse in India: Retrospect and Prospect,* 1(2): 86-94.

Tiwari, K.B. and A. Saxena. 2001. Economic analysis of FLD of oil seed in Chhindwara. *Bhartiya Krishi Anusandhan Patrika,* 16(3&4): 185-189.

Tiwari, R.B.; V. Singh and P. Parihar. 2003. Role of FLD in transfer of gram production technology. *Maharashtra Journal of Extension Education,* 22(1): 19.

Tomar, L.S.; B.P. Sharma and K. Joshi. 2003. Study on yield gap and adoption level of potato production technology in grid region. *Maharashtra Journal of Extension Education,* 22(1): 15-18.

Received on April, 2019, Revised on July 2019

Journal of Community Mobilization and Sustainable Development Vol. 14(2), 262-266, May-August, 2019

Farmers' Attitude Towards Aerobic Rice Cultivation in Muktsar District of Punjab

Karamjit Sharma[1]*, N.S. Dhaliwal[2] and V.K. Rampal[3]

[1]Professor of Extension Education, KVK Sri Muktsar Sahib, Punjab Agricultural University, Ludhiana-141004, Punjab

[2]Associate Director, KVK Sri Muktsar Sahib, Punjab Agricultural University, Ludhiana-141004, Punjab

[3]Deputy Director, KVK Fatehgarh Sahib, Punjab Agricultural University, Ludhiana-141004, Punjab

ABSTRACT

In Punjab rice is cultivated mainly through transplanting method which is more laborious, time consuming and water demanding. Aerobic rice is becoming popular among the farmers to overcome these problems. The main purpose of this study was to determine farmers' attitude towards aerobic rice cultivation. It also explored the relationship between selected characteristics of the farmers and their attitude towards aerobic rice cultivation. Sri Muktsar Sahib District of Punjab has selected purposively for this study as maximum area under aerobic rice cultivation was grown under this district of Punjab. From the four blocks of the district Gidderbhaha block of the district was selected randomly, again from this selected block four villages namely Chattiana, Gurisangar, Dhulkot and Kauni were selected randomly and from each village 30 farmers were selected by using simple random sampling technique therefore constituting a sample of 120 farmers. Likert method of scale construction was used to develop the scale (consisting of eleven statements) to measure dependent variable *i.e.* attitude of the farmers' towards aerobic rice cultivation. Pearson's Product Moment Correlation Coefficient (r) was computed to describe the relationships between the dependent variable (attitude of the farmers) and independent variable (age, education, land holding, family size, income, training experience, risk orientation, innovativeness, extension contacts etc.). Correlation analyses showed that five characteristics of the farmers, namely education, extension contact, training experience, risk orientation, innovativeness had significant positive relationships with their attitude towards aerobic rice cultivation. It may be concluded that if education and training facilities are available to the farmers, the level of skill will increase which in turn help in the formation of favourable attitude towards aerobic rice cultivation. Based on findings, it can be said that age, land holding, family size, family income are not important attributes in gaining favourable attitude towards aerobic rice cultivation.

Keywords: Aerobic rice, Attitude, Correlation coefficient, Innovativeness, Likert method, Risk orientation

INTRODUCTION

Rice is the staple food crop of India contributing over 43.00 per cent to nation's food grain production covering about 44.13 million hectares area with a total production of 106.65 million tonnes and productivity of 2.41 t ha^{-1} (Anonymous, 2015). Firstly, rice was the main crop of West Bengal, but with the new technology, infrastructure and Green Revolution, rice has become an important crop of Punjab region too. In Punjab, rice occupied an area of 2.89 million hectares during 2014-15 with total production of 11.10 million tonnes and productivity of 3.84 t ha^{-1} (Anonymous, 2016). In India especially, in Punjab the rice is cultivated mainly through transplanting method into flooded puddled fields. This cultivation practice is more water demanding, laborious, cumbersome, time consuming and entails a lot of expenditure on raising nursery, uprooting, and transplanting. Scarcity of labour during peak period of transplanting, uncertain supply of irrigation water, depletion of groundwater and increasing production cost necessitate the search for an alternative to the conventional puddled transplanting of rice. As rice production is intricately linked with land and water, this has unique and profound implications for the environment. Therefore, careful management of the natural functioning of rice ecosystems is critically important for protecting the environment while raising rice productivity to meet growing demand (Ladha *et al.*, 2003). Aerobic rice cultivation is the technology which is water, labour and

*Corresponding author email id: sharmakaramjit@pau.edu

energy efficient along with eco-friendly characteristics and can be a potential alternative to conventional puddled transplanted rice (Kumar and Ladha, 2011). The adoption of direct seeding onto flooded and saturated soils has increased in Asia due to labour shortage in rural areas. Direct seeding, however, requires large quantities of seed. Also weed competition in direct seeded fields is high (Jha *et al*., 2012). In Asia direct seeded rice occupies about 29 M ha which is approximately 21 per cent of the total rice area in the region. Countries like USA and Australia extensively practicing direct seeding of rice are with profitable results as it avoids all the penalties entailed in transplanting. Direct seeded rice under no/reduced tillage is an efficient resource conserving technology (RCT) holding good promise in coming days (Pathak *et al*., 2011).

Gill *et al.* (2006) reported that dry matter accumulation, leaf area index, effective tillers, etc. under direct seeding were significantly more than transplanted rice at PAU, Ludhiana. The direct-seeded crop matured 10 days earlier than transplanted crop. The water productivity in direct seeded rice ranged between 0.40 and 0.46 kg grain/m^3 irrigation water, while under transplanting, it varied between 0.29 and 0.39 kg grain/m^3 irrigation water; clearly showing the more water use efficiency. The maximum productivity was obtained when direct-seeded crop was raised on 10th June and short-duration; early-maturing 'PR-115' variety excelled other medium and long duration varieties in all growth and yield determinants. Direct seeding of rice is an alternative to transplanting that can reduce the delays and cost of rice establishment (Malik and Yadav, 2006). A shift to direct seeding would save time and energy, reduce the cost of cultivation and increase net returns, in addition to benefits for soil health. Weed infestation due to poor management of irrigation water is one of the major constraints in direct seeded rice (Singh *et al.,* 2005).

The saving in production cost is another significant factor in encouraging farmers to switch from transplanted rice to direct seeded rice. The economic analysis based on experimental data and farmers' interview revealed that the highest net return of 33.00 per cent was achieved from direct drill seeded rice followed by zero-tillage direct seeded rice (22%) and wet seeded rice (21%) over conventional transplanted rice (Tripathi *et al.,* 2004).

Keeping in view the above facts and there is a need to develop a sound plan and strategy for imparting favourable attitude to the farmers in various aspects of aerobic rice cultivation. In doing so, it is necessary first to have a clear understanding of existing attitude possessed by the farmers. Keeping above facts under consideration the present study was planned with following objectives; (1) to determine the attitude of the farmers towards aerobic rice cultivation and (2) to determine the relationship between selected characteristics of the farmers and their attitude towards aerobic rice cultivation.

MATERIALS AND METHODS

Sri Muktsar Sahib District was purposively selected for the study as maximum area under aerobic rice cultivation was grown under this district of Punjab. Considering the adaptability of the design, *ex post facto* design was chosen as the phenomenon had already occurred. From the four blocks of the district, Gidderbhaha block of the district was selected randomly, again from this selected block four villages namely Chattiana, Gurisangar, Dhoolkot and Kauni were selected randomly and from each village 30 farmers were selected by using simple random sampling technique therefore constituting a sample of 120 farmers.

For the construction of attitude scale, Likert method of scale construction was considered more appropriate, as it requires less number of items and judges in initial phase. It consisted of following steps. According to Edward, the class of all possible statements that could be made of a given psychological object (attitude about aerobic rice cultivation in present study) is often called universe of content or simply universe. Thus, a total of 23 statements were collected from different available literature, books, journals, newspaper etc. for this purpose. These 23 statements which are collected were carefully revised and restructured in accordance with informal fourteen criteria as suggested by Edwards (1969). These statements were framed in such a way that they express both positive and negative attitude. These statements were further discussed with various experts and scientists. They were asked to add, modify and reframe the statement, if needed. For editing the statements, all irrelevant items were eliminated and 16 statements were considered which clearly covers the various aspects of aerobic rice cultivation. These sixteen statements were given to about 30 aerobic rice cultivated farmers for assessing the suitability of statements. The farmers were asked to respond against each item in terms of their own agreement or disagreement. The responses were classified into 5 point continuum scale i.e. strongly agree form of five categories viz. strongly agree, agree, undecided, disagree and strongly disagree. For favourable statements, the strongly agree, agree, undecided,

disagree and strongly disagree were given the weightage of 4,3,2,1,0 respectively. In case of unfavourable statements the score were reversed.

For eliminating statements in the Likert method, an item analysis was carried out. The frequency distribution of scores based upon the responses to all the statements was considered. Then twenty five percent of the high value scores and twenty five percent of the lowest value scores were taken. These two groups were considered as criterion groups to evaluate the *t*-value of individual statements. The value of *t* obtained was a measure of the extent to which a given statement differentiated between high and low groups. The *t*-value equal to or greater than 1.75 indicated that the average response of the high and low groups to a statement differed significantly. Finally, 11 statements (six positive and five negative) were selected for attitude scale having significant difference.

$$t = \frac{\overline{X}_H - \overline{X}_L}{\sqrt{\frac{S_H^2}{n_H} + \frac{S_L^2}{n_L}}}$$

where, X_H = the mean score on a given statement for the high group

X_L = the mean score on the same statement for the low group

S_H^2 = the variance of the distribution of responses of the high group to the statement

S_L^2 = the variance of the distribution of responses of the low group to the statement

n_H = the number of subjects in the high group

n_L = the number of subjects in the low group

The reliability coefficient of attitude scale was determined by using Spearman Brown formula which was estimated to be 0.74.

$$r_{xy} = \frac{N\Sigma xy - (\Sigma x)(\Sigma y)}{\sqrt{[N\Sigma x^2 - (\Sigma x)^2][N\Sigma y^2 - (\Sigma y)^2]}}$$

Where, r_{xy} = coefficient of correlation between odd and even items

x = scores of odd statements

y = scores of even statements

N = number of respondents

Spearman brown prophecy formula: was used to calculate co-efficient of co-relation for the whole test using

$$r_{tt} = \frac{2r_{xy}}{1 + r_{xy}}$$

Where, r_{tt} = reliability coefficient

r_{xy} = coefficient of correlation

The empirical type of validity which was called intrinsic validity was determined by taking the square root of reliability coefficient. The validity estimate of attitude scale was obtained as 0.86.

Intrinsic validity = $\sqrt{rtt}$

The data was collected by personal interview schedule. Pearson's Product Moment Correlation Coefficient (r) was used for testing relationship between concern variables.

RESULTS AND DISCUSSION

Socio-personal characteristics: The results revealed that majority of the respondents belonged to middle age group and all respondents were educated and majority of them passed upto 10+2 class. The farmers were predominantly from nuclear family and majority of them possessed 4 to 10 ha of land holding and their annual income ranged between Rs. 2.5 lakh to Rs. 6 lakh. Mass media exposure was studied in terms of reading farm literature and newspaper, viewing television programme and listening to radio. The respondents were placed into three categories by using range method. Majority of the farmers had low to medium level of mass media exposure. Extension contact refers to the frequency of contacts made by the respondents with different extension agencies for seeking information related to production of aerobic rice cultivation. Majority of the farmers had high to medium level of extension contacts. Risk taking capacity refers to the degree to which an individual is oriented towards risk and uncertainty and had courage to face the problems emerging from time to time while starting aerobic rice cultivation.

Majority of the farmers had high to medium level of risk taking capacity. Innovativeness is taken as the degree to which an individual is relatively earlier in adopting aerobic rice cultivation technique than other members of his social system. Majority of the farmers had high to medium level of innovativeness.

Farmers' attitude towards aerobic rice cultivation: The attitude score of the farmers towards aerobic rice cultivation ranged from11 to 55. However, their observed

Table 1: Distribution of respondents according to their socio-personal characteristics (n=120)

Characteristics	Category	F	%
Age (Years)	Young (18-31)	35	29.17
	Lower Middle (32-45)	75	62.50
	Upper Middle (46-59)	10	8.33
Education	Middle	6	5.00
	High School	37	30.83
	10+2	65	54.17
	Graduation	12	10.00
Family Size	Small (< 4)	4	3.33
	Medium (5-8)	88	73.33
	Large (>8)	28	23.33
Family Type	Nuclear	94	78.33
	Joint	26	21.67
Land holding	Small (1-2 ha)	20	16.67
	Medium (4-10 ha)	86	71.67
	Large (>10 ha)	14	11.66
Annual Income (Rs)	250000- 450000	22	18.33
	450001- 650000	78	65.00
	650000- 850000	20	16.67
Mass media exposure	Low (up to 6)	26	21.67
	Medium (7-11)	82	68.33
	High (>11)	12	10.00
Extension contact	Low (up to 6)	5	4.17
	Medium (7-11)	78	65.00
	High (>11)	37	30.83
Innovativeness	Low (up to 6)	8	6.67
	Medium (7-11)	70	58.33
	High (>11)	42	35.00
Risk taking capacity	Low (up to 6)	15	12.50
	Medium (7-11)	66	55.00
	High (>11)	39	32.50

score ranged from 21 to 51 with average score and standard deviation was 35.73 and 6.94 respectively. On the basis of attitude scores of the farmers, they were classified into three categories as shown in the table 2.

The data presented in Table 2 indicate that the highest proportion (67.50 per cent) of the farmers had favourable attitude towards aerobic rice cultivation while 30.00 per cent of them possessed neutral attitude and only 2.50 per cent possessed unfavourable attitude towards aerobic rice cultivation. Singh *et al.* (2010) and Yadav *et al.* (2017) also

Table 2: Distribution of the farmers according to their attitude towards aerobic rice cultivation (n= 120)

Category	Farmers		Mean	Std.
	Freq.	%		Deviation
Unfavourable (up to 22)	3	2.50		
Neutral (23-33)	36	30.00	35.73	6.94
Favourable (34-55)	81	67.50		

reported that the farmers having positive attitude towards Bt cotton production technology. This means about 98 per cent of the farmers possessed neutral to favourable attitude towards aerobic rice cultivation. The continuous efforts of KVK Mukatsar Sahib and PAU, Ludhiana have played a key role in inculcating positive and favourable attitude towards aerobic rice cultivation. So, possession of such favourable attitude in study area may in turn helpful for dissemination of aerobic rice cultivation in other area of Punjab.

Relationship of socio-personal characteristics of the farmers with their attitude towards aerobic rice cultivation: In order to have idea about which socio-personal variables of farmers influencing the attitude of farmers towards aerobic rice cultivation, Pearson correlation coefficients were determined. The correlation coefficients of socio-personal variables of farmers with their attitude towards aerobic rice cultivation are presented in Table 3. A critical perusal of the Table 3 clearly revealed that out of eight independent variables; education, annual income, extension contact, innovativeness and risk taking capacity were statistically found to have significant relation with attitude of the farmers towards aerobic rice cultivation. Similarly, age, family size, land holding were not statistically related with farmers' attitude towards

Table 3: Correlation of socio-personal characteristics of the farmers with their attitude towards aerobic rice cultivation

Dependent variable	Independent variable	Computed value of 'r'
Farmers' attitude towards aerobic rice cultivation	Age	-.087
	Education	.345**
	Family Size	-.036
	Land Holding	.147
	Annual Income	.266*
	Mass media exposure	.166
	Extension Contact	.407**
	Innovativeness	.438**
	Risk Taking Capacity	.584**

**Significant at 0.01% level; *Significant at 0.05% level

aerobic rice cultivation. The findings indicates that persons having more education was found to have more favourable attitude towards aerobic rice cultivation because education helps individual gain knowledge and skill in different cognitive and affective levels of learning and develop positive attitude. The annual income had significant relation with farmers' attitude, the probable reason might be sufficient income for purchasing inputs and seed drill and wish to protect their crop from weeds leads them for positive attitude. The extension contact had highly significant relationship with the attitude towards aerobic rice cultivation. This indicated that extension contact had influenced the attitude of farmers. The probable reason behind this may be that the extension workers are giving much weightage for cultivation of aerobic rice cultivation. Sufficient knowledge though extension contact leads to positive attitude towards the aerobic rice cultivation. The farmers with more innovativeness were motivated to seek more information about improved agricultural technology and increased the level of attitude towards aerobic rice cultivation in positive way. The adoption of any new practices in agriculture involves considerable risk due to uncertainties of rainfall, weather conditions, insect-pest, new technology and so on. The basic motive of any farmers to earn higher income by taking risk will always help them for positive attitudes regarding aerobic rice cultivation.

CONCLUSION

Aerobic rice cultivation with suitable conservation practices has potential to produce slightly lower or comparable yields as that of puddled transplanting of rice and appears to be a viable alternative to overcome the problem of labour and water shortage. Despite controversies, if properly managed, comparable yield may be obtained from aerobic rice cultivation compared with puddled transplanting. If not managed efficiently, weeds may cause partial to complete failure of aerobic rice crops. The aerobic rice cultivation is more knowledge intensive than input intensive. To transfer this knowledge, skills and management to farmers, it is necessary to generate desirable changes in the attitudes of farmers as first step; therefore, assessing attitudes in connection with the principles and concepts of aerobic rice cultivation gives a standard of existing status on which basis, planning could be made to achieve desirable status. Based on the research findings, age of farmers understudy, their literacy level and their landholding were appropriate for aerobic rice cultivation. Similarly, it was said that age, family size, land holding and mass media exposure of the farmers had no relationship with attitude of the farmers' towards aerobic rice cultivation. Thus, these attributes are not important in gaining favourable attitude towards aerobic rice cultivation.

REFERENCES

Anonymous. 2015. Annual report, 2015-16 Retrieved from http://agricoop.nic.in/ (Accessed on 18-11-2016)

Gill, M.S.; A. Kumar and P. Kumar. 2006. Growth and yield of rice (*Oryza saliva*) cultivars under various methods and times of sowing. *Ind. J. Agron.,* 51(2): 123-127.

Jha, A.K.; M. Singh; M.S. Meena and R.K.P. Singh. 2012. Constraints of rainfed rice production in eastern India: An overview. Available at http://dx.doi.org/10.2139/ssrn.2061953

Kumar, V. and J.K. Ladha. 2011. Direct seeded rice: Recent development & future research needs. *Adv. Agron.,* 111: 297-413.

Ladha, J.K.; J.E. Hill; J.M. Duxbury; R.K. Gupta and R.J. Buresh. 2003. Improving the productivity and sustainability of rice-wheat systems: Issues and Impacts. *ASA Special Publication,* 65: 231.

Malik, R.K. and A. Yadav. 2006. Alternate crop establishment techniques to avert puddle transplanting in rice – Problem and prospective. Abstract, International Rice Congress, held at New Delhi, India, Oct. 9-13, 2006, pp. 489-490.

Pathak, H.; J.K. Ladha; P.K. Aggarwal; S. Pen; S. Das; Y. Singh; B. Singh; S.K. Kamra; B. Mishra; A. Sastri; H.P. Aggarwal; D.K. Das and R.K. Gupta. 2011. Climatic potential and on farm yield trends of rice and wheat in the Indo- Gangetic plains. *Field Crops Res.,* 80: 223-234.

Singh, S.P.; J. Singh; V.K. Singh and V. Bansal. 2010. Association between socio-personal characteristics and knowledge, attitude of farmers towards wheat cultivation. *J. Comm. Mob. and Sus. Dev.,* 5(2): 57-59.

Singh, V.P.; G. Singh; R.K. Singh; A. Kumar; V.C. Dhyani; M. Kumar and G. Sharma. 2005. Effect of herbicides alone and in combination on direct seeded rice. *Ind. J. Weed Sci.,* 37: 197-201.

Tripathi, J.; M.R. Bhatta; S. Justice and N.K. Shakya. 2004. Direct seeding: An emerging resource conserving technology for rice cultivation in the rice-wheat system. *In:* Proc. 24th national summer crops research workshop, July 8-10, 2004, Lalitput, Nepal, pp. 273-281

Yadav, S.; A.K. Godara and M.S. Nain. 2017. Attitude of Farmers towards Bt Cotton Production Technology. *J. Comm. Mob. and Sus. Dev.,* 12(2): 157-162.

Anonymous. 2016. *Package of Practices for Kharif Crops*. pp. 1-20. Punjab Agricultural University, Ludhiana, India.

Received on April, 2019, Revised on July 2019

Journal of Community Mobilization and Sustainable Development Vol. 14(2), 267-270, May-August, 2019

Working Women's Perspective on Sustainable Practices for Management of Menstruation

Shalini Soni[1]*, Meenu Srivastava[2], Shweta Jha[1] and Sirisha Deepthi Sornapudi[1]

[1]Research Scholar, [2]Professor, Department of Textile and Apparel Designing, College of Community and Applied Sciences, MPUAT, Udaipur, Rajasthan

ABSTRACT

More the technological advancements more are the options available to women for management of menstruation like sanitary napkins, tampons, menstrual cups, reusable cloth napkins, menstrual under wear. But not all are safe for health of women as well as environment. Working women's perspective on selection, adoption, use and disposal of menstrual hygiene products was assessed in the present study in Udaipur district of Rajasthan. It was found that women were aware of all the products available, of their pros and cons with regard to environment friendliness but were not able to adopt sustainable practices due to varied reasons. Suggestions for sustainable and environmentally sensitive disposal practices were also recorded.

Keywords: Environment, Menstrual cups, Menstruation, MHP-Menstrual hygiene products, Sanitary napkins, Sustainability, Tampons, Waste disposal, Working women

INTRODUCTION

When women empowerment is talked about, various epidemiological researches, all over the world, stipulate that the menstrual hygiene is a major issue to address. With time, women have managed to get suitable and safe (up to an extent) menstrual hygiene products such as sanitary napkins, tampons and menstrual cups to take care of their menstrual issues. Use of these products has emerged as women's life support especially to those who are working. Menstruation and its management practices are linked with several social, cultural and religious taboos. According to a report by WHO, generally, in India, women are less aware about menstruation and its management. Majority of women either rural or urban, believe that menstruation is the process in which body dispenses unchaste blood. As a result, the women mostly think of themselves as impure and dirty (World Health Organization, 1999). Such thoughts regarding management of menstruation can hinder the working women's contribution to the work force.

Acknowledging the 28 days long menstrual cycle as an average, German based NGO WASH United have selected the 28th of May to celebrate it as annual Menstrual Hygiene Day to create awareness since 2014. Its aim is to favour women and girls worldwide about issues related to menstruation and menstrual hygiene management. A study conducted in West Bengal implies that adoption of high quality menstrual hygiene will play an important role in prevention of Reproductive Tract Infection and Cervical Cancer among the women population. Therefore, promoting positive attitudes towards management of menstruation and related problems among the women is the need of the hour (Pandey and Shukla, 2018).

India has a huge population base of working women in the age group between 20-45 years and an average woman uses 10,000 to 12,000 disposable menstrual hygiene products during her reproductive years. These products take nearly 500 to 800 years to biodegrade completely. Such products, although, are suitable to working women's lifestyle they can be potentially harmful to both the female body as well as to the environment. Evidence about working women's menstrual hygiene management (MHM) in the light of environmental concern still remains limited. For the purpose of this study, working women refer to those women who are engaged, in formal or informal context, in income generating activities.

*Corresponding author email id: shalini27soni@gmail.com

MATERIALS AND METHODS

The present study was undertaken among the working women of Udaipur city, Rajasthan. Forty women aged 20 to 45 years from different localities of Udaipur were selected for the study. User of internet and economical independence were some of the criteria for selection of sample. A pretested questionnaire was used for the study. The data were collected through personal interview of the respondents.

Firstly, rapport was built up with the respondents and their verbal consents were obtained. The rationale of the study and the type of the information which was aimed to be gathered from the respondents were explained to them. The designed, pretested and structured questionnaire included topics which were related to the awareness about menstrual hygiene products, the sources of information regarding menstruation, the adoption and usage pattern of preferred menstrual hygiene product, the disposal practices for menstrual hygiene products, sense of responsibility towards environmental impact and suggestions regarding correct disposal practices. The chronological age and the duration of using menstrual hygiene products since menarche were also elucidated.

RESULTS AND DISCUSSION

Background Information: For the purpose of the study working women were purposively selected from different areas of Udaipur like Ashok Nagar, Payada, Pratapnagar, South Sundarnagar, Samraat Vaas, Gitanjali housing. 21 respondents (52.5%) were above 35 years old and the remaining were below 35 years. 20 (50%) respondents were from families with income of more than Rs. 50,000.

Early Information about MHP: Most of the respondents (62%), as shown in Table 1, knew about MHP, for the first time, from their mother, 20 per cent knew from media including social media and 5 per cent knew from mother and media both. Sanitary napkin was used for the first cycle by 57.5 per cent of respondents while 37.5 per cent women used cloth and only 5 per cent used tampon for the first time (Figure 1).

It was found that 47.5 per cent women switched over from their first MHP choice to other products and 52.5 per cent did not switch over at all. Amongst this 47.5 per cent, 22.5 per cent respondents switched over to Sanitary napkin, 12.5 per cent to tampons, 7.5 per cent to sanitary napkins and tampons and 5 per cent to menstrual cups.

Table 1: Sources of Information (n=40)

Source of Information	Number of Respondents	Percent
Mother	25	62.5
Friend or relative	2	5
Media / Social Media	8	20
Other	3	7.5
Mother and media both	2	5

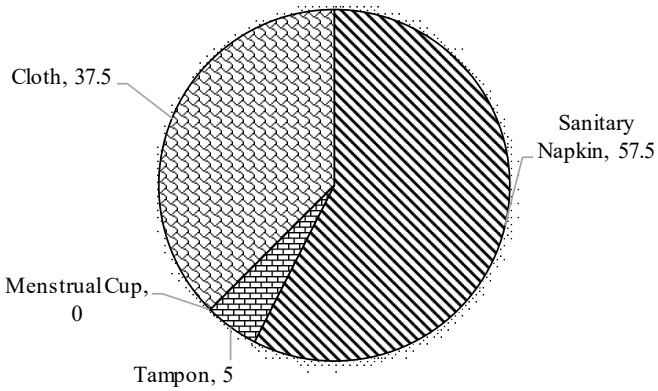


Figure 1: MHP used for first cycle

Reasons for switch over as indicated by the respondents were lifestyle suitability (5%), comfort and lifestyle suitability (30%). On asking the reason for not adopting the product they switched over to, out of all 40 (100%) respondents reported that it was because of habit (10%), 10 per cent because of unavailability of desired MHP, 10 per cent because of unawareness of particular type of MHP, 10 per cent due to hesitation in using new product, 2.5 per cent because of habit and unawareness, 2.5 per cent due to habit and hesitation, 5 per cent because of other reasons such as satisfaction with present product, uneasiness associated with other products etc. whereas 40 per cent respondents did not answer this question.

After many trials, switch over and adoption to other product types among MHP, 85 per cent respondents ended up using sanitary napkins, while tampons (7.5%) and cloth (7.5%) were given equal preference. Denoting an increase in the number of women using safe menstrual hygiene products than the number stated in a report of National Family Health Survey (Government of India 2015-16) which reveals that in Rajasthan 78.8 per cent urban women use hygienic methods to manage their menstruation which includes sanitary napkins and tampons. All the (7.5%) respondents using tampons were from high income group families whereas all 7.5 per cent respondents using cloth

to manage menstrual hygiene belonged to families with low income.

Usage and Disposal Pattern: Majority (57%) of the respondents were using MHP since 10 to 20. 17.5 per cent respondents purchase MHP monthly, 37.5 per cent respondents purchase once in 2 months and 45 per cent respondents purchase once in 3 months. Cent per cent respondents stock MHP for next cycle. Family members of almost all (97.5%) respondents use sanitary napkin. Monthly expenditure by working women on MHP is shown in Table 2.

Table 2: Monthly expenditure on MHP (n=40)

Expenditure	Number of Respondents	Percent
<Rs. 50	6	15
Rs. 50 to 100	26	65
>Rs. 100	8	20

Majority 77.5 per cent of respondents wrap the used MHP and throw it in dustbins as depicted in Figure 2. Only 2.5 per cent women throw MHP in dustbin as it is, 2.5 per cent separate plastic and biodegradable material and then throw in dustbin, 2.5 per cent women wash under water and then throw the used MHP in dust bins. Cent per cent respondents dispose MHP daily and in dustbins only. Researchers in a study 'Greenhouse gas emissions from municipal solid waste management in Indian mega-cities: A case study of Chennai landfill sites' (Jha *et al.,* 2008) measured emission of methane gas from municipal solid waste management sites using IPCC methodologies which is one of the greenhouse gases harmful for environment. Apparently, soiled menstrual hygiene products which go directly to the municipal waste through municipal dustbins also have contributing role to this.

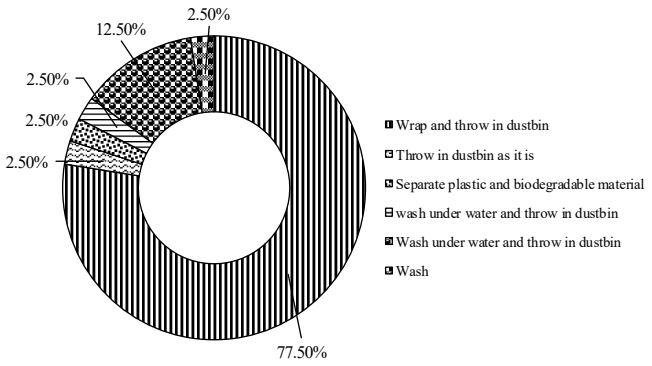


Figure 2: Disposal of MHP

Environmental Impact and Suggestions: A study 'A Study of Extension Scientists' Awareness on Climate Change' by Ghanghas *et al.* (2015) depicts that overall awareness of extension scientists regarding climate change was low to medium for 70.67 per cent of extension scientists where as 29.33 per cent scientists belonged to the high level of awareness. It can be said that none of those who are working unaware about human induced impacts on environment and climate. Similarly during present study it was found that all the respondents were aware that use of readymade MHP is harmful for the environment in one way or other.

It was reported by 65 per cent women that trash created due to MHP increases not only the ever elevating landfills and various kinds of pollution (air, land and water) but also results as hazard to animals and community. Gathered data show the immediate need for proper disposal methods along with eco-friendly alternatives to presently available menstrual hygiene management products. Finding of a study 'Municipal solid waste: Generation, composition and GHG emissions in Bangalore, India' (Ramchandra *et al.,* 2018) proclaims that the high amount of organic material in municipal solid waste and its unscientific disposal is responsible for emission of GHG (methane, CO_2, etc.) in the atmosphere. For 65 per cent respondents the waste created by MHP was not causing pollution their locality. Only 35 per cent said that waste created by MHP was the reason for pollution in their area. When asked about disposal practices in their surroundings 65 per cent said that MHP is being wrapped and then dumped into dustbins whereas 32.5 per cent respondents accepted that MHP waste dumped in dustbins

Table 3: Suggestions from respondents for proper disposal to reduce impact of MHP waste on environment (n= 40)

Suggestions	Number of Respondents	Percentage
Burning, dry wet separate waste disposal	14	35
Burning, separate waste collectors, eco-friendly covers	1	2.5
Eco-friendly and reusable alternatives	2	5
Eco-friendly wrappers	2	5
Modification of incinerator, different colored covers for waste, burning	11	27.5
Blank response	10	25

usually does not happen to be wrapped. Only 2.5 per cent respondents said that waste dumping in open ground is a practice in their area. Some suggestions recorded from participants are shown in Table 3 for proper disposal such as adoption of eco-friendly alternatives and use of incinerators so that the hazardous impact of MHP waste can be reduced to a significant degree. Incinerators were found to have potential to reduce greenhouse gas emission from municipal solid waste management sites (Liu *et al.,* 2017).

CONCLUSION

In the era of internet, working women are aware of what options are available for them to manage their menstrual cycle but very few 10 per cent women use the environment friendly products like menstrual cups, cloth pads, period under wears. Sanitary napkin is the only readymade option available widely in every locality as Tampons and menstrual cups were not found available easily in local market. Though 45 per cent women knew about Menstrual Cups but were not using the same. This awareness if converted into practical usage can be helpful in adopting sustainable menstrual hygiene management practices. Singh *et al.* (2018) in their study 'Effectiveness of Extension Methods for Knowledge and Skill Development' found that combination of training, demonstration and literature is effective for knowledge and skill development. Most popular MHP was sanitary napkin. Sanitary napkin and tampons together make up for 92.5 per cent of users hence adding to the enormous waste buildup on regular basis. On the note of impact of MHP waste on environment 47.5 per cent respondents were willing to adopt new kind of product if it proves to be efficient and environment sensitive if proper education regarding benefits and how-to-guide is provided. As much as 85 per cent women spend Rs. >50 per month on MHP which indicates room for cheaper sustainable options. Keeping in mind that for working women, dustbin is the only destination where MHP waste lands, valuable suggestions like specially designed dustbins, installation of incinerators with proper emission outlet in colonies, use of biodegradable material for packaging can be taken into consideration.

REFERENCES

Ghanghas, B.S.; P.S. Shehrawat and P.K. Chahal. 2015. A study of extension scientists awareness on climate change. *Journal of Community Mobilization and Sustainable Development*, 10(2): 246-250.

Jha, A.K.; C. Sharma; N. Singh; R. Ramesh; R. Purvaja and P.K. Gupta. 2008. Greenhouse gas emissions from municipal solid waste management in Indian mega-cities: A case study of Chennai landfill sites. *Chemosphere*, 71(4): 750-758.

Liu, Y.; W. Sun and J. Liu. 2017. Greenhouse gas emissions from different municipal solid waste management scenarios in China: Based on carbon and energy flow analysis. *Waste Management*; 68: 653-661.

National Family Health Survey, 2015-16; page 4.

Pandey, B. and D. Shukla. 2018. Perception and practices about menstrual hygiene among women of reproductive age group (15–49 years) attending out-patient department of CIMS, Bilaspur, Chhattisgarh. *International Journal of Community Medicine and Public Health,* 5(7).

Ramchandra, T.V.; H.A. Bharathi; G. Kulkarni and S.S. Han. 2018. Municipal solid waste: Generation, composition and GHG emissions in Bangalore, India. *Renewable and Sustainable Energy Reviews*, 82(1): 1122-1136.

Singh, D.; R.N. Yadav; D.K. Singh; G. Singh; R. Singh and B. Singh. 2018. Effectiveness of extension methods for knowledge and skill development. *Indian Journal of Extension Education*, 54(4): 147-152.

Sommer, M. *et al*., 2016. Managing menstruation in the workplace: an overlooked issue in low- and middle income countries. *International Journal for Equity in Health,* 15: 86.

WHO Health needs of adolescents. 1999. Report of WHO Expert Committee, Technical Report series; pp 609-615.

Received on April, 2019, Revised on July 2019

Journal of Community Mobilization and Sustainable Development Vol. 14(2), 271-275, May-August, 2019

Impact Assessment of Training Programmes on Knowledge and Adoption of Cutting and Tailoring Technique

Sunita Pandey[1]*, Ashish Kumar Bajpai[2] and Renu Singh[3]
[1]Scientist-Home Science, [2]Computer Programmer, ICAR-Krishi Vigyan Kendra, PG College Ghazipur
[3]Scientist-Home Science, ICAR-Krishi Vigyan Kendra, Barabanki

ABSTRACT

Krishi Vigyan Kendra are grass roots level vocational training institution designed on bridging the gap between the available technology at one end and adopted on other end through conducting training programmes with the help of method demonstration. KVK imparts trainings to raise the knowledge level and transferring of recommended farm and home technologies to increase the self-employment opportunities among the farming community especially to rural women. Therefore, the present investigation was carried out to assess the knowledge level and adoption level of rural women who has under gone trainings programme on cutting and tailoring. A sample of 100 rural women was selected among the trainees who had undergone trainings in KVK, Ghazipur from Sadar and Karanda block. The present study has been planned to assess the impact of trainings on cutting and tailoring to measure the knowledge level and adoption. Sufficient gain in knowledge after the training on cutting and tailoring was recorded for sub-components viz. measurement, drafting, designing, paper pattern, cutting, stitching, entrepreneurial education and precautions. Effect size was calculated using suitable equation; we found highest effect size of cutting (2.66) followed by Paper Pattern (2.28), Measurement (2.16), Stitching (2.11), and Precautions (2.07), Designing (1.88), Drafting (1.76) and Entrepreneurial Education (1.07). Determination of correlation matrix revealed that pre-exposure components were perfectly positively correlated. Correlation matrix of post-exposure exponents revealed significant improvement and positive correlation in all components.

Keywords: Adoption, Correlation matrix, Effect size, Knowledge, Overall impact, Skill, Training

INTRODUCTION

Women empowerment is a way of challenging and overcoming barriers in a women's life through she increases her ability to shape her life. It has been realized in last few years that the wide spread economic growth cannot be achieved unless sustainable economic activities by women are encouraged. Thus, it is natural that women need special attention and focus. Skill trainings has been acclaimed as powerful tool in developing scientific attitude, skill and willingness required for creating the awareness of latest technology among the rural women. In this the Krishi Vigyan Kendras which are the grass roots level institution committed for vocational trainings on relevant technologies and their transfer play an important role. The Krishi Vigyan Kendra, Ghazipur established as such centre is catering to the needs of Ghazipur district. Cutting and tailoring is good for self employment which requires less technical knowledge, minimum infrastructure and moderate financial needs. Clothing construction is a technical accomplishment, which requires knowledge of fabrics, principles of clothing construction and skills involved in it. Proficiency in the art of cutting and tailoring is an essential pre-requisite in clothing construction. It is very important to know the techniques of cutting and tailoring for producing fancy garments. Cutting and tailoring is very common in Indian household and girls learn this art from their elders. Despite limited women welfare programme, much headway could not be increased because of illiterate rural women and deprived of mass media exposure and outside world that is why their knowledge is limited to traditional practices.

The present study was conducted in the Karanda and Sadar block of Ghazipur to study the knowledge and adoption level of rural women, who has undergone trainings on cutting and tailoring. KVK not only motivate them to start their own enterprise but also help them to be empowered.

*Corresponding author email id: sunitapandeykvk@gmail.com

MATERIALS AND METHODS

The study was conducted in Karanda and Sadar block of Ghazipur district. Karanda and Sadar blocks were selected purposively as KVK Ghazipur is organizing trainings for rural women at regular interval. Therefore, three trainings imparted by home scientist of Krishi Vigyan Kendra, Ghazipur were finally selected for the present study and comprising of 50 rural women from each block. A total sample of 100 rural women from different villages of Karanda and Sadar blocks were selected who had undergone training on Cutting and Tailoring. Impact of trainings was assessed in terms of gain in knowledge, change in attitude, skill acquisition and adoption. (Bala and Jain, 2016, 2017; Bhuyan *et al.,* 2018). A well structured interview schedule was conducted for data collection on the basis of objectives. Data was collected on likert scale i.e. 1 to 5. The collected data was quantified and interpreted by using suitable statistical tools such as weighted mean score, standard deviation, effect size, correlation matrix.

Effect size: Effect Size is a easy way of quantifying the difference between two groups that has many advantages over the use of statistical significance alone. Effect size denotes the size of difference rather than related with sample size. Effect size is simply a way of quantifying the size of difference between two groups. It is easy to calculate, readily understood and can be applied to any measured outcome in social science. It is very effective for quantifying a specific intervention undertaken relative to some comparison. Effect size emphasizes on intervention rather than its statistical significance. It is a scientific approach to the accumulation of knowledge. Following equation is used for Effect Size calculation for paired observation. (https://www.leeds.ac.uk/educol/documents/00002182.htm) We apply following equation in this research.

$$\text{Effect Size} = \frac{\text{Mean of Post Exposure-Mean of Pre Exposure}}{\text{Standard Deviation of Difference}}$$

Correlation matrix: A correlation matrix is a table showing correlation coefficients between set of variables. Each variables of row in table is correlated with each variable of columns in the table. Thus it allows us to see which pairs have the highest correlation.

The diagonal of the table is always a set of ones, because the correlation between a variable and itself is always 1. We can fill in the upper right triangle, but these would be a repeat of the lower-left triangle (Because B1:B2 is the same as B2:B1). In other words, a correlation matrix is also a symmetric matrix. (https://www.statisticshowto.datasciencecentral.com/correlation-matrix/)

	B1	**B2**	**B3**	**B4**	**B5**
B1	1	0.53	0.73	0.87	0.43
B2	0.53	1	0.44	0.96	0.71
B3	0.73	0.44	1	0.41	0.72
B4	0.87	0.96	0.41	1	0.56
B5	0.43	0.71	0.72	0.56	1

RESULT AND DISCUSSION

Impact of training of trainees was assessed in terms of knowledge, skill and adoption. Pre-exposure and post-exposure mean scores and effect size were computed for cutting and tailoring in Karanda and Sadar blocks of Ghazipur district which are presented as under:

Data collections from selected trainees were made through personal interview/feedback method. The selected trainees were personally interviewed. Data was recorded on 'Likert' scale. To determine the skill of trainees in five-scale as below:

Lowest skill score up to: 1

Highest skill score up to: 5

Responses were recorded on five point scale (Likert scale) by assigning 1 for lowest and 5 for highest exposure, respectively. Percentage of weights was given to each component i.e. Measurement (20%), Drafting (5%), Designing (15%), Paper Pattern (5%), Cutting (15%), Stitching (15%), Entrepreneurial Education (10%) and Precautions (15%). Based on weight given, pre and post exposure of each component, weighted mean score was calculated. Thereafter standard deviation and average of weighted mean score was calculated and difference between pre and post weighted mean score of each component was calculated.

Component wise weighted mean score was calculated and given in Table 1. Selected trainees had highest exposure in the measurement before training as given in Table 1. Measurements mean score found 4.00 in measurement. After measurement trainees has knowledge about Stitching. Stitching mean score was found 3.66. Thereafter trainees had exposure about Cutting (mean score: 3.53), Precautions

Table 1: Knowledge of women regarding cutting and tailoring

Components	Pre-Exposure (Weighted Mean Score)	Standard Deviation	Post-Exposure (Weighted Mean Score)	Standard Deviation	Gain in Knowledge (Weighted Mean Score) Col 5- Col 3	Effect Size (N=100)
Measurement	4.00	1.51	8.05	2.35	4.05	2.16
Drafting	0.86	0.30	1.61	0.58	0.74	1.76
Designing	2.48	0.88	5.59	2.05	3.12	1.88
Paper Pattern	1.20	0.21	2.25	0.46	1.05	2.28
Cutting	3.53	0.72	6.47	1.35	2.94	2.66
Stitching	3.66	0.56	6.54	1.50	2.89	2.11
Entrepreneurial Education	1.48	0.48	3.11	1.65	1.64	1.07
Precautions	3.49	0.71	6.38	1.62	2.89	2.07
Overall	**2.59**	**0.43**	**5.00**	**1.06**	**2.41**	**3.08**

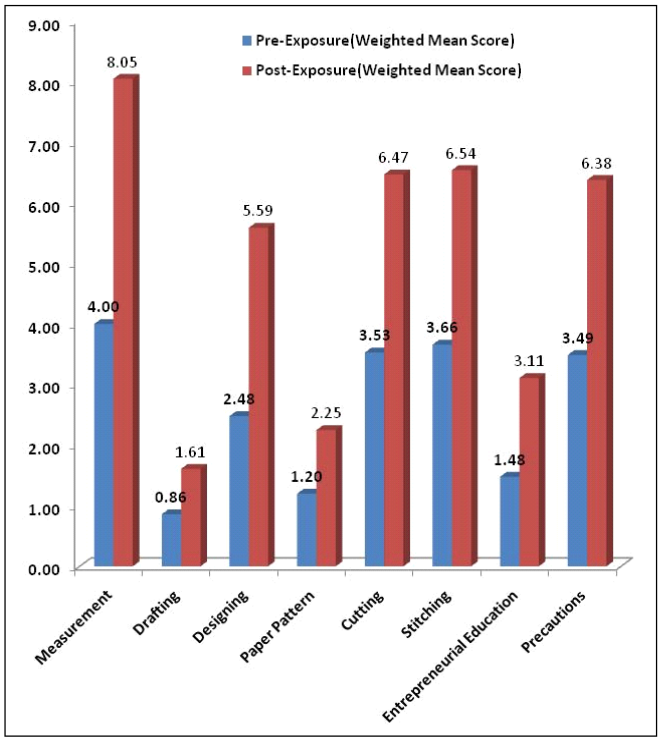


Figure 1: Knowledge of women regarding cutting and tailoring

(mean score: 3.49), designing (mean score: 2.48), entrepreneurial education (mean score: 1.48), Paper pattern (mean score: 1.20) and least exposure was found in drafting (mean score: 0.86). Table 1 reveals that highest pre-exposure in measurement and lowest pre-exposure were found in drafting. It means selected trainees were poor in drafting (Singh *et al.,* 2010 and Shankara *et al.,* 2013).

In Table 1, highest post-exposure was found in measurement (mean score: 8.05). After measurement trainees has knowledge about Stitching. Stitching mean score was found 6.54. Thereafter trainees had exposure about Cutting (mean score: 6.47), Precautions (mean score: 6.38), designing (mean score: 5.59), entrepreneurial education (mean score: 3.11), Paper pattern (mean score: 2.25) and lowest exposure was found in drafting (mean score: 1. 61). Table 1 reveals that highest post-exposure in measurement and lowest post-exposure were found in drafting. It means selected trainees were poor in drafting. After seeing the Table 1, it shows that pre and post weighted mean score reveals that gain in knowledge was positive in all eight components. Figure 1 shows the graphical view of weighted mean score of all subcomponents with pre and post exposure.

As we have selected 50 trainees from each block i.e. Karanda and Sadar, Table 2 reveals the overall weighted means score of pre-exposure and post-exposure with standard deviation, change in attitude and effect size. In this table there was significant increase in weighted mean score found. In Karanda and Sadar block difference between pre-exposure and pos-exposure was 2.49 and 2.34 respectively. Figure 2 shows similar findings in graphical view.

After attending the trainings organized by Krishi Vigyan Kendra, Ghazipur, highest difference between pre and post exposure (Col-5 – Col-3) was found in Measurement i.e. 4.05. After that other components viz. Designing i.e. 3.12 followed by Cutting i.e. 2.94, Stitching i.e. 2.89, Precautions i.e. 2.89, Entrepreneurial education i.e. 1.64, Paper pattern i.e. 1.05 and Drafting i.e. 0.74. It reveals that highest knowledge gain found in measurement (4.05) and lowest in drafting (0.74). In overall eight components pre-exposure mean score found 2.59 and post

Table 2: Change in attitude of women respondents for cutting and tailoring

Block	Pre-Exposure (Weighted Mean Score)	Standard Deviation	Post-Exposure (Weighted Mean Score)	Standard Deviation	Gain in Knowledge (Weighted Mean Score)	Effect Size (N=50)
Karanda	2.55	0.40	5.03	1.13	2.49	2.99
Sadar	2.62	0.40	4.97	1.14	2.34	2.93

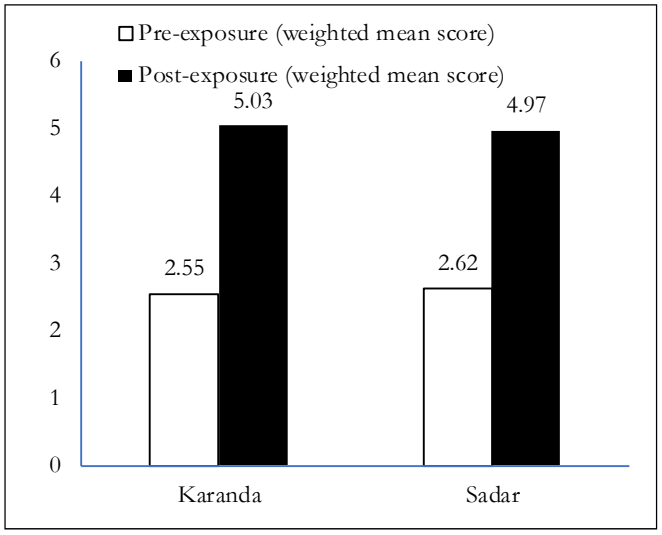


Figure 2: Change in attitude of women respondents for cutting and tailoring

exposure was 5.00. Thus the overall difference between pre-exposure and post-exposure mean score was 2.41.

Effect size: Effect size was calculated using above equation, we found highest effect size of cutting (2.66) followed by Paper Pattern (2.28), Measurement (2.16), Stitching (2.11), and Precautions (2.07), Designing (1.88), Drafting (1.76) and Entrepreneurial Education (1.07). It reveals that trainees gained highest knowledge in Cutting and lowest in Entrepreneurial Education.

Correlation matrix: Testing of hypothesis concerning correlation between pre-exposure and post-exposure viz. measurement, drafting, designing, paper pattern, cutting, stitching, entrepreneurial education and precaution was also performed by calculating correlation matrix through MS-Excel 2007 Data Analysis Tools software package (Table 3 and Table 4). The results revealed highly significant positive relations of all components with training. The positive and significant correlation between pre-exposure and post-exposure component explains the true and direct relations relationship and these characters can be major concern for experts involved in cutting and tailoring trainings. Pre-measurement was perfectly positively correlated with all other components. All 100 respondents completed all questionnaires.

Correlation coefficients (Kumari *et al.,* 2017) between pre and post evaluation of training programme are given in Correlation matrix. Correlation coefficients of pre-exposure varies from -0.00 to 0.65. Minimum Correlation coefficient found between Precaution and Paper pattern i.e. -0.00. And maximum correlation coefficient found between Designing and drafting i.e. 0.65. It means highest coefficient found in designing and drafting and minimum in precaution and paper pattern. Correlation coefficient of post-exposure varies from 0.16 to 0.72. Minimum Correlation coefficient found between Precaution and Stitching i.e. 0.16. And maximum correlation coefficient found between Designing and drafting i.e. 0.72. It means

Table 3: Correlation matrix of pre-exposure of components

	Pre- Measu-rement	Pre-Drafting	Pre-Designing	Pre- Paper Pattern	Pre-Cutting	Pre-Stitching	Pre- Entre-preneurial	Pre- Pre-cautions
Pre-Measurement	1	0.49	0.53	0.09	0.31	0.22	0.27	0.24
Pre-Drafting	0.49	1	0.52	0.19	0.30	0.20	0.28	0.18
Pre-Designing	0.53	0.52	1	0.09	0.21	0.11	0.23	0.08
Pre-Paper Pattern	0.09	0.19	0.09	1	0.23	0.16	0.03	-0.00
Pre-Cutting	0.31	0.30	0.21	0.23	1	0.65	0.28	0.30
Pre-Stitching	0.22	0.20	0.11	0.16	0.65	1	0.25	0.29
Pre-Entrepreneurial	0.27	0.28	0.23	0.03	0.28	0.25	1	0.24
Pre-Precautions	0.24	0.18	0.08	-0.00	0.30	0.29	0.24	1

Table 4: Correlation matrix of post-exposure of components

	Pre- Measurement	Pre-Drafting	Pre-Designing	Pre- Paper Pattern	Pre-Cutting	Pre-Stitching	Pre- Entrepreneurial	Pre- Precautions
Post-Measurement	1	0.62	0.64	0.54	0.62	0.37	0.49	0.57
Post-Drafting	0.62	1	0.72	0.49	0.51	0.50	0.36	0.31
Post-Designing	0.64	0.72	1	0.44	0.42	0.41	0.53	0.40
Post-Paper Pattern	0.54	0.49	0.44	1	0.55	0.52	0.36	0.33
Post-Cutting	0.62	0.51	0.42	0.55	1	0.67	0.26	0.45
Post-Stitching	0.37	0.50	0.41	0.52	0.67	1	0.22	0.16
Post-Entrepreneurial	0.49	0.36	0.53	0.36	0.26	0.22	1	0.35
Post-Precautions	0.57	0.31	0.40	0.33	0.45	0.16	0.35	1

highest coefficient found in designing and drafting and minimum in precaution and stitching.

CONCLUSION

The above findings clearly indicate that the KVKs are working and realizing the objective of skill trainings programmes in terms of achieving knowledge level and adoption. Significant increase in knowledge level of trainees was recorded for all 7 components of cuttings and tailoring after training. Overall impact assessment of trainees reveals very good result. Thus this type of trainings can be organized to enhance knowledge level of rural women and it will help in income generation. Regular evaluation of trainings programmes may be part of KVK activities.

REFERENCES

Bala, K. and V. Jain. 2016. Decision making pattern of scheduled caste women to take cutting and tailoring as an enterprise. *International Journal of Home Science,* 2(2): 271-276.

Bala, K. and V. Jain. 2017. Symbolic adoption of cutting and tailoring trainings organized for scheduled caste women caste women. *International Journal of Home Science,* 3(2): 162-165.

Bhuyan, M; K. Ponnusamy and S. Bhattacharya. 2018, Knowledge level of farm women in scientific dairy farming. *Journal of Community Mobilization and Sustainable Development,* 13(3): 507-512.

https://www.leeds.ac.uk/educol/documents/00002182.htm

https://www.statisticshowto.datasciencecentral.com/correlation-matrix/

Kumari, V.; R. Vasantha and M. Preethi. 2017. Correlates of selected independent variables and attitude of rural women towards homestead technologies of Rajendra Agricultural University (RAU) Bihar. *Journal of Community Mobilization and Sustainable Development,* 12(2): 223-226.

Shankara, M.H.; H.S. Mamatha; K.S. Reddy and Nagappadesai. 2013. *International Journal of Farm Sciences,* 4(2): 240-248.

Singh, K.; R. Peshin and S.K. Saini. 2010. Evaluation of the agricultural vocational training programmes conducted by the Krishi Vigyan Kendras (Farm Science Centres) in Indian Punjab. *Journal of Agriculture and Rural Development in the Tropics and Subtropics,* 111(2): 65-77.

Received on March, 2019, Revised on July 2019

Journal of Community Mobilization and Sustainable Development Vol. 14(2), 276-282, May-August, 2019

Dynamics of Linkage among the Stakeholders involved in Dairy Farming in Kerala State

S. Smitha[1]*, M.C.A. Devi[2] and S. Subash[3]

[1]Assistant Professor, [1]Centre for Gender Studies in Agriculture and Farm Entrepreneurship Development, Kerala Agricultural University, Kerala, India

[2]Principal Scientist, [3]Scientist, Division of Dairy Extension, SRS of ICAR-NDRI, Adugodi, Bengaluru, Karnataka

ABSTRACT

Effective transfer of a technology in dairying may depend on various actors like researchers, extension officials from animal husbandry and dairy development departments, cooperative societies and other enterprises related to input and output markets. The study was undertaken in Kerala to identify and analyze the major stakeholders involved in dairy farming in the State. A total of 200 respondent farmers and stakeholders from research and extension domain in the study area were selected through random sampling. The linkage activities between the stakeholders in the study area were analyzed with the help of linkage index. Among the technology dissemination activities, research- extension linkage was strong with involvement of researchers as resource person for training programme organized for extension personnel and involvement in animal health and veterinary services. Among technology development activities, a research-extension linkage was weak in identifying research problems from field level. There is strong linkage between the extension and clientele in health and veterinary service and involvement in training programmes and seminar. Among the technology dissemination activities, the linkage between research-clientele is strong in organizing training programmes, exhibitions and mela. There is weak linkage between research clientele in technology development activities. Overall linkage index is strong in extension clientele linkage, moderate in research-extension linkage and weak in research-clientele linkage. The linkage between the research and extension is dominated by training, workshop/ seminar and farm publication followed by field days and dairy mela. The linkage between the extension-clientele is dominated by training programmes, seminar, farm publications, exhibition, demonstration, field days and dairy mela.

Keywords: Clientele, Extension, Linkage, Research, Stakeholders, Technology

INTRODUCTION

Stakeholder' is a term commonly used to identify those actors who have a stake or an interest in an issue or activity and is important for improving the functioning of the system. In general, stakeholders can be grouped in several ways, such as "who is concerned, who finally makes decisions, who works and benefits, and who is actively collaborating" (Gerster, 2015). A Stakeholder is operationalized as any person, organization, or society with major stakes in dairying.

Multi-stakeholder approach was proposed for use in agricultural research and development, as it was successfully used in a few other sectors in some countries and reported a surge in productivity (Hemmati, 2012). Under this arrangement each stakeholder's group carries out the task they do best based on their competencies, resource domain and mode of operation (Adekunle and Fatunbi, 2012). Strengthening the linkage between all the actors of innovation is important to hasten the information/ knowledge or technology transfer system and also to increase the effectiveness of the developed and disseminated technologies. Each stakeholder possesses unique and complementary strengths and should be best positioned to avoid duplication of efforts and to create genuine decisions on agriculture and dairy investment. Participation of key stakeholders reduces the risk of the development of inappropriate technologies. There is rampant scope to improve the present condition of farmers' information and technology needs through team efforts of different actors. Extension system should design appropriate technology transfer model and strategies to

*Corresponding author email id: smithasiva88@gmail.com

diffuse technical knowhow and do-how according to the farmer's preference. Research and extension need to be in synergy, so as to motivate and encourage the farmers towards scientific dairy farming.

MATERIALS AND METHODS

The study was conducted in Kerala State owing to the high potential for increased dairy production, as 87.00 per cent of total cattle population of Kerala is exotic/cross bred cattle. Based on the topographical parameters, Kerala could be divided as Northern Region (Kasaragod, Kannur, Kozhikode and Malappuram), Central Region (Palakkad, Thrissur, Ernakulam), Southern Region (Thiruvananthapuram, Kollam, Alappuzha, Pathanamthitta and Kottayam) and High Range Region (Wayanad and Idukki). From each region the one representative district viz. Kasargode, Thrissur, Thiruvananthapuram and Wayanad was selected for the study through random sampling technique. From each district, two villages were selected and from each village twenty five farmers engaged in dairying were randomly selected for the study. The sample size of the respondent farmers comprised of 200 numbers from the selected villages. The other stakeholders involved in technology reach in the State were identified through key informant survey, through participatory rural appraisal technique with different stakeholders and through secondary sources at district level. Thus a total sample size of 200 farmers and 90 stakeholders were selected for this study. Data collection was done using the structured and pilot tested interview schedule developed for the intended purpose.

Linkage Index: Linkage index developed by Devi (2004) was used with necessary modification to measure the linkage between selected stakeholders under Research –Extension linkage, Research Clientele linkage and Extension Clientele linkage. The frequency of linkage activities was ascertained on a three point continuum as frequently, occasionally and never with the scores 2, 1 and 0 respectively. Extent of linkage was measured based on the scores obtained against frequency of activities. Linkage index was calculated by using the following formula

$$\text{Linkage Index} = \frac{\text{Actual score obtained}}{\text{Maximum possible score}} \text{ X } 100$$

Based on the index values obtained, the extent of linkage was categorized into strong, moderate and weak. The cumulative frequency method was used for categorization.

RESULTS AND DISCUSSION

It is observed from the Table 1 that among the technology dissemination activities, research-extension linkage was strong in involvement of researchers as resource person for training programme organized for extension personnel and involvement in animal health and veterinary services. The linkage was moderate in case of involvement in field days/farmer days, workshops, seminar, dairy mela, exhibitions/livestock shows, involvement in farm broadcast and telecast and technical article publication. It may be due to the fact that the ultimate aim of all the research and extension activities is to transfer the technologies to field

Table 1: Research-Extension linkage as expressed by researcher

List of items	Linkage Index	Category
Technology Development Activities		
Involving extension personnel in identifying research problems	40.00	Weak
Involving extension personnel in evaluation of technologies	55.00	Moderate
Discussing with extension personnel to get feedback from dairy farmers	50.00	Moderate
Technology Dissemination Activities		
Involvement in workshops and seminar	66.66	Moderate
Participating as resource person for training programme organized for extension personnel	100.00	Strong
Involvement in field days/farmer days	60.83	Moderate
Involvement in Dairy Mela /Exhibitions/Livestock shows	58.33	Moderate
Involvement in farm broadcast and telecast	60.00	Moderate
Involvement in publication of technical article	66.66	Moderate
Involvement in animal health and veterinary services	100.00	Strong

level. Hence the research and extension system may work synergically for technology dissemination of dairy technologies through involvement in seminar, training programme, animal health and veterinary services, farmers' day, mela etc.

Among technology development activities, research extension linkages were moderate in evaluation of technologies and in getting feedback from dairy farmers. It may be due the fact that the actual field situations are known or realized by the extension system due to their regular contact with the farmers. The weak linkage in identifying research problems from field level may be due to the fact that technologies are developed based on the researcher expertise and institute mandates.

Table 2, indicates that among technology dissemination activities, there was moderate linkage between extension-research in case of involvement in workshops, seminar, training programmes, field days/farmer days, dairy mela, exhibitions/livestock shows and involvement in animal health and veterinary services with researchers. This might be due to the fact that farmers are interested to update their knowledge in dairying activities.

Among technology development activities, research extension linkages were moderate in case of evaluation of technologies and in getting feedback from dairy farmers. It may be due to the fact that the field situations are known or realized by the extension system due to their regular contact with the farmers. Also extension personnel often contact the researcher to get information on new technologies. The weak linkage in identifying research problems from field level might be due to the reason that technologies are developed based on the researcher's expertise and mandate of the research institutes.

Extension Clientele linkage: From Table 3, it could be observed that among technology dissemination activities, there was a strong linkage between the extension personnel and clientele in health and veterinary service and involvement in training programmes and seminar. This could be due to the fact that clientele gives prime importance to animal health, which directly affects the milk production and in turn the economic returns. The clientele might have realized the importance of new and improved technologies at field level, to make dairy farming profitable, which implies the strong linkage with regard to training and dissemination of technologies.

It is clear from Table 3, that with regard to technology dissemination activities, moderate linkage was found in case of involvement in infertility camps, exhibitions/awareness campaigns, demonstrations and farm publications for farmers'. This might be due to the fact that extension system is the primary source disseminating the technologies through various extension methods to reach the end users. Sreeram and Gupta (2018) also reported that the veterinary doctor is the key information source in the extension network among dairy farmers. Weak linkage was found in those activities which are organized outside the location of clientele group at district level like farmers' day/field day, owing to the lack of time of clientele, to travel and participate in those activities amidst time consuming farming activities. Involvement of extension in farm broadcast and telecast was weak, which might be due to the fact that

Table 2: Extension-Research linkage expressed by extension personnel

List of items	Linkage Index	Category
Technology Development Activities		
Contacting researcher for knowing new technologies	52.00	Moderate
Helping researchers in identifying Research Problems	41.66	Weak
Helping researchers in evaluation of technology	54.00	Moderate
Give Clientele Feedback to researchers regarding new technologies	50.00	Moderate
Technology Dissemination Activities		
Involvement in workshops/seminar	60.00	Moderate
Involvement in training programmes	66.66	Moderate
Involvement in field days/farmer days	60.83	Moderate
Involvement in Dairy Mela /Exhibitions/Livestock shows	55.00	Moderate
Involvement in animal health and veterinary services with researchers	65.00	Moderate
Mean	**57.31**	

Table 3: Extension-Clientele linkage as expressed by extension personnel

List of items	Linkage Index	Category
Technology Dissemination Activities		
Involvement in Animal health and veterinary services	100.00	Strong
Involvement in demonstration of new technologies	65.00	Moderate
Involvement in infertility camps	54.44	Moderate
Involvement in farmers' day/field days	48.00	Weak
Conducting training programmes/seminars	82.00	Strong
Involvement in exhibitions/awareness campaigns	58.33	Moderate
Involvement in farm broadcast and telecast	48.00	Weak
Involvement in farm publication	51.11	Moderate
Technology Development Activities		
Meeting dairy farmers' for identifying field problems	72.22	Strong
Meeting dairy farmers' for field trials	50.00	Moderate
Involvement in feedback	61.11	Moderate

extension personnel are more focused on field level activities. In case of technology development activities, strong linkage between extension-clientele was found as the extension system had close contact with the clientele and have better understanding of the field level problems. Moderate linkage between extension and clientele system in field trials and feedback activities may be because field trials are mainly conducted by research system.

Table 4, indicate the extent of linkage exist between the clientele and extension system. Farmers have regular contact with the extension personnel for animal health and veterinary services and for getting technical advice on field problems. Extension -clientele relationship was more strong and had mutual involvement in organizing camps, giving feedback on technology performance. It may be because farmers have direct access to the extension personnel. Weak linkage was found in those activities which were organized in district level activities like exhibitions and campaigns and farmers day. Access and use of information sources is a first step toward better targeting of extension programs and advisory services that facilitate information sharing (Nain *et al*., 2015).

Researcher-Farmer linkage: Results on research clientele linkage as expressed by the researchers are presented in Table 5 implies that among the technology dissemination activities, the linkage was strong in organizing training programmes, exhibitions and mela. Also there was strong linkage in providing advice during field visit and involvement in writing farm articles for farmers. Moderate linkage was observed in involvement in farm broadcast/ telecast and advice through phone calls/letters.

Table 4: Clientele- Extension linkage expressed by farmer

List of items	Linkage Index	Category
Meeting extension personnel for animal health and veterinary services	100.00	Strong
Contacting extension personnel for getting technical advice for field problems	100.00	Strong
Participation in training programmes	68.00	Moderate
Involvement in demonstration of new technologies	66.73	Moderate
Involvement in farmers day/field days	46.00	Weak
Involvement in health and infertility camps	72.00	Strong
Involvement in exhibitions/ campaigns	48.00	Weak
Reading farm publications to update technologies	74.00	Strong
Giving feedback to extension personnel on technology performance	83.00	Strong
Mean	**62.10**	

Table 5: Research-Clientele linkage as expressed by farmer

List of items	Linkage Index	Categories
Technology Development Activities		
Involving dairy farmers in identifying Field Problems	33.33	Weak
Involving dairy farmers in technology refinement	55.00	Moderate
Technology Dissemination Activities		
Organizing training programmes for dairy farmers	88.33	Strong
Organizing Farmers day/field day	66.66	Moderate
Organizing Exhibitions/Mela	72.00	Strong
Advice during field visit	78.00	Strong
Involvement in farm broadcast/telecast	60.00	Moderate
Involvement in farm articles	76.00	Strong
Advices through phone calls/letters	66.00	Moderate
Mean	**66.14**	

Table 6 indicates the linkage activities between clientele and research system as expressed by the farmers. The linkage was strong in case of reading farm articles by the farmers and was weak in case of meeting researchers at research institutes and during village visits for technical advice, involvement in farmers day/field day, involvement in exhibitions/mela, seminar/workshops, advices through phone calls/letters and involvement in discussions.

The possible reasons could be that the linkage activities organized in the villages had strong linkage, as the farmers need not spend time and expenditure to reach in between their farming activities. If the research system organizes training programmes at the village level and field visits, the farmer participation was more for gaining knowledge and technical advice. Majority of the farmers regularly read the farm articles and listen to the radio and television programmes regarding agriculture and dairying, the linkage was strong in involvement of these activities.

In technology development activities, the research-clientele linkage was weak in identifying field problems and involvement in evolving new technologies and the linkage is moderate in case of involvement in technology refinement. The possible reason might be the importance of linkage in these activities may not have been felt by researchers as well as the farmers and non availability of time for these activities. The linkage was moderate in technology refinement because it could be done by conducting field trials which needs farmer co-operation and participation.

Among the linkage activities between research–farmer, the linkage was comparatively more in technology dissemination than technology development. This could be due to the fact that the importance being felt by both the systems for technology transfer than for technology development.

Table 6: Clientele-Research linkage as expressed by farmer

List of items	Linkage Index	Category
Meeting researchers at research institutes for getting technical advice	30.00	Weak
Meeting researchers at villages during their visits	40.00	Weak
Participating in training programmes organized by research institutes	68.00	Moderate
Participating in farmers day programmes organized at research institutes	48.00	Weak
Participating in seminars/workshops organized at research institutes	33.50	Weak
Writing letters/phone calls to researchers seeking advice in dairy farming	34.00	Weak
Participating in discussions with researchers for solving field problems	30.00	Weak
Reading farm articles by researchers	74.00	Strong
Mean	**44.68**	

Overall linkage Index: From Table 7, it could be seen that the results of overall linkage index indicates strong linkage in case of extension-clientele, moderate in research-extension linkage and weak in research clientele linkage.

Table 7: Overall linkage Index

Type	Linkage Index	Category
Research-Extension Linkage	61.19	Moderate
Research-Clientele linkage	55.41	Weak
Extension-Clientele linkage	66.61	Strong

This could be due to the fact that the extension system had direct contact with the farmers and had regular field visits on day to day basis, where farmers were able to reach them directly at village level. Research institute and extension system mutually supported in disseminating and implementing improved technologies at field level. Research institutes direct and update the extension system through technical advices and training. The researcher in institutes and farmers in villages are apart from one another due to their exclusive sphere of work which rarely bring them together.

Linkage Mechanism: From the linkage index, the major linkage mechanism between research-extension-clientele system is concluded and represented in Figure 1 & 2. It is evident from Figure 1 & 2, that the linkage between the research- extension is dominated by training, workshop/ seminar and farm publication followed by field days and dairy mela. The linkage between the extension-clientele is dominated by training programmes, seminar, farm publications, exhibition, demonstration, field days & dairy mela.

CONCLUSION

The performance of overall agricultural system can be improved by having strong linkage between research, education, extension, farmer and other stakeholders (Van Crowder and Anderson, 1997) since it improves the efficiency of technology transfer and adoption. Practices

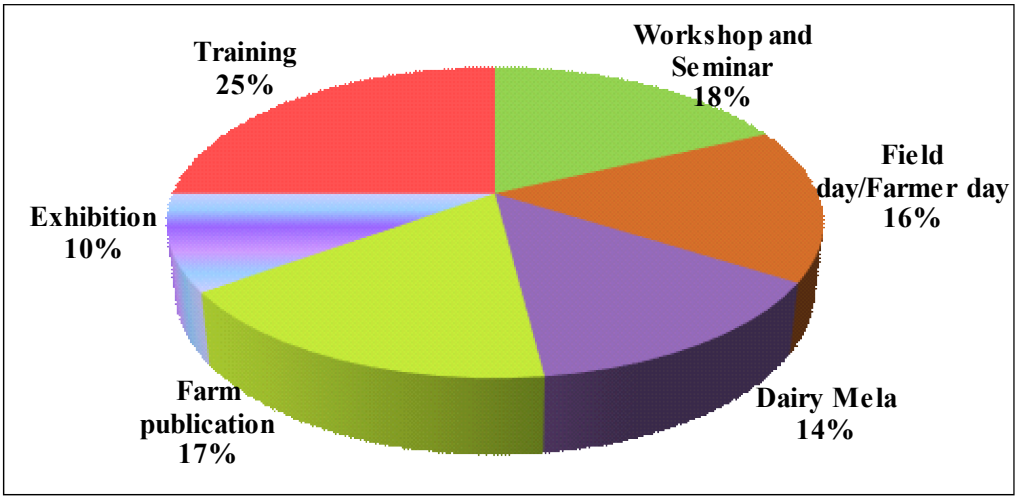


Figure 1: Linkage mechanisms among stakeholders involved in research and extension

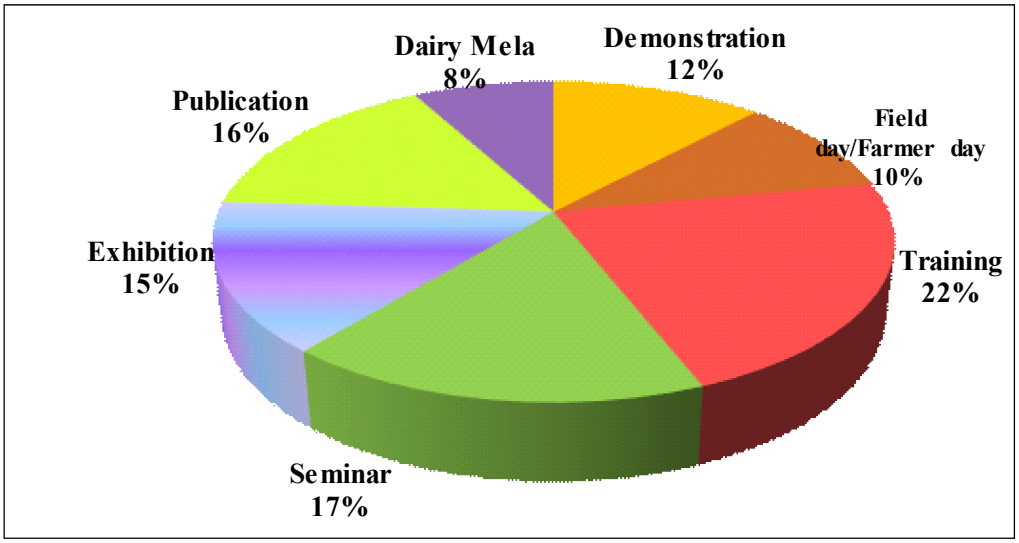


Figure 2: Linkage mechanisms among extension and clientele system

of the agricultural innovation system aimed at fostering inclusive networking among sets of heterogeneous actors (Klerkx *et al*., 2009) rather than following the linear information transfer system. The research extension clientele linkage implies that linkage was more in case of technology dissemination activities compared to technology development activities. Overall linkage index was strong in extension-clientele linkage, moderate in research-extension linkage and weak in research-clientele linkage and was dominated by training, workshop/seminar and farm publication. Technology development process in research system needs to include extension and clientele representation to ensure appropriate and need based technology development and effective technology dissemination.

REFERENCES

Adekunle, A.A.; and A.O. Fatunbi. 2012. Approaches for setting-up multi-stakeholder platforms for agricultural research and development. *World Applied Sciences Journal*, 16(7): 981-988.

Devi, M.C.A. 2004. Research- Extension-Clientele linkages in Dairy sector in Karnataka. Doctoral dissertation, Annamalai University, Tamil Nadu.

Gerster, B.M. 2015. Stakeholder Analysis. In: Urban Agriculture for Growing City Regions: Connecting Urban-Rural Spheres in Casablanca. F. Hel-ton, (Eds.). London: Routledge Chapman & Hall.

Hemmati, M. 2012. Multi-stakeholder processes for governance and sustainability: beyond deadlock and conflict. London: Earthscan.

Klerkx, L.; A. Hall and C. Leeuwis. 2009. Strengthening agricultural innovation capacity: are innovation brokers the answer? *International Journal of Agricultural Resources, Governance and Ecology*, 8(5-6): 409-438.

Nain, M.S.; R. Singh; J.R. Mishra and J.P. Sharma. 2015. Utilization and Linkage with Agricultural Information Sources: A Study of Palwal District of Haryana State. *Journal of Community Mobilization and Sustainable Development,* 10(2): 152-156.

Raina, V.; M.S. Nain; B.S. Hansra and D. Singh. 2011. Marketing Behaviour and Information Sources Utilization Pattern of Flower Growers. *Journal of Community Mobilization and Sustainable Development*, 6(2): 180-184.

Sreeram, V. and J. Gupta. 2018. A Study on the Information System of Nature Fresh dairy Project in Kerala. *Journal of Community Mobilization and Sustainable Development*, 13(1): 84-90.

Van Crowder, L. and J. Anderson. 1997. Linking research, extension and education: why is the problem so persistent and pervasive? *European Journal of Agricultural Education and Extension*, 3(4): 241-249.

Received on April, 2019, Revised on August 2019

Journal of Community Mobilization and Sustainable Development Vol. 14(2), 283-292, May-August, 2019

Role Perception of Subject Matter Specialists of Selected *Krishi Vigyan Kendras* of Northern India

Pankaj Kumar[1] and Prabhjot Kaur[2]

[1]Assistant Extension Specialist, [2]Professor, Department of Extension Education, Punjab Agricultural University, Ludhiana, Punjab

ABSTRACT

Study was undertaken in Punjab, Haryana and Himachal Pradesh while selected 20 KVKs proportionally and included all subject matter specialists (total 97) as respondents. Scale was constructed to measure the role expectation of SMSs of KVKs comprising 11 role segments viz. organization of trainings, on farm trials, front line demonstrations, programme planning and execution, subject matter authority, communication and feedback, evaluation, management, services and supplies, office work and reporting, and supporting activities was used for studying the role performance. Findings revealed that most of the respondents were male (63.91%), in middle category of age (49.48%), from Home Science discipline (18.56%), having doctorate education (63.92%), rural background (57.73%), family occupation service (69.07%) and service experience of 1-11 years (55%). Assessment of the training needs of the farmers of the district, selection of location specific problems, proper selection of site for demonstration, implementing or helping in implementation of plan of work, fully conversant with the agricultural situation in the district w.r.t. area of specialization, serving as a channel of communication between university and farmers, self-evaluation, developing contact with progressive farmers, helping farmers in difficult situation e.g. pest attack, epidemics, draught, flood, etc., attending to visiting farmers and other visitors and dealing politely with them and publishing the research/extension publications were the most perceived roles respectively. Overall mean score of the role segment in on-farm trials was highest (4.66) followed by organization of trainings (4.63) and communication and feedback (4.58), whereas supporting activities (4.44) got lowest. Majority of the respondents (43.30%) were having high role perception, 37.11 per cent fallen under medium role perception category and only 19.59 per cent of the respondents were having low perception with regard to overall role perception of the SMSs.

Keywords: Role perception, Subject matter specialists, *Krishi vigyan kendra*, Role segments

INTRODUCTION

Krishi vigyan kendras have now emerged as prime agricultural institute at district level at all over the India. In the beginning, the mandate of KVKs was confined only to provide skill based training to the farmers, farm women and rural youth in agriculture as a whole and other allied vocations such as apiculture, mushroom cultivation etc. With the consolidation of other front-line extension projects of the Council during the Eighth Five Year Plan, the mandate was enlarged and revised to take up on-farm testing, long term vocational training, in service training for grass root level extension workers and front-line demonstrations on major cereal, oilseed and pulse crops and other enterprises (Venkatasubramanian *et al.*, 2009). Now mandate of KVKs is no doubt crystal clear, but how to comply with these mandates is still a challenging task. Many roles are to be played by Subject Matter Specialists (SMSs) of KVKs while fulfilling the KVK mandate. Many times role related problems come in the way while working in the KVKs *viz* role ambiguity and role conflict. Understanding ones' role in an organization is essential for making sure that the right things are being done at the right time (Biddle & Thomas, 1966). It is very important to find out the role perception of the SMSs of KVKs so that more role clarity could be achieved. So keeping this point in view the present study is undertaken with the following specific objective:

MATERIALS AND METHODS

The study was conducted in the Punjab, Haryana and Himachal Pradesh states. A total of twenty KVKs were selected using probability proportion to number. Eight KVKs from Punjab i.e. Jalandhar, Fatehgarh Sahib, Ludhiana, Ferozepur, Kapurthala, Amritsar, Bhathinda,

*Corresponding author email id: shelleypankaj@pau.edu

Mansa, seven from Haryana i.e. Sonipat, Panipat, Jind, Kaithal, Rohtak, Kurukshetra and Faridabad, and five from Himachal Pradesh viz. Kangra, Una, Bilaspur, Kullu and Mandi were selected randomly. For determining the role perception all the subject matter specialists (total 97) working in the selected KVKs were taken as the respondents. Scale developed by Kumar and Kaur (2016) to measure the role expectation/perception was used. The statistical analysis was done using tools such as mean, standard deviation, analysis of variance and Tukey post hoc test. The mean was used to classify the different variables in low, medium and high categories. ANOVA was applied to know any significant difference between different role segments and Tukey post hoc test was applied to know which two role segments differs significantly.

RESULTS AND DISCUSSION

Socio-personal characteristics of the respondents: Perusal of the data given in the Table 1 denotes the socio-personal characteristics of the respondents. Most of the respondents were male (63.91%) and were falling in the middle category (38-48 years) of age with a percentage of 49.48. If we observe the discipline of the respondents, it was Home Science (18.56%) which leads the tally

Table 1: Distribution of the respondents according to their socio-personal characteristics

Particulars	Category	Subject Matter Specialists (n_1=97)	
		Frequency	Percentage
Sex	Male	62	63.91
	Female	35	36.08
Age	28-38	29	29.90
	38-48	48	49.48
	Above 48	20	20.62
Discipline	Agronomy	13	13.40
	Vegetables	9	9.28
	Agricultural Engineering	4	4.12
	Entomology	9	9.28
	Home Science	18	18.56
	Soil Science	11	11.34
	Extension Education	11	11.34
	Pomology	6	6.19
	Animal/Vet. Science	3	3.09
	Plant Pathology	6	6.19
	Forestry	4	4.12
	Nematology	1	1.03
	Agri Economics	2	2.06
Education	M.Sc./Post graduation	35	36.08
	Ph. D	62	63.92
Family back ground	Rural	56	57.73
	Urban	41	42.27
Family occupation	Agriculture	18	18.56
	Business	3	3.09
	Service	67	69.07
	Agriculture + Service	9	9.28
Service Experience	1-11	55	56.70
	11-21	26	26.80
	Above 21	16	16.50

followed by Agronomy (13.40%), Soil Science and Extension Education with an equal percentage of 11.34. Majority of the respondents was having doctorate education (63.92%). If we notice the family attributes of the respondents, majority of them was coming from rural background (57.73%), and family occupation was service with a percentage of 69.07 per cent. As far as the service experience of the respondents was concerned majority (55%) were having service experience of 1-11 years. The finding of the study was quite in line with Singh and Kumar (2012) who reported that qualification of most of the trainers was found to be Ph.D., 5-10 years of experience of their service, exception of age as most of the trainers in KVKs were 30-40 years old.

Role perception regarding organization of trainings: Data given in Table 2 clearly indicates that as far as the different roles under organization of trainings are concerned, respondents perceived the assessment of the training needs of the farmers of the district is most important (mean score 4.88) followed by developing need based curriculum (mean score 4.80) and delivering well prepared lecture to the trainees (mean score 4.72). Whereas arranging field trips to the demonstration sites, experiment fields and other relevant places was the least perceived role (mean score 4.42). Findings were different from Dhillon (1975) with the exception that arranging field trips to the demonstration sites, experiment fields and other relevant places was least perceived role reported.

Role perception regarding on-farm testing: It is observed from the data presented in the Table 3 that respondents perceived the selection of location specific problems as most important, followed by inspection of the field trials and critically observing and recording data of trials. However, forming appropriate research hypotheses was the least perceived role under the role segment of on-farm testing with mean score of 4.36 followed by applying appropriate statistical tools to analyse the data and publishing the findings of the on-farm-research trials. Generally, KVKs were known as extension institutes rather than research institutes. Here these least perceived roles were a core activity of research. Moreover, the probable solutions to the location specific problems

Table 2: Distribution of SMSs according to their role perception regarding organization of trainings

S.No.	Role items	Mean Score	Rank
1	Assessment of the training needs of the farmers of the district	4.88	1
2	Developing need based curriculum	4.80	2
3	Use of proper AV aids	4.45	9
4	Necessary arrangements for the successful conduct of training	4.66	5
5	Delivering well prepared lecture to the trainees	4.72	3
6	Organizing discussion session for the better understanding of subject matter	4.59	6
7	Developing skills through practical field training	4.55	7
8	Arranging field trips to the demonstration sites, experiment fields & other relevant places	4.42	10
9	Measuring the impact of training programme	4.51	8
10	Modifying training programme on the basis of feedback received	4.69	4

Table 3: Distribution of SMSs according to their role perception regarding on-farm testing

S.No.	Role items	Mean Score	Rank
1	Selection of location specific problems	4.87	1
2	Stating the objectives of the research clearly	4.71	5
3	Forming appropriate research hypotheses	4.36	8
4	Laying out the experiments properly	4.79	4
5	Inspection of field trials	4.85	2
6	Critically observing and recording data of trials	4.81	3
7	Applying appropriate statistical tools to analyse the data	4.38	7
8	Publishing the findings of the on-farm-research trials	4.48	6

found by SMSs were not recommended directly by SAUs. They have to submit their research results to main research system of SAUs, which if found needed, conduct research on those lines and after getting the promising results made recommendations. So in this whole process SMSs were not so motivated about forming appropriate research hypotheses and applying appropriate statistical tools to analyse the data. In this way these roles were least perceived by respondents. However, these results are altogether different from that of Dhillon (1975).

Role perception regarding front line demonstrations: Data in the Table 4 shows that in the role segment of frontline demonstrations, proper selection of site for demonstration and monitoring on continuous and regular basis through visits to FLD plots, recording observations, getting the feedback from the farmers and extension workers were the most perceived roles having bracketed mean score of 4.77. Here interestingly, conducting survey to ascertain the socio-economic conditions of farmers and farming situations under which the crop is grown was the least (15th rank) perceived role. Conducting survey to find existing level of adoption of technologies and productivity was among the least (13th rank) perceived roles which is otherwise a primary and mandatory step of FLDs. The possible reasons behind this may be either they were not clear about the necessary steps for conducting FLDs or might be over engaged in other KVKs' activities resulting in lack of full involvement in FLDs. Further it was verbal conveyance that every KVK should conduct at least 100 FLDs every year. So all the roles were not possible to play for so many FLDs keeping in view the limited manpower and only one vehicle for all KVK activities.

Role perception regarding programme planning and execution: Programme planning and execution is a basis of any extension project and so is of the KVK. Table 5 reveals that implementing or helping in implementation of plan of work was the most perceived role by respondents with mean score of 4.61. Here also one interesting observation was come out. ATMA, a core agency for the agricultural development of the district in present scenario, emphasizes on development of Strategic Research and Extension plan of the district (Anonymous,

Table 4: Distribution of SMSs according to their role perception regarding front line demonstrations

S. No.	Role items	Mean Score	Rank
1	Getting thorough knowledge of technologies/thematic areas on which the FLDs are to be conducted	4.61	5.5
2	Developing a comprehensive plan for organizing the demonstrations	4.68	3
3	Proper selection of site for demonstration	4.77	1.5
4	Participatory approach in conducting demonstrations associating farm scientists, extension workers and demonstrating farmers.	4.57	8.5
5	Conducting survey to ascertain the socio-economic conditions of farmers and farming situations under which the crop is grown	4.21	15
6	Conducting survey to find existing level of adoption of technologies and productivity	4.34	13
7	Organizing a orientation training for all the participating individuals /agencies about all aspects of technologies and methodologies to be demonstrated	4.23	14
8	Informing, all participating agencies/persons well in advance about the date and venue prior to the launching of the demonstrations	4.38	12
9	Supervising and guiding all important farm operations carried out by the demonstrating farmers	4.66	4
10	Organizing field day	4.57	8.5
11	Recording the information pertaining to different technological interventions adopted at Check plot and FLD plot to evaluate the technological gap	4.61	5.5
12	Keeping records of various expenses incurred and yields for deriving cost benefits	4.59	8
13	Monitoring on continuous and regular basis through visits to FLD plots, recording observations, getting the feedback from the farmers and extension workers.	4.77	1.5
14	Documenting, reporting, circulating the results of demonstration among all the concerned personnel and demonstrating farmers	4.49	10.5
15	Publishing the success stories in popular extension journals, newspapers and magazines	4.49	10.5

2014). However, the SMSs of KVKs (a key stake holder of ATMA) kept it at the bottom (9th rank) of their perception of different roles under this role segment. Reason behind this may be that the work of ATMA was still not properly channelized due to individual targeted activities of the constituent departments. Similarly, there were mandated targets of KVKs which leave less time for collaborative work with other line Departments. KVKs were already coping up with two power centres i.e. ZPDs and SAUs and there would be additional interference of Project Director, ATMA. So many directing centres would lead to complete ambiguity of roles. And the present outcome was one of the results of this.

Role perception regarding subject matter authority: The data in table 6 clearly indicates that fully conversant with the agricultural situation in the district w.r.t. his area of specialization was most perceived role (mean score 4.70), as far as the role perception regarding subject matter authority is concerned. This was equally followed by selecting, interpreting and making solutions to the specific problems and reading periodicals, journals, magazines and other literature to get latest research developments (mean score 4.60). The least perceived roles were attending refresher training courses to update the subject matter knowledge (mean score 4.46) and attending professional meetings, conferences, seminars and workshops (mean score 4.49). The only possible reason come to mind was that overburden of the work of KVKs activities and priority of other work over this may left less or no time for attending refresher training courses, professional meetings, conferences, seminars and workshops. However, results did not support the findings of Dhillon (1975) and Kaur (1986).

Role perception regarding communication and feedback: Role perception in this area was studied on different role items such as identifying the key communicators, using key communicators in the diffusion and adoption of agricultural innovations etc. It is quite clear from the Table 7 that serving as a channel of communication between university and farmers was the role most perceived by the respondents under role segment of communication and feedback (mean score 4.74). However, they gave least importance to the role, using key communicators in the diffusion and adoption of

Table 5: Distribution of SMSs according to their role perception regarding programme planning and execution

S.No.	Role items	Mean Score	Rank
1	Be knowledgeable about the results revealed through evaluation and field studies of the past years	4.42	5.5
2	Be knowledgeable about the steps and approaches of programmme planning	4.42	5.5
3	Collecting &analysing the facts pertaining to the agricultural production problems of the farmers	4.47	4
4	Preparing the technical information collected for presentation to the head of the organization for planning a programme	4.40	7.5
5	Personal involvement in finding the suitable solution to the problem/need of the area	4.58	2
6	Drawing up of a suitable plan of work	4.57	3
7	Implementing or helping in implementation of plan of work	4.61	1
8	Reconsidering the plan in the light of results of evaluation of the programme	4.40	7.5
9	Development of Strategic Research and Extension plan of the Distt	4.36	9

Table 6: Distribution of SMSs according to their role perception regarding subject matter authority

S.No.	Role items	Mean Score	Rank
1	Fully conversant with the agricultural situation in the district w.r.t. his area of specialization	4.70	1
2	Serving as liaison with agricultural research in general and with his own discipline in particular	4.51	5
3	Maintaining close association/links/contacts with parent and other technical departments	4.54	4
4	Selecting, interpreting and making solutions to the specific problems	4.60	2.5
5	Attending professional meetings, conferences, seminars and workshops	4.49	6
6	Attending refresher training courses to update the subject matter knowledge	4.46	7
7	Reading periodicals, journals, magazines and other literature to get latest research developments	4.60	2.5

agricultural innovations and giving feedback regarding the non-availability of certain inputs which hinder the adoption of new technology (mean score 4.46).

Role perception regarding evaluation: Data placed in the Table 8 specifies that under the role segment of evaluation, the self-evaluation was most perceived role having a mean score of 4.72, which came as a surprise result. It might be due to the reason that scientists perceived that self-evaluation helps to improve their performance and better output. Further evaluating the different individual activities of KVK was least perceived role (7th rank) which is otherwise could be considered as one of most important role. This may be due to that SMSs might be thinking that evaluation was not their business but the superiors should do evaluation with active involvement of SMSs. However, self-evaluation role goes well under this segment.

Role perception regarding management: Critical examination of the data placed in table 9 tells about the role perception of SMSs of KVKs in the role segment of management. Under this dimension, developing contact with progressive farmers came out to be most perceived role followed by create team spirit through cooperation and coordination and establishing working relationships with small, marginal farmers and financial institutions having mean scores of 4.63 4.62 and 4.56 respectively. However, as a matter of surprise, observing the norms and standards set by the organization/authorities was the least perceived role which is otherwise one of the most important role (10th rank). Perhaps SMSs were thinking in the present competitive world where they have to compete with NGOs and private players, the old norms and standards set by organization/authorities were not too relevant. Or they might be keeping different opinion about the norms and standards with that of organization/ authorities.

Role perception regarding service and supplies: Table 10 reveals that helping farmers in difficult situation e.g. pest attack, epidemics, draught, flood, etc. was the most important role as perceived by the respondents (mean score 4.77). It was quite expected result as farmers were in dire need of their help in those conditions. The SMSs who were having good rapport with farmers perceived it as primary duty to help them. Here too an important role i.e. providing services in collecting soil and water samples came out to be among the least perceived roles (9th rank). KVKs were well equipped with soil labs and they were supposed to do soil and water testing of the concerned district. But firstly this is a discipline specific role of Soil Science, so the other scientists were least concerned with

Table 7: Distribution of SMSs according to their role perception regarding communication and feedback

S.No.	Role items	Mean Score	Rank
1	Identifying the key communicators	4.60	3
2	Using key communicators in the diffusion and adoption of agricultural innovations	4.46	5.5
3	Giving feedback regarding the non-availability of certain inputs which hinder the adoption of new technology	4.46	5.5
4	Giving feedback regarding cultural difficulty & attitude of farmers in adoption of new technology	4.51	4
5	Informing the insect/pest outbreaks/attacks and other calamities which need emergency reporting to concerned authorities	4.71	2
6	Serving as a channel of communication between university and farmers	4.74	1

Table 8: Distribution of SMSs according to their role perception regarding evaluation

S.No.	Role items	Mean Score	Rank
1	Active involvement in evaluation of programme	4.71	2
2	Knowledgeable about steps involved in evaluation of a programme/ project	4.43	5
3	Acquaintance with the use of results revealed by evaluation	4.42	6
4	Be knowledgeable about how to interpret the results	4.62	4
5	Self-evaluation	4.72	1
6	Evaluating the different individual activities of KVK	4.35	7
7	Impact analysis of KVK	4.67	3

Table 9: Distribution of SMSs according to their role perception regarding management

S.No.	Role items	Mean Score	Rank
1	Understanding and practicing the concept of integration of teaching, research and extension	4.41	8
2	Observing the norms and standards set by the organization/authorities	4.34	10
3	Developing and maintaining good relations with superiors, subordinates &associates	4.51	4
4	Developing contact with progressive farmers	4.63	1
5	Create team spirit through cooperation and coordination	4.62	2
6	Keeping close liaison with the staff of agricultural and allied departments	4.47	6
7	Keeping informed all concerned associates about what has been decided at organizational level	4.35	9
8	Establishing working relationships with small, marginal farmers and financial institutions	4.56	3
9	Stimulating the enthusiasm of people to take up agril development on self-help basis with the needed aid from govt and other agencies	4.48	5
10	Effectively supervising the execution of the plan	4.46	7

it. Further SMSs might perceive that they were concerned with giving trainings and technical know-how regarding how to collect soil and water samples. But they themselves go to field for collecting soil and water samples was not desirable.

Role perception regarding office work and reporting: The perusal of Table 11 indicates that attending to visiting farmers and other visitors and dealing politely with them was the most perceived role item among different roles under office work and reporting segment. This was quite expected outcome. However, assisting the office in the preparation of budget and other day to day work followed by having thorough knowledge of rules and proper use of vehicle according to instructions/guidelines were the least perceived roles (9th, 8th, and 7th rank). It was true that assisting the office in the preparation of budget and other day to day work was not the task of SMSs of KVKs with a note that they can submit their demands while budget preparations were going on. These results were quite in line with Dhillon (1975) but were contrary to Kaur (1986).

Role perception regarding supporting activities: Role segment of supporting activities was given in Table 12. It clearly denotes that publishing the research/extension publications was widely perceived role which was followed by assisting the Programme Coordinators in holding SAC meetings and delivering TV/radio talks. In the light of new career advancement scheme under the guidelines of

Table 10: Distribution of SMSs according to their role perception regarding service and supplies

S. No.	Role items	Mean Score	Rank
1	Ensuring supply of all agriculture inputs required for demonstration, training and other purposes	4.58	4
2	Providing services in collecting soil and water samples	4.36	9
3	Providing diagnostic services	4.48	7
4	Submission of indents well in time to ensure the supply of inputs	4.44	8
5	Ensuring the delivery of technical inputs to farmers before planting/sowing season	4.69	2
6	Helping farmers in difficult situation e.g. pest attack, epidemics, draught, flood, etc.	4.77	1
7	Collaborating with other Department such as Markfed, IFFCO, KRIBHCO, Department of Agriculture etc. providing services to farmers	4.56	6
8	Launching a special programme in case of epidemic	4.60	3.5
9	Procuring and supplying fruit plants, seed etc as per the demand of the farmers	4.28	12
10	Joint touring with Agricultural Extension officers for the solution of agricultural problems	4.29	11
11	Providing technical guidance and other specialized services to the farmers in establishing individual projects	4.31	10
12	Visiting farmers' fields for inspection advice and guidance	4.60	3.5

Table 11: Distribution of SMSs according to their role perception regarding office work and reporting

S.No.	Role items	Mean Score	Rank
1	Preparation and timely submission of various periodic reports prescribed by University and ZPD	4.64	4.5
2	Preparing and submitting special reports like survey report, FLD report as per requirement	4.64	4.5
3	Keeping up-to-date record of all sorts of information related to agriculture	4.69	2
4	Attending to visiting farmers and other visitors and dealing politely with them	4.76	1
5	Ensuring timely replies to the correspondence from superior officers, farmers and other Departments	4.66	3
6	Keeping the record of all offices goods which are under charge and the other day to day work	4.59	6
7	Having thorough knowledge of rules	4.44	8
8	Assisting the office in the preparation of budget and other day to day work	4.15	9
9	Proper use of vehicle according to instructions/guidelines	4.46	7

Table 12: Distribution of SMSs according to their role perception regarding supporting activities

S.No.	Role items	Mean Score	Rank
1	Arranging Ex trainee sammelan	4.38	9
2	Arranging film shows for farmers	4.16	13
3	Participating in short duration training/workshops organized by different agencies	4.47	7
4	Holding agricultural fairs	4.15	14
5	Organization of exhibitions	4.28	11.5
6	Arranging farm tours	4.28	11.5
7	Organizing campaigns to solve the problems of masses	4.53	6
8	Assisting the Programme Coordinators in holding SAC meetings	4.69	2
9	Delivering invited lectures	4.62	4
10	Delivering TV/radio talks	4.65	3
11	Publishing the research/extension publications	4.71	1
12	Holding the special days like world food day, world environment day	4.38	9
13	Organizing technology weeks	4.54	5
14	Facilitating the formation of self-help groups, farmers' club etc.	4.38	9

ICAR, which emphasise greatly on the publications, the present outcome was not surprising. Whereas holding agricultural fairs was least perceived role followed by arranging film shows for farmers, organization of exhibitions and arranging farm tours. This result is quite expected as holding agricultural fairs is a very time consuming task with not so much impact at KVK level and film shows are losing interest of the farmers these days in the sampled area. These results were in contrast to Kaur (1986).

Difference between role perception w.r.t. different role segments: Table 13 depicts the overall mean score of role perception in each role segment. It denotes that overall mean score of the role segment in on-farm trials was highest (4.66) followed by organization of trainings (4.63) and communication and feedback (4.58). At the bottom role segment of supporting was there with overall mean score of 4.44. However front line demonstrations which is at the priority of KVKs' mandate, hovers at 7th rank with overall score of 4.53. To find out the difference between different role segments one way ANOVA test followed by Tukey post hoc test was performed. Outcome of the test reveals that there was no significant difference between different role segments as a whole as well as in comparison to each other.

Overall role perception of the SMSs: Data in Table 14 indicates about the overall role perception of the respondents. It is clear from the table that majority of the respondents (43.30%) were having high role perception, 37.11 per cent fallen under medium role perception

Table 13: Overall mean perception score of different role segments

S.No.	Role Segment	Overall Mean Score	Standard Deviation	Rank
1	Organization of trainings	4.63	0.187	2
2	On-farm trials	4.66	0.185	1
3	Front line demonstrations	4.53	0.163	7
4	Programme planning and execution	4.47	0.101	10
5	Subject matter authority	4.56	0.155	5
6	Communication and feedback	4.58	0.124	3
7	Evaluation	4.56	0.082	5
8	Management	4.48	0.093	9
9	Services and supplies	4.50	0.175	8
10	Office work and reporting	4.56	0.215	5
11	Supporting activities	4.44	0.150	11

F value = 1.704, p value= 0.91 with degree of freedom= 106, non-significant at 5%

Table 14: Distribution of the SMSs according to their overall role perception score

Category	Role Perception Score	Frequency	Percentage
Low	409-451 (Low)	19	19.59
Medium	451-493 (Med)	36	37.11
High	493-535 (High)	42	43.30

category and only 19.59 per cent of the respondents were having low perception with regard to overall role of the SMSs. The finding of the study is quite in line with the study conducted by Patel *et al.* (2007) who reported that majority of the teachers in Anand Agricultural University had high to medium role perception in general and in case of research and extension work, slightly more than half had high level of perception. But the findings are different from the Singh and Kumar (2012), Mistry *et al.* (2007) and Singh (2002) who reported that most of the trainers in KVKs had medium level of overall perception about their roles in the dimensions of planning, organization, motivation, training material, training, reporting, evaluation and supporting activities, majority of the women sarpanches had medium overall role perception of leadership roles and majority of the Gram Panchayat Members (GPMs) and Gram Sabha Members (GPMs) in all the five dimensions perceived medium role perception respectively.

CONCLUSION

Role perception is an important aspect of organizations to be studied for the better functioning. KVKs are the important institutes for the development of agriculture in India and role analysis of their SMSs is an essential activity. Role of SMSs was related to 11 major role segments. Role perception in these entire role segments do not differ significantly which indicates that SMSs consider all the role segments equal. Although they were having high overall role perception, but there were certain highly perceivable important to which they didn't give importance. These roles may require more clarity or there may be role conflict associated with them. Working on the lines of the study, a greater role perception can be achieved which will enhance the functioning of the KVKs.

REFERENCES

Anonymous. 2014. ATMA guidelines, 2014 under NMAET. pp 20,50. Retrieved on 21/9/2014 from http://agricoop.nic.in/imagedefault/whatsnew/Uploaded%20ATMA%20Guidelines%20%20-%20FINAL.pdf

Biddle, B.J. and E.J. Thomas. 1966. *Role theory concepts and research*. John Wiley & Sons, New York, USA.

Dhillon, J.S. 1975. Role identification, perception, performance and determinants of job effectiveness of District Extension Specialists in Punjab. Ph.D. dissertation. Punjab Agricultural University, Ludhiana, India

Gautam, A.K.; R.K. Dohrey, B. Jirli; A. Kumar and M. Mishra. 2014. Impact of KVK entrepreneurship training onknowledge of trainees. *Journal of Community Mobilization and Sustainable Development,* 9: 182-185.

Kaur, M. 1986. Role analysis of *Mukhya Sevikas* in Punjab. Ph.D. dissertation. Punjab Agricultural University, Ludhiana, India.

Kumar, P. and P. Kaur. 2016. A scale to measure the role expectation/perception of Subject Matter Specialists of *Krishi Vigyan Kendras*. *Indian J. Soc. Res.,* 57: 83-92.

Kumar, P. and P. Kaur. 2016. Role Performance of Subject Matter Specialists in *Krishi Vigyan Kendras* of Northern India. *Journal of Community Mobilization and Sustainable Development,* 11: 9-18.

Kumar, P. and P. Kaur. 2017. Role Expectation of Subject Matter Specialists of Selected *Krishi Vigyan Kendras* of Northern India. *Indian Journal of Extension Education* 53: 37-44.

Mistry, J.J.; V.B. Patel and M.C. Soni. 2007. Role perception of elected women *Sarpanches* under *panchayati raj* system. *Guj. J. Ext. Edu.,* 28-29: 68-70.

Patel, J.K.; M.R. Patel and N.P. Patel. 2007. Perception of teachers about the roles to be performed by them. *Guj. J. Ext. Edu.,* 28-29: 71-72.

Singh, S. 2002. Multidimensional analysis of role perception and performance of panchayat members Ph.D. dissertation. Chaudhary Charan Singh Haryana Agricultural University, Hisar, India.

Singh, H.C. and R. Kumar. 2012. Role perception of the trainers of *Krishi Vigyan Kendras*. *Ind. Res. J. Ext. Edu.,* 12: 83-86.

Venkatasubramanian, V.; M.V. Sajeev and A.K. Singha. 2009. *Concepts, approaches and methodologies for technology application and transfer - a resource book for KVKs*. Pp 3-4. Zonal Project Directorate, Zone – III ICAR, Umiam, Meghalaya.

Received on May, 2019, Revised on July 2019

Journal of Community Mobilization and Sustainable Development Vol. 14(2), 293-298, May-August, 2019

Standardization of Sustainability Indicators for Hill Vegetable Farming

Surinder Singh[1] and B.S Hansra[2]
[1]Ph.D. Scholar, School of Agriculture, IGNOU New Delhi
[2]Professor Emeritus, Amity International University, Noida, Uttar Pradesh

ABSTRACT

Sustainability is an important concept which tries to find a good balance between the need for food production and the preservation of the ecological system within the environment. Sustainability is all about to meet overall production, social and ecological requirements in consonance with changing demographics and diet structure. Very limited tools are available to assess agriculture sustainability at farm level and the tools which has been developed does not satisfy regional needs. Though sustainability is a global concept but region specific indicators required to be developed to assess it as the indicators developed for agriculture in plains are not necessarily suitable for hill agriculture. Sustainability indicators inform about the state of the functioning of a system and help to define goals, link them to objectives and assess progress towards meeting them; selection of appropriate indicators is very important step in sustainability studies. In the present study, an attempt has been made to standardize indicators for sustainability of vegetable farming in Himachal Pradesh. In total, eleven indicators were finalized under three dimensions of sustainability viz economic, social and environmental after deliberation with experts in the area. To assess their relative importance, the selected indicators were send to the panel of experts and on the basis of gathered opinion indicators were analyzed to find out appropriateness in sustainability studies. Among 11 finalized indicators, production efficiency and soil health were having maximum relative weightage (1.00) followed by net profit, market accessibility and farmers' knowledge on improved practices with relative weightage above 0.95. Comparatively to other indicators preparedness to drought, community relations have minimum weightage which is < 0.90. In total, all selected indicators were found suitable for sustainability studies in hill vegetable farming with varying degree of weightage. The selected indicators can be employed for calculating overall sustainability index for vegetable farming in hills. Economic dimension carries maximum importance followed by social and environmental dimensions of sustainability.

Keywords: Sustainability, Indicators, Vegetable farming, Himachal Pradesh

INTRODUCTION

By 2050, the world's population will reach 9.1 billion, 34 per cent higher than the present. Nearly all of this population increase will occur in developing countries. Urbanisation will continue at an accelerated pace, and about 70 per cent of the world's population will be urban (compared to 49 per cent today). In order to feed this larger and more urbanised population, food production (net of food used to biofuels) must increase by 70 percent. According to the 2016 edition of the United Nations' World Population Prospects reports "the world population is increasing by 83 million people each year. As per these estimates world population will be 11.2 billion in 2100.

In latest revised estimates of World Population Prospects of UN, it is projected that the population of India will surpass China by 2022 and is expected to be most populous country by 2050. Reported increase of 1.60, 1.00, 0.90 and 1.30 per cent per year for maize, rice, wheat and soybean respectively against requirement of 2.40% per year to double production by 2050 is a matter of great concern to agriculture (Ray *et al.,* 2013). Increasing population and consumption are placing unprecedented demands on agriculture and natural resources in India too and in order to meet these requirements agriculture has to be sustainable. Viewing environmental perspectives and growing concerns related to ecological balance in nature together with social, agricultural, industrial and economic developments, sustainable development of ecosystem has become critical issue with a particularity to hills and mountain regions of the world (Rais and Sharma, 2008). Food production systems are extremely sensitive to climate changes and innovations would be needed to accelerate rate of adaptation of agriculture to keep pace with climate

change (Hansra *et al.,* 2019). There is immediate requirement to answer questions like whether we are moving on the right track? Is our agriculture is sustainable? Little study has been done in the area of sustainability and still we are also lacking tools to measure sustainability.

Sustainability in agriculture is a complex concept and there is no common view point among scholars about its dimensions. Hayati *et al.* (2010). To analyse whether we are on the track for attaining sustainability, there is a need to develop tools to measure the sustainability of agriculture in consonance with future goals. Indicators represent a powerful tool to reduce complexity of the system description and to integrate complex system information (Giampietro, 1997). Hence indicators have been deduced for different systems such as agriculture production systems or other ecosystems. Sustainability is a concept and cannot be measured directly. Appropriate indicators must be selected to determine levels and duration of sustainability (Zinck and Farshad, 1995). An indicator of sustainability is a variable that allows describing and monitoring the processes, state and tendency of system of the farm, regional, national or worldwide levels. An indicator of sustainability must be sensitive to temporal and spatial changes, predictable, measurable and interactive (Liverman *et al.,* 1988).

A large number of indicators have been developed, they do not cover all dimensions due to variation in biophysical and socioeconomic conditions, indicators used in one country are not necessarily applicable to the other countries (Rasul and Thapa, 2003). Farmers in hill states like Himachal Pradesh have small landholdings and cannot sustain agriculture for future requirements (Singh *et al.,* 2018) therefore location specific indicators should be constructed within the context of contemporary socio-economic perspective (Dumanski and Pieri, 1996). Importance of indicators has been concluded by Hayati *et al.* (2010) as under

1. Although sustainability is a global concept and a farm is only the small subsystem that interacts in various ways with surrounding system, indicators are need to know whether farm system is moving towards or away from sustainability.
2. Indicators can also be used to educate farmers and other stakeholders about sustainable production.
3. Indicators provide farmers with a tool to measure their achievements towards sustainability.
4. Indicators allow for comparison between farms performance in the economic, social and environmental aspects of their production.
5. Indicators also inform policy makes about current status and trends in farm performance or sector performance.
6. Sustainable performance measure can be used as input for policy tools and stimulate better integration of decision making.
7. Sustainability indices can encourage public participation in sustainability discussions.

OBJECTIVES OF THE STUDY

Keeping in view the importance of indicators in the sustainability studies, present study was conducted for hill vegetable farms with following objectives:

1. To conceptualize sustainability with respect to small hill vegetable farms.
2. Standardization of indicators under various dimensions of sustainability for hill vegetable farming.
3. To find out relative importance of various indicators under three dimensions of sustainability.

MATERIALS AND METHODS

To develop composite index on sustainability of vegetable farming for the state of Himachal Pradesh, the indicators under various dimensions *viz.*, economic, social and environmental dimensions were identified to know their relative weightage (RW) in sustainable system. The method of identification and measuring relative weightage on tiny hill farms consisted of following steps:

STEP 1: Developing a preliminary outline for determining sustainability

A preliminary outline of sustainability in hill vegetable farming was developed based upon the literature research and in consultation with experts in the field of sustainability. Assessment was based on three dimensions of sustainability

a. Economic sustainability which is defined as ability of the vegetable grower to continue his vegetable farming i.e. economic viability, profitability and productivity.
b. Social sustainability which associated with farmer's participation, group action and participation of local institutions, knowledge and adoption of technologies, culture and farming community.

c. Environmental sustainability concerns with threat to flora, fauna, soil, water and climate. Ecological indicators included to measure environmental impacts of vegetable farming in hills.

STEP 2: Making a list of indicators that determine sustainability

While making selection of indicators important critical issues raised during in depth interviews, observation and field visits were considered which are as under:

1. Vegetable cultivation contributes a major part of agriculture system in the state and is source of income to many farm families. Productivity and profit are major factors to continue vegetable farming by the farming families.
2. Market is dominated by middlemen, fluctuation in price cause uncertainty for farm business and also accessibility of market is issue due to tough geographical conditions of the state.
3. Issues on community relations; Vegetable production is confined typically to some particulars communities in the state. Community involvement of the farmers and subsequent involvement of community on farms is an area of concern. There is positive role of vegetable farming in supporting local economies and livelihood.
4. Knowledge and awareness of farmers about agricultural resources and conservation of ecosystem in general. It is expected from the farmers that they apply best standards for quality production for which knowledge is concern.
5. Vegetable production areas are limited and access to resources like timely availability of labour for farm activities like land preparation, weeding, harvesting and at the time of carrying produce to road head though labour or mules besides timely availability of inputs and advisory services is an issue.
6. Vegetable farms are situated on steep to very steep slopes and there is need to apply efforts to control erosion. Soil conservations practices are required to maintain long term fertility of land.
7. Good practices like reduced use of pesticides, synthetic fertilizers and protection of local varieties are also an issue.
8. Excess/imbalanced use of fertilizers, pesticides/ weedicides causes health hazard to the consumers.
9. It is difficult to store water in hills and most of the water from hills gets drained into plains. There is need to develop water resources at village/farm level for irrigating vegetable crops at least at critical stages.
10. Issues on adoption of technology and ease of getting resources, agricultural services and government support.

The extensive list of all possible indicators having positive or negative impacts on various dimension of sustainability was prepared. The list was subjected to discussion with various experts in the fields of vegetable farming in the state to refine and finalise various indicators under different dimensions. A total of 11 indicators were finalized including 7 practice based and 4 operation based indicators which are presented in Table 1.

STEP 3: Assessing the relative weightage of each selected indicator

The indicators selected in step 1 and 2 were evaluated for assessing their importance level under sustainability of vegetable farming. For this purpose the list of selected indicators was sent to a panel of judges in the, agricultural economics, vegetable production and management and extension experts in the vegetable growing. The judges were requested to indicate appropriateness (relevancy) of each indicator for inclusion in the scale. The responses of judges were scored on three point quantum namely "Most Relevant", "Relevant" and "Not Relevant" and scored as 2, 1 and 0 respectively.

The responses of judges were used to work out Relative Weightage (RW) of each indicator by using the formula given by Chaudhari *et al.* (2007) which is as under

$$\text{Relative Weightage} = \frac{\text{Most Relevant} \times 2 + \text{Relevant} \times 1 + \text{Not Relevant} \times 0}{\text{Maximum possible score}}$$

Considering Relative Weightage (RW), the indicators were screened for relevancy. Accordingly all components having RW more than 0.75 were considered fit for sustainability study

RESULT AND DISCUSSION

From intensive review of literature and frequent field visits it was observed that economic, social and environmental dimensions play role in sustainability of vegetable farming and farmer will continue his vegetable farming as business only if it is economically and socially viable. For sustainable

Table 1: Final list of indicators under three dimensions of sustainability in hill vegetable farming

S. No.	Sustainability Indicators	Type of indicator	Dimension	Explanation
1	Production efficiency	obi	Economic	Vegetable production per hectare in the farm.
2	Net Profit	obi	Economic	Total cost-total return
3	Market	obi	Economic	Market accessibility to the farmer
4	Community relations	pbi	Social	Community involvement and the subsequent involvement of the community on the individual farms
5	Farmers knowledge on vegetable farming	obi	Social	Amount of knowledge by the vegetable farmer on improved vegetable production practices
6	Access to resource and support resources	pbi	Social	Access of resources such as water and support services such as extension and training services, marketing and credit services
7	Adoption of improved technologies	pbi	Social	Extent to which different vegetable production practices are adopted by the respondent farmers
8	Soil health	pbi	Environment	The nutritional and microbial balance of the soil
9	Toxicity	pbi	Environment	Check on toxicants by the farmers by minimizing the use of chemicals.
10	Water Management	pbi	Environment	Steps taken by the farm for preventing water pollution from fertilizers, pesticides etc.
11	Preparedness to drought	pbi	Environment	Ability to manage natural disasters mainly drought

obi: operation based indicator, pbi: practice based indicator

Table 2: Frequency distribution based on judges opinion (n=35)

Indicators	Most Relevant (2)	Relevant (1)	Not Relevant (0)	Weight	Group Ranking	Overall Ranking
Economic indicators						
Production Efficiency	35	0	0	1.00	I	I
Net Profit	34	1	0	0.99	II	II
Market	33	2	0	0.97	III	III
Social indicators						
Community relations	28	6	1	0.89	IV	IX
Farmers knowledge on vegetable farming	32	3	0	0.96	I	IV
Access to resource and services	29	6	0	0.91	III	VII
Adoption of improved practices	31	4	0	0.94	II	V
Environmental indicators						
Soil health	35	0	0	1.00	I	I
Toxicity	30	3	2	0.90	III	VIII
Water Management	30	5	0	0.93	II	VI
Preparedness to drought	24	8	3	0.80	IV	X

system it is very much required that vegetable farming as entrepreneur is in consonance with needs of future generation covering environmental aspects also. When the agricultural policies and measures consider only economic values, they are not sustainable and future generations may suffer access to resource base. Therefore, the policies favouring direct and indirect support to maintain hill farming are necessitated by both ecological and economic considerations (Gim, 1998). Thus, various indicators under three dimensions of sustainability *viz.*, economic, social and environmental were screened and finally 11 indicators found fit for sustainability of vegetable farming in hill

agriculture. Sustainability as a holistic notion based on economic, ecological and social pillars has also been considered by various researchers (Goodland, 1995; Gomez-Limon and Sanchez-Fernandez, 2010; Bertochhi *et al.,* 2016). All selected 11 indicators under three dimensions of sustainability (economic, social and environmental) in the present study were found governing sustainability of hill vegetable farms. Overall production efficiency and soil health ranked top of the list with equal relative weightage of maximum possible score (1.00) followed by net profit (0.99), market (0.97) and farmer's knowledge on vegetable farming (0.96). Preparedness to drought and community relations (0.89) scored minimum rank among the overall selected indicators. Among three dimensions of sustainability, economic indicators carry maximum importance followed by social and environmental dimensions. Similar observations were given by Waney *et al.* (2014).

All economic indicators i.e. production efficiency, net profit and market rank at the top of the list with relative weightage of 1.00, 0.99 and 0.97 respectively. Production efficiency was also revealed most important indicator in a study conducted by Rehman (2011). Farm income was reported as most preferred indicators of sustainability by Waney *et al.* (2014) which is directly related to production efficiency. Environmental indicator soil health ranked I with relative weightage of 1.00 which is at par with production efficiency followed by water management (0.93). Social indicator farmers' knowledge on vegetable farming ranks I in the category having fourth rank in overall indicators ranking followed by adoption of improved practices with overall ranks of V in selected indicators list.

CONCLUSION

Findings of the study concluded that economic dimension carry maximum importance in sustainability studies followed by social and environmental dimensions. Vegetable farming in hills is sustainable if it is economical, socially viable and is in consonance with future requirements of environment. Farming families has priority of economy from the farms and any farmers will try to get maximum profit from the limited resources. Under such conditions there is huge pressure on available natural base which can be disturbed to the extent that future generation do not have access to productive resource base. Thus, in present scenario it is very much required to take care of future needs which are important for sustainable agriculture. Monitoring sustainability of vegetable production system is an area of concern for planning in agriculture sector for which continuous monitoring of sustainability is required. As very less tools are available to study sustainability therefore present study is limited to the state of Himachal Pradesh. It is necessary to expand the study to other provinces/regions of the country to gather momentum towards sustainability and in order to fulfil extension activities requirements to achieve goals towards a sustainable system.

REFERENCES

Bertochhi, M.; E. Demartini and M.E. Marescotti. 2016. Ranking Farms Using Quantitative Indicators of Sustainability: the 4 Agro Method. 2nd International Symposium "New Metropolitan Perspectives" Strategic Planning, special planning, economic programs and decision support tool, through the implementation of Horizon/Europe 2020. ISTH 2020, Reggio Calabra (Italy), 18-20 May, 2016.

Bertochhi, M.; E. Demartini and M.E. Marescotti. 2016. Ranking Farms Using Quantitative Indicators of Sustainability: the 4 Agro Method. 2nd International Symposium "New Metropolitan Perspectives" Strategic Planning, special planning, economic programs and decision support tool, through the implementation of Horizon/Europe 2020. ISTH 2020, Reggio Calabra (Italy), 18-20 May 2016

Chaudhari, R.R.; L.V. Hirevenkanagoudar; S.N. Hanchinal; A.N. Mokashi; P.A. Katharki and B. Banakar. 2007. A scale for measurement of entrepreneurial behaviour of dairy farmers. *Karnataka J. Agric. Sci.,* 20(4): 792-796.

Dumanski, J. and C. Pieri. 1996. Application of the Pressure-State Response Framework for Land Quality Indicator (LQI) Program In: Land Quality Indicators and Their Use in Sustainable and Rural Development. P 41. Proceedings of the Workshop Organised by the Land and Water Development Division, FAO Agricultural Department. Agriculture Institute of Canada. Ottawa. 25-26. Jan 1996.

Giampietro, M. 1997. Socioeconomic pressure, demographic pressure, environmental loading and technological changes in agriculture. *Agric. Ecosyst. Envirn.,* 65: 201-229.

Gim, U.H. 1998. Republic of Korea- A Country Report. In: Proceedings of the Workshop on Perspectives on Sustainable Farming Systems in Upland Areas, Asian Productivity Organization, (Tokyo), Japan

Gomez-Limon, J.A. and G. Sanchez-Fernandez. 2010. Empirical Evaluation of Agricultural Sustainability Using Composite Indicators. *Ecological Economics,* 69: 1062-1075.

Goodland, R. 1995. The concept of environmental sustainability. *Annual Review of Ecological Ecosystem,* 26: 1-24.

Hansra, B.S.; R.R. Burman and P. Roy. 2018. Climate change: Scenario Analysis and Consequences in Indian Agriculture.

Journal of Community Mobilization and Sustainable Development, 13(3): 613-617.

Hayati, D.; Z. Ranjbar and E. Karami. 2010. Measuring agricultural sustainability. (in) Biodiversity, Biofuels, Agroforestry and Conservation Agriculture (Lichtfouse, E., ed.). Springer Science-Business Media B.V. pp. 73- 100.

Liverman, D.; M. Hanson; B. Brown and R. Merideth. 1988. Global sustainability: toward measurement. *Environmental Management,* 12(2): 133-143.

Rais, M. and D.C. Sharma. 2008. Characterising indicators of sustainable land management in Indian Himalayan slopping lands. *Journal of Environmental Assessment Policy and Management,* 10(4): 431-460.

Rasul, G. and G.B. Thapa. 2003. Sustainability analysis of ecological and conventional agricultural systems in Bangladesh: An assessment based on environmental, economic and social perspective. *Agric. Syst.,* 79: 327-351.

Ray, D.K.; N.D. Muller; P.C. West and J.A. Foley. 2013. Yield trends are insufficient to double global crop production by 2050. *PLoS ONE* 8(6): e 66428.doi:10.1371/Journal Pone. 0066428

Rehman, S. 2011. Sustainability of dairy based self help groups in Assam: An exploratory study in Kamrup District. PhD Thesis submitted to NDRI Karnal. 2011

Singh, S.; N.L.M. Raman and B.S. Hansra. 2017. Perspectives of Agritourism in Himachal Pradesh: A new dimension in hill agricultural diversification. *Journal of Community Mobilization and Sustainable Development*, 12(2): 207-215.

Wan, H.; G. Daniel and K. Paul. 2011. An Aging World: 2015- International Population Reports. United States Census Bureau. June 2016.

Waney, N.F.L.; Y.S. Yuliaty and B. Polii. 2014. Developing indicators of sustainable agriculture at farm level. *Journal of Agriculture and Veterinary Science,* 7(2): 42-53.

Zinck, J.A. and A. Farshad. 1995. Issues of sustainability and sustainable land management. *Canadian J. Soil Sci.,* 75: 407-412.

Received on May, 2019, Revised on July 2019

Journal of Community Mobilization and Sustainable Development Vol. 14(2), 299-304, May-August, 2019

Impact of Information and Communication Technologies on Agricultural Education: Users' Perception

D.K. Pandey[1]*, H.K. De[2], L. Geetarani[1] and N. Anandkumar Singh[1]
[1]Department of Social Science, College of Horticulture and Forestry, Pasighat, Arunachal Pradesh
[2]Social Science Section, ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar, Odisha

ABSTRACT

This article reports the impacts of technology integration on teaching and learning from a study that examines the impact of ICT deployment in higher learning institutions in agricultural sciences of North Eastern Hill States of India. The survey data were drawn from 463 respondents (students and teachers). The study finds impacts of ICT in teaching and learning such as - time saving, accuracy and ease in exchange of ideas, research works, professional attainment and updation of knowledge. There appears to be general consensus that both teachers and students feel ICT use greatly contributes to student motivation for learning. However, security, privacy, social problems, lack of innovation & creativity and time wastage were also perceived by the respondents as challenges with integration of ICT in education. Authors argue that users must exercise utmost care and discretion is using ICT tools so as to maximize its benefits in agricultural education.

Keywords: *e*-Learning, Higher education, ICT integration, Impact, North-East India

INTRODUCTION

An information and communication technology (ICT) is considered as a mainstream in higher education. ICTs are being used in many areas such as: developing course materials; delivering content and sharing content; communication between learners, teachers and the outside world; creation and delivery of presentation and lectures; academic research; administrative support and student enrolment (Mondal and Mete, 2012). ICTs have become the essential factor for educational development in the current century (Agrawal and Mittal, 2018; Sarkar, 2012; Tondeur *et al.,* 2017). It is widely accepted that advances in information technology and new developments in learning science provide opportunities to create well-designed, learner-centered, interactive, affordable efficient, flexible e-learning environments (Khan, 2005).

During the last decades, considerable resources have been invested in hardware, software, connections, training and support actions under the scope of improving the quality of teaching and learning. A major tenet of the policies that supported the introduction of ICT in education was that they can become catalysts for change. It has been noted that while there is clearly much promise in the use of ICT for education, there is also concern of a widespread ignorance of the specific impact of ICT on education goals and targets (World Bank, 2003). LDCs with an emerging thrust in technology are gradually deploying technology because of its prowess, but they do not seriously consider evaluating the impact of technology on the system it is deployed for. Technology penetration in LDCs has been observed to be driven by the promises inherent in technologies however, evaluating its impact has been evasive (Adedokun-Shittu and Shittu, 2011). This illusive perception of technology has beclouded the specific and local impacts technology has on education in LDCs. This has consequently led educators in LDCs to entirely refer to technology impacts derived by evaluation tools designed in developed countries (DC) rather than create local tools that derive specific and local impacts. Further research has shown that the effectiveness in the use of ICT to support learning is a function of the curriculum content and the instructional strategy such that when appropriate content is addressed using appropriate strategies students and teachers will get benefit (Sharma, 2015).

The Agricultural Education Division, ICAR is involved in strengthening and streamlining of higher Agricultural

*Corresponding author email id: dkpextension@gmail.com

Education system to enhance the quality of human resources in agri-supply chain to meet future challenges in agriculture sector in the country. This calls for regular planning, development, coordination and quality assurance in higher Agricultural Education in India. The integration of ICT in education is affecting educational systems in multiple ways. Likewise, ICT use in education influences the private life of all educational actors in the sense that these are engaged in innovative practices which require new methodologies, techniques and attitudes (European Union/ OECD, 2009). The influence, effect, contributions and changes that occur in a system as a result of ICT intervention to study and improve routine activities within the system is not well explored in Indian context. Hence, the present study was undertaken with aim to assess the impact of ICT in higher agricultural education and facilitate the scaling up of innovations that have a demonstrated impact on student learning. This would provide useful information for policy makers, university leaders, administrators and teaching staff to adopt and adapt these innovations in higher Agricultural Education system.

MATERIALS AND METHODS

The present study was conducted during 2016-17. From six North-Eastern Hill States, one college from Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Sikkim and two colleges from Tripura have been selected for this study. In absence of standard tools and procedures to assess the impact of ICT on education, three dimensions/outcomes viz. time saving, accuracy and ease were considered to measure four major tasks of academia (communication, research, knowledge updation and other professional activities) based on review of literature. Accordingly, users' perception was measured using five point Likert scale as follows: 1-strongly disagree, 2-rather disagree, 3-neutral, 4-rather agree, and 5-strongly agree. Mean score on level of users' agreement was calculated accordingly. Further, extent of improvement in learning and attainment among students and teachers using ICT was measured using 10 point rating scale viz. score 0 for value 0-9%; 1 for value 10-19%; 2 for value 20-29%.....9 for value 90-99%. Based on availability and eagerness of the respondents, 343 students and 120 teachers from 7 colleges of NEH region has taken part in the survey, which constitutes about 70 per cent of the total population under investigation. Two sets of structured questionnaires were developed separately for students and teachers. Frequencies, percentage and mean were used for interpretation of data.

RESULTS AND DISCUSSION

ICTs impact on students' learning: Time is one of the important indicators for assessing the effectiveness of ICTs in higher education. The above table reveals the students rating on time saving as a consequence of using ICT tools and technologies. It was observed that in major task like keeping up-to-date subject information (MS 4.30) ICTs had helped in saving time. The learner with Internet access is able to access online libraries, journals, conferences and online virtual classrooms, and through this they could achieve a high volume of the latest information (Faraj and Zarif, 2009; Markovic, 2010; Sarkar 2012). Further, in communication & interaction (MS 4.26), preparing seminar/workshop/conference presentation/alerts (MS 4.16) and in conduct of research (MS 4.15) the usage of ICT tools had helped in reducing time. Respondents have also indicated that usage of ICT tools and technologies for communicating and interacting (MS 4.05) led to accurate information gathering. The tasks like keeping-up-to-date subject information (MS 3.97), preparing seminar/ workshop/conference/presentation/alerts (MS 3.94) and research work (MS 3.94) were performed with greater accuracy by using ICT tools and technologies. Ease of using ICT is an indicator that enhances the effectiveness of ICT in the field of education. In case of ease, the respondents perceived that communication and interaction (MS 4.19) and keeping-up-to-date subject information (MS

Table 1: ICTs impact on students' learning (n=343)

Items	ICT impact indicator		
	Time Saving (Mean score)	Accuracy (Mean score)	Ease (Mean score)
For research purpose (thesis/dissertation/projects/articles)	4.15	3.84	4.06
For keeping-up-to-date subject information	4.30	3.97	4.14
For seminar/workshop/conference presentation/alerts	4.16	3.94	4.05
For communication and interaction (to exchange ideas)	4.26	4.05	4.19

4.15) and research work and preparing seminar/ workshop/conference/presentation/alerts (MS 4.05) had become easier with the usage of ICT tools and technologies.

Students' perception on extent of improvement in learning and attainment: The extent of improvement of the students in terms of clarity of concept, academic performance, placement and employment opportunity and prospects for higher education has been assessed. The finding in Table 2 depicts the rating of the students on a 10 point scale regarding the extent of improvement after using ICT tools. It could be seen that highest improvement (64.16%) was reported in garnering opportunity for higher education followed by improvement in academic performance (62.18%) after using ICT tools by the students. Conceptual clarity improved by 61.16 per cent and placement and employment opportunity improved by 55.48 per cent. Singh and Prasad (2017) have also reported improvement in oration capability among the students using audio cassette technology. In case of instructional effectiveness of Online Courses in Agriculture, learners found it moderately relevant and fairly effective (Fartyal, 2015).

Table 2: Extent of improvement in learning and attainment after using ICT tools (n=343)

Items	Extent of improvement (Mean Percent Score)
Conceptual clarity	61.16
Academic performance	62.18
Placement and employment opportunity	55.48
Opportunity for higher education	64.16

Students' perception on negative impact of ICT: Table 3 shows the extent to which the respondents agree with the negative impact of ICTs. Majority (67.93% and 66.47%) of the students were of the view that time wastage in irrelevant activities and health related issues were the major negative impacts of ICTs. Students, and sometimes teachers, can get hooked on the technology aspect, rather than the subject content. Facebook, Twitter, Youtube, Instagram and other social media networking sites can be a distraction to living and learning in the real world. Security and privacy social problems and lack of innovation and creativity were indicated as negative impact by 62.68%, 49.56% and 43.73% respondents. ICT has both advantages and disadvantages for education. One has to be careful when using it. Internet, TV, radio and others are the ICT that provide the news and information to us. One can increase his/her vision, knowledge by using it judiciously. But, when one is too focused on these things, he/she may develop health problems by using them. One must be wise in using the tools of ICT. Being able to work from home is usually regarded as being a positive effect of using ICT, but there can be negative aspects as well. Most people need some form of social interaction in their daily lives and if they do not get the chance to meet and talk with other people they may feel isolated and unhappy.

Table 3: Frequency distribution of negative impact of ICT in education (n=343)

Items	Respondents	
	Freq.	%
Health problems/lack of physical activity	228	66.47
Time wastage in irrelevant activities	233	67.93
Reduced personal interaction	219	63.85
Security and privacy	215	62.68
Social problems	170	49.56
Lack of innovation & creativity	150	43.73

ICTs impact on teachers' attainment: Table 4 reveals the ICT's impact when studied from the teacher's point of view and it was found that ICTs have saved their time in the enlisted (Table 4) tasks and the mean score ranges from 4.07 to 4.48. Maximum time saving was observed in keeping up-to-date information and getting seminar/ workshop/conference presentation/alerts. In terms of accuracy, the mean score was found to be in the range 3.96 to 4.33 indicating a very high level of agreement of the respondents with regard to beneficial aspects of using ICT. Respondents also indicated that ICT has rendered communication and gathering additional learning resources more accurate (mean score 4.34). The acts of searching, retrieval and reporting became much easier by adopting ICT tools as perceived by the teachers. All most all the enlisted tasks become easier by integrating ICT as the mean scores (3.34– 3.99) revealed. Data in table 4 also reveals that communication& interaction become much easier (mean score 4.34) with advent of ICT. It helps in providing a good communication system in higher education system (Magni, 2009). ICT helps in providing timely information to all concerned. Communication could be for internal and external information acquisition and dissemination. It includes communication between the important stakeholders of the system such as sending e-circulars to

Table 4: ICTs impact on teachers' attainment (n=120)

Items	ICT impact indicator		
	Time Saving (Mean score)	Accuracy (Mean score)	Ease (Mean score)
For research purpose (thesis/dissertation/projects/ articles)	4.41	4.10	4.30
For keeping-up-to-date subject information	4.48	4.20	4.30
For seminar/workshop/conference presentation/ alerts	4.48	4.30	4.32
For communication & interaction (to exchange ideas)	4.41	4.33	4.34
Concept understanding	4.17	3.96	4.00
Improving student learning outcome	4.28	4.17	4.16
Teaching style & strategy improvement	4.23	4.15	4.13
Transparent assessment	4.12	4.01	4.02
Review & updating course content	4.38	4.27	4.27
Provision of additional learning resources	4.44	4.33	4.31
Professional development (online training, MOOCs)	4.07	4.03	3.99

students, faculty and staff. The study 'E-learning Nordic' which looks at the perceived impact of ICT, shows that all stakeholders (students, parents, teachers, principals) believe that ICT can have a positive impact on teaching and learning (Ramboll Management, E-learning Nordic 2006).

Teachers' perception on extent of improvement after using ICT tools: The findings in Table 5 depicted the rating of the teachers on a 10 point scale regarding the extent of improvement after using ICT tools. It could be seen that highest improvement (72.08%) was reported in academic development of students particularly for competitive examinations. This was followed by academic development of staff (68.50%) by means of providing easy access to research articles, information about awards, projects and overseas visits etc. Respondents perceived that transparency & accountability, employability of students and governance improved by 63.41%, 63.17% and 62.58% respectively as a consequence of using ICT.

Table 5: Extent of improvement in academic attainment after using ICT tools

Items	Extent of improvement (Mean Percent Score)
Transparency and accountability	63.41
Academic development of staff (High rated articles/awards/ projects/overseas visit)	68.50
Academic development of students (JRF/SRF/NET/competitive exams etc.)	72.08
Employability of students	63.17
Governance	62.58

Teachers' perception on negative impact of ICTs: The data in Table 6 reveals the negative impacts of ICT in education, as perceived by the respondent teachers. It was observed that the main negative impact of ICT in education was 'misuse of internet and time wastage by students is a serious concern' as reported by 46.67 per cent of the teachers and was therefore ranked I. The second main negative impact that ICT had in education was excessive and undesirable use of ICT in areas not related to education leading to over dependency and diminishing creativity of students. It was reported by 37.50 per cent of the teachers and accordingly was ranked II. Other negative impacts of ICT, perceived by the respondent teachers in descending order are - ICT in education had led to reduced use of textbooks, articles, journals, magazines, etc., high cost of ICT tools made them unaffordable for students to purchase and duplicity. Learner sometimes access to erroneous information on the Internet which is not scientifically confirmed and therefore unsupportive to refer to. Using this type information may cause confusion and making it difficult for individual learning (Levin, 2000). e-learning can provide training for students in agricultural education, but education should be such that learners would be able to test their performance and get master in visualizing. There is no advantage in memorizing the content of course as a parrot and transfer it haphazardly to others (Mirshekari, 2006). In this case, we are just consuming the knowledge and do not get to the deep of knowledge.

Table 6: Frequency distribution of negative impact of ICTs in education (n=120)

Negative impacts	Frequency	Percentage	Rank
Excessive and undesirable use in areas not related to education leads to over dependency and diminishing creativity of students	45	37.50	II
Unreliability of information from ICT	22	18.33	V
High cost of ICT tools makes them unaffordable for students to purchase them	27	22.50	IV
Lack of innovative works due to easy availability of information	18	15.00	VI
Physical interaction between scientists, students and farmers will not be materialized on the ground.	12	10.00	VII
Misuse of internet and time wastage by student	56	46.67	I
Duplicity in many cases	10	8.33	VIII
Reduce use of textbooks, articles, journals, magazinesetc. by the student	33	27.50	III

CONCLUSION

A clear picture emerged from this study is that the impacts of ICT tools in teaching and learning process were manifold. Effective utilization of ICT tools in agricultural education found to have positive roles on all the relevant stakeholders. Use of ICT by the students had widened their access to tertiary education. ICT use in education created opportunity of higher education, employment and enhanced the academic performance of the students to the maximum level. The use of ICT tools considered as time saving instrument for the teachers in preparing seminar/workshop/conference/presentation and also for keeping them up-to-date on subject information. Again the uses of ICT tools were considered accurate to support teaching and learning process mainly in terms of getting additional learning resources. These indicate that use of ICT can help teachers and students to exploit enormous possibilities to acquire information to perform better however; one must be wise in using the tools of ICT as it has both advantages and disadvantages to education.

ACKNOWLEDGEMENTS

The first author duly acknowledges the financial support granted by the Education Division of Indian Council of Agricultural Research, New Delhi for conducting the present research work. Authors are also thankful to the respondents' teachers and students for their active participation in the survey.

REFERENCES

Adedokun-Shittu, N.A. and A.J.K. Shittu. 2011. Critical issues in evaluating Education Technology. In: M.S. Al-Mutairi and L.A. Mohammad (Eds.), Cases on ICT utilization, practice and solutions: Tools for managing day- to- day issues. *IGI Global*: pp 47–58.

Agrawal, A.K. and G.K. Mittal. 2018. The role of ICT in higher education for the 21st century: ICT as a change agent for education. *Multidisciplinary Higher Education, Research, Dynamics & Concepts: Opportunities & Challenges for Sustainable Development (ISBN 978-93-87662-12-4)*, 1(1): 76-83.

European Union/OECD. 2009. Assessing the effects of ICT in education, Indicators, criteria and benchmarks for International comparisons, Publications Office of the European Union, Luxembourg.

Faraj, A.M. and S.N. Zarif. 2009. Education based on information and communication technology in higher education. *Journal of Educational Strategies,* 4(2): 167-171.

Fartyal, S. 2015. Instructional Effectiveness of Online Courses in Agriculture. *Journal of Community Mobilization and Sustainable Development*, 10(1): 9-12.

Khan, B.H. (Ed.). 2005. *Managing e-learning: Design, delivery, implementation, and evaluation*. IGI Global.

Levin, B. 2000. Putting students at the centre in education reform. *Journal of Educational Change*, 1(2): 155-172.

Magni. 2009. CT usage in Higher education, International Technology and Education and Development Conference, Spain March 9-11.

Markovic, M. 2010. Advantages and disadvantaged of e-learning in comparison of traditional forms of learning. *Annals of the University of Petrosani, Economics*, 10(2): 289-298.

Mirshekari, A. 2006. Studying the barriers of applying the latest software in higher education. (Master's thesis). University of Tehran, Iran.

Mondal, A. and J. Mete. 2012. ICT in higher education: opportunities and challenges. *Institutions*, 21(60): 4.

Ramboll Management, E-learning Nordic. 2006. Impact of ICT on education. Copenhagen: Ramboll Management 2006.

Sarkar, S. 2012. The role of information and communication technology (ICT) in higher education for the 21st century. *The Science Probe*, 1(1): 30-41.

Sharma, H.K. 2015. Role of ICT in Improving the Excellence of Education. *International Journal of Computer Science Engineering and Communication,* 7(8): 78-81.

Singh, O.P. and A. Prasad. 2017. Attitude towards Audio Cassette Technology among the Students of Post Graduate Agricultural Colleges. *Journal of Community Mobilization and Sustainable Development,* 12(2): 306-310.

Tondeur, J.; K. Aesaert; B. Pynoo; J.B. Van; N. Fraeyman and O. Erstad. 2017. Developing a validated instrument to measure preservice teachers' ICT competencies: Meeting the demands of the 21st century. *British Journal of Educational Technology*, 48(2): 462-472.

World Bank. 2003. Infrastructure services: The building blocks of development. Washington, DC.

Received on May, 2019, Revised on August 2019

Journal of Community Mobilization and Sustainable Development Vol. 14(2), 305-312, May-August, 2019

Does Parents' Level of Education Moderates Quality of Sibling Relationship between Mentally Challenged Children and their Normal Siblings? A Cross-Sectional Study

Ritu Singh* and Manisha Mehra
Department of Human Development and Family Studies, College of Home Science, G.B.P.U.A.T., Pantnagar, Uttarakhand

ABSTRACT

The present study investigated the influence of parent's level of education on sibling relationship between mentally challenged children and their normal siblings. For the present study, 150 families with mentally challenged children were randomly selected from 3 different rehabilitation centers of Delhi across four different levels of parent education viz. illiterate; educated up to primary; educated up to high school/intermediate; educated up to Under Graduate/Post Graduate. The respondents for the present study comprised of one (any) of the parents (150) and one (any) of the normal sibling (150) of mentally challenged children making a total sample of 300 respondents. Sibling Relationship Scale was administered to respondents to arrive at meaningful inferences about sibling relationship between mentally challenged children and their normal siblings. Findings of the present study revealed that higher the level of education of parents, father and mother both, significantly better was the relationship between mentally challenged children and their normal siblings. Higher education of parents meant higher warmth/closeness, nurturance and dominance by sibling, and lower conflict and rivalry between mentally challenged children and their normal siblings.

Keywords: Antagonism, Competition, Dominance of/by sibling, Nurturance, Prosocial behavior, Warmth

INTRODUCTION

Families in various stages of life, experience different type of crisis events which may be normative or non-normative stressors. Normative stressors are developmental or universal challenges most families encounter. They are typical and can be anticipated and some of their consequences alleviated like birth, marriage, retirement, death of elderly members, and so on. Non-normative stressors are atypical for all families, that is, they are idiosyncratic challenges and unpredicted life events which are not always disastrous but extremely stressful such as accidental death, caring for a disabled or elderly family member etc. The birth of a baby is normative stress that normally changes the ethos of the family. It often requires reorientation and re-evaluation of family goals, responsibilities and relationships. Still this stressful event is an occasion for rejoicing, pride, gathering together loved ones and sharing with them the celebration of new life. However, when the new born is mentally challenged, it brings about non normative stress due to the challenges associated with mental disability. Parents undergo a series of adaptation to birth of a special need child through denial, self blame, and guilt, aggression and acceptance and adaptation.

Mental challenge is a condition of mental deficiency, a state of mental deficit of such a kind and degree that the individual is incapable of adapting himself to the normal environment of his fellows; in such a way as to maintain existence independently of supervision, control or external support. A disabled child residing with the family, especially a mentally challenged child, also increases consumptive demands without proportionately increasing the family's productive capability. Consistent evidence has been indicating that comprehensive early intervention programs can help children learn necessary life skills specifically those who are in mild or borderline range of mental challenge. A study by Ahuja *et al.* (2018) studied the impact evaluation of an intervention program on adolescents and reported that interventions were effective in enhancing life skills and abilities necessary to survive successfully. Generally speaking, children with special needs develop into adults with special needs. While this may seem apparent,

*Corresponding author email id: ritu.singh07@gmail.com

inattention to pre-vocational abilities can have a serious impact on the capacity of adolescents to join the workforce and live a self-sustainable life. The implementation of abilities that are transferred to the workplace can have a positive effect on children's unique requirements in terms of cognitive development, quality of life and overall well-being. According to a study by Singh *et al* (2018) intervention can significantly affect an individual's knowledge and choice of vocation according to their skills and interest.

Presence of a member with mental challenge irrevocably changes the family environment affecting all the subsystems such as; marital, parental, and sibling subsystems that are interconnected and interdependent. Pelchat and Lefebvre (2004) in their study observed that caretaking for children with ID generates stress which affects the physical, cognitive, and emotional development of all family members (including siblings). Siblinghood is unique. Unlike relationship with parents and peer, siblings are likely to spend more years of togetherness, thus influencing each other's well being throughout lifetime. According to Milevsky (2005) positive sibling relationships have been found to compensate for low parental and peer support and to act as a buffer against risk factors and adverse life events.

Hill (1958) in his work proposed that the families can mitigate the negative effects of stressors on family dynamics and functioning with the availability of resources, perception of the stressor, societal support and so on. Socio-economic factors such as education, income, occupation are potent and equally predictive variables of family crisis and play an important role in determining the impact of presence of mentally challenged child on quality of familial relationships. Education in this perspective plays a key role in determining the occupation and income of an individual with better educated individual landing prestigious jobs with healthier salaries. Education is the process of facilitating learning or acquisition of knowledge, skills, values, beliefs, and habits by a person in every realm of life thereby widening his/her mental horizons. Education of an individual begins from birth itself; the parents being his/her first teachers and the most influential coaches and it continues lifelong through schooling; college; life experiences and so on. Education not only strongly influences an individual's life but also family dynamics, cohesion and functioning. Education also broadens an individual's viewpoint towards any situation and makes him/her challenge predisposed notions, make better decisions and prepare for required adjustments in familial relationships.

Azar and Badr (2010) in their study revealed that higher the education level of the parent, the less stress the family experienced. According to Greenstein (1990) better or higher education on the part of woman reduces the likelihood of marital dissolution. Probably, because a woman's education reflects skills including communication, adapting strategies and so on that improves conjugal relationship. Mother's educational status influences their attitude and knowledge towards their mentally challenged children. Pant and Singh (2017) observed that adolescents of only highly educated mothers were found to be significantly more emotionally progressive and socially adjusted. Thus, parents with a higher educational background may experience less stress because they more positive and accepting about the prospects for their special needs child because of resource availability and accessibility and thus aid in improving adaptive behavior skills of the child. Lewinstein *et al.* (1991) too found that parents who are more educated, belong to a higher social class, and have fewer children accept their child's retardation better and tend to cope with emerging difficulties by approaching external helping sources. The literature also suggests that level of education influences parents' knowledge, beliefs, values, and goals about childrearing. Sola and Dikmen (2008) suggested that the mothers who were university graduate collect more information about their disabled children. Fox *et al.* (2002) reported that in traditional families, especially with low level of education, mothers are bringing up children with higher and frequent incidences of conflict and rivalry between mentally retarded child and other children of the family. Better educated parents translate their challenges into opportunities for developing patience, tolerance, empathy, sensitivity, and experience better spousal relations and encourage healthy sibling relations. Seligman (1988) observed that larger family size and lower socioeconomic status in particular have both been associated with poorer outcomes for siblings of disabled children. Shali and Patil (2017) in their study observed that children from low socio economic status had moderate level of sibling relation and children from high SES had moderate and low sibling relation and also that majority of the children from joint family were in moderate level of sibling relationship and the children from nuclear family were in moderate and low level of sibling relationship. So, if both the parents are educated then the

cumulative effect of this may also have a direct influence on sibling relationships. Education may influence parent's position to manage complexities in the relationship between mentally challenged and normal children. In this study, we aim to examine the hypotheses that parental education could serve as a predictor of level and quality of sibling relationship between the mentally challenged children and their normal siblings. The objectives of the present study are-

1. To assess the quality of sibling relationship between mentally challenged and normal siblings across their mother's level of education
2. To assess the quality of sibling relationship between mentally challenged and normal siblings across their father's level of education

MATERIALS AND METHODS

Locale: The present research study was carried out exclusively in Delhi. Delhi, was purposively selected as it is the nearest region having an appreciable number of RCI (Rehabilitation Council of India) recognized special schools meant exclusively for mentally challenged children. Out of the 9 RCI recognized institutes for mentally retarded children in Delhi, only 3 institutes namely NIMH (National Institute for Mentally Handicapped), Manovikas and C.B.S Memorial granted permission to use their institute as a research base for the present study.

Participants: The list of mentally challenged children enrolled in National Institute for Mentally Handicapped (NIMH), Manovikas and CBS Memorial was procured from their Directors to pick up families with mentally challenged children. A total of 150 families were selected for the present study wherein 150 (any one) normal sibling and 150 (any one) parent were taken up as respondents.

Measures: Sibling relationship was assessed using Sibling Relationship Scale (SRQ) by Wyndol Furman and Duane Buhrmester (1985). Sibling Relationship Questionnaire is the 48- item standard version questionnaire to assess sibling relationship on domains like Warmth/Closeness (It consists of the average of the scale scores for intimacy, pro-social behavior, companionship, similarity, admiration by sibling, admiration of sibling, and affection); Relative Status / Power (It consists of nurturance of sibling, dominance of sibling, minus the scale scores of nurturance by sibling and dominance by sibling); Conflict (It consists of the average of the quarrelling, antagonism, and competition); Rivalry (It consists of the average of maternal and paternal partiality). It was pretested for Indian culture and found to be reliable and valid for use without any modification.

Data Collection and analysis: The respondents were extensively interviewed in their homes and participant observation was made to confirm collected data. The data thus, collected was classified and tabulated in accordance with the objectives to arrive at meaningful and relevant inferences. The data was analyzed using statistical techniques like mean, standard deviation and t- test.

RESULTS AND DISCUSSION

It can be clearly seen from Table 1 and Table 2 that mentally challenged children's mothers' and fathers' level of education had significant influence on all the dimensions of sibling relationship between mentally challenged children and their mentally normal siblings. With the increase in level of education of mothers and fathers, there is an increase in warmth/closeness including intimacy, pro-social behavior, companionship, similarity, admiration of sibling, and affection in sibling relationship between mentally challenged children and their normal siblings. Joseph *et al.* (2014) reported that educational status of mothers and fathers influences attitude and knowledge towards mentally retarded children. This in turn will eventually influence their ways of dealing with issues concerned with sibling relationship of their children. Awadalla *et al.* (2008) found that parent's education and occupation were significantly associated with psychosocial adaptation. Warmth/closeness in a relationship requires genuine care, pleasure in company, shared recreational interests, accepting the other in the same way as they are and so on. Education paves way for development of healthy perspective towards unpredictable life events, such as, birth of mentally challenged child. The equation of family relationships gets affected when one subsystem is deficient. As discussed earlier, stress in one subsystem can easily translate into difficulties in relationships among members of other subsystem. Such as, the transition of spouse to parenthood shows conflicting results when the couple becomes parents of mentally challenged child which in long run influences the marital, family functioning and parent-child interaction. Erel *et al.* (1998) in their study reported that in families in which parents are dissatisfied with their marriages, there is more sibling conflict, rivalry, and lack of warmth. Thus, the interplay among these different subsystems can alter developmental trajectories for both normal as well as the mentally challenged children. Parents of such children have to manage situations that

Table 1: Mean difference in sibling relationship between mentally challenged children and their mentally normal siblings across their fathers' level of education

Domains of sibling relationship	Subscales	Mentally challenged children having illiterate fathers (n_1= 7) Mean (S.D)	Mentally challenged children having fathers educated upto Primary (n_2=32) Mean (S.D)	Mentally challenged children having fathers educated upto High school/ Intermediate (n_3= 71) Mean (S.D)	Mentally challenged children having fathers educated upto U.G./P.G. (n_4= 40) Mean (S.D)	F calculated
Warmth/ Closeness	Intimacy	0.98^a (0.46)	1.94^b (0.83)	2.90^c (0.68)	3.89^d (0.84)	4.39**
	Prosocial behaviour	0.47^a (0.79)	1.61^b (0.62)	2.58^c (0.58)	4.24^d (0.66)	5.99**
	Companionship	0.88^a (0.93)	1.93^b (0.78)	2.97^c (0.81)	3.86^d (0.69)	4.38*
	Similarity	0.37^a (0.90)	1.42^b (0.75)	2.45^c (0.89)	3.97^d (0.40)	4.49**
	Admiration by sibling	0.66 (0.86)	0.69 (0.59)	0.67 (0.64)	0.65 (0.73)	0.78
	Admiration of sibling	0.59^a (0.45)	1.82^b (0.82)	2.90^c (0.47)	4.09^d (0.52)	4.48**
	Affection	0.53^a (0.39)	1.73^b (0.45)	2.68^c (0.41)	4.38^d (0.56)	4.70**
Overall Warmth/ Closeness		0.64^a (0.52)	1.59^b (0.28)	2.45^c (0.39)	3.58^d (0.34)	4.42**
Relative Status/Power	Nurturance of sibling	0.38 (0.57)	0.30 (0.74)	0.40 (0.66)	0.35 (0.52)	0.81
	Dominance of sibling	0.45 (0.55)	0.35 (0.77)	0.37 (0.59)	0.33 (0.62)	0.83
	Nurturance by sibling	0.94^a (072)	1.78^b (0.70)	2.85^c (0.78)	4.07^d (0.78)	3.69*
	Dominance by sibling	1.07^a (0.62)	1.97^b (0.67)	2.89^c (0.86)	3.95^d (0.85)	3.62*
Overall Relative Status/ Power		0.71^a (0.83)	1.10^b (0.94)	1.63^c (1.12)	2.17^d (1.00)	4.83**
Conflict	Quarreling	3.97^a (0.64)	2.50^b (0.68)	1.35^c (0.74)	0.63^d (0.64)	4.28**
	Antagonism	3.65^a (0.72)	2.38^b (0.49)	1.23^c (0.47)	0.29^d (0.56)	3.48*
	Competition	4.09^a (0.97)	3.10^b (0.84)	1.72^c (0.59)	0.59^d (0.83)	4.63**
Overall Conflict	3.90^a (0.63)	2.66^b (0.60)	1.43^c (0.55)	0.50^d (0.54)	3.61*	
Rivalry	Maternal partiality	3.77^a (0.83)	2.39^b (0.84)	1.26^c (0.82)	0.25^d (0.97)	3.85**
	Paternal partiality	3.40^a (0.99)	2.25^b (1.01)	1.42^c (0.97)	0.34^d (0.88)	3.58*
Overall Rivalry	3.58^a (0.76)	2.32^b (0.75)	1.34^c (0.78)	0.29^d (1.00)	3.56*	

*****Significant at $P \leq 0.05$; ****** Significant at $P \leq 0.01$; Means with different superscripts are significant at $P \leq 0.05$/ $P \leq 0.01$

are beyond imagination for a regular parent. Educated parents are able to help their children (mentally challenged and their mentally normal sibling) to create a supportive and stimulating environment for both in which they mutually benefit. Educated parents make the normal child feel that they are partners of parents in care of the mentally challenged sibling by taking counsel and involving them in therapy sessions and decision making encouraging intimacy and affection among siblings. It is probably more difficult for less educated parents to comprehend complex constellation of symptoms and associated challenges and develop effective coping strategies. According to Venkatesh (2008) educational level had significant influence over psychological stress and coping; higher the educational level lesser was the psychological stress and higher coping strategies of parents of mentally challenged children. Pro-social behaviors are the traits that are inclusive of helping, sharing, comforting, and so on intended to benefit the other. The mentally normal children provide social, emotional, physical care to mentally challenged siblings. Siblings by nature, are affectionate and loving towards each other regardless of hardships. According to a study by Pourbagheri *et al.* (2018) the siblings of children with autism significantly showed more pro-social behaviors such as respecting others' feelings, sharing food and personal items with others, being kind to younger children and volunteering to help others. A study by Unal and Baran (2011) reported that informing the normal sibling of their

Table 2: Mean difference in sibling relationship between mentally challenged children and mentally normal siblings across their mother's level of education

Domains of sibling relationship	Subscales	Mentally challenged children having illiterate mothers (n_1= 62)	Mentally challenged children having mothers educated upto Primary (n_2=39)	Mentally challenged children having mothers educated upto High school/ Intermediate (n_3= 32)	Mentally challenged children having mothers educated upto U.G./P.G. (n_4= 17)	F calculated
		Mean (S.D)	Mean (S.D)	Mean (S.D)	Mean (S.D)	
Warmth/ Closeness	Intimacy	0.88^{a} (0.76)	1.93^{b} (0.82)	2.98^{c} (0.66)	3.92^{d} (0.80)	3.64*
	Prosocial behaviour	0.53^{a} (0.80)	1.54^{b} (0.52)	2.53^{c} (0.60)	4.24^{d} (0.64)	4.82**
	Companionship	0.82^{a} (1.02)	1.90^{b} (0.59)	2.90^{c} (0.80)	3.83^{d} (0.67)	3.31*
	Similarity	0.45^{a} (0.74)	1.39^{b} (0.91)	2.57^{c} (0.79)	3.96^{d} (0.96)	3.80**
	Admiration by sibling	0.72 (0.91)	0.81 (0.67)	0.76 (0.71)	0.70 (0.51)	0.80
	Admiration of sibling	0.61^{a} (0.40)	1.78^{b} (0.57)	2.82^{c} (0.45)	4.15^{d} (0.49)	3.87**
	Affection	0.50^{a} (0.37)	1.77^{b} (0.49)	2.63^{c} (0.42)	4.47^{d} (0.41)	4.94**
Overall Warmth/ Closeness		0.64^{a} (0.48)	1.59^{b} (0.53)	2.45^{c} (0.38)	3.61^{d} (0.28)	3.65*
Relative Status/Power	Nurturance of sibling	0.37 (0.61)	0.30 (0.59)	0.35 (0.48)	0.40 (0.83)	0.95
	Dominance of sibling	0.51 (0.91)	0.44 (0.63)	0.48 (0.75)	0.52 (0.65)	0.68
	Nurturance by sibling	0.96^{a} 0.79)	1.89^{b} (0.88)	2.80^{c} (0.74)	4.50^{d} (0.74)	4.79**
	Dominance by sibling	1.04^{a} (0.88)	1.96^{b} (0.82)	2.88^{c} (0.86)	4.15^{d} (0.75)	3.29*
Overall Relative Status /Power		0.52^{a} (0.55)	1.15^{b} (0.77)	1.78^{c} (0.64)	2.40^{d} (0.60)	3.03*
Conflict	Quarreling	3.92^{a} (0.97)	2.57^{b} (0.76)	1.31^{c} (0.44)	0.53^{d} (0.58)	3.84**
	Antagonism	3.61^{a} (0.79)	2.35^{b} (0.51)	1.29^{c} (0.53)	0.15^{d} (0.28)	3.35*
	Competition	4.10^{a} (1.03)	3.06^{b} (1.07)	1.70^{c} (0.90)	0.50^{d} (0.94)	4.15**
Overall Conflict	3.88^{a} (0.78)	2.66^{b} (0.62)	1.43^{c} (0.40)	0.39^{d} (0.53)	3.99**	
Rivalry	Maternal partiality	3.66^{a} (0.66)	2.32^{b} (0.84)	1.22^{c} (0.82)	0.24^{d} (0.89)	3.39*
	Paternal partiality	3.35^{a} (0.89)	2.38^{b} (1.06)	1.30^{c} (1.02)	0.34^{d} (0.88)	3.34*
Overall Rivalry	3.50^{a} (0.61)	2.35^{b} (0.73)	1.26^{c} (0.80)	0.29^{d} (0.66)	4.16**	

*Significant at $P \leq 0.05$; ** Significant at $P \leq 0.01$; Means with different superscripts are significant at $P \leq 0.05$/ $P \leq 0.01$

sibling's disability and how it affects the disabled sibling's behavior increased the normal sibling's empathy towards the disabled sibling and led to a closer sibling relationship. Mentally normal children admire the strength, determination and courage in their mentally challenged sibling that helps restore their faith in challenging situations of life and learn to be joyful no matter what the situations are. Educated parents inculcate skills and instill values in their mentally normal children which are in consonance with social perspective. According to Dunn (1983), siblings' frequent contact and companionship can produce relationships characterized by intense intimacy.

Relative status/power is seen in terms of position that an individual holds determining his/her roles in a system. No significant difference is observed in components of dominance and nurturance of sibling with the education level of the parents. However, nurturance and dominance by sibling is observed to differ significantly. The normal sibling relationships are complementary (hierarchical) and reciprocal (egalitarian). However, in case of dyad of mentally normal and mentally challenged siblings this picture may differ. The mentally normal siblings may dominate over their mentally challenged sibling to guide, advice, support or direct them in activities that require their

direction and assistance. The educated parents directly or indirectly through their actions transmit values that help the mentally normal children develop respect for differences in abilities, intellect of their mentally challenged siblings. Children of better educated parents are considerate and value others' opinions. Whereas, less educated or uneducated parents more often have prejudices and stereotypical attitude towards the mentally challenged child and are more likely to transmit the same in their behavior.

Conflict is inclusive of quarreling, antagonism and competition among individuals. Conflict is discord manifested as incompatibility or disagreement arising among individuals in case of contrasting values or beliefs. According to a study by Stoneman *et al.* (1988) increased childcare responsibilities were linked to sibling conflict, and opportunities for peer contacts and out - of-home activities were reduced. It is completely normal for siblings to oscillate between two extremes of loving and squabbling with each other which is healthy indicator that neither of the children is problematically submissive. However, the sibling relationship of mentally challenged and their mentally normal sibling is a bit complicated with differing evolving needs, intellect, identities, roles and responsibilities. The way parents handle sibling quarrel and rivalry is an important determinant of positivity or negativity in sibling relationship. Parents serve as role models for children and their ways of coping with conflicts presents an important example for them. If the parents react aggressively in such situations then the children also tend to become less cooperative. Educated parents intervene and attempt to resolve sibling issues in a more positive and impartial manner that assures the children that they are equally important to the parents. This intervention is more effective when parents talk, discuss, explain and reason with the mentally normal child. Banderix and Sivberg (2007) also found that in traditional families, especially with low level of education, mothers are bringing up children with higher and frequent incidences of conflict and rivalry between mentally retarded child and other children of the family. Quarreling occurs in situations of arguments due to differences in opinions between individuals. Mostly the quarrel is about possession over resources. Educated parents consistently enforce rules encouraging equality and emphasizing fairness which helps siblings develop respect for one's rights and the children eventually learn to work out their disagreements. Competition in general, is seen as an activity to establish supremacy over another for recognition and status in any context. Normally, siblings compete with one another to meet parental expectations. The parents too indirectly reinforce differences in the children by acknowledging one's expertise in an area inciting feeling of qualitative analysis in other child who strives to prove himself better through competition.

Rivalry among siblings in present context is inclusive of components of paternal and maternal partiality. Parental partiality is defined by actions by which parents prioritize needs, affection, resources, of one child over another. Educated parents are able to reason positively with mentally normal child for differential treatment and inclination towards the child with special needs. Educated parents may also plan some common activities for their mentally challenged and mentally normal children so as to spend more quality time together thereby bringing them closer, encouraging cooperation and making them more sensitive of each other' needs. Less educated or uneducated parents may lack in balancing care and affection between their mentally challenged and mentally normal children and most often fail to realize the importance of quality sibling relationship. Davis-kean (2005) and Dearing *et al.* (2005) too reported that parental education level is an important predictor of children's educational and behavioral outcomes. Less educated or uneducated parents might also feel embarrassed about their educational level and perceive lack of welcome and acceptance in the society which may act as a powerful predictor of their coping strategies and adaptation with mentally challenged child. According to a study by Chourasiya (2018) lower socio-economic group family suffers more in handling the mentally disabled children. Result of study conducted by Mohan (2013) revealed that significant differences were found between parental occupations *i.e.* government, private, self employed and unemployed on mild stress, moderate stress, severe stress in coping and adjusting in the family. According to a study by Gupta and Kaur (2010) parents of children with ID reported experiencing greater stress than parents of children without disabilities.

CONCLUSION

Parent' education significantly influenced sibling relationship between their mentally challenged children and normal children. Higher the education of parents, significantly better was the sibling relationship between their children. More educated parents meant higher warmth/closeness, nurturance and dominance by sibling, and lower conflict and rivalry between their mentally challenged and mentally normal children. Better educated parents have access to

resources and awareness of effective strategies to deal with the challenges of the mentally challenged child and thereby reducing the overall stress on familial relationships involving all the subsystems. Education gives the vision to parents that mental challenge of the child is not a stigma or burden and thus having realistic expectations from both their normal and challenged children. The attitude of parents towards this situation influences the sibling relationship between the mentally challenged and the normal child directly.

ACKNOWLEDGEMENT

This research paper is a part of university minor project on "An Analytical Study of Family Functioning in Families with Mentally Challenged Children". The financial support rendered by G.B. Pant University of Agriculture and Technology, Uttarakhand and data collection by Ms. Ashneet Kaur is duly acknowledged.

REFERENCES

Ahuja, A.; R. Singh; H. Parveen; N. Agarwal and S. Thakur. 2018. Adolescents' life skills training for effective transformation into ideal youth. *Journal of Community Mobilization and Sustainable Development,* 13(3): 567-572.

Awadalla, H.L.; E.G. Kamel; A.A. Mahfouz; Mohamed and A.M. El-Sherdeeny. 2008. Determinants of maternal adaptation to mentally disabled children in El Minia, Egypt. *Eastern Mediterranean Health Journal,* 16(7): 759-764.

Azar, M. and L.K. Badr. 2010. Predictors of coping in parents of children with an intellectual disability: Comparison between Lebanese mothers and fathers. *Journal of Paediatric Nursing,* 25: 46- 56.

Banderix, Y. and B. Sivberg. 2007. Siblings experiences of having a brother or sister with autism and mental retardation: A case study of 14 siblings from five families. *Journal of Paediatric Nursing,* 22: 410-418.

Chourasiya, K.S.; A. Baghel; S. Kale and A. Verma. 2018. A cross-sectional study on stress perceived by families of mentally retarded children enrolled in special schools of a city of central India. *International Journal of Community Medicine and Public Health,* pp 3618-3623.

Davis-Kean, P.E. 2005. The influence of parent education and family income on child achievement: The indirect role of parental expectations and the home environment. *Journal of Family Psychology,* 19: 294–304.

Dearing, E.; K. McCartney and B.A. Taylor. 2001. Change in family income matters more for children with less. *Child Development*, 72: 1779–1793.

Derouin, D. and P.O. Jessee. 1996. Impact of a chronic illness in childhood: Sibling's perceptions. *Issues in Comprehensive Paediatric Nursing*, 19: 135-147.

Dunn, J. 1983. Sibling relationships in early childhood. *Child Development*, 54: 787–811.

Fox, T.L., P.M. Barrett and A.L. Shortt. 2002. Sibling relationships of anxious children: A preliminary investigation. *Journal of Clinical Child and Adolescent Psychology*, 31: 375-383.

Gupta, R.K. and H. Kaur. 2010. Stress among parents of children with intellectual disability. *Asia Pacific Disability Rehabilitation Journal,* 21(2): 118-126.

Hornby, G. 1994. Counselling in child disability: Skills for working with parents. London: Chapman & Hall.

Joseph, V.; S. Thomas; R. Reddy and K. Sagar. 2014. Psychosocial issues of siblings of children with autism spectrum disorder. *Int. J. Adv. Res.,* 3(4): 119-124.

Kumar, V.G. 2008. Psychological stress and coping strategies of the parents of mentally challenged children. *Journal of the Indian Academy of Applied Psychology,* 34: 227-231.

Lewinstein, E.; A. Nadler and G. Rahav. 1991. Acceptance of mental retardation and help-seeking by mothers and fathers of children with mental retardation. *Mental Retardation,* pp 25-29.

Mohan, T. 2013. Stress, emotional maturity and personality of parents of disabled children. M.A. Thesis, Andhra University, Visakhapatnam.

Murray, J.S. 2000. Attachment theory and adjustment difficulties in siblings of children with cancer. *Issues in Mental Health Nursing,* 2: 149-169.

Pant, K. and R. Singh. 2017. Educational status of parents as a predictor of social and emotional maturity of adolescents. *International Journal of Environment, Ecology, Family and Urban Studies,* 7: 53-64.

Pelchat, D. and H. Lefebvre. 2004. A holistic intervention program for families with a child with a disability. *Journal of Advanced Nursing,* 48: 124-131.

Pourbagheri, N.; N. Mirzakhani and A. Akbarzadehbaghban. 2018. A comparison of emotional-behavioral problems of siblings at the age range of 3-9 year old children with autism and down syndrome. *Iran J. Child Neurol.*, 12: 73–82.

Seligman, M. 1988. Psychotherapy with siblings of disabled children. In: Kahn M and Lewis K. (Eds.), *Siblings in therapy*, pp 167–189.

Shali, A.A. and M. Patil. 2017. Influence of familial factors on sibling relationship of normal children with mentally challenged children. *International Journal of Home Science,* 3: 247-250.

Singh, R.; H. Parveen; N. Agarwal and S. Thakur. 2018. Vocational education of academically backward rural adolescents: A step towards furtherance. *Journal of Community Mobilization and Sustainable Development,* 13(1): 142-146.

Sobolewski, J.M. and P.R. Amato. 2005. Economic hardship in the family of origin and children's psychological well-being in adulthood. *J. Marriage Fam.,* 67: 141-56.

Sola, C. and H.Y. Dikmen. 2008. The identification of needs of the mothers under the risk of having premature and reducing the infant. *J. Special Edu.,* 9(2): 21-36.

Stoneman, Z.; G.H. Brody; C.H. Davis and J.M. Crapps. 1988. Childcare responsibilities, peer relations, and sibling conflict: Older siblings of mentally retarded children. *American Journal on Mental Retardation, 93*(2): 174-183.

Strohm, K. 2002. Siblings: Brothers and sisters of children with special needs. Kent Town: Wakefield Press.

Unal, N. and G. Baran. 2011. Behaviors and attitudes of normally developing children toward their intellectually disabled siblings. *Psychological Reports,* 108: 553-562.

Upreti, R. and R. Singh. 2017. Influence of social class on type and level of coping stress among parents of mentally challenged children. *Asian Journal of Home Science,* 12: 235-242.

Veisson, M. 1999. Depression symptoms and emotional states in parents of disabled and non-disabled children. *Social Behavior and Personality: An international journal*, 27: 87-98.

Wicks-Nelson, R. and A.C. Israel. 1997. Behaviour disorders of childhood .3rd edition. New Jersey: Prentice Hall.

Received on May, 2019, Revised on July 2019

Journal of Community Mobilization and Sustainable Development Vol. 14(2), 313-317, May-August, 2019

Impact of Kisan Mobile Advisory Services (KMAS): A study in Barwani District of Madhya Pradesh

Lalita Nargawe[1]* and Yagya Dev Mishra[2]

[1]Ph.D. Scholar, Department of Agricultural Extension and Communication RVSKVV-College of Agriculture, Gwalior, Madhya Pradesh

[2]Scientist (Ag. Extension), Directorate of Extension Services, RVSKVV, Gwalior, Madhya Pradesh

ABSTRACT

The Kisan Mobile Advisory Service KMAS has been playing a vital role in spreading desired information among farming community since more than a decade. The KMAS has potential to deal with lack of effectiveness in information delivery system for farmers. Hence, to make such a prospective service more responsive, it is necessary to assess its impact on actual clientele i.e. the farmers. Considering the above perspective, the present study was conducted in Barwani district of Madhya Pradesh. A sample of 140 beneficiaries of KMAS programme of KVK, Barwani served as respondents of the study. The data were collected through personal interviews of respondents with the help of a structured interview schedule. Findings of the study indicate that among the parameters chosen for impact assessment of KMAS, the beneficiaries gave first preference to applicability of message followed by subject matter of SMS, received message when needed, understandability of message, horizontal spread and cost effectiveness of messages provided under KMAS programme. As far as overall impact of the KMAS programme is concerned, more than half of the respondents considered medium level impact of KMAS followed by high and low level impact.

Keywords: Information communication technology, Kisan mobile advisory service, Impact assessment

INTRODUCTION

Communication of appropriate information always matter in agriculture, which accounted for 13.9 per cent of the National GDP in 2013-14 and management of 54.6 per cent of the total workforce of the country. Information Communication Technologies (ICTs) has been widely established in India as important source of information and a promising tool for socio-economic development during past few decades. Information Technologies (IT) has been described as the acquisition, processing, storage and dissemination of vocal, pictorial, textual and numeric information by a micro-electronics based to a combination of computers and telecommunication. In the past few years, the usefulness of Information Communication Technologies (ICT_S) especially, internet and cell phone has been felt in agriculture sector also to bridge the gap between scientific recommendations and its application by the farmers.

Information communication technology can be used to strengthen communities and farmers' organizations for their own capacities and better representation of their own part when negotiating input and output prices, land claims, resource rights and infrastructure projects. ICTs help in providing up-to-date information on various aspects of farming like information on latest technologies, weather updates, inputs and product prices, consumer trends and many more which ultimately improve farmers' socio-economic status. Despite rapid spread and enormous potential of ICTs application in agriculture sector, it is being access on a limited scale due to various issues like weaker IT infrastructure in rural areas, sustainability, and affordability, ease of use, accessibility, scalability and availability of relevant and localized content in appropriate language.

The introduction of cell phone or mobile phone is a major turning point in the communication revolution in all spheres of life. The level of acceptance for the communication through mobile was highest after the direct contact method. Hence, the mobile based communication text as well as voice SMS to be selected to reach vast number of farmers to deliver the information timely (Shamna *et al.,* 2019). Kisan Mobile Advisory Service (KMAS) is one such initiative of ICTs which provides

*Corresponding author email id: nargawelalita01@gmail.com

location-specific and crop specific farm advisory services and facilities to the farming community in a particular area. KMAS has been considered as a communication service by which messages are being provided in the form of SMS through KVKs. Main features of the service is to help farmers by providing timely information through SMS (twice in a week) based on urgent local needs covering all important components of farming like crop production, horticulture, plant protection and animal science etc. Although the farm advisories through mobile phone may not be the only agent for improving farm production, productivity and rural economy, yet the quality of information, timeliness of information and trustworthyness of information help the farmers to a considerable extent in their day to day job for which they were found struggling with the non experts or input dealers and most of the times and most of the time ended up in disaster and loss (Khan *et al.,* 2018).

In Madhya Pradesh, KMAS was initiated in 2007 by JNKVV- KVK, Chhindwara and later on started by different Krishi Vigyan Kendras (KVKs). Presently, the KMAS is among the largest ICT initiatives in Madhya Pradesh for providing need based and regular farm advisory services to the farmers in shortest time. It delivers real-time need based agricultural information and customized knowledge to improve farmers' decision making ability so that they are able to increase their production and productivity, better aligning the farm output to market demands; securing better quality and improved price recovery. The KMAS was started in Barwani district during 2009 by Krishi Vigyan Kendra under its ICT based initiatives for transfer of technology. Barwani district is facing a problem of inefficient rural information delivery system and shortfall of field extension staff. The KMAS has been playing a vital role in spreading desired information among farming community in shortest period of time. Thus, considering important role of ICT in general and KMAS in particular to tackle the issue of ineffective information delivery system for farmers, a systematic impact assessment study of KMAS was planned in Barwani.

RESEARCH METHODOLOGY

Locale of the Study: District Barwani: The present study was conducted in Barwani district which is one of the tribal dominated districts of Madhya Pradesh. The district consists of seven blocks; hence the sample of the study was drawn from all seven blocks viz; Barwani, Thikri, Pansemal, Newali, Rajpur, Pati and Sendhwa.

The KVK Barwani has been implementing KMAS programme in the district since last eight years. An inclusive block wise list of registered 5350 KMAS beneficiaries was collected from KVK, Barwani to draw the sample. The number of respondents from each block of the district was decided from list of KMAS beneficiaries following proportionate random sampling method with the formula given below.

$$n_h = \frac{N_h}{N} \times n$$

Where, n_h = sample size for stratum h

N_h = population size for stratum h

N = total population size

n = total sample size

Systematic random sampling method was adopted to draw the sample from the block wise list of beneficiaries of KMAS. Thus, a sample of 140 beneficiaries of KMAS programme of KVK, Barwani served as respondents of the study.

Impact of Kisan Mobile Advisory Service (KMAS): The impact of KMAS was assessed as per the responses of the selected beneficiaries on various parameters related to agricultural technology, communication effectiveness and social development. A set of parameters/components were developed with the help of scientists working at various levels and ICT experts to quantify the impact of KMAS. The broad parameters decided to assess the impact of KMAS are;

- Need of message
- Understandability of message
- Subject matter covered
- Applicability of message
- Cost effectiveness
- Horizontal spread of message by beneficiaries

The responses of respondents were collected on three and five - point continuum as per questions framed above parameters. The parameter/components wise and cumulative scores were obtained to determine the overall impact of KMAS. To ascertain the overall impact of KMAS, the respondents were categorized in to three categories viz; low, medium and high on the basis of mean and standard deviation of total score (cumulative) given in all parameters of impact.

RESULTS AND DISCUSSION

The impact of KMAS in district Barwani was assessed on various technological and procedural parameters/ components as perceived by the beneficiaries. The findings are presented as follows.

Components/Parameters of Impact Assessment

Need of message: KMAS provided a vide bouquet of agricultural information ranging from their land preparation to harvesting and storage and also about allied enterprises. But providing need based messages is very important to get adequate response. The data presented in Table 1 indicate that 54.28 per cent respondents agreed that sometimes they receive messages before operation while about one fourth of them (25.72%) mentioned that they always get information ahead of need. About two third of the respondents (63.57%) mentioned that sometimes they get messages at actual need while 22.86 per cent said that they always get information at the actual time of operation. About one third of the respondents (32.86%) mentioned that they always get messages after the need whereas 44.28 per cent respondents mentioned that sometimes they get information when the operation is over.

Understandability of message: Understandability of message is very important before actual adoption in the field. The date given in Table 2 indicate that thirty per cent of respondents considered presentation of subject is always simple followed by those 26.43 per cent who had agreed that the language chosen is always simple. Only 12.86 per cent considered the regular use of scientific units/ vocabulary in the messages. Majority of the respondents (58.57%) stated that sometimes they use simple understandable language while only 15 per cent respondents mentioned that they never use simple language. It is notable that about four out of ten (39.28%) respondents said that they never use scientific units/ vocabulary in the messages.

Subject matter covered: As far as coverage of various subject areas in KMAS is concerned, the messages regarding crop production had first choice both in terms of number and frequency followed by soil conservation, *w*eather forecasting, marketing of farm produces and weed management (Table 3). Other major areas covered in KMA messages are; use of manure & fertilizer, improved variety, vegetable production, adverse weather conditions and allied areas like animal husbandry, fisheries and poultry farming.

Applicability of message: When asked about actual applicability of the message in the field, the responses were very interesting. The data presented in Table 4 reveal that the applicability of messages on fisheries was highest followed by field crops, market price, weather forecasting, vegetables and fruit orchards as respondents actually applied the information in their fields given through SMSs either regularly or occasionally.

Cost effectiveness of message: The data given in Table 5 indicate that maximum number of the respondents i.e. 45 per cent expressed medium level of cost effectiveness of messages followed by 41.42 per cent who considered it as low cost service. Only 13.58 per cent of the respondent considered KMA as high cost which indicates the wide availability of mobile in rural areas and reduced tariff of mobile service providers.

Table 1: Distribution of the respondents according to Need of message

Particulars	Category (n=140)		
	Always	Sometimes	Never
Ahead of need (Before operation)	36 (25.72)	76 (54.28)	28 (20.00)
At actual need (At operation time)	32 (22.86)	89 (63.57)	19 (13.57)
After the need (Post operation)	46 (32.86)	62 (44.28)	32 (22.86)

Table 2: Distribution of the respondents according to Understandability of message

Particulars	Understandability of Message (n=140)		
	Always	Sometimes	Never
Simple presentation of subject	41 (29.29)	62 (44.28)	37 (26.43)
Selection of simple language	37 (26.43)	82 (58.57)	21 (15.00)
Use of scientific units/ vocabulary	18 (12.86)	67 (47.86)	55 (39.28)

Table 3: Distribution of Message according to subject matter

Subject matter areas	Frequency of SMS (n=140)			
	Weekly	Fortnightly	Monthly	Bimonthly
Crop production	5 (03.57)	29 (20.71)	22 (15.71)	2 (01.42)
Soil conservation	-	9 (06.42)	32 (22.85)	6 (04.28)
Weather forecasting	-	8 (05.71)	30 (21.42)	5 (03.57)
Marketing of farm produce	1 (00.71)	13 (09.28)	21 (15.00)	8 (05.71)
Weed management	1 (00.71)	6 (04.28)	20 (14.28)	1 (00.71)
Manure & fertilizer use	1 (00.71)	3 (02.14)	20 (14.28)	-
Improved varieties	-	9 (06.42)	10 (07.14)	4 (02.85)
Vegetable production	-	16 (11.42)	6 (04.28)	-
Weather aberrations	2 (01.42)	2 (01.42)	6 (04.28)	3 (02.14)
Fisheries	-	2 (01.42)	2 (01.42)	4 (02.85)
Animal husbandry	-	1 (00.71)	3 (02.14)	1 (00.71)
Poultry farming	-	-	4 (02.85)	1 (00.71)

Table 4: Distribution of the respondents according to Applicability of message

Particulars	Applicability of Message (n=140)		
	Always	Sometimes	Never
Field crops	52 (37.15)	62 (44.28)	26 (18.57)
Vegetables	42 (30.00)	67 (47.85)	31 (22.15)
Fruit orchards	47 (33.57)	64 (45.71)	29 (20.72)
Poultry production	38 (27.15)	70 (50.00)	32 (22.85)
Fisheries	55 (39.28)	61 (43.57)	24 (17.15)
Market price	49 (35.00)	63 (45.00)	28 (20.00)
Weather forecasting	46 (32.85)	65 (46.43)	29 (20.72)
Adverse weather conditions	40 (28.57)	70 (50.00)	30 (21.43)

Table 5: Distribution of the respondents according to cost effectiveness of message

Category	No. of respondents	Percentage
Low	58	41.42
Medium	63	45.00
High	19	13.58
Total	**140**	**100**

Horizontal spread of message: The actual impact of KMAS can be generated only by horizontal spread of message in and around the jurisdiction. The data presented in Table 6 indicate that 30.72 per cent of the respondents always go for oral publicity of information received in KMAS followed by 17.85 per cent who always forward the message to others while only 15 per cent of them go for public display of message. A range of four to five out of ten respondents adopted one or other listed means/ techniques for horizontal spread of information received through KMAS.

Table 6: Distribution of the respondents according to Horizontal spread of message

Particulars	Horizontal spread (n=140)		
	Always	Sometimes	Never
Message forward	25 (17.85)	61 (43.57)	54 (38.57)
Display on public places	21 (15.00)	72 (51.43)	47 (33.57)
Oral publicity/Extension	43 (30.72)	64 (45.71)	33 (23.57)

Respondents' preference on different Parameters/ Components of KMAS

The preference of the respondents on various parameters on which the impact of KMAS was assessed have been given in Table 7. It is evident from the data generated through weighted mean score that among various parameters of impact, Applicability of message was given first preference with highest mean score (16.91) followed by Subject matter of message (7.21), Need based message (6.22), Understanding of message (5.82), Horizontal spread of message (5.67) and Cost effectiveness of message (2.27).

The results clearly indicate that beneficiaries are sensitized enough on information seeking part as they have given preferences to the applicability, subject matter and need based information delivered through KMAS. The findings of the study are in trend with the other fellow

Table 7: Preference of different Parameters/ aspects of KMAS by the respondents (n=140)

Parameters/Components	Weighted Mean Score	Rank
Need based message	6.22	III
Understanding of message	5.82	IV
Subject matter of message	7.21	II
Applicability of message	16.91	I
Cost effectiveness of message	2.27	VI
Horizontal spread of message	5.67	V

scientists like Saxena *et al.* (2011), Singh *et al.* (2011), Yadav *et al.* (2011), Parganiha *et al.* (2012), Dhakar *et al.* (2013), Singh *et al.* (2013), Kumar *et al.* (2014) and Patel *et al.* (2015) who worked on similar aspects/ parameters of mobile based extension approach.

Overall Impact of KMAS

Overall impact was assessed on the basis of cumulative scores of the respondents on all parameters considered for impact assessment. It is evident from Table 8 that majority of the respondents i.e. 54.28 per cent pointed out medium level impact of Kisan Mobile Advisory Services. It is very fascinating to learn from the data that an equal number of respondents (22.86%) considered high and low impact of Kisan Mobile Advisory Services.

Table 8: Distribution of the respondents as per overall impact of Kisan Mobile Advisory Services (KMAS) (n=140)

Category	No. of respondents	Percentage
Low (up to 47)	32	22.86
Medium (48 to 55)	76	54.28
High (Above 55)	32	22.86
Total	**140**	**100**

CONCLUSION

Among the parameters chosen for impact assessment of KMAS, the beneficiaries gave first preference to applicability of message followed by subject matter, received message when needed, understandability of message, horizontal spread and cost effectiveness of messages provided under KMAS programme. As far as overall impact of the KMAS programme is concerned, more than half of the respondents considered medium level impact of KMAS followed by high and low level impact. The findings of the study indicate that applicability, needfulness, and understandability of information received through KMAS have been endorsed by entire extension system. The mobile based transfer of technology is a new sphere in technology delivery system and mobile appeared to be a game changing device. The farmers need to be made aware about the importance of this approach and scientists engaged in KMAS need more focus and a regular watch on entire process.

REFERENCES

Dhakar, K.S.; S. Singh; R.A. Sat wane; H.K. Niranjan and A. Patel. 2013. Utility perception of farmers in relation to modern mass media under information communication technology in Rewa District (M.P.). *Environment and Ecology*, 31(2C): 1022-1025.

Khan, G.; A.K. Dixit; A. Saxena and D.S. Tomar. 2018. Adoption and Impact of Kisan Mobile Advisory: An ICT tool on Agriculture Progress in Malwa Region of Madhya Pradesh. *J. Community Mobilization and Sust. Develop.,* 13(1): 7-12.

Kumar, S.; S.R.K. Singh and R.C. Sharma. 2014. Impact of Kisan Mobile Advisory Service on Transfer of Agricultural Technologies. *International Journal of extension Education,* 10: 70-72.

Parganiha, O.; K.S. Shrivastava; K.A. Chaubey and L.J. Nag. 2012. Impact of Kisan Mobile Advisory (KMA) on Agricultural Technology Dissemination. *Indian Research journal of Extension Education*, 2 (Special Issue): 175-178.

Patel, M.R.; M.V. Patel and R.A. Patel. 2015. Assessment of Kisan Mobile Advisory (KMA) Service for Dissemination of Agriculture Information in Mehsana District: Gujarat, *International Journal on Recent and Innovation Trends in Computing and Communication*, 7(3): 4599-4602.

Saxena, A.; D.S. Tomar and A.K. Dixit. 2011. Cyber extension– An effective linkage between Scientist and farmers. *Rajasthan J. Extension Education*, 19: 25-29.

Shamna, A.; A.K. Chakraborty; S. Kumar and S.K. Jha. 2019. Rural Farmers and ICT Based Extension-Farmers Response and Preferences to ICT Based Extension. *J. Community Mobilization and Sustainable Development,* 14(1): 15-19.

Singh, G.; H. Dixit and R. Pathak. 2013. Kisan Mobile Sandesh reaches to unreached. *Technofame- A Journal of Multidisciplinary Advance Research*, 2: 54-60.

Singh, K.R.; K.S. Tyagi; C.R. Jainand and K.Y. Jain. 2011. ICT-based Kisan Mobile Sandesh: An innovative approach. 6th National Extension Education Congress, Dec.17-19, 2011 at ICAR Res. Complex for Goa, Old Goa: 232.

Yadav, S.B.; M.I. Khan and M. Kumar. 2011. Utilization pattern of different sources and channels of agriculture information used by the Fenugreek Growers. *Indian Research Journal of Extension Education,* 11(1): 44-49.

Received on May, 2019, Revised on July 2019

Journal of Community Mobilization and Sustainable Development Vol. 14(2), 318-324, May-August, 2019

Dynamics of Grazing Land Resource Availability and Utilization in Central Region of Uttar Pradesh

Rakesh Kumar Singh[1]*, A.K. Sharma[2], Y.P. Singh[3] and V.K Singh[4]
[1]SMS (Animal Science), KVK, Lucknow, Uttar Pradesh
[2]Principal Scientist (Agriculture Economics), [4]Principal Scientist (Agronomy), Indian Institute of Sugarcane Research, Lucknow, U.P.
[3]SMS (Agriculture Extension), ICAR-KVK (IARI), Shikohpur, Gurugram

ABSTRACT

Based on primary and secondary data pertaining to the availability, utilization and conservation of grazing land resources at a village level in Indo-Gangetic plains of India, the paper highlights that there has been a significant decline in the grazing land resources over the last 15 years. Only 53.1 per cent of grazing lands and forest land resources are actually available for grazing purposes. Out of available grazing land resource, the main source of grazing is forest land (72.46%) followed by cultivable waste lands (16.56%). The scenario at the district level is also the same, as the area of grazing lands has decreased from 71 thousand ha in 1991-92 to 48.2 thousands ha during last 25 years. The intensity of grazing is 16 animals per ha. The village is acutely deficit in green fodder availability against its requirement, and the farmers resort to grazing of animals (except costly milch animals) to optimize the nutritional constraints. The worst sufferers are the livestock owners having very less or no availability of cultivated land. Neglect, poor maintenance and overgrazing have resulted in most of the grazing resources declining to a poor and degraded condition. Farmers lack guidance, extension service and the requisite sensitization to efficiently manage these resources. The role of village-panchayat institution in efficient management of grazing land resources is almost negligible. Much detailed work at ground level for green fodder production, grazing land maintenance and conservation is desired with the active involvement of multi-stakeholders and under the ambit of a national policy in this regard.

Keywords: Land-use, Grazing land resources, Livestock production, Fodder demand, Grazing practices, Grazing land maintenance and conservation

INTRODUCTION

With a livestock population of around 623 M, India has world's 56.7 per cent buffaloes and 12.5 per cent cattle, and the Indian livestock sector is one of the largest sector in the world (Islam *et al.,* 2016). It is an important segment of the Indian economy, and in itself expanding and undergoing structural change in general and in the fertile Indo-Gangetic Plains (IGP), in particular. In IGP, the contribution of bovine has been quite significant, as it accounts for 36 per cent of the bovine in the country, higher ratio of cattle to buffalo, and the concentration of improved breeds of buffalo (Singh *et al.,* 2005). Since, the size of landholdings across IGP region is declining, the livestock sector holds greater promise in enhancing farm income from milk production, ensuring manurial nutrient availability in sustaining agriculture by maintaining soil health as well as providing draught animal power for the smallholders. As elsewhere in India, it is also true to IGP also that the whole system of rural economy has revolved around livestock production. One of the notable characteristics of livestock production in India is that almost its entire feed requirement is met from crop residues and byproducts; grasses, weeds and tree leaves gathered from cultivated and uncultivated lands and grazing on common lands and harvested fields. Grazing in common forest and pastures in India was estimated to account for 31 per cent of livestock feed consumption (World Bank, 1999). Also about 20 per cent of the households depend on common grazing resources for livestock grazing (Osman *et. al.,* 2001.) Landless farmers graze their animals on, as well as collect fodder, from the common property grazing resources (CPRs). About 84-100 per cent poor households gather food, fuel, fodder and fiber items from these CPRs. As per GOI (2011), the livestock population of India, over the years, has exhibited two prominent features, namely:

*Corresponding author email id: rksaskvkiisr@yahoo.in

(i) the number of stall-fed bovines, owned mainly by people with arable land and resources to grow or procure green fodder, and (ii) the number of small ruminants like goats and sheep, surviving mainly by free grazing the available pasture lands and tree foliage, has increased. Despite the fact that a lot of significant work (including development of technologies) has been done for improving productivities of grazing lands, these grazing resources are in a very dilapidated condition, and the feed resources are quite less compared to the demand. Birthal and Jha (2005) have found feed scarcity as the main limiting factor in improving livestock productivity. The actual milk yield of bovines, at around 26-51 per cent below the attainable yield under field conditions (Birthal and Jha, 2005), could have been realized with better feeding *inter alia*. The present paper is an attempt to analyse the bovine feeding practices including grazing at district as well as at a village level setting in one sub-region of IGP, the central region of Uttar Pradesh. The paper attempts to examine the traditional practices and the adjustment being carried out over time in animal feeding and in the use of grazing land resources available at the village level in Lucknow district of UP. The paper also explores the possibility of strengthening the dairy or the livestock sector at the basic unit of planning and development

MATERIALS AND METHODS

The paper is based on information gathered from primary and secondary sources on the nature and extent of grazing lands in Lucknow district. Lucknow district located in the central region and combining features of both west and east UP, was purposively selected for the study. Three stage random sampling technique was followed with community development block as stage-I unit, village panchayat as stage-II unit and the livestock owners as the stage-III sampling units. The primary information pertaining to the grazing land resources conservation and its utilization was compiled from 40 livestock owners as well as from the panchayat officials in Ismailnagar village panchayat under Gosaiganj community development block office in 2016. The information on the nature of grazing lands available, the role of farmers in the use of grazing lands, constraints associated in grazing, the degradation pattern associated with grazing lands and the conservation efforts made were obtained from selected livestock owners. Group discussion at the village panchayat level was also carried out to capture the collective wisdom in the village panchayat in grazing land resource management and conservation. Secondary data was compiled from the Statistical Dairy of Lucknow District and Livestock Census for different years. Reports of feed and fodder scenario were also browsed to understand the implications of concerns raised at ground level. Simpler tabular techniques and percentages were used to present the results.

RESULT AND DISCUSSIONS

District Land use dynamics and grazing lands: In this section, the land-use dynamics with respect to grazing land resources in Lucknow district of central region of Uttar Pradesh have been analyzed. From broader perspective, except for the cultivated land during cropping season, each and every class of land where there is some vegetation, is

Table 1: Nature and Extent of Grazing Lands in Lucknow District of Uttar Pradesh

Year	Ag. Waste Land	Current fallow	Other fallow	*Usar* ag. Unsuitable land	Groves & trees	Grass lands	Total grazing lands (GL) (ha)	Forests (F)	GL&F (ha)
1991-92	16.04	37.26	19.68	14.51	7.69	4.8	70879	11408	82287
2001-02	12.17	42.08	22.29	13.63	4.93	4.9	63836	20967	84803
2011-12	11.26	33.22	31.44	13.87	3.69	6.2	48845	12000	60845
2014-15	10.20	28.10	37.57	13.59	4.16	6.38	48200	12000	60200
Change in 2001-02 over 1991-92	-32.0	1.2	1.5	-15.8	-42.5	-9.0	-10.4	83.79	2.7
Change in 2011-12 over 2001-02	-28.9	-39.3	8.4	-21.8	-38.2	-1.7	-23.1	-42.77	-28.0
Change in 2014-15 over 2001-02	-36.44	-49.35	27.86	-26.93	-36.02	-0.87	-24.49	-42.77	-29.01

Abbr: GL- Grazing Land, TRA- Total Reported Area, NSA- Net Sown Area, BB-Breedable Bovines, F-Forest Land
Source: Govt of UP, 2014., Govt of UP, 2013

used for grazing at one time or another in a village level setting. After harvesting of crops, farmers fields become another grazing resources, as they tend to be available to livestock belonging to all members of community, not just the land owner. However, there may or may not be the institutional arrangements for the use of these resources. As per land use classification, the total reported area (TRA) in the District is 251.6 thousands ha, out of which 135.4 thousands ha area is the net sown area and just 3 thousand ha area (1.21% of TRA) has been classified under the heading grasslands or pastures. The grazing lands are not well defined and easily identifiable in village level setting. On practical grounds, the grazing lands (GL) at present, include (i) village pastures and grazing land specially mentioned for the purpose in revenue papers, (ii) other waste land commonly utilized for grazing and (iii) degraded forest land illegally or legally allowed for grazing. Considering these resources, the extent of grazing lands in Lucknow district is high at 60 thousands ha (23.92% of TRA). The district is having around 12000 ha of area classified as forest and is also having access to animals for grazing. Excluding forest land, the total grazing lands are around 48.2 thousand ha which constitutes around 19 percent of total reported area of the district. Out of total grazing lands (excluding forests), the category "grassland" represented only 6.2% (or 3051 ha area), while the other categories[1] were current fallows (33.2%), other fallows (31.4%), *usar* and unsuitable land to agriculture (13.8%), agriculture waste land (11.3%) and groves etc. (3.9%). The analysis of data for 25 years (1991-92 to 2014-15) reveals that the extent of grazing lands has decreased over the years from 71 thousand ha in 1991-92 to 48.2 thousands ha during 2014-15. The extent and proportion of other categories of grazing lands except other fallow has also decreased over the years (Table 1).

The ratio of grazing land area to net sown area is 0.36. If forest land is also considered, the ratio is 0.44. It means that for every ha of cultivated land (NSA), the availability of grazing land is 0.36 to 0.44 ha. It seems quite significant. However, it includes agricultural wastes and fallow lands, the ownership of these grazing resources is with numerous people living or not living in the same locality. The access to these lands may not be available to the village community for grazing purposes. The livestock population in the District as per Livestock Census 2013 is 767 thousands animals, and the intensity of grazing is 0.06 ha. per livestock or 16 animals (comprising 6 cattle, 5 buffaloes and 5 other animals) per ha. High density of animals per unit of grazing land highlights less availability of grass and other forage resources. During last 15 years, these type of grazing land resources per unit of NSA, and as percentage of TRA has decreased by more than 20 per cent (Table 2), highlighting increasing pressure on grazing resources and on the availability of feed resources.

Village land use dynamics: The number of households in the selected village were 375 out of which 265 were farmers and 341 were having animal rearing activity. Majority (92%) of farmers were small and marginal farmers while the large farmers were just 8 per cent. Social

Table 2: Grazing lands in relation to livestock population

Year	GL/NSA	GL as % of TRA	GL/Livestock	GL & F/Livestock
2011-12	19.4	0.36	0.06	0.11
Decadal change in nineties	-10.25	-2.02	-	-
Change in last 10 years	-23.04	-20.84	-	-

Source: Govt of UP, 2014., Govt of UP, 2013

[1]In India, forest is defined as all lands classed as forests under any legal enactment dealing with forests or administered as forests, implying those lands which need not have a tree cover. Forested land is defined as land under cultivated or non-cultivated stands of trees irrespective of its ownership rights. Barren and uncultivable land includes all barren and uncultivable land like mountains, deserts etc. In India, about 6 percent of the total geographical area comes under this category and there are hum an settlements in such areas. Permanent pastures and other grazing lands include all grazing lands where they are permanent pastures and meadows or not. Village common grazing land is included under this head. Land under miscellaneous tree crops and groves etc., includes all cultivable land, which is not included in 'Net Area Sown' but is put to some agricultural uses. Lands under Casuarina trees, thatching grasses, bamboo bushes, and other groves for fuel, etc. which are not included under 'Orchards' are classified under this category. Culturable wasteland includes lands available for cultivation. Such lands may be either fallow or covered with shrubs or jungles, which are not put to any use. Land once cultivated but not cultivated for five years in succession should be included in this category at the end of the five years. Fallow lands other than current fallows are defined as all lands, which were taken up for cultivation but are temporarily out of cultivation for a period of not less than one year and not more than five years. Current fallows represent cropped area, which are kept fallow during the current year. For example, if any seeding area is not cropped in the same year again, it may be treated as current fallows.

status wise breakup revealed 44.20 per cent farmers were general category, 32.77 per cent OBC and 23.00% were SC/ST category. About 9.09 per cent were landless households. Analysis of the land-use pattern in the selected village revealed that the net sown area (NSA) in the village was 227 ha. The extent of grazing lands and forest land was 91 ha (29.35% of TRA), out of which 35 ha (38.46% of GLF) was the extent of the forest land in the village. The other available grazing resources were agricultural waste lands followed by current fallows, other fallows, groves and miscellaneous tree land, grasslands and *usar* and agriculturally unsuitable lands. The classified grassland were only to the extent of 3 ha. All these land resources were not available for grazing purposes due to ownership issues, scatter of grazing resources and accessibility problems. The fallow and waste lands were reported to be under the ownership of absentee landlords. Only 23.8 per cent of the GL resources and 53.1 per cent of grazing lands and forest land (GL&F) resources were actually available for grazing purposes (Table 3). Hence, the available grazing land resource was predominantly forest land (72.46%) followed by culturable waste lands (16.56%). The use pattern at the village level also highlights that there has been a significant decline in the grazing land resources over the last 15 years. The common grazing resources classified under the heading "grassland" have been reduced significantly, predominantly due to the distribution of this resource to landless people for house making or for cultivation of crops.

Livestock production and fodder requirement: The livestock population in the village is 677 animals comprising cattle 15.13 per cent, buffaloes 31.37 per cent, and goats 53.51 per cent. Though, the villagers have good breeds of Sahiwal and Jersy, most of the breeds are non-descript. The traditional practices for open or free grazing[2] is still being followed. However, the type of animals that used to be grazed in the village have changed over time. At present, the breedable bovines (51.89%) which are quite costly (more than Rs. 50000 per animal) are not being subjected to free or distant grazing. These animals are now being preferred for stall feeding (Singh *et al.,* 2018). In some cases, these animals have been subjected to controlled grazing in culturable waste lands and nearby fallows. Forest land or the degraded forest land was preferred for grazing dry animals, sheep and goats (Table 4). It highlights that the traditional practices of grazing all types of animals have been reduced in magnitude as risk of loss of high value animal in forest grazing is high on account of theft, animal fight or other factors such as snake bites. The

Table 3: Land-use pattern and extent of grazing lands in a village

Particulars	Ag. Waste Land	Current fallow	Other fallow	UAUL	Groves & trees	Grass-lands	Total grazing lands (GL) (ha)	Forests (F)	GL&F (ha)
Grazing Resources (ha)	26	12	9	1	5	3	56	35	91
Extent of grazing resource use (%)	30.8	4.2	5.6	50.0	20.0	93.3	23.8	100.0	53.1
Percent share of used GLF	16.56	1.04	1.04	1.04	2.07	5.80	27.54	72.46	100.00
Change over last 15 years	DECR	DECR	INCR	SAME	DECR	DECR	DECR	DECR	DECR

Note: Total reported area (TRA) is 310 ha, Net sown area (NSA) is 227 ha and number of livestock were 650 in the village. UAUL refers to Usar & Agriculturally unsuitable land

Table 4: Grazing land use practices at village level

Particulars	Distribution	Animal grazing land-source wise (%)			
Category of animals	(%)	Forest Land	CW	Fallows/ others	Stall feeding
Breedable bovines	51.89	16.67	15.63	0	67.71
Dry and Youngstock	29.19	90.74	9.26	0	0
Sheep and goats	18.92	100.00	0.00	0	0
Total	**100**	**54.05**	**10.81**	**0**	**35.14**

[2]Open grazing is a practice where animals are let loose and directed for grazing towards vast tract of land (forest land etc.) with minimum or no vigil on the animal during their grazing time. The animals come to respective places in the evening. In controlled grazing, the animal is tethered to a point with a long rope and allowed to graze in very limited area, as covered by the length of the rope.

practice of open or free grazing has also been reduced due to the quarrels associated with the grazing practice as the stray animals may enter in fields and graze the crops bringing animosity amongst the farming community. The grazing lands in the village have degraded due to management neglect. These resources have been invaded by unpalatable species like Lantana*, Eupatorium, Parthenium, Prosopis juliflora* and others, severely affecting their productivity. The animal fodder requirement in the village is not met adequately, the worst sufferers are the livestock owners having very less or no availability of cultivated land. As per estimates, the fodder demand in the village is about 2970 metric tonnes (MT) of green fodder and 999 MT of dry fodder (Table 5), whereas, the supply of dry fodder is mainly from crop lands and estimated at 1589 MT. About 1000MT of green fodder is also produced for feeding, mostly to milch animals. The village is thus surplus in dry fodder production but acutely deficit in green fodder production to the extent of 970 MT. To meet this requirement, grazing of animals is resorted to. About 5-15 per cent of the total DM intake in the case of large ruminants is obtained through grazing (Dikshita and Birthal, 2010), and the lowest for in-milk animals. However, the productivity of grazing and forest land is less and the actual supply of green fodder from grazing has been estimated at about 25 per cent of actual requirement. The area allocated for the cultivation of green fodders is also very less. Even at all-India level, land allocation to cultivation of green fodder crops has hardly ever exceeded 5 per cent of the gross cropped area (GoI, 2009). The supply of feed has always remained short of normative requirement (GoI, 1976; Singh and Mujumdar, 1992; Ramachandra *et al*., 2007), restricting realization of the true production potential of livestock. Consequently, the milk yield in the village is less, at 2 kg per day per cow and 4.87 kg per day per buffalo. It is thus clear that the landholders are resorting to green fodder cultivation to meet the requirement and its stall feeding to the animals, however, for the landless people owning livestock or doing livestock based activities for income generation, there is no choice but to resort to grazing. Enhancing dairy activity and improving milk productivity of animals owned by these households is the main issue under the present village level setting. This calls for not only the maintenance and conservation of common grazing land and forest resources but also to make a provision to provide access to the waste and fallow lands available in the villages.

Grazing land maintenance and conservation practices: Neglect, poor maintenance and overgrazing have resulted in most of the grazing resources declining to a poor and degraded condition. The once robust village-level traditional institutions, that ensured the sustainable management of grasslands, have broken down and there is no responsible agency to look after the management issues (Planning Commission of India, 2011). The role of institutions such as village panchayats in efficient management of grazing land resources is minimal. Their role is visible in terms of distribution of land resource (issue of land patta) by Village Pradhan to the poor landless people (Table 6). This practices was preferred as it involved monetary benefits to the village Panchayat officials also. Due to this reason, the grazing lands near to the village have been distributed to the landless people for cultivation

Table 5: Livestock production and fodder demand-supply scenario at village level

Particulars	Livestock nos/ Area in ha	Per day fodder Requirement		Fodder Requirement	
		Green F	Dry F	Green F	Dry F
Fodder Demand in the village (metric tonnes)					
Breedable bovines	351 (51.89)	20kg	2 kg	2562	256
Dry and Youngstock	198 (29.19)	5 kg	10 kg	361	720
Sheep and goats	128 (18.92)	1 kg	0.5 kg	47	23
Total	**677 (100)**	**-**	**-**	**2970**	**999**
Fodder supply in the village (metric tonnes)					
Cultivated land (ha)	227.0	35 qt crop yield with straw		-	1589
Green fodder area	1.0	ratio of 1:1		1000	-
Total				**1000**	**1589**
Deficit/surplus				1970	-590

Note: Figures in parentheses are the percentages.

Table 6: Grazing land management practices at village level

S.No.	Activities carried out by Gram Panchayat in Grazing land Management	Response (%)
1	Distribution of grassland to landless people	90
2	Afforestation / planting of fodder or fuel trees/grasses	0
3	Creation of water conservation structures	0
4	Allowing people to graze animals	100
Perceptions of livestock owners for efficient use of grazing lands		
1	Need for better coordination among all concerned departments	65
2	Involvement of rural youths and linking the activities with employment generation schemes	90
3	Involvement of schools and school-goers for developing a piece of land	55
4	Creation of civil works for water conservation and fencing	95
5	Organization of awareness programmes and availability of technical guidance	75
6	Initiate and establish fodder (green and dry) market facilities in the village	100
7	Making provisions to have access to grazing in waste lands under the ownership of other villagers	52

of crops. The role of the village institutions in terms of carrying out investment for development, afforestation, water conservation, fencing, etc. in the selected village is almost nil, as no investment has been made over the years. The farmers too have no clear cut idea and the requisite sensitization on how to use the grazing land resources more efficiently. The extension approach and capacity in this regard is almost nil. In the selected area, the grazing land resources classified as forests and which provided fodder to animals and fuel-wood to poor village households, this resource though is regenerating with grass and fuel wood on yearly basis, these lands are degrading with every passing year, and require immediate attention and action.

The farmers' perceptions about efficient management of available grazing land resources were also analysed (Table 6). According to them, the existence of the better coordination of the forest and agriculture department under the technical guidance of the experts for carrying out grassland management practices is must. Much detailed work at ground level in terms of planting saplings of fuel and production trees, creating water conservation infrastructure, afforestation campaign, planting of perennial fodder grasses. Adoption of a patch of land by the local school for its development as a model patch with the active involvement of multi-govt. agencies may be a better initiative. Fodder production and conservation strategies (silage making etc.) need to be disseminated to the farmers to control grazing and meet the fodder requirement during periods of low productivity. A network of nurseries and seed banks is also required for the rejuvenation of grasslands. A fodder market is also required to purchase and sell fodder as per need. Whole villages may be adopted for working out sustainable models. There is need to revisit research, educational and extension needs for grazing resource management. The departments of forest, rural development, agriculture and animal husbandry departments, the concerned KVK, village panchayat, and the local schools must coordinate their efforts in this regard. The employment linked schemes such as agri-clinics and agri-business centers (Armorikar *et al.,* 2016) need to be developed for more efficient and sustainable use of grazing land resource. The unemployed youths from the concerned village may be trained and the local institution of the school may be involved in conservation and sustainable development of these resources. There is also a need to make a regulatory provision to make use of waste lands under the ownership of absentee landlords or other villagers at least for grazing or in fodder production. A national policy, involving various stakeholders, needs to be formulated and its protocols be developed for the development of grazing resources.

CONCLUSION

The villages in Indo-gangetic plains of India are acutely deficit in green fodder availability against its requirement, and the farmers resort to grazing to optimize the nutritional constraints. The nature and extent of grazing land at the village level as well as the district level was ascertained. The extent of grazing land has decreased over the years by 24 per cent in the last 15 years to 48 thousands ha. The predominant factor responsible for this is the distribution of grazing land to landless people for house making or

for cultivation of crop by the concerned village panchayat. The available grazing land resource left in the village is, predominantly, the degraded forest land. The traditional practices for grazing has changed in magnitude as breedable bovines (51.89%) are not preferred for grazing in nearby forest land. The role of institutions in efficient management of grazing in this land resources is almost negligible, and the farmers lack guidance, extension service and the requisite sensitization to efficiently manage these resources. For the development of grazing land resources, much detailed work at ground level is desired with the active involvement of multi-stakeholders. A national policy for developing grazing land resources by involving local level schools and also linking it with entrepreneurship development in the society under the technical guidance of experts is needed.

REFERENCES

Armorikar, P.S.; B.S. Hansra; M.J. Gowda Chandre and P.K. Jain. 2016. economic dimensions of enterprises established under agri-clinics and agri-business centres. *Journal of Community Mobilization and Sustainable Development,* 11(1): 39-44.

Birthal, P.S. and A.K. Jha. 2005. Economic losses due to various constraints in dairy production in India. *Indian Journal of Animal Sciences,* 75(12): 1470-1475.

Dikshita, A.K. and P.S. Birthal. 2010. India's livestock feed demand: estimates and projections. *Agricultural Economics Research Review,* 2010: 15-28.

GOI. 1976. Report of the National Commission on Agriculture. Part 3, Demand and Supply. Controller of Publications, New Delhi.

GOI. 2011a. Report on Task Force on Grassland & Forests. Planning Commission, Government of India, New Delhi: 34 pp. GOI, 2011.

GOI. 2011b. Report of the Subgroup III on Fodder and Pasture Management. Planning Commission, Government of India, New Delhi: 22 pp.

GOI. 2014. Nineteenth Livestock Census-21012, All India Report. Ministry of Agriculture, Animal Husbandry and Fisheries, Krishi Bhavan, New Delhi. p.120. http://dahd.nic.in/sites/default/files/Livestock%20%205.pdf

GOUP. 2012. Livestock Census of Uttar Pradesh -2012. Directorate of Animal Husbandry, Government of Uttar Pradesh, Lucknow.

GOUP. 2013. Livestock Census-2012. Department of Animal Husbandry, Lucknow. http:// animalhusb.up.nic.in/anim_livestock_census.htm

GOUP. 2014. District Agricultural Statistics of Lucknow District (in Hindi). online. http://updes.up.nic.in/spatrika/spatrika.htm

Islam, M.M.; A. Shabana; R.J. Modi and K.N. Wadhwani. 2016. Scenario of livestock and poultry in india and their contribution to national economy. *International Journal of Science, Environment and Technology,* 5(3): 956–965.

Osman, M.; P.K. Mishra; D.S. Mishra; K. Ramchandran; H.P. Singh; C.A. Rama Rao and G.R. Korwar. 2011. Common pool resources in semi arid India A review of dynamics, management and livelihood contributions. CRIDA/CWS/AKRSP(I)MSU/NRI/ Common pool resources research project report No.1 NRI Report No. 2647, Natural Resources Institute, Chathum, U.K.

Planning Commission of India. 2011. Report of the Sub Group III on Fodder and Pasture Management constituted under the Working Group on Forestry and Sustainable Natural Resource Management. Planning Commission of India, 21 September 2011. http://goo.gl/lgn5dr

Ramachandra, K.S.; V.K. Taneja; K.T. Sampath; S. Anandan and U.B. Angadi. 2007. Livestock feed resources in different agro-ecosystems of India: Availability, Requirement and their Management. National Institute of Animal Nutrition and Physiology, Bangalore.

Singh, N.P.; R. Kumar and R.P. Singh. 2005. Dynamics of bovine economy in the Indo-Gangetic Plains of India: Issues of Growth, equity and sustainability. *Agril. Econ. Res. Rev.,* 18(1): 51-70.

Singh, P. and A.B. Mujumdar. 1992. Current status of feed and forage management of livestock in India. *Agriculture Situation in India,* 47(5): 375-382.

Singh, R.K.; Y.P. Singh; A.K. Sharma and B. Prakash, 2018. Animal trade practices and opportunities for small dairy units in central region of Uttar Pradesh. *Journal of Community Mobilization and Sustainable Development,* 13(3): 410-418.

World Bank. 2009. Minding the stock: bringing public policy to bear on livestock sector development. Report no. 44010-GLB.Washington, DC.

Received on May, 2019, Revised on July 2019

Journal of Community Mobilization and Sustainable Development Vol. 14(2), 325-328, May-August, 2019

Revolving Stool: A Drudgery Reducing Ergonomic Intervention

Sarita Joshi*, Surender Kumar and Gajendra Pal

Krishi Vigyan Kendra Baghpat Sardar Vallabh Bhai Patel University of Agriculture and Technology Modipuram, Meerut, Uttar Pradesh

ABSTRACT

Dairy farming has always been a traditional component of rural life in India. Sixty percent (60%) of the farm women in western Uttar Pradesh (UP) perform the dairy activity every day. Amongst frequently performed dairy activities, milking animal in squatting posture is one of them. It causes pain in lower back, legs, knees & feet. Present study was conducted in an adopted village Sankrod of District Baghpat with an aim to collect the feedback from the respondents regarding opinion about introduced technology of revolving stool and to find out the acceptability of drudgery reducing tool in the field. Percentage distribution of the respondents to measure their opinion on the improved technology was calculated. It was found that with the use of revolving stool, 80% farm women were able to maintain comfortable posture whereas in 60% cases they synchronized the movement of animal. It is highly acceptable among farm women. It also reduced physical stress by minimizing pain in lower back, legs, knees & feet. An increase in efficiency was found as milking process took 6.5 minutes per animal using revolving stool as compared to 9 minute per animal in squatting posture. Overall revolving stool helped in reducing drudgery and enhancing efficiency.

Keywords: Dairy, Drudgery, Ergonomic intervention

INTRODUCTION

Dairy farming has always been a traditional component of rural life in India. Cattle and buffaloes are commonly reared in every farm household. Conventionally dairy farming activities are considered as an extension of domestic activities and women are responsible for maintenance of these. They are engage in various managerial and other operations but there is no scientific outlook attached in their operation due to continuous use of local methods and less access to information about the technology .Although most of the works related to dairy farming is carried out by the women, their contribution is being ignored. Vikas *et al.* (2013), studied participation of farm women in livestock management and concluded that the frequency of involvement of farm women was found highest in watering, feeding of animal followed by milking and so on.

Tedious, menial, or unpleasant work can be termed as drudgery. Drudgery is generally conceived as physical and mental strain, agony, fatigue, monotony and hardship experienced by human being, while all these result in decline in performance of men and women alike. The plight of women in this regard is alarming as they are constrained by illiteracy, poor health, unemployment, low technical know-how and skills. Lakhotia (1996) revealed that rural women perceived maximum amount of drudgery in collection and disposal of dung, in collection and bringing of fodder, cleaning cattle-shed, taking animals to pasture and milking. Moderate amount of drudgery was perceived in preparing dung cakes and their storage, taking care of sick animals and making butter from milk while preparing feed and bathing/cleaning of animals were the least drudgery-oriented tasks. Kumar and Prajapati (2011) conducted study on quantification of involvement of farm women in animal and dairy based farming system and found that involvement of women belonging to large farmers families in milking and preparation of milk products was maximum where as women from landless farmers families were equally involve in all operations.

Women make a significant contribution in animal husbandry like care of animals, animal milking, selling milk and milk products. Besides this, they also contribute to agriculture. Shilaja (1994) also reported that in animal husbandry, women do all the work related to domestic animals. They were totally involved in animal based tasks like feeding and cleaning animals, chaffing the fodder, making of cow dung cakes, milking of animals and ghee making etc. (Sisodia, 1981; Choudhari, 1983; Pathak and Shailbala, 1985).

*Corresponding author email id: saritajoshi156@yahoo.com

Sixty per cent (60%) of women in western UP perform the dairy activity every day & contribute substantially to family income. The frequently performed dairy activities are feeding animals, collecting dung, cleaning sheds, milking animals & cutting fodder. Every woman performs milking activities every day for 10-15 minutes. Women perform this activity in squatting posture. During interaction with the farm families it was found that during milking, farm women experience pain in lower back, legs, knees & feet. Lower legs become heavy & stiff due to the pooling of blood in the lower extremities. It is considered drudgery prone activity. Therefore in order to reduce the drudgery of farm women while milking an animal the, present study was taken up with the following objectives-

1. To collect the feed back from the respondents regarding opinion about introduced technology of revolving stool
2. To enhance the efficiency of milking activity
3. To find out the acceptability of drudgery reducing tool in the field.

MATERIALS AND METHODS

The study was conducted in the village Sankaroud, adopted village of Krishi Vigyan Kendra, Baghpat with an aim to reduce the drudgery occurred while milking animals and to find out the field acceptability of revolving stool. For the purpose of assessing the need, an informal interview was held. It was felt to introduce the technology of revolving stool in order to reduce the drudgery of farm women while milking an animal, revolving stool may prove to be a boon for farm women. Therefore revolving stool, designed by department of family resource management, college of Home science, Govind Ballabh Pant University of Agriculture and Technology Pantnagar were distributed/introduced to 10 farm women of village Sankaroud, adopted village of Krishi Vigyan Kendra, Baghpat. The revolving stool was based on anthropometric dimensions of rural women. Initially 10 women were provided revolving stool for milking activity, thereafter they were circulated to other 20 women in 2 rounds. Thus total 30 women used the revolving stool for milking the cow. After using the revolving stool for one month, tool/ questionnaire consisting of 18 items pertaining to biomechanical, physical stress, work output, tool factors, field acceptability were administered and feed back in order to measure respondents opinion based on five point scale were collected. So the maximum attainable score a respondent can obtain is 90.

RESULTS AND DISCUSION

Findings of Table 1 reveals that 80 per cent farm women were able to maintain comfortable body posture at sitting positions while using the revolving stool (pheri). According to 78 per cent farm women, twisting of trunk while doing milking was with the use of improved technology. In 60 per cent cases they could synchronize the movement of animal. As far as physical stress is concerned 80 per cent women experienced no pains and cramps in body after performing the activity with revolving stool (pheri). With regard of time, 45 per cent respondent stated that revolving stool (pheri) is effective in improving the production efficiency. In most of the cases analysis based on tool factor depicted that in 60 per cent cases milking activity becomes light enough when revolving stool is used. As far as field acceptability is concerned, 85 per cent respondent were ready to possess the revolving stool.

Table 2 envisaged that in various aspects including biomechanical, stress factor, work output, tool factor and field acceptability maximum attained score were 14(92.20%), 9(90%), 8(80%), 35(87%), 13(86.66%) respectively. Thus showed total attained scores of 79 (87.7%) against maximum attainable score of 90 (100%). therefore it is concluded that stool is highly acceptable by farm women.

The result revealed that there was increase in efficiency as milking process took 6.5 minutes per animal as compare to 9 minute per animal. Thus, it could save 27.77 per cent time in milking one animal. It is also proved that the use of revolving stool while milking the animal significantly reduces the stress of farm women. Respondents stated that this technology of revolving stool also reduces the severity of pain in lower back legs, knees & feet significantly due to the comfortable posture as also reported by Vinay (2005) in the study conducted that physiological workload of women in terms of heart rate, energy expenditure, total cardiac cost of work, physiological cost of work for all the selected dairy activities was found high and above the permissible limits of women.

CONCLUSION

All the respondents reported hundred percent reduction of pain in lower back and ankle/feet in improved condition and found revolving stool an effective measure to save time. Thus revolving stool was found to be both efficient and effective measure of milking.

Table 1: Percentage Distribution of the Respondents (N=30) to Measure their Opinion on the Improved Technology after Ergonomic Intervention

Statements	HR (%)	R (%)	N (%)	IR (%)	HIR (%)
Bio Mechanical					
I am able to maintain comfortable body posture at sitting positions while using the Pehri	80	17	3		
Twisting of trunk while doing the activity was minimized with the use of the Pehri	14	78	4		
I could synchronize the movements of the animal	35	60	5		
Physical Stress					
No pains and cramps in the region of my body after performing the activity with the Pehri	18	80	2		
Body pains in the upper parts after performing this activities			2	18	80
Work Output					
The tool is effective as per time cost	60	37	2	1	
The Pehri is effective in improving the production efficiency	40	45	15		
Tool Factors					
The milking activity is light enough when I use the Revolving Stool	60	40	-		
The height of the Pehri needs to be adjusted to my working height	10	15	70	5	
The Pehri is compact enough to store	29	71			
Easy to maintain or repair this tool	5	10	85		
The Pehri serves multiple purposes	80	20	-		
The Revolving Stool is stable while sitting and performing the activity	35	60	5		
It is difficult to move the Pehri on uneven grounds	30	40	30		
The seat of Pehri is smooth and soft	55	45	-		
Field Acceptability					
The improved tool is a good replacement to the existing work practice	65	35	-		
I shall possess the Revolving Stool	85	12	3		
The tool requires modification			-	35	65

*HR-highly Relevant R-Relevant N-Neutral IR-Irrelevant HIR- Highly Irrelevant

Table 2: Acceptability Score for Revolving stool

Factors assessment during intervention	Maximum attainable score	Maximum attained score	Percent of maximum Attained score	Acceptability
Biomechanical	15	14	92.20	Highly acceptable
Stress factor	10	9	90	Highly acceptable
Work output	10	8	80	Highly acceptable
Tool factor	40	35	87	Acceptable
Field acceptability	15	13	86.66	Highly acceptable
Overall	90	79	87.7	Highly acceptable

Table 3: Assessment of efficiency using revolving stool

Parameters observed	During milking		Time saved	Remarks
	Squatting posture	Revolving stool		
Time	9 minutes/animal	6.5 minutes/animal	27.77%	Milking process become easier with the use of revolving stool

RECOMMENDATION

Farm women should use the revolving stool for sitting while milking the animals in order to reduce the drudgery. The steel plate of the revolving stool can be replaced by wooden plank/tin sheet to reduced its manufacturing cost and Improved stool can also be used for other household activities, which are performed in squatting posture.

REFERENCES

Choudhari, S. 1983. Nature and extent of female labour use in agriculture : A comparison between progressive and non-progressive area. *Economic Affairs,* 31(1): 81-86.

Kumar S. and C.R. Prajapati. 2011. Quantification of involvement of farm women in animal husbandry and dairy based farming system *Journal of Community Mobilization and Sustainable Development,* 6(2): 190-193.

Sharma, D.; I. Khanna *et al.* 2005. Allied farm activities : assessment of gender participation. *Rural India April Satyasai,* pp. 64-69.

Sisodia, J.S. 1981. Role of farm women in agriculture: A case study of Chambal command area of M.P. *Indian of Agriculture Economics,* 40(3): 223-225.

Vikas, B.; K. Kumaraphool and K. Singh. 2013. Participation of farm women in livestock management. *Journal of Community Mobilization and Sustainable Development,* 8(2): 179-181

Vinay, D. and S. Sharma. 2005. Technology to reduce farmwomen's drudgery while milking : a revolving stool Pantnagar. *Journal of Research,* 3(1): 98-102.

Received on May, 2019, Revised on July 2019

Journal of Community Mobilization and Sustainable Development Vol. 14(2), 329-333, May-August, 2019

Impact of Varietal Intervention on Mustard Yield across Agro-climatic Zones in Madhya Pradesh – A Cluster Approach

S.R.K. Singh[1]*, Anupam Mishra[2], Alok Suryawanshi[3] and A.A. Raut[4]
[1]Principal Scientist, [2]Director, [3]SRF-CFLD and [4]Scientist, ICAR-ATARI, Jabalpur, M.P.

ABSTRACT

Frontline demonstrations have been proven one of the most effective tools for showcasing the technological benefits among the farming community. Cluster Frontline demonstrations (CFLD), a further advanced methodology has been used to enhance the yield and income of the mustard growers. During 2016-17, under CFLD, demonstrations were conducted by KVKs in different agro-climatic zone of Madhya Pradesh in mustard crop using variety Arpana, DRMR 2, Giriraj, NRCDR 2, NRCHB 101, Pusa Jai Kisan, RH 406, RH 479, RVM 2 and ROHINI. Besides, scientists recommended seed treatment, line sowing, timely sowing, seed cum fertilizer drill for proper spacing & placing, System of Mustard Intensification, use of balanced fertilizer, integrated pest management, etc. under demonstration. Results showed that variety DRMR-2 in Gird zone provided highest yield 23.37q/ha as compared to 15.33q/ha in farmer practices. The additional yield of 7.99q/ha with increase in mustard productivity by 52.19 percent would contribute significantly to the present oilseed requirement. As economic gains in Gird zone, the net return of Rs. 39706/ha was realized by the farmer with benefit cost ratio of 2.87. The results clearly indicate the positive effects of FLDs over the existing practices during the cluster approach.

Keywords: Mustard, Cluster frontline demonstration, Variety, Agro-climatic zone, Yield, economic performance

INTRODUCTION

Edible oilseed crops have significant contribution in Indian agriculture. Oilseed crops form the second largest agricultural commodity in India after cereals sharing 14 per cent of the gross cropped area and accounting for nearly three percent of gross national product and 10 per cent value of all agricultural products. There is continuous increase in import of oilseed crops. Mustard occupies a prominent position in Indian oilseeds scenario. The total area under rapeseed-mustard was occupying 6.17 lakh ha area, which under the 2.63 percentage of total area, 6.66 million tons production and 1079 kg/ha productivity in 2015-16. The productivity is quite low due to sub-optimal application of fertilizers, lack of hybrid varieties and technology intervention. The productivity of oilseeds can be increased by proper fertilizer management in conjunction with some important technology. Front Line Demonstrations on farmer's field help to identify the constraints and potential of the rapeseed–mustard in specific area as well as it helps in improving the economic and social status of the farmers. The aim was to convey the technical message to farmers that if they use recommended package and practices then the yield of this crop can be easily doubled than their present level. Mustard is a major oilseed crop. Another objective of the study was to study the effect of varietal performance of mustard on production and productivity per unit area by the farmers in Madhya Pradesh.

MATERIALS AND METHODS

This research paper is based on the cluster frontline demonstrations conducted by the KVKs in their operational areas. The cluster approach is being promoted with FLDs to realize the visible impact of the technological intervention over a larger areas so that a mass of farmers could be aware with the technology and would be able to adopt the same over due course of time. In this finding, results in terms of productivity and profitability per unit area realized by the farmers are given. Performance of the demonstrating KVKs has been compiled and compared for interpretation and inference. The demonstrations were conducted on 1172 farmers' fields covering 520 ha area in 17 districts (Datia, Tikamgarh, Dindori, Mandla, Gwalior, Bhind, Morena, Shivpuri, Sheopur, Jabalpur, Panna, Satna, Jhabua, Mandsour,

*Corresponding author email id: singhsrk@yahoo.co.in

Neemuch, Rajgarh, Ratlam) in 2016-17 under rainfed and irrigated conditions.

RESULTS AND DISCUSSION

Technological intervention on cluster basis: KVKs and farmers made efforts in collaborative manner for making difference in higher production and productivity of mustard. The recommended packages of practices were followed to conduct the Front Line Demonstrations (FLDs) at the farmer's field. The recommended practices for mustard were followed. Improved mustard Variety viz., Arpana, DRMR 2, GIRIRAJ, NRCDR 2, NRCHB 101, Pusa Jai Kisan, RH 406, RH 479, RVM 2 and ROHINI were demonstrated at farmers' fields. In demonstration plots, use of seed treatment, line sowing and timely weeding, need based pesticides, use of balanced nitrogenous fertilization (using micronutrient sulphur) was used as technical interventions. For the control of aphid, methyl parathion 2% dust was used in demonstrated plots given in package and practices for the Madhya Pradesh were emphasized and comparison has been made with the existing practices.

The difference between the demonstration package and farmers practices has been given in Table 1. As technical interventions, use of improved varieties, seed treatment, line sowing, seed cum fertilizer drill, SMI and timely sowing, use of balanced fertilizer, integrated pest management as suggested by Chattopadhyay *et al.* (2003) was used.

In Bundelkhand region, under Rohini and NRCHB 101 varieties of mustard which covered 30 area by involving 75 farmers respectively and result showed that their yield was significantly higher (22.70 q/ha) as compared to local check (17.00 q/ha) with an increase upto 35.53 % followed by NRCHB 101 variety with coverage of 30 ha area and 75 farmer and the result showed 13.83 q/ha yield in demonstration plot as compared to local check 7.5 q/ha with increasing percentage of 84.40. Gird Zone under NRCHB 101 variety covered 30 ha area by involving 75 farmers with 19.60 q/ha yield as compared to local check yield of 14.02 q/ha with an increased percentage of 39.80. GIRRAJ (IJ31) variety covered 30 ha area and 75 farmer and the result showed 14.63q/ha yield as compared to local check 7.66 q/ha with increasing percentage 52.36, DRMR 2 variety covered 20 ha area and 46 farmer and demonstrated yield of 23.32 q/ha as compared to local check 15.33 q/ha with increasing percentage 52.12, NRCHB-101 variety covered 20ha area and 65 farmer with demonstrated yield of 19.60 q/ha as compared to local check 14.02 q/ha with increasing percentage 39.80 , RH 749 variety covered 30 ha area and 64 farmer with demonstrated yield of 23.17 q/ha as compared to local check 15.31 q/ha with increasing percentage 51.34, RVM-2 variety covered 50 ha area and 118 farmer with demonstrated yield of 18.63 /ha as compared to local check 14.97q/ha with increasing percentage 24.45. Jhabua hills under NRCDR 2 variety covered 18 ha area and 45 farmer with yield of 15.20 q/ha as compared to local check 10.35 q/ha with increasing percentage 46.86, NRCHB 101 variety covered 6 ha area and 15 farmer with yield of 12.58 q/ha as compared to local check 11.30 q/ha with increasing percentage 11.33, RH 406 variety covered 6 ha area and 15 farmer with demonstrated yield

Table 1: Difference between Farmers practice and demonstrated practices for use of intervention

Intervention	Farmer's Practices	Demonstrated practices
Farming situation	Irrigated/Rainfed	Irrigated/rainfed
Variety	Local	Improved variety RH-749, RVM-2, NRCHB 101, NRCDR 2, Pusa Jai Kisan
Seed treatment	Seed Treatment Not done	Seed treatment with fungicide and KVK provides Carbendazim 2 gm/kg seed, *trichocoderma* 5 gm/kg Seed and imidacloprid 48% @ 5ml/kg seed
Method of sowing	Broadcasting	Line sowing, Fertilizer cum seed drill, System of mustard intensification
Fertilizer Doses	Use of unbalance fertilizer	Balance dose of fertilizer, MOP -20 kg/acre NPKS 80:40:20:30 kg/ha + Azotobactor + PSB @ 2.5kg/ha seed
Weed control	No hoeing and application of stomp 30 EC (Pendimethalin) @500 ml/acre	Application of pendimethalin @ 1 liter/acre as pre-emergence within 2-3 days after sowing
Plant Protection Measures	Non-adoption of recommended package ofpractices	Dursban 20 EC (Chloropyriphos) @1 litre/acre

of 13.33 q/ha as compared to local check 9.20 q/ha with increasing percentage 44.89, RH 406 variety covered 6 ha area and 15 farmer also they result showed 13.33 /ha as compared to local check 9.20 q/ha with increasing percentage 44.89. Malwa Plateau NRCDR 2 under variety covered 40 ha area and 100 farmer with yield of 19.21 q/ha as compared to local check 14.93 q/ha with increasing percentage 28.67. NRCHB – 101 under variety covered 40 ha area and 100 farmer with yield of 16.95 q/ha as compared to local check 12.40 q/ha with increasing percentage 36.69. RVM 2 under variety covered 30 ha area and 75 farmer with yield of 18.50 q/ha as compared to local check 18.37 q/ha with increasing percentage 0.71. RVM 2 under variety covered 30 ha area and 75 farmer with yield of 18.50 q/ha as compared to local check 18.37 q/ha with increasing percentage 0.71. North Hills of CG RVM 2 under variety covered 30 ha area and 75 farmer with yield of 18.50 q/ha as compared to local check 18.37 q/ha with increasing percentage 0.71. Arpan under variety covered 30 ha area and 75 farmer with yield of 11.82 q/ha as compared to local check 4.5 q/ha with increasing percentage 162.67. Pusa Jai kisan under variety covered 20 ha area and 50 farmer with yield of 4.6/ha as compared to local check 3.5q/ha with increasing percentage 31.43. Kymore Plateau and Satpura Hills Pusa Jai kisan under variety covered 30 ha area and 45 farmer with yield of 8.82 /ha as compared to local check 6.63 q/ha with increasing percentage 33.03. RH-749 under variety covered 60.80 ha area and 76 farmer with yield of 4.20/ha as compared to local check 2.13 q/ha with increasing percentage 97.18. RVM-2 under variety covered 30 ha area and 58 farmer with yield of 9.66 /ha as compared to local check 3.47 q/ha with increasing percentage 178.39 (Table 2).

Yield gap of mustard crop in various agro-climatic zones of Madhya Pradesh: In this exercise highest yield gap recorded in Bundelkhand region 11.45 q/ha and lowest recorded in Jhabua hill 4.64 q/ha (Table 3). Whereas the demonstration yield of agro-climatic zones ranged between 14.26 to 21.30 q/per ha were considered. Grouping of highest an average yield performance in Gird

Table 2: Performance of mustard crops

Agro-climatic Zones	Variety	Area (ha)	No. of demo	Yield performance (q/ha)		Yield difference	
				DP	FP	(q/ha)	%(±)
Bundelkhand Region	ROHINI	30	75	13.83	7.5	6.33	84.40
	NRCHB 101	30	75	22.70	17.00	5.7	33.53
Gird Zone	GIRIAJ (IJ31)	30	75	22.29	14.63	7.66	52.36
	DRMR 2	20	46	23.32	15.33	7.99	52.12
	NRCHB-101	20	65	19.60	14.02	5.58	39.80
	RH 749	30	64	23.17	15.31	7.86	51.34
	RVM-2	50	118	18.63	14.97	3.66	24.45
Jhabua Hills	NRCDR 2	18	45	15.20	10.35	4.85	46.86
	NRCHB 101	6	15	12.58	11.30	1.28	11.33
	RH 406	6	15	13.33	9.20	4.13	44.89
Malwa Plateau	NRCDR 2	40	100	19.21	14.93	4.28	28.67
Nimar valley	NRCHB - 101	40	100	16.95	12.40	4.55	36.69
	RVM 2	30	75	18.50	18.37	0.13	0.71
North Hills of CG	Arpana	30	75	11.82	4.5	7.32	162.67
	Pusa Jai kisan	20	50	4.6	3.5	1.1	31.43
Kymore Plateau and	Pusa Jai Kisan	30	45	8.82	6.63	2.19	33.03
Satpura Hills	RH-749	60.8	76	4.20	2.13	2.07	97.18
	RVM-2	30	58	9.66	3.47	6.19	178.39

Table 3: Yield gap of mustard crop in various agro-climatic zones of Madhya Pradesh

Agro-climatic zones	District plots(q/ha)	Demonstration plots (q/ha)	Yield gap(q/ha)
Bundelkhand Region	6.80	18.25	11.45
Gird Zone	11.39	21.30	9.91
Jhabua Hills	9.62	14.26	4.64
Kymore Plateau and Satpura Hills	7.65	15.03	7.38
Malwa Plateau	11.71	18.23	6.52
Nimar velley	6.91	17.34	10.43
North Hills of Chhattisgarh	5.92	16.28	10.36

Table 4: Economic performance of Mustard

Agro climatic region	Farmer's Plot				Demonstration Plot			
	Gross Cost (Rs/ha)	Gross Return (Rs/ha)	Net Return (Rs /ha)	B:C Ratio	Gross Cost (Rs/ha)	Gross Return (Rs/ha)	Net Return (Rs/ha)	B:C Ratio
Bundelkhand Region	16000	48012	32012	3.00	17334	63170	45836	3.64
Gird Zone	20725	50367	29642	2.43	21248	60954	39706	2.87
Kymore Plateau	10500	24000	13500	2.28	14250	46110	31860	3.24
Malwa Plateau	15363	57040	41677	3.71	16372	69958	53586	4.27
Nimar velly	12533	55400	39867	3.56	14522	65200	46678	3.52
North Hills of Chhattisgarh	13250	36006	22756	2.71	15792	54640	38848	3.46

region 21.30 q/ha and lowest an average yield obtain in Jhabua Hills 14.26q/ha and districts plots yield ranged between 5.91 to 11.71 q/ha was recorded. In this study other zones was recorded demonstration yield as Bundelkhand Region, Kymore Plateau, Malwa Plateau, Nimar velly, North Hills of Chhattisgarh offered others yield 18.25, 15.03, 18.23, 17.34 and 16.28 q/ha whereas district plot yield obtain 6.80, 7.65, 11.71, 6.91, 5.92 respectively. Gird zone in mustard production due to more suitable agro-climatic conditions.

Economic performance of mustard: Economic performance of mustard in different agro-climatic zone brought out that overall net returns were Rs. 42752 per ha with benefit of cost ration of 3.50. As the cost of cultivation differed from zone to zone, the net return ranged from Rs 31860 (Kymore Plateau) to Rs 53586 (Malwa Plateau), whereas benefit of cost ratio from 2.27 (Kymore Plateau) to 4.27 (Malwa Plateau) indicated that malwa plateau is best suited for profitable cultivation of mustard on following improved technology. Other zone which support profitable crop of mustard are North hills off CG, Nimar Velley, Bundelkhand Region, Gird Zone, Malwa Plateau (Table 4).

CONCLUSION

Frontline demonstrations were carried out with mustard hybrid/composite at different locations in Madhya Pradesh in 2016-17. Full package of practices was followed by the participating farmers. KVKs facilitated the farmers to conduct effective demonstrations. On an average 20.59 q/ha was realized by the farmers which was 38.18 per cent higher over local check. Net return of Rs 59690/ha was obtained by the participating farmers. The varieties NRCDR 2, NRCHB 101 and NRCHB 506 performed better in varied conditions. For realizing higher productivity and profitability per unit area by cultivating hybrid mustard, suitable varieties, integrated nutrient management, integrated pest management play a greater role to the farmers. District specific technology modules again can make a difference for enhancing productivity.

REFERENCES

Ahmad, A.; P. Guru and R. Kumar. 2013. Impact of frontline demonstrations on Indian mustard through improved technologies. *Indian Res. J. Extn. Edu.,* 13(1): 117-119.

Balai, C.M.; R.P. Meena; B.L. Meena and R.K. Bairwa. 2012. Impact of Frontline Demonstration on Rapseed-Mustard Yield Improvement. *Indian Res. J. Ext. Edu.,* 12(2): 115.

Chauhan, R.S.; S.R.K. Singh; Y.D. Mishra; P. Singh; M.K. Bhargava and H.P. Singh. 2013. Impact Analysis of Frontline Demonstrations (FLDs) on Gram (Chickpea) in Shivpuri District of Madhya Pradesh. *Journal of Community Mobilization and Sustainable Development,* 8(2): 205-208.

Dwivedi, A.P.; A. Mishra; S.K. Singh; S.R.K. Singh and M. Singh. 2014. Yield gap analysis of chickpea through front line demonstration in different agro-climatic zones of M.P. and Chhattisgarh. *Journal of Food Legumes,* 27(1): 60-63.

Dwivedi, A.P.; S.R.K. Singh; A. Mishra; R.P. Singh and M. Singh. 2011. Adoption of Improved Production Technology of Pigeonpea. *Journal of Community Mobilization and Sustainable Development,* 6(2): 150-154.

Katare, S.; S.K. Pandey and M. Mustafa. 2011. Yield gap analysis of rapseed- mustard through frontline demonstrations. *Agric. Update,* 6(2): 5-7.

Rajan, P.; N. Khare and S.R.K. Singh. 2015. Factors affecting the income generation of tribal farmers in Madhya Pradesh State of India. *Journal of Community Mobilization and Sustainable Development,* 10: 147-151.

Sagar, R.L. and G. Chandra. 2004. Evaluation of Frontline Demonstration on Mustard in Sunderbans, West Bengal. *Indian J. Ext. Edu.,* 40 (3&4): 96-97.

Singh, A.K.; C. Kinjulck; Y.P. Singh and D.K. Singh. 2014. Impact of Frontline Demonstration on Adoption of Improved Practices of Oilseed Crops. *Indian Research Journal of Extension Education,* 14(3):75-77.

Singh, S.R.K.; A. Mishra; U.S. Gautam; A.P. Dwivedi and P. Chand. 2014. Scouting technological vis-à-vis extension gaps in soybean production in Madhya Pradesh. *Ind. Res. J. of Ext. Edu.,* 14(2): 41-45.

Tiwari, K.B. and A. Saxena. 2001. Economic analysis of FLD of oilseed in chhindwara. *Bhartya Krishi Anusandhan Patrika,* 16(3&4): 185-189.

Received on May, 2019, Revised on August 2019

Journal of Community Mobilization and Sustainable Development Vol. 14(2), 334-336, May-August, 2019

Decision making, Access and Control over resources of CSR women beneficiaries

Nishu Kanwar Bhati[1]* and Rajshree Upadhyay[2]

[1]SMS, Jodhpur Agriculture University, [2]Professor and Head, Department of Extension Education and Communication Management, College of Community and Applied Sciences, MPUAT, Udaipur, Rajasthan

ABSTRACT

It is being increasingly recognized that progress and welfare of a society is not only the responsibility of the Government alone, but various stakeholders need to be involved to attain the development goal. Companies too have been the target of those perturbed by this uneven development and as a result, their contributions to society are under severe scrutiny. Many corporate houses are working towards empowering women by improving income and employment for them in rural areas. The present paper thus scrutinizes the efforts done by these private players in making rural women empowered in terms of involvement in decision making in economic matters, access to and control over economic resources of rural women beneficiaries of Corporate Social Responsibility (CSR) initiatives.

Keywords: Corporate Social Responsibility (CSR), Economic empowerment, Decision making, Access to resources, Control over resources

INTRODUCTION

Corporates consider them as an integral part of society and accordingly act in a socially responsible way that goes beyond economic performance. As a result of this shift from pure profit to profit with social responsibility, many corporates are endorsing the term 'Corporate Social Responsibility (CSR)'. As CSR deals with corporate responsibility towards society, talking about women becomes equally important. Corporate world also recognizes women in every possible area in which it functions. As the women are core of family system in India, it is important for the rural society, like in urban society, that she should not only be educated but also socially and economically empowered. Business houses equally claim that their social projects for women empowerment aim to establish a bright and empowered future for the rural women. Though various studies are planned from time to time to study the impact of government schemes and policies, sporadic attempts have been made in this regard to study the impact of these companies' CSR initiatives. Thus, the present paper aims in understanding and highlighting how various CSR initiatives particularly for economic empowerment of rural women have been able to bring about a change in their lives in terms of their involvement in decision making in economic matters, access to and control over economic resources.

MATERIALS AND METHODS

The present study was conducted in Rajasthan state. Four companies comprising of Hindustan Zinc Limited (HZL), Chambal Fertilisers and Chemicals Limited (CFCL), JK Lakshmi Cement Limited (JKCL) and Shree Cement Limited (SCL) were purposively selected on the basis of their activities focusing on empowerment of rural women. From each company 60 rural women beneficiaries of CSR initiatives and 15 non beneficiaries were included in the study to make a total sample of 300 respondents. For the purpose of data collection, an interview schedule was developed to gather information related to their involvement in decision making, access to resources and control over resources after becoming the beneficiaries of CSR initiatives, which was compared with non beneficiaries. Frequency and percentage were used to analyze the data.

RESULTS AND DISCUSSION

Involvement in decision making, access to resources and control over resources were assessed for both beneficiaries and non beneficiaries of CSR (Corporate Social

*Corresponding author email id: nishubhati9@gmail.com

Responsibility) initiatives of four selected private companies. These were then classified into three categories each to compare beneficiaries and non beneficiaries respectively.

Decision making: A *decision* can be defined as a course of action purposively chosen from a set of alternatives to achieve day to day objectives or goals. Decision making on the part of rural women is their involvement to take day to day decisions related to various economic matters. These were measured on a three point continuum as to whether the decisions were taken individually, jointly or not at all. An attempt was made to categorize the respondents on the basis of their involvement in decision making i.e. poor, average and good. Results in Figure 1 revealed that majority of the non beneficiaries (91.66%) had poor involvement in decision making with a few of the non beneficiaries (8.33%) having average involvement. On the other hand more than half of the beneficiaries (67.91%) had average involvement in decision making and 29.71 per cent had poor involvement. The difference in the categories clearly indicates that say in decisions related to economic matters is affected by income in hand. When the women become economically independent, she gains confidence to put forth her views and influence decisions. The small income generating initiatives acted as a powerful tool of socio-economic development of the poor women in rural areas as it accelerates the change in income, occupation, social participation, expenditure, decision making and change in confidence level (Bansode *et al.,* 2013). The findings also get support from study by Das (2006) and Bhati *et al.* (2019) who reported alike improvement in women's decision making after employment.

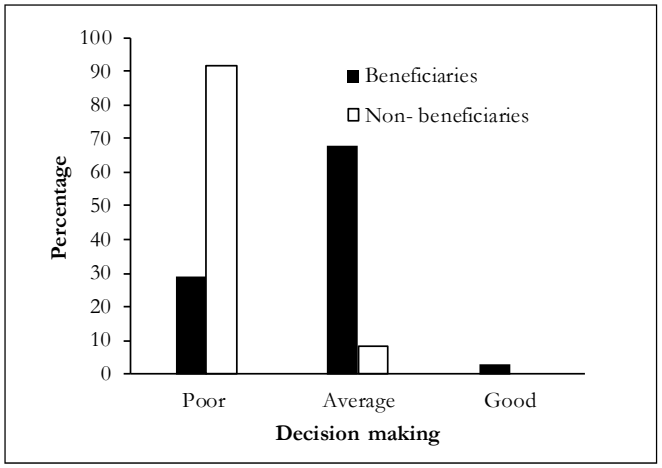


Figure 1: Categorization of the respondents by in decision making

Access to resources: Resources can be defined as assets that are used for making the benefits. Access implies unhindered use of the resources at one's disposal. The respondents were asked whether the listed resources were in their range of utilization. Categorizing of the respondents on the basis of access to resources (Figure 2) reveals that majority of the non beneficiaries (89.34%) had poor access to resources while more than half of the beneficiaries (66.25%) had average access to resources with a few beneficiaries (1.3%) had good access to resources. The reason being that due to income in hand they were able to use it for availing various resources as and when required compared to non beneficiaries.

Control over resources: Control over the resources at hand by the respondents, were categorized into having

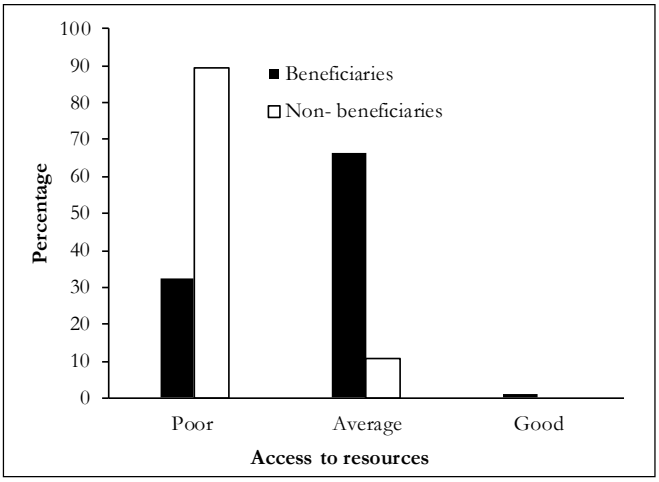


Figure 2: Categorization of the respondents on the basis of access to resources

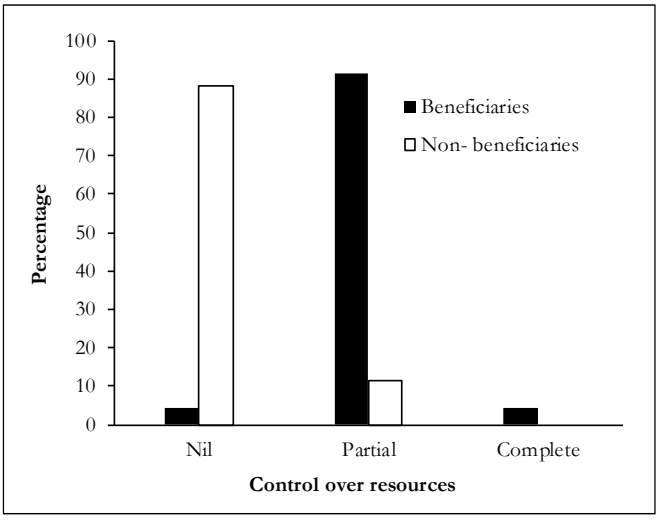


Figure 3: Categorization of the respondents on the basis of control over resources

no, partial or complete control. The results in Figure 3 reveal that majority of the non beneficiaries (88.33%) had no control over resources compared to majority of the beneficiaries having partial control (91.66%) with meager (1.3%) even possessing good control. The results find support from findings of Jain (2012) who reported meager respondents (6%) in good control over livestock resources.

CONCLUSION

It is clear from the above finding that as far as the efforts of the private companies through CSR is concerned; they have been able to bring about a positive change in the decision making, access and control over the resources of their beneficiaries. This can be attributed to the reason that providing them a source of income, has instilled a sort of confidence in them to put forth their views in day to day decisions and also income in hand has led to better resources at their disposal.

REFERENCES

Bansode, S.M.; G.S. Ankush; J.V. Mande and D.D. Suradkar. 2013. Impact of SHG on socio-economic development of their members. *Journal of Community Mobilization and Sustainable Development*, 8(1): 117-120.

Bhati, N.K.; R. Upadhyay and G. Singh. 2019. Comparative Analysis of Economic Empowerment of Rural Women Non Beneficiaries and Beneficiaries of CSR Initiatives. *Journal of Community Mobilization and Sustainable Development*, 14(1): 76-78.

Das, S. 2006. Increasing Gender Gap and Socio – Economic Status of Women in North – East India cited fromhttp://shodhganga.inflibnet.ac.in/bitstream/10603/10190/8/08_chapter2.pdf retrieved on April 28th, 2018

Jain, P. 2012. Participation and Opinion of Rural Women Regarding Management of Livestock Resources. M.Sc. Thesis submitted to MPUAT, Udaipur.

Received on May, 2019, Revised on August 2019

Journal of Community Mobilization and Sustainable Development Vol. 14(2), 337-340, May-August, 2019

Occupational Health Assessment of Textile unit Workers

Manisha Sethi[1]*, Sandeep Bains[2] and Rajdeep Kaur[3]
[1]Research Fellow, [3]Assistant Scientist, Department of Apparel and Textile Science, Punjab Agricultural University, Ludhiana, Punjab
[2]Dean, College of Home Science, Punjab Agricultural University, Ludhiana, Punjab

ABSTRACT

Textile is a part and parcel of human being as it plays an essential role right from cradle to grave. Small Scale Industry is considered as the backbone of the private sector all over the world, which assures their role in production, employment and sales. In addition to their role in economic development, the workers working in textile units face several challenges. A study was conducted to find the problems of workers working in weaving and printing units of Punjab. Sixty respondents were selected from weaving and printing units for the study. The respondents were asked about the problems faced by them during the work hours in the units. Fifteen per cent of the respondents had severe headache, followed by 6.66 per cent faced eye irritation/itching, while 5 per cent, encountered running nose during the reeling of yarn. While warping, 6.66 per cent of the workers had backache due to bending, 8.33 per cent each of the workers had body ache and sweating, followed by 3.33 per cent each of the workers who faced the problem of backache due to bending, shoulder ache, itching/irritation in hand and eye irritation during the sizing of yarn. The imperative solution to these problems is to educate the managers as well as workers regarding the use of protective measures in textile units.

Keywords: Industry, Problems, Textile, Workers

INTRODUCTION

Ludhiana universally famous as the Manchester of India is an industrial capital of small scale industry in the country. It is the main centre of textile industry in Punjab. Its 100 year old hosiery industry has today grown to mammoth proportions with more than 12,000 units spread over massive area to a multitude of cottage, home-based, industries located in virtually every nook and cranny (Jolly, 2013). Textile industry in India is divided into several segments namely fabric production, readymade garments and hand crafted textiles (CCI, 2014). All these segments need technical staff as well as daily wagers. Thus, textile industries employ lakhs of workers annually to meet their requirements. Thousands of workers are employed in textile industries under different job categories including dyeing, printing, finishing, cutting, weaving and spinning. The textile industry workers are exposed to a number of chemicals including dyes, solvents, optical brighteners, finishing agents and numerous types of natural and synthetic fibre dusts which affect their health. In a study on gender based participation by (Sukanya Barua, 2018), it was noted that considerable difference was found between male and female respondents in terms of psychological, economic, social and political dimensions.

Health care is the right of every individual and attainment of the healthy life is the important worldwide social goal. Health of the people is really the foundation upon which their well being depends. Health at work is consideration to deal with the health problems related to employment. Occupational health is concerned with the health safety issue of work. The hazards exposure in work setting can adversely affect the human health. The working conditions of dyeing and finishing units are in very pitiable state as the processing area is covered by water and chemicals and is very dirty and unhygienic. Further, the equipment and automated machinery is being used by unskilled and semi-skilled workers. This results in minor and major accidents.

In this paper an attempt has been made to summarize the health problems among a group of textile industry workers. Thus, a survey was conducted to find the problems of workers working in weaving industry of Ludhiana city, Punjab, India.

*Corresponding author email id: msrajdeepct@pau.edu

MATERIALS AND METHODS

To conduct this study, a total of sixty textile industry workers (40 males and 20 females) engaged in weaving and printing units were selected from textile based industries at *Rahon* Road, Ludhiana, Punjab. The textile industries selected for this study were running on full time basis without any seasonal gap and the workers were recruited on a full time basis for whole of the year. A questionnaire designed for this study was administered to the chosen textile industry workers. An attempt was made to record occupational health hazards faced by the workers.

RESULTS

Socio-personal profile of the respondents: The finding in the Table 1 shows the distribution of respondents according to the age. It is evident from the table that a total of 66.6 per cent were from 30-40 years of age group followed by 21.68 per cent who were below 20 years of age and only 11.66 per cent were from the age group of 40-50 years. The educational status of the respondents was categorized into illiterate, up to primary, up to secondary, graduate and post graduate. It was observed in the Figure 1 that 46.66 per cent of the respondents studied till secondary level followed by 36.6 per cent of the respondents who studied upto primary level while rest 16.6 per cent of the respondents were illiterate. It is clear from the data shown in Figure 2 that majority of the respondents (61.66 per cent) belonged to joint families whereas rest (38.33 per cent) were from nuclear families. As evident in Table 2, the male respondents were involved in various activities like, reeling of yarn, warping, sizing of yarn, weaving, printing and embroidery. On the other hand, females were indulged only in two activities i.e., reeling of yarn and machine embroidery on the suits. Further, the table reveals that forty five per cent of the male respondents performed the activity of fabric weaving followed by reeling of yarn, warping, sizing of yarn and printing done by 12.5 per cent of the respondents each. It was also observed that one third of the female respondents were involved in embroidery while 35 per cent in reeling of yarn.

It was observed from the Table 3 that 15 per cent of the respondents had severe headache followed by 6.66 per cent faced eye irritation/itching while 5 per cent,

Table 1: Distribution of the respondents according to their age (n=60)

Age group (Years)	No. of respondents	Percentage
Below 20 years	13	21.68
30-40 years	40	66.6
40-50 years	7	11.66
Above 50 years	-	-

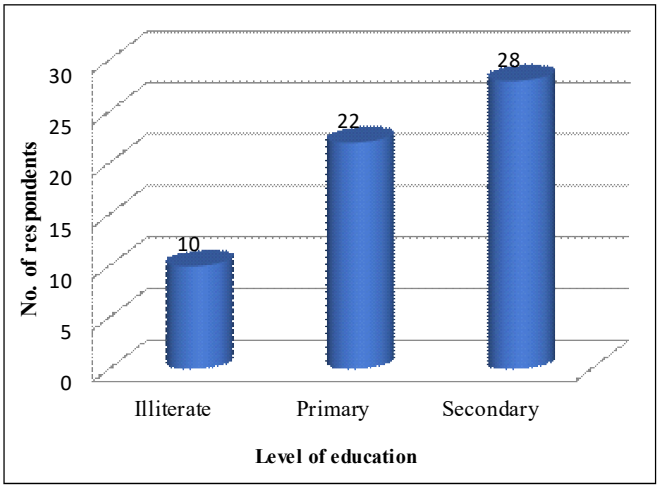


Figure 1: Distribution of respondents according to level of education

Table 2: Distribution of respondents according to textile related activities [n=60(Male-40, Female -20)]

Activities	Male (%)	Female (%)
Reeling of Yarn	5(12.5	7 (35)
Warping	5(12.5)	-
Sizing of yarn	5(12.5)	-
Weaving	18 (45)	-
Printing	5 (12.5)	-
Embroidery	2 (5)	13(65)

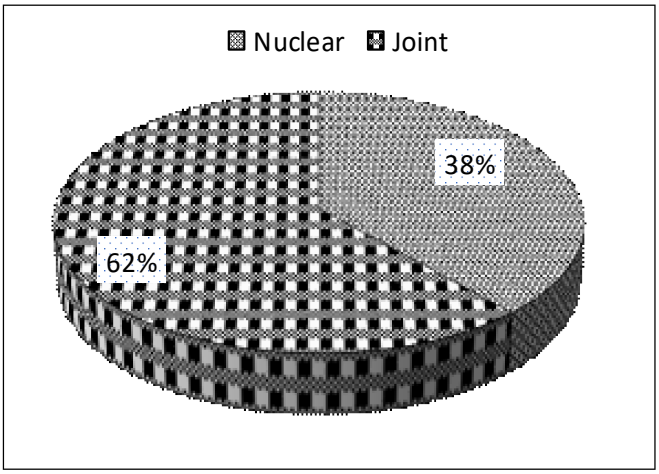


Figure 2: Distribution of respondents according to family type

Table 3: Problems encountered by the respondents (n= 60)

Problems encountered	Reeling of yarn (%)	Warping (%)	Sizing of yarn (%)	Weaving (%)	Printing (%)
Skin allergy in hands	-	-	-	-	8(13.33)
Skin allergy in feet	-	-	-	-	2 (3.33)
Backache due to bending	-	4 (6.66)	2 (3.33)	4 (6.66)	7 (11.66)
Shoulder ache	-	3 (5)	2(3.33)	3 (5)	7(11.66)
Headache	9 (15)	3(5)	-	10 (16.66)	6 (10)
Body ache	-	3 (5)	5 (8.33)	3 (5)	7 (11.66)
Hand ailments	-	2(3.33)	-	-	8 (13.33)
Itching/irritation	-	-	7 (11.67)	5 (8.33)	6 (10)
Eye irritation/itching	4 (6.66)	-	2(3.33)	-	4 (6.66)
Running nose	3 (5)	-	2 (3.33)	-	2 (3.33)
Nausea	-	-	-	-	4 (6.66)
Vomiting	-	-	-	-	3 (5)
Sweating	-	-	5 (8.33)	5 (8.33)	7 (11.66)
Breathlessness	-	-	-	-	6 (10)

Table 4: Existing dress pattern of the respondents [n=60(Male-40, Female -20)]

Dresses	Frequently		Occasionally		Never	
	Male	Female	Male	Female	Male	Female
Shirt/Pant	15(37.5)	-	-	-	-	-
Kurta /Pyjama	12 (30)	-	-	-	-	-
Kameez/ Salwar	-	13(65)	-	-	-	-
Saree/Blouse	-	7 (35)	-	-	-	-
T-shirt	13(32.5)	-	-	-	-	-
Cap	5 (12.5)	-	-	-	25 (62)	-
Turban	10 (25)	-	-	-	-	-
Gloves	-	-	-	-	60(100)	60(100)
Hanky	*5(12.5)*	-	*8(20)*	-	-	-
Chappal	25(62.5)	20 (100)	-	-	-	-
Shoes	15 (37.5)	-	-	-	-	-

encountered nose running during the reeling of yarn. While warping 6.66 per cent of the workers had backache due to bending followed by shoulder ache, head ache and body ache (5% each) whereas only 3.33 per cent faced the hand ailments during warping of yarns. The respondents (11.67%) faced itching/irritation in their hands and other body parts followed by 8.33 per cent of the respondents who had body ache and sweating, 3.33 per cent of the respondents faced the problem of backache due to bending, shoulder ache and eye irritation during the sizing of yarn. While weaving, 16.66 per cent of the respondents had head ache followed by the problem of sweating, itching/irritation in hands and other body parts 8.33 per cent each faced and 5 per cent encountered shoulder ache and full body ache during weaving of the fabric. Majority of the workers had faced problems during printing from which 13.33 per cent encountered the problem of skin allergy in hands and due to which hand ailments occurred followed by 11.66 per cent each faced the problem of backache due to bending while pressing the stick onto the screen, shoulder ache, body ache and itching/irritation in hands and other body parts. Ten per cent of the

respondents faced the problem of headache, itching / irritation in hands and other body parts and breathlessness. A study by Kirti *et al.* (2018) reveals that drudgery is the universally recognized phenomenon and mostly experienced by most of the women. It is directly proportional to the work intensity. Women intensively participate in agriculture and allied sectors.

Existing dress pattern: The data in the Table 4 shows that shirt/pant was worn by 37.5 per cent frequently, 32.5 per cent wore T-shirt, 30 per cent wore *kurta/pyjama* followed by 12.5 per cent used cap and hanky frequently. Around 20 per cent of the workers used hanky to cover their face occasionally. Around one third of the respondents (62%) wore chappal frequently while 37.5 per cent of the respondents wore shoes while performing various activities in the industry. Similarly, data regarding the dress pattern of female respondents' shows that all the respondents wore chappal frequently followed by 65 percent wore *salwar* and *kameez* whereas only 35 per cent use to wear *saree* and blouse. Hence, it is evident that none of the respondents used any protective accessory like gloves, mask, face cover etc. which would protect the worker from various health hazards. Similarly, (Zamzami *et al.,* 2019) states in their study that potential hazards can also threaten the safety and health of workers at risk of workplace accidents and work-related illnesses.

CONCLUSION

The workers engaged in different sections of the textile industry are exposed to various health related problems. The present study reveals that textile industry workers are more prone to develop different health related ailments due their occupational environment. Conclusively, textile industry workers must change their work-style and should use proper protection equipment's to minimize the effect of the different factors in the textile industry. It is also essential that the workers be aware of the various occupational hazards in the industry. At the same time, it is necessary that the management take the necessary steps to protect workers from potential hazardous situations.

REFERENCES

CCI Corporate Catalyst India. 2014. A brief report on textile industry in India, pp. 1-13.

Erisabet, Z.L.; P.A. Alayyannur; H.D. Nasirul and M. Tri. 2019. Relationship Between Knowledge and Availability of Personal Protective Equipment with the Attitudes Toward Occupational Safety and Health of the Students in Laboratory X. *Indian Journal of Forensic Medicine & Toxicology*, 13(3): 446-450.

Jolly, A. 2013. Hosiery capital cranks up the industry, emerging City (Ludhiana Economy). *India Today*: March 4, 2013.

Sukanya, B.; M. Wason; P. Singh and R. Kumar. 2018. Nature and Extent of Gender Based Participation and Empowerment in Tribal Sub Plan (TSP). *Journal of Community Mobilization and Sustainable Development*, 13(2): 233-238.

Tripathi, K.M.; J.P. Sharma; S.K. Dubey; U.S. Gautam; R. Parvez and S. Arya. 2018. Participatory Diagnosis of Drudgery Perceived by the Women Farmers: A Micro level Analysis. *Journal of Community Mobilization and Sustainable Development,* 13(2): 301-307.

Received on May, 2019, Revised on August 2019

Journal of Community Mobilization and Sustainable Development Vol. 14(2), 341-346, May-August, 2019

Development and Validation of Knowledge Test on Technologies for Risk Adjustment in Wheat Cultivation

Priti Priyadarshni[1]*, R.N. Padaria[2], R.R. Burman[2] and N.V. Kumbhare[3]

[1]Research Scholar, [2]Principal Scientist, [3]Senior Scientist, Division of Agricultural Extension, ICAR-Indian Agricultural Research Institute, New Delhi-110012

ABSTRACT

The farmers suffer huge loss in production due to climatic, biotic and abiotic risks. Therefore, there is a need to focus upon knowledge intensive extension strategies. To examine the prior status of knowledge, a knowledge test on technologies for adjustment to climatic and soil salinity risks with use of zero tillage system and other good practices for wheat cultivation was developed. The study was conducted in Mewat district of Haryana. A set of 19 items were screened and selected based on expert opinion for item analysis. These items were administered to 120 farmers who cultivated wheat and operated salinity affected areas. Item difficulty and item discrimination index were worked out. Except for one statement all other statements had desirable difficulty and discrimination index. The internal consistency (Cronbach Alpha) was found 0.95. Besides content validation with jury opinion, discriminant validity was worked out with known group, which showed that all other statements significantly differentiated the high and low score groups. One statement having low difficulty and discrimination index was revised and retained. Thus, valid Knowledge test of 19 items was developed.

Keywords: Knowledge test, Difficulty index, Discrimination index

INTRODUCTION

There is growing attention towards conservation agriculture in order to address the challenges to sustainable agriculture posed due to intensive use of tillage system. Continued intensive use of Green Revolution (GR) technologies (high-yielding varieties, fertilizers, pesticides and irrigation) in recent years has resulted in lower marginal returns (Ladha *et al*., 2000) and, in some locations it has resulted in lowering soil fertility and organic matter content (Yadav *et al*., 1998), depleting ground water resources in tube-well irrigated areas (Gulati, 1999), exacerbating weed problem, including resistance to herbicide, (Malik and Singh, 1995; Malik, 1996; Malik *et al*., 1998), and pest problems (Pingali and Gerpacio, 1997). As there are not many profitable alternatives to the predominant rice-wheat system, which is fundamental to employment, income, and livelihoods for millions of rural people, it is essential to have resource conservation technologies involving tillage and crop establishment options that are enabling farmers to sustain productivity of intensive rice–wheat systems (Gupta and Seth, 2007). Since knowledge is key to adoption of innovations, it is important to assess the initial knowledge level of farmers for devising and customizing the technology dissemination approaches. As knowledge is an invisible, intangible asset and cannot be directly observed, a robust test using psychometric principles needs to be developed. Knowledge as term and psychological construct has been viewed differently. 'Knowledge - cognitive behaviour of human' is acquired when an individual is exposed to an innovation and gains some understanding of its use (Mukherjee *et al*., 2019). According to Rogers (2003), innovation-decision process begins with the knowledge stage, which commences when an individual is exposed to an innovation's existence and gains an understanding of how it functions. Knowledge has also been defined as an understanding of information and their associated patterns (Jana, 2016). McQueen (1999) describes knowledge as experiences, understanding and the comprehension of an environment or the context of a problem which governs our behavior in such a way to get a required response. Oxford dictionary defined knowledge as a familiarity with someone or something, which can include facts, information, descriptions, or skills acquired through experience or education. Conventionally it has been defined

*Corresponding author email id: priyadarshani.priti@gmail.com

as beliefs that are true and are justified (Hunt, 2003). Knowledge has also been defined as capacity to act (Sveiby, 1997). According to Bloom *et al.* (1956), knowledge has been defined as those behaviours and test situations which emphasize remembering either by recognition or recall of ideas, material or phenomena. Taking cognizance of knowledge being based on true beliefs and remembrance of phenomenon, methods of measurement of knowledge often relied upon correctness or incorrectness of answers. The present study aimed at developing a test to measure the knowledge of farmers about technologies for adjustment to climatic and soil salinity risks with use of zero tillage system and other good practices for wheat cultivation in Mewat district of Haryana.

MATERIALS AND METHODS

Test construction involves systematic generation of pilot test items, expert review of pilot items, and calculation of pilot item properties (Sullivan and Dunton, 2004). The testing of knowledge level is a highly complex process which needs systematic investigation with some highly structured scientific steps viz., Items collection and preliminary screening; Items selection based on experts' judgments; Item Analysis (Difficulty Index, Discrimination Index), Testing Validity of the knowledge test, Testing reliability of the knowledge test, and Final Administration. Item statistics should be reviewed from a psychometric perspective (Althouse, 2000). For the present study, suitable items related to zero tillage method of wheat sowing, weed management, irrigation management, disease and insect management, soil fertility restoration, and cultivars were generated based on review of literature. With experts' opinion they were refined for item analysis. The items were administered to 120 farmers of Mewat region of Haryana, who operate under climatic as well as soil salinity risks. A score of 1 and 0 was assigned to correct and incorrect answer, respectively. Item properties like item difficulty and item discrimination indices as well as reliability and validity of the knowledge test were worked out.

Item difficulty index: Item difficulty index (Also called p-Value) indicated the proportion of respondents who respond to the item in a manner which indicates that the characteristic in question is present to a greater extent. Item difficulty was computed as the proportion of respondents who answered a question affirmatively or correctly, where the coding is: affirmative or correct = 1, negative or Incorrect = 0.

p_i = (number of people getting an item correct) / (number of people taking the test)

If the p-value was high, the item was interpreted as easy, while items with low p-value were considered as difficult.

***Item Discrimination*:** Item discrimination is the correlation between an item and the item battery without this item. It is ability of each individual item to discriminate between people with different levels of knowledge. It was measured by correlating the score on each item with the overall test score. Item discrimination was computed for every item.

Internal consistency: The internal consistency refers to the reliability of the test. Cronbach's alpha was used to measure the reliability of the test.

Validity: It referred to the degree to which the test measured what it intended to measure. The content validity with juries' opinion and discriminant validity were done.

RESULTS AND DISCUSSION

Item difficulty index: Analysis revealed that difficulty index ranged from 0.23 to 0.95 (Table 1). It is usually recommended that difficulty index (*p* values) should fall within the range 0.2 to 0.8. Value as high as 0.8 can be useful for easy lead in items. Value as low as 0.2 can be useful to ensure that the test as a whole challenges the abler farmers and discriminates amongst them. According to Kline (1993), items are not useful if they are answered correctly by more than 80 per cent or fewer than 20 per cent of respondents. However, Althouse (2000) suggested that item with p-value greater than 0.95 could be much easy, while the item with p-value less than 0.3 should be flagged for revision as it may be too difficult. As a rule, a good mix in an item battery is desirable. With binary items the p-value lies between 0 and 1 (0.5 = middle difficulty): Items with $p < .1$ (very difficult) or $p > .9$ (very easy) should be revised. However, while developing a general nutrition knowledge questionnaire, Parmenter and Wardle (1999) retained even those items which did not meet the criteria on the grounds of content validity. Since in the present case, all values are in limit, all items were retained considering the content validity.

Item Discrimination: The item discrimination value of an item indicates how well this single item predicts the value of the item battery. The difficulty index values range from -1 to 1. The higher the value, the better the item

Table 1: Item Difficulty Index of statements

Statement No.	Knowledge statements	Item difficulty index	Status
k1	Do you know about Zero tillage practice of wheat sowing?	0.50	Moderately difficult
k2	Do you know, what is the seed rate of wheat per acre in Zero tillage method?	0.47	Difficult
k3	Do you know, what is the depth of sowing of wheat seeds in Zero tillage method?	0.53	Moderately difficult
k4	Do you know, what is the fertilizer recommendation per hectare for wheat in Zero tillage method?	0.95	Easy
k5	Do you know the name of disease, which has black muddy ear head symptom?	0.69	Moderately difficult
k6	Do you know about irrigation scheduling in zero tillage method of wheat sowing?	0.68	Moderately difficult
k7	Do you know about insecticides for termite management?	0.33	Difficult
k8	Do you know about herbicides use for management of *Phalaris minor?*	0.23	Difficult
k9	Do you agree zero tillage method of wheat sowing requires less water?	0.52	Moderately difficult
k10	Do you know about methods to reduce soil salinity?	0.72	Moderately difficult
k11	Do you know sesbania *(dhaicha)* enriches soil fertility?	0.65	Moderately difficult
k12	Do you know about symmetry in two furrows in zero-till machine?	0.50	Moderately difficult
k13	Do you know about productivity in zero-till method of wheat sowing?	0.50	Moderately difficult
k14	Do you agree zero-till method encourages early sowing of wheat?	0.52	Moderately difficult
k15	Do you agree early sowing of wheat increases the terminal heat resistance?	0.53	Moderately difficult
k16	Do you agree high temperature at grain filling stage affects yield of wheat?	0.84	Easy
k17	Do you know about variety of wheat having terminal heat resistance capacity?	0.23	Difficult
k18	Do you know about soil salinity tolerant variety of wheat?	0.32	Difficult
k19	Do you agree ploughing lowers the soil humidity?	0.74	Moderately difficult

measures what the item battery measures. Positive values near 1 are desirable. If the value is negative, this may be due to the rotation of the item (direction/polarity). If the rotation is correct, however, the item should be discarded or revised. Item discrimination (point biserial correlation) of above 0.3 is considered 'good'. A discrimination of 0.2 to 0.3 is considered 'workable' while a discrimination of below 0.2 is considered unacceptable (Falvey *et al.*, 1994). In the present case, the item-to-total-score correlation ranged from 0.02 to 0.98 (Table 2). The two items, (item no K-4 and K-11) had low item-to-total-score correlation. Under such circumstances, generally the items should be dropped or modified. However, it is evident from table-2 if item no. k-4 was dropped, Cronbach alpha will be improved to 0.956, while if the K-11 is deleted then Cronbach alpha will be improved to 0.961. Since the improvement of internal consistency would be too minimal, the items were retained considering its content validity but were suitably modified. There are other important considerations too for retaining items. Parmenter and Wardle (1999) cite Kline (1986) and Streiner & Norman (1992) to state that an item-to-total-score correlation of 0.2 could be the cut-off point below which items should be discarded. However, while developing a general nutrition knowledge questionnaire, Parmenter and Wardle (1999) retained items which did not meet the criteria on the grounds of content validity. Althouse (2000) argues that the numeric values provided above for item difficulty and discrimination are only guidelines. The criteria may vary depending on the purpose of the testing program. The items are flagged but they will still be retained.

Discriminant validity: The item discrimination index shows whether an item really discriminates a well-informed respondent from a poorly informed respondent (Yadav *et al.,* 2009). The discriminant validity was worked out with known-groups. Ranging from 25 to 50 per cent, various percentages have been suggested and used (Fourie *et al.,* 2010) to divide the respondents in two groups for working out discrimination index. For the present study, the sample of respondents were split into high and low score groups with 50 per cent of respondents in both groups. The

Table 2: Item-total statistics

S. No.	Statement	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1	Do you know about Zero tillage practice of wheat sowing?	9.93	35.56	.98	.946
2	Do you know, what is the seed rate of wheat per acre in Zero tillage method?	9.97	35.98	.91	.947
3	Do you know, what is the depth of sowing of wheat seeds in Zero tillage method?	9.91	35.77	.95	.946
4	Do you know, what is the fertilizer recommendation per hectare for wheat in Zero tillage method?	9.48	41.11	.19	.956
5	Do you know the name of disease, which has black muddy ear head symptom?	9.74	38.18	.58	.952
6	Do you know about irrigation scheduling in zero tillage method of wheat sowing?	9.75	37.63	.67	.951
7	Do you know about insecticides for termite management?	10.10	37.39	.71	.950
8	Do you know about herbicides use for management of *Phalaris minor?*	10.21	39.16	.45	.954
9	Do you agree zero tillage method of wheat sowing requires less water?	9.92	35.67	.96	.946
10	Do you know about methods to reduce soil salinity?	9.72	37.94	.64	.951
11	Do you know sesbania (*dhaicha)* enriches soil fertility?	9.78	41.31	.024	.961
12	Do you know about symmetry in two furrows in zero-till machine?	9.93	35.56	.98	.946
13	Do you know about productivity in zero-till method of wheat sowing?	9.93	35.56	.98	.946
14	Do you agree zero-till method encourages early sowing of wheat?	9.92	35.72	.95	.946
15	Do you agree early sowing of wheat increases the terminal heat resistance?	9.91	35.78	.94	.946
16	Do you agree high temperature at grain filling stage affects yield of wheat?	9.59	39.77	.39	.954
17	Do you know about variety of wheat having terminal heat resistance capacity?	10.20	38.67	.54	.953
18	Do you know about soil salinity tolerant variety of wheat?	10.12	37.62	.67	.951
19	Do you agree ploughing lowers the soil humidity?	9.69	38.47	.56	.953

respondents whose scores were above mean score (10.43) were placed in high score group and those respondents had scores below the mean were placed in the low score group. It is evident from the Table 3 that except for the item no k-11, the mean scores of high and low score groups were significantly different (Table 3). It suggests that other items could discriminate the two groups significantly. Though item no k-4 had low item-total correlation value (below 0.2), reflecting low discrimination index, the discriminant validity showed that it was able to significantly discriminate the high and low score groups. Therefore, item no k-4 was retained as such. However, the findings of item discrimination index and discriminant validity suggested for either dropping the item no k-11 or modifying it. Considering the content importance for the test, the item was modified as Do you know, sesbania (*dhaicha)* provides, which nutrient to soil? The final knowledge test comprised of 19 items. The internal consistency (Cronbach Alpha) of the knowledge test was found 0.95.

CONCLUSION

The study revealed that while developing any test, the process must lay emphasis upon several checks in order to have a reliable and valid test with items having adequate properties like difficulty index and discrimination index. However, it is also pertinent to note that numeric values obtained for item difficulty and discrimination could be guidelines for rejection and modification of items. It depends upon the test developer to utilize the results for betterment. The content validity as well as importance of the item too comes in to play while deciding to reject any item. The criteria may vary depending on the purpose of the testing program. However, it is highly essential to carry out reliability and validity tests with suitable methods in order to be more succinct in result.

Table 3: Mean knowledge score of farmers of high and low scoring groups

S. No.	Statements	Mean score		t-value	p-value
		High group	Low group		
1	Do you know about Zero tillage practice of wheat sowing?	1.0	0.0	2776.827	.010
2	Do you know, what is the seed rate of wheat per acre in Zero tillage method?	0.93	0.0	28.740	.010
3	Do you know, what is the depth of sowing of wheat seeds in Zero tillage method?	1.0	0.05	33.481	.010
4	Do you know, what is the fertilizer recommendation per hectare for wheat in Zero tillage method?	1.0	0.9	2.560	.012
5	Do you know the name of disease, which has black muddy ear head symptom?	0.97	0.42	8.052	.010
6	Do you know about irrigation scheduling in zero tillage method of wheat sowing?	1.0	0.37	10.095	.010
7	Do you know about insecticides for termite management?	0.67	0.0	10.863	.010
8	Do you know about herbicides use for management of *Phalaris minor?*	0.42	0.03	5.612	.010
9	Do you agree zero tillage method of wheat sowing requires less water?	1.0	0.30	41.364	.010
10	Do you know about methods to reduce soil salinity?	1.0	0.43	8.784	.0100
11	Do you know sesbania (*dhaicha)* enriches soil fertility?	0.68	0.67	.761	.448
12	Do you know about symmetry in two furrows in zero-till machine?	1.0	0.0	2776.827	.010
13	Do you know about productivity in zero-till method of wheat sowing?	1.0	0.0	3077.256	.010
14	Do you agree zero-till method encourages early sowing of wheat?	1.0	0.03	41.364	.010
15	Do you agree early sowing of wheat increases the terminal heat resistance?	1.0	0.05	33.481	.010
16	Do you agree high temperature at grain filling stage affects yield of wheat?	1.0	0.68	5.229	.010
17	Do you know about variety of wheat having terminal heat resistance capacity?	0.47	0.0	7.185	.010
18	Do you know about soil salinity tolerant variety of wheat?	0.63	0.0	10.095	.010
19	Do you agree ploughing lowers the soil humidity?	1.0	0.48	7.942	.010

REFERENCES

Althouse, L.A. 2000. Test development: Ten steps to a valid and reliable certification exam. In: *Proceedings of the Twenty Eighth Annual SAS Users Group International Conference* Paper244–25. http://www2.sas.com/proceedings/sugi25/25/po/25p244.pdf [Google Scholar]

Bloom, B.S.; M. Engelhardt; E. Furnst; W. Hill and D.R. Krathwal. 1956. Taxonomy of educational objectives – The cognitive domain. Longmans Green, New York.

Falvey, P.; J. Holbrook and C. David. 1994. Assessing students. Longman: Hong Kong.

Gulati, A. 1999. Globalization of agriculture and its impact on rice–wheat system in the Indo-Gangetic Plains. In: Pingali, Prabhu, L. (Eds.) Sustaining Rice–Wheat Production Systems: Socio-economic and Policy Issues. Rice–Wheat Consortium Paper Series 5. *Rice–Wheat Consortium for the Indo-Gangetic Plains*, New Delhi, India, pp. 43–60.

Gupta, R. and A. Seth. 2007. A review of resource conserving technologies for sustainable management of the rice–wheat cropping systems of the Indo-Gangetic plains (IGP). *Crop protection*, 26(3): 436-447.

Hunt, Darwin P. 2003. The concept of knowledge and how to measure it. *Journal of Intellectual Capital*, 4(1): 100-113.

Jana, M. 2016. Measuring Knowledge. *Journal of Competitiveness,* 8(4): 5-29.

Kline P. 1986. A Handbook of Test Construction. London: Methuen.

Kline P. 1993. The Handbook of Psychological Testing: London, Routledge.

Ladha, J.K.; K.S. Fischer; M. Hossain; P.R. Hobbs and B. Hardy. 2000. Improving the productivity and sustainability of rice–wheat systems of the Indo-Gangetic plains: a synthesis of NARS-IRRI partnership research. *IRRI Discussion Paper* Series No. 40, IRRI, Los Banos, Philippines.

Malik, R.K. 1996. Herbicide resistant weed problems in developing world and methods to overcome them. In: Proceedings of the Second *International Malikional Weed Science Congress*, Copenhagen, Denmark. Food and Agriculture Organization, Rome, Italy, pp. 665–673.

Malik, R.K. and S. Singh. 1995. Little seed canary grass resistance to isoproturon in India. *Weed Technol.*, 9: 419–425.

Malik, R.K.; G. Gill and P.R. Hobbs. 1998. Herbicide resistance-a

major issue for sustaining wheat productivity in rice–wheat cropping system in the Indo-Gangetic plains. *Rice–Wheat Consortium Paper* Series 3, 32p.

McQueen, R.J. 1999. Can collaborative technology support tacit knowledge creation in individuals? In: P*roceedings of the Fifth America's Conference on Information Systems, August* (Vol. 5, pp. 13–15). Atlanta, USA.

Mukherjee, A.; P. Singh; R.R. Burman; S.K. Satyapriya and M.L. Roy. 2019. Development of test to measure knowledge level of farmers producer organization members about improved hill agricultural practices. *Journal of Community Mobilization and Sustainable Development*, 14(1): 57-64.

Parmenter, K. and J. Wardle. 1999. Development of a general nutrition knowledge questionnaire for adults. *European Journal of Clinical Nutrition,* 53: 298-308.

Pingali, P.L. and R.V. Gerpacio. 1997. Towards reduced pesticide use for cereal crop in Asia. *Economics Working* Paper No. 97-04. CIMMYT, Mexico, D.F., Mexico.

Sophia, F.; S. Beverley and Z. Monika. 2010. Difficulty and discrimination indices as quality assurance tools for assessments in a South African problem-based pharmacy programme. *Pharmacy Education,* 10(2): 119-128.

Streiner, D.L. and G.R. Norman. 1992. Health Measurement Scales: A Practical Guide to Their Development and Use. Oxford: Oxford University Press.

Sullivan, K. and N.J. Dunto. 2004. Development and Validation of the Stroke Knowledge Test. *Topics in Stroke Rehabilitation,* 11(3).

Sveiby, K.E. 1997. The new organizational wealth: Managing & measuring knowledge-based assets. *Berrett-Koehler Publishers*.

Yadav, D.S.; A. Kumar and U. Singh. 2009. Development of test to measure the knowledge level of dairy farmwomen. *Journal of Community Mobilization and Sustainable Development*, 4(1): 34-38.

Received on May, 2019, Revised on August 2019

Journal of Community Mobilization and Sustainable Development Vol. 14(2), 347-354, May-August, 2019

Knowledge of Extension Personnel and Farmers Regarding the Effect of Open Burning in Paddy and Wheat Cropping System

Lawanrisha Lyngdoh[1]*, Ravinder Kaur Dhaliwal[2] and Lopamudra Mohapatra[3]

[1]Ph.D. Research Scholar, [2]Professor, [3]Assistant Professor of Extension Education, Department of Extension Education, Punjab Agricultural University, Ludhiana-141004, Punjab

ABSTRACT

In the state of Punjab, majority of the rice straw is presently disposed by open burning during the months of October to November. The release of various pollutants from the open burning of straw affects the health of humans, animals and deteriorates the quality of the environment. Although there are several potential uses of the straw, farmers still practice straw burning. The present study involved 210 respondents of which, 150 extension personnel (ADOs) were selected randomly from the state and 60 farmers were selected randomly from three agro climatic zones. The knowledge of the respondents was evaluated with the help of a knowledge test regarding various paddy and wheat straw management alternatives and effect of open agricultural burning. The study revealed that 78.00 per cent of the extension personnel and 81.67 per cent of the farmer respondents had medium level of knowledge regarding the economic effect of paddy straw, 59.33 and 64.67 per cent of the extension personnel had high knowledge while 75.00 and 63.33 per cent of the farmer respondents had medium level knowledge regarding environmental effect and pictorial identification for paddy wheat straw management respectively. The overall analysis showed that 63.33 per cent of the extension personnel and 70.00 per cent of the farmer respondents had medium level of knowledge. The variables like education, service experience, extension contact, mass media and economic motivation showed a positive and highly significant correlation with knowledge while age of the farmer respondents was negatively and significantly correlated with knowledge.

Keywords: Farmer and extension personnel, Knowledge, Residue burning, Straw management alternatives, Paddy wheat system

INTRODUCTION

In Punjab, 14462.85 thousand tonnes per year crop residues are generated from different crops (Singh *et al.,* 2013). Traditionally, straw is managed through on-farm burning during the harvesting season as it is the cheapest and probably easiest way to prepare the field for the next cultivation season. Straw burning is practiced particularly where crop rotations do not allow sufficient time for decomposing; progressing ploughed-in straw (Silalertruksa and Gheewala, 2013) and due to lack of cost-effective treatment approaches (Qian *et al*., 2014). Burning a tonne of straw will reportedly produce 3 kg of particulate matter, 60 kg of carbon monoxide, 1460 kg of carbon dioxide, 199 kg of dust and 2 kg of sulphur dioxide and these gases play an important role in polluting the atmosphere and environment which lead to global climate change (Gupta *et al.,* 2004). Over the years, there have been many alternatives to combat straw burning in Punjab by various organizations. If not burnt, the straw can be used as inputs for industries like paper, brick, electricity, packaging, etc. Machines like the happy seeder have been introduced to cut, chop and sow the wheat crop on a single operation. The most economical alternative which can easily be adopted by the farmers is in- situ incorporation of the straw. To adopt straw management, it is important that farmers should learn more of the opportunities, with continuous information through demonstrations in the field, workshop, training, farm visits and open discussion, and incentives. Farmers also need to be exposed to information about the adverse effects of open-burning and the economic potential of straw in the economy. They also have to change more from their traditional practices to environmental farm management (Bridhikitti and Kanokkanjana, 2009). According to Doll and Francis (1992), extension professionals' knowledge about the

*Corresponding author email id: lawanlyngdoh33@gmail.com

concept of sustainability is necessary in order to move the program forward. Professionals must remain current on agricultural information and technologies. Extension must understand the needs and problems of its clientele so it can select the appropriate information to help farmers understand their short and long term goals and provide them with tools for problem solving.

MATERIALS AND METHODS

The study comprised of two types of respondents i.e. farmers and extension personnel. A sample of 150 extension personnel (Agricultural Development Officers) was selected randomly from the state. From the three agro climatic zones of Punjab, *viz*. Central Plain Zone, Western Zone and Sub Mountain Undulating Zone, one district was selected and further two villages were selected randomly. From each village 10 farmers were randomly selected, thus comprising a sample of 60 farmers and 150 extension personnel as respondents, making the total sample size to be 210.

Knowledge refers to the understood information which can be recalled through memory of ideas and events. It was measured in terms of level of respondents' knowledge on various aspects of paddy and wheat straw management by using a standardized knowledge test. For developing a knowledge test, the procedure followed by Jha and Singh (1970) was adopted. The knowledge of the extension personnel and farmer respondents was studied to examine the knowledge level regarding various paddy and wheat straw management alternatives and the effect of open burning practices in paddy and wheat cropping system. With regard to the various paddy and wheat straw management alternatives in paddy-wheat cropping system, the knowledge of the extension personnel and farmer respondents was studied under two heads, i.e. economic benefit and pictorial identification of techniques for paddy wheat straw management. Under economic effect, the respondents were asked if paddy wheat straw can be used for paper making and for any enterprises, etc. A brochure consisting of pictures of various techniques for paddy wheat straw management was prepared and distributed to the respondents for their identification. While the knowledge of the extension personnel and farmer respondents regarding the effect of open burning in paddy-wheat cropping system was studied under two heads, i.e. environmental effect and health effect. In the matter of environmental effect, the respondents were asked to identify the gasses and nutrients loss by straw burning, etc. and under health effect; questions were based on symptoms of straw burning on human and animal health.

The reliability of a measuring instrument refers to the degree to which it yields consistent scores when it is administered number of times. The split half method was employed for testing the reliability of the scale and Pearson Product Moment Correlation Coefficient was worked out of the scale. The correlation coefficient gave the reliability of the half of the test. Therefore, it was necessary to correct the reliability coefficient before taking it as evident reliability. The equation which is referred as "Spearman Brown Correlation" formula for split half reliability (Guilford, 1954) was used to find out the reliability coefficient for the full scale. The reliability coefficient of the scales test is given in Table 1.

Validity refers to the degree to which an instrument measures what it is supposed to measure (Guilford, 1954). The empirical type of validity determination was used to calculate what Guilford (1954) called the intrinsic validity. According to him, it is the degree to which whether a test measures the true score components. Validity of the scale was worked out by using the square root of its reliability. The intrinsic validity of the scales is given in Table 1.

Table 1: Reliability and validity of scales / test

Instruments	Reliability	Validity
Knowledge Test (Farmers)	0.923	0.960
Knowledge Test (Extension Personnel)	0.916	0.956

RESULTS AND DISCUSSION

The information regarding socio-economic profile of the extension personnel which include age, education, service experience, etc. has been presented in Table 2.

The age of the extension personnel varied from 28-52 years. The data in Table 2 indicated that less than two third of the extension personnel belonged to the age group of 28-36 years followed by 21.33 per cent of them falling in the age group of 44-52 years while only 15.33 per cent belonged to the age group of 36-44 years. It is interesting to note that majority of the extension personnel (94.67%) were male and only 5.33 percent were female. This indicates that extension service is dominated by men and the findings are in line with that of Saito and Weidemann (1990); Jiggins *et al.* (1998); Adomi *et al.* (2003); Hassan (2010) and Rad *et al.* (2011). Regarding the education of the extension

Table 2: Socio personal profile of extension personnel respondents (n=150)

S.No.	Socio-personal characteristics	Category	Extension Personnel	
			Frequency	Percentage
1.	Age (years)	28-36	95	63.33
		36-44	23	15.33
		44-52	32	21.33
2.	Gender	Male	142	94.67
		Female	8	5.33
3.	Education	Graduate	94	62.66
		Post-graduate	47	31.33
		Doctorate	9	6.00
4.	Service Experience (years)	4-11	97	64.67
		11-18	28	18.67
		18-25	25	16.67
5.	Training/Seminar / Conference /	Yes	—	—
	Workshop attended in straw management	No	150	100.00

personnel, they were categorized into three categories of B.Sc. (Graduate), M.Sc. (Post-graduate) and Ph.D. (Doctorates). About 62.66 per cent were found to be graduates while 31.33 and 6 per cent of the extension personnel were post-graduates and doctorates, respectively. The extension personnel were categorized into three groups based on their service experience. Over 64.67 per cent of the extension personnel had service experience of 4-11 years followed by 18.67 and 16.67 per cent having service experience of 11-18 years and 18-25 years, respectively. The results clearly indicated that none of the extension personnel had attended any form of training/seminar/ conference/ workshop in straw management during the last five years.

The information regarding socio-economic profile of the farmer respondents which include age, education, farming experience, family size, etc. has been presented in Table 3.

The age of the farmer respondents varied from 23-56 years. The data revealed that less than half of the farmer respondents (40%) belonged to an age group of 40-56 years followed by 31 per cent and 28.33 per cent of them falling in the age groups of 38-40 years and 23-38 years, respectively.

The education of farmers ranged from primary to graduate level. The data showed that 33.33 per cent were educated up to senior secondary, 20 per cent were middle, 16.67 per cent had gained education up to matric and 15 per cent were primary and graduates, respectively. These results are in line with the findings of Singh (2013). The farmer respondents were categorized into groups according to their operational land holding on the basis of criteria given in Statistical Abstract of Punjab (2015). The data revealed that 35 per cent of the farmer respondents had a medium i.e. 10-25 acres of land holding followed by 25 per cent having semi medium (5-10 acres) operational land holdings which is similar to the findings of Singh (2013). About 21.67 percent and 10 per cent of the farmer respondents had large (above 25 acres) and marginal (below 2.5 acres) while only 8.33 percent had small (2.5-5 acres) holdings, respectively. The results were similar as those found by Roy and Kaur (2016); Anand (2016) and Deepika (2017). About 46.66 per cent had medium annual gross income followed by 31.66 percent in the low annual income category. On an overall basis, it can be concluded that maximum farmer respondents had medium to low annual income. The data given in Table 3 revealed that less than half, i.e. 43.33 per cent of the farmer respondents had medium extension contacts. These results were found to be in line with the findings of the study by Kumar (2008). While 33.33 per cent and 23.33 percent had low to high extension contacts. The findings are in line with Roy and Kaur (2016). It was observed that majority of the extension worker were disseminating technologies through progressive farmer (Kumar and Singh 2014). More than half of the farmer respondents (56.66%) had a medium mass media exposure while a little more than

Table 3: Socio-personal and psychological characteristics of farmer respondents (n=60)

S.No.	Socio-personal characteristics	Category	Farmer respondents	
			Frequency	Percentage
1.	Age (years)	23-38	17	28.33
		38-40	19	31.66
		40-56	24	40.00
2.	Education	Primary	9	15.00
		Middle	12	20.00
		Matric	10	16.67
		Senior Secondary	20	33.33
		Graduate	9	15.00
3.	Operational Land Holding (acres)	Marginal (< 2.5)	6	10.00
		Small (2.5-5)	5	8.33
		Semi-medium (5-10)	15	25.00
		Medium (10-25)	21	35.00
		Large (> 25)	13	21.67
4.	Annual Gross Income(in rupees)	Low (< 420048.89)	19	31.66
		Medium (420048.89-600159.09)	28	46.66
		High (>600159.09)	13	21.66
5.	Extension Contacts	Low (< 7.42)	20	33.33
		Medium (7.42-8.67)	26	43.33
		High (> 8.67)	14	23.33
6.	Mass Media Exposure	Low (< 9.93)	4	6.66
		Medium (9.93-11.24)	34	56.66
		High (> 11.24)	22	36.66
7.	Innovative Proneness	Low (< 14.93)	15	25.00
		Medium (14.93-18.53)	20	33.33
		High (> 18.53)	25	41.66
8.	Scientific orientation	Low (< 10.23)	15	25.00
		Medium (10.23-11.30)	24	40.00
		High (> 11.30)	21	35.00
9.	Risk Orientation	Low (< 13.81)	25	41.66
		Medium (13.81-15.31)	36	60.00
		High (> 15.31)	5	8.33
10.	Ecological Consciousness	Low (< 14.49)	9	15.00
		Medium (14.49-17.00)	13	21.67
		High (> 17.00)	38	63.33
11.	Economic Motivation	Low (<12.70)	13	21.66
		Medium (12.70-17.75)	20	33.33
		High (>17.75)	27	45.00

one-third of them (236.66%) had a high mass media exposure. Only 6.67 per cent of the farmer respondents had low mass media exposure. It can be said that majority of the farmer respondents had medium level mass media exposure. Similar findings were reported by Singh (2013) and Kumar (2008). Less than half of the farmer respondents (41.66%) had a high level of innovativeness followed by 33.33 and 25 per cent of them having medium and low level of innovativeness, respectively in Punjab. These findings contradict the findings of Roy and Kaur (2016) and Kumar *et al.* (2013) who reported that farmers respondents had medium level of innovativeness.

About 60 percent of the farmer respondents had a medium risk orientation while 41.66 per cent of them had a low risk orientation. Only 8.33 per cent of the farmers had a high risk orientation. It can be concluded that farmers had medium to high level of risk orientation. These findings are in line with Roy and Kaur (2016). Regarding the scientific orientation of the farmer respondents, the results revealed that less than half of the farmer respondents (40%) had a medium level of scientific orientation followed by 35 and 25 percent of the farmers having high and low level of scientific orientation respectively. Similar kind of reports was found by Kumar *et al.* (2013); Pandey *et al.* (2011); Johnson and Monoharan (2007) and Chaudhary (1999). The results further indicated that, 63.33 per cent of the farmer respondents had a high level of ecological consciousness while 21.67 per cent and 15 per cent of them had a medium and low level of ecological consciousness. Farmers and policy makers are well-aware of the consequences of on-farm burning (Anonymous, 2012). These findings are in line with Roy and Kaur (2016). Farmers were more concerned on issues which affect them immediately, such as increasing levels of salinity in soil and water, weed growth and encroachment of non agricultural land use (Garforth and Lawrence, 1997). Regarding the economic motivation, about 45 per cent of the farmer respondents had a high level of economic motivation while 33.33 per cent and 21.66 per cent of them had a medium to low economic motivation. In Punjab farmers have been compelled to burn the crop residue due to lack of cost-effective treatment approaches (Qain *et al.,* 2014), which involves high cost of human labor for removing and collection of the crop residue (Anonymous, 2012).

The data set in Table 4 revealed that more than half (58%) of the extension personnel had medium knowledge level while 21.33 per cent and 20.66 per cent had low and high knowledge level regarding the economic benefits of using straw. Regarding the pictorial identification of techniques for paddy wheat straw management, 64.67 per cent of the extension personnel had high knowledge level followed by 27.33 per cent and 8 per cent having high and low knowledge level, respectively.

It was observed from Table 5 that 73.33 per cent and 19.33 per cent of the extension personnel had medium and low knowledge level on the environmental effect of residue burning while only 7.33 per cent had high knowledge level. The results also revealed that 41.33 per cent of the extension personnel had medium knowledge level on the health effect of straw burning while 35.33 per cent and 23.33 per cent had high and low knowledge level.

A perusal of the data in Table 6 reveals that three fourth of the farmer respondents had medium knowledge regarding the economic benefit of paddy straw followed by 16.66 per cent and 8.33 per cent having high and low knowledge level, respectively. A little less than two third (63.33%) of the farmer respondents had medium level of knowledge under pictorial identification of techniques for paddy wheat straw management while 26.67 per cent and 10 per cent had low and high knowledge level.

Table 4: Knowledge level of extension personnel respondents regarding various paddy and wheat straw management alternatives in paddy-wheat cropping system in Punjab (n=150)

S.No.	Parameter	Knowledge level	Extension personnel	
		(Scores)	Frequency	Percentage
1.	Economic Benefit	Low (< 5.3)	32	21.33
		Medium (5.3-7.4)	87	58.00
		High (>7.4)	31	20.66
2.	Pictorial identification of techniques	Low (< 19.96)	12	8.00
	for paddy wheat straw management	Medium (19.96-21.27)	41	27.33
		High (> 21.27)	97	64.67

Table 5: Knowledge level of extension personnel respondents regarding the effect of open burning in paddy-wheat cropping system in Punjab (n=150)

S.No.	Parameter	Knowledge level (Scores)	Extension personnel	
			Frequency	Percentage
1.	Environmental Effect	Low (<3.3)	29	19.33
		Medium (3.3-4.3)	110	73.33
		High (>4.3)	11	7.33
2.	Health Effect	Low (<2.2)	35	23.33
		Medium (2.2-3.9)	62	41.33
		High (>3.9)	53	35.33

Table 6: Knowledge level of Farmer respondents regarding various paddy and wheat straw management alternatives in paddy-wheat cropping system in Punjab (n=60)

S.No.	Parameter	Knowledge level (Scores)	Farmer respondents	
			Frequency	Percentage
1.	Economic Benefit	Low (< 9.7)	5	8.33
		Medium (9.7-11.7)	45	75.00
		High (> 11.7)	10	16.66
2.	Pictorial identification of techniques for paddy wheat straw management	Low (< 19.24)	16	26.67
		Medium (19.24-21.25)	38	63.33
		High (> 21.25)	6	10.00

The data presented in Table 7 indicated that under environmental effect, half of the farmer respondents had medium knowledge level followed by 31.66 per cent and 18.33 per cent having high and low knowledge level, respectively. Although majority of the farmers were aware of the environmental effect of straw burning, straw burning was practiced due to convenience, both economically and operationally. The findings were in line with Roy and Kaur (2016). Regarding the effect of straw burning on health, 60 per cent of the farmer respondents had medium level of knowledge while 26.67 per cent and 13.33 per cent had low and high knowledge level.

A positive and significant relationship was found between the knowledge level regarding effect of open burning in paddy and wheat cropping system and variable viz. education and service experience of the extension personnel (Table 8). This signifies that higher the education and more the experience, higher the knowledge level. The results are in line with the findings of Pandey and Kushwaha (2010); Oladele and Tekena (2010). Whereas age was not significantly correlated with knowledge of the extension personnel.

A negative and significant relationship was found between the age and knowledge level of the farmer

Table 7: Knowledge level of Farmer respondents regarding the effect of open burning in paddy-wheat cropping system in Punjab (n=60)

S.No.	Parameter	Knowledge level (Score)	Farmer respondents	
			Frequency	Percentage
1.	Environmental Effect	Low (<2.1)	11	18.33
		Medium (2.1-3.8)	30	50.00
		High (>3.8)	19	31.66
2.	Health Effect	Low (< 2.1)	16	26.67
		Medium (2.1-3.5)	36	60.00
		High (> 3.5)	8	13.33

Table 8: Relationship of various independent variables with the knowledge of the extension personnel respondents

Variable	(r value)
Age	0.149
Education	0.352*
Service Experience	0.639*

*Significant at 0.05 level

Table 9: Relationship of various independent variables with the knowledge of the farmer respondents

Variable	(r value)
Age	-0.570*
Education	0.679*
Operational Land Holding	0.193
Annual Income	0.117
Extension Contact	0.287*
Mass Media Exposure	0.612*
Innovative Proneness	0.144
Scientific Orientation	0.176
Risk Orientation	0.247
Ecological Consciousness	0.013
Economic Motivation	0.382*

*Significant at 0.05 level

respondents regarding effect of open burning in paddy and wheat cropping system which indicated that higher the age of the farmers, lower the knowledge level (Table 9). It indicated that aged farmers do not update their knowledge. A positive and significant relationship was found between the knowledge level of the farmer respondents and variable viz. education, extension contact, mass media and economic motivation. This signifies that higher the education, extension contacts, mass media and economic motivation of the farmers, higher the knowledge level. The findings are in line with Baksh *et al.* (2015) but contradicts those of Alltalb and Filipek (2016) who reported that there was no significant correlation between knowledge level with age and education. Other variables like operational land holding, annual income, innovative proneness, scientific orientation, risk orientation and ecological consciousness was not significantly correlated with knowledge of the farmers.

CONCLUSION

Based on the findings of the study it can be concluded that, most of the extension personnel and farmer respondents had medium level of knowledge regarding the effect of open burning in paddy and wheat cropping system. This suggests that special straw management programmes by various training institutes for both the extension personnel and farmers of Punjab should be conducted to sensitize them on the economic and the environmental effect of paddy straw burning. From the study, it can be concluded that the extent of knowledge acquisition is influenced by age, education, service experience, extension contact, mass media and economic motivation. Training agencies must consider these characteristics for the designing and implementation of any programmes in straw management. This would increase the knowledge of extension personnel for imparting awareness regarding paddy wheat residue management therefore, encouraging farmers to discontinue the practice of straw burning.

REFERENCES

Adomi, E.E.; M.O. Ogbomo and O. Inoni. 2003. Gender factor in crop farmers' access to agricultural information in rural areas of Delta State, Nigeria. *Library Review,* 52: 388-93.

Alltalb, A.T. and T. Filipek. 2016. The knowledge level of farmers toward agricultural extension in Lublin province, Poland. *International Journal of Agricultural Extension and Rural Development,* 3: 21-29.

Anand, A. 2016. *Stakeholders opinion on agricultural subsidies and their impact in Punjab*. M.Sc. Thesis, Punjab Agricultural University, Ludhiana, India.

Anonymous. 2012. *Crop residues management with conservation agriculture: Potential, constraints and policy needs*. pp 56-69. Indian Agricultural Research Institute, New Delhi.

Baksh, K.; W. Ganpat and L. Narine. 2015. Farmers' knowledge, attitudes and perceptions of occupational health and safety hazards in Trinidad, West Indies and implications for the Agriculture sector. *Journal of Agricultural Extension and Rural Development,* 7: 221-28.

Bridhikitti, A. and K. Kanokkanjana. 2009. Sustainable rice straw management for urban air pollution in Bang Bua Thong, Nonthaburi. In: Ranjith Perera (Ed.) *Nonthaburi: Southeast Asia urban environmental management applications project.* Canadian International Development Agency (CIDA) and the Asian Institute of Technology (AIT), Bangkok, Thailand.

Chaudhary, R.P. 1999. *Study on information sources utilization pattern and its impact on farmers knowledge and adoption of rice production technology of Milkipur block, Faizabad (U.P.)*. M.Sc. Thesis, Narendra Dev University of Agriculture and Technology, Faridabad, U.P. (India).

Dipika. 2017. *Farmer's perception on their vulnerability towards weather variability in different cropping systems of Punjab*. M.Sc. thesis, Punjab Agricultural University, Ludhiana, India.

Doll, J.D. and C.A. Francis. 1992. Participatory research and Extension strategies for sustainable agricultural systems. *Weed Technology,* 6: 473-82.

Garforth, C. and A. Lawrence. 1997. Supporting sustainable agriculture through extension in Asia. *Natural Resource Perspective* pp. 1-10. Overseas Development Institute, London, UK.

Guilford, J.P. 1954. *Psychometric methods*. Tata McGrawHill Publication Co. Ltd.Pp 378-382. Bombay, India.

Gupta, P.K.; S. Sahai; N. Singh; C.K. Dixit; D.P. Singh; C. Sharma; M.K. Tiwari; R.K. Gupta and S.C. Garg. 2004. Residue burning in rice-wheat cropping system: causes and implications. *Current Science,* 87: 1713-1717.

Hassan, M. 2010. Gender mainstreaming in agricultural extension: analysis and obstacles to gender mainstreaming in Agriculture Extension: A case study of district Muzaffargarh, Pakistan. Dr. Müller GmbH & Co.KG Publisher, VDM-Verlag, Germany.

Jha, P.N. and S.N. Singh. 1970. A test to measure farmer's knowledge about high yielding variety programme. *Interdiscipline,* 7(1): 65-78.

Jiggins, J.; R.K. Samanta and J.E. Olawoye. 1998. Improving women farmers' access to extension markets. *American J. Agri. Econ.,* 80: 1102-08.

Johnson, B. and M. Monoharan. 2007. Extent of adoption of improved cashew cultivation practices. *Indian J. Extn. Edu.,* 43: 57-63.

Kumar, P. 2008. *Status of protected cultivation of vegetable by the farmers of Punjab*. M.Sc. Thesis, Punjab Agricultural University, Ludhiana, India.

Kumar, R. and S.K. Singh. 2014. Approaches adopted by extension workers for dissemination of improved pulse production technologies in Uttar Pradesh. *Journal of Food Legumes,* 27: 249-54.

Kumar, V.H.M.; M.K.M. Ali; S.S. Kumar; K.N. Ramana and G.V. Gowda . 2013. Personal and socio-psychological characteristics of the beneficiary farmers of community based tank management project and their relationship with socio-economic status. *International Journal of Advance Biology Research,* 3: 184-87.

Oladele, O.I. and S.S. Tekene. 2010. Factors influencing agricultural extension officers' knowledge on practice and marketing of organic agriculture in North West Province, South Africa. *Life Science Journal,* 7: 91-98.

Pandey, N.K. and R.K. Kushwaha. 2010. Knowledge level of agricultural officers regarding sustainable agricultural practices in Uttar Pradesh. *Indian Research Journal of Extension Education,* 10: 69-73.

Pandey, R.; R.P. Chaudhary; A.K. Chaturvedi and T.N. Rai. 2011. Level of knowledge and scientific orientation towards integrated pest management among vegetable growers. *International Journal of Agriculture Science,* 7(2): 396-99.

Qian, X.; G. Shen; Z. Wang; C. Guo; Y. Liu; Z. Lei and Z. Zhang. 2014. Co-composting of livestock manure with rice straw: Characterization and establishment of maturity evaluation system. *Waste Management,* 34: 530-35.

Rad, S.T.; A. Boz; S. Polatöz and H.C. Ates. 2011. Women's literacy and extension education in rural eastern Mediterranean Turkey. *African Journal of Agricultural Research,* 6: 2807-19.

Roy, P. and M. Kaur. 2016. Assessment of Farmers' Knowledge about Beneficial Effects of Application of Paddy Straw onto Soil in West Bengal. *Journal of Community Mobilization and Sustainable Development*, 11(1): 100-106.

Saito, K.A. and C.J. Weidemann. 1990. *Agricultural extension for women farmers in Africa*, World Bank Publications.

Silalertruksa, T. and S.H. Gheewala. 2013. A comparative LCA of rice straw utilization for fuels and fertilizer in Thailand. *Bioresource Technology,* 150: 412-19.

Singh, J.; L. Singh and G. Singh. 2013. Evaluation of crop residue potential for power generation for Indian state Punjab. *IOSR Journal of Agriculture and Veterinary Science,* 4: 99-112.

Singh, K. 2013. *Reactions of the trainees about three months training course of practical education in agriculture for young farmers organized by PAU Ludhiana*, M.Sc. Thesis, Punjab Agricultural University, Ludhiana, India.

Sunita, P.; R.K. Pandey; D. Singh; S.K. Pandey and A.K. Bajpai. 2018. Evaluation of Knowledge level of farm women and rural youth in post harvest technology. *Journal of Community Mobilization and Sustainable Development,* 13(3): 246-250.

Received on May, 2019, Revised on August 2019

Journal of Community Mobilization and Sustainable Development Vol. 14(2), 355-362, May-August, 2019

An Assessment on Value Chain Dynamics of Mango in Pratapgarh District of Uttar Pradesh

S.K. Dubey[1]*, Reshma Gills[2], U.S. Gautam[3], Atar Singh[1], R.R. Burman[4], Uma Sah[5], Bhaskar Shukla[6] and Rajeev Kumar Singh[1]

[1]Agricultural Technology Application Research Institute, Kanpur- 208002, Uttar Pradesh
[2]ICAR-Central Marine Fisheries Research Institute, Kochin-682018, Kerala
[3]Banda University of Agriculture and Technology, Banda-210001, Uttar Pradesh
[4]ICAR-Indian Agricultural Research Institute, New Delhi-110012
[5]ICAR- Indian Institute of Pulses Research, Kanpur- 208024, Uttar Pradesh
[6]Krishi Vigyan Kendra, Pratapgarh-229408, Uttar Pradesh

ABSTRACT

The study highlighted the pertaining market dynamics of mango value chains in the Pratapgarh district of Uttar Pradesh. Results of the investigation showed that mango production is a profitable venture for the farmer (BC Ratio = 4.12:1) with an average cost of production of Rs. 93100/ha and a net return of Rs. 384020/ha. Though, Uttar Pradesh is known for the high production level of mango, consumers need to abide burden on purchasing price (Rs. 31.70/kg) without adding much benefit to the producer's income (Producer share in consumer price is 50.47%). The explorative data collection method done in the study area revealed the existence of monopolistic marketing channel for the mango (C1: Producer-Whole Sellers-Retailers-Consumers). Estimated cost along the mango value chain showed that producers bore maximum share (82.27%) of total cost incurred followed by whole sellers (9.71%) and retailers (8.02%). Study findings highlighted the need of implementation of innovative market policies and pricing strategies for substantial increase in the famers income and considerable subtraction in the consumers price which otherwise taken as the huge market margin by the retailers and wholesaler.

Keywords: Value chain mapping, Cost of production, Profitability, Marketing channel, Market margin

INTRODUCTION

Mango (*Mangifera indica*) is the choicest fruits in India (Deependra and Singh, 2017) with great economic and cultural importance. It is one of the most prominently cultivated fruit in the world. With the vast number of native and improved cultivar of mango (about 1,000 varieties) (APEDA, 2019), India assumed the first position in the world mango production with more than 22 million tonnes of production (PIB, 2019) and almost half of the global supply. The interest and importance given in the mango segment is translated into its enhanced production (18 million tonnes during 2015-16 to 22 million tonnes in 2018-19) and productivity (Ademonla *et al.,* 2017) year after year in India with the advanced technological interventions. At the same time, as evident from various post harvest losses estimation studies conducted at different time gaps, a significant portion of mango production is wasted (12.74%, Nanda *et al.,* 2010; 15.6%, Murthy *et al.,* 2002; 17.9% Srinivas *et al.,* 1997; 20-30%, IIHR 2013; 34.49%, Moula *et al.,* 2017) which points to the poor handling and post harvest management aspects followed by different functionaries. Though the fruit has identified with huge market value creation and income fetching potentials (Rangegowda *et al.,* 2016; Sarada, 2013) the problem of large quantum of post-harvest lose associated with this especially at the farmers' level creating struggle in taking economic advantages from this important fruit crop by the farmers. Despite the fact that, India being the largest producer of mangos, the journey of mango from field to fork suffers from many hurdles like market inefficiencies, low consumer share in producer price, technological and infrastructural bottlenecks at the field level, which in turn reduces the profitability of the mango cultivation (IFPRI, 2013; Priyadarsini and Anshuman, 2014). Creation and development of the value chains (VCD) assumes

*Corresponding author email id: skumar710@gmail.com

significance at this juncture, as it will facilitate reduction in post harvest losses by proper management in attaining economically, socially and environmentally sustainable post production scenario (Gogh *et al.,* 2017; Pedro *et al.,* 2016).

Value chain concept introduced by Porter (1985) to create a strategic decision support system by analysing the activities and operations of a firm to produce and deliver the product and services to its consumers had made tremendous development in diversified areas like agriculture, health (Sharan *et al.,* 2015; Pitta and Laric, 2004), education (Dorri *et al.,* 2012), global economy and trade (WTO, 2019; UNIDO, 2015) etc. Value chains, by the conceptual definition itself are competing with each other for the profitability making and sustainability. With the innate nature of competitiveness in value chains, it is very difficult to make any strategic decision for the development aspects without an in-depth analysis of its dynamics. Hence value chain analysis (VCA) is very important prerequisite for any development oriented policy decisions especially in agriculture field where millions of people in the country finds a livelihood options. Value chain analysis not only has the single dimension of marketing channel analysis (Trond *et al.,* 2015; Goodwin and Harper, 2000; Suryavanshi *et al*., 2006) but also have diverse analytical tools and procedures which help to describe and visualize the process and quantity of the value creation through direct and supportive activities (ILO, 2007; ILO, 2015). Mango being an internally important and export oriented fruit cultivated in India, needs a meticulous analysis at each level in different value chains through which ultimately the fruit reaches to the consumers. The current research work there for was farmed and carried out with the aim of identifying the value chains present in the mango fruit production-postproduction scenario and capturing the value creation and its magnitude, agents and activity involved in it. The analysis conducted in this study was with the purpose of providing a knowledge map for the policy makers to suggest a profit feting marketing strategy to the farmers, and for the researchers and scientist to identify, develop and out scale the best innovations in it in comparable situations.

MATERIALS AND METHODS

Identifying value chains of a commodity like Mango and its analysis, is not as straightforward as it might seems due to the large number of players involved in it, starting from the point of sapling collection, cultivation, production and post production including marketing. Hence we planned to have a robust research design to capture all the aspects with a precision as we anticipated. Reference to Kerlinger and Rint (1986) and Landman (1988), we executed the research activities with an *expost-facto* research design of descriptive and diagnostic nature with special emphasis to reveal possible relationships of all value creating activities by observing existing condition or state of affairs and searching back in time for plausible contributing or supporting factors with complete description. The next step to do the research work was the sampling methodology. To get a holistic view regarding the mango value chains, we decided to have a representative sample from Uttar Pradesh. The state Uttar Pradesh and district Pratapgarh was selected logically and purposively as this state ranks first in mango production with a share of 23.47 per cent and highest productivity of 17.1 MT/ha (APEDA, 2019), which is even much higher than the national productivity (8.7 MT/ha) recorded. We followed a multistage random sampling procedure to select the final respondents. Thus the randomly selected 120 mango growers from 8 villages (15 each) (Bariyawan, Tewaripur, Kiyanwan and Priyawan from block Kalakankar and Jamethi, Barai, Gotani and Bhadri from block Kunda) and 10 whole sellers and 20 retailers (from Kalakankar and Kunda blocks) constituted the sampling frame for the study. The eloquent data collection methods like structured and semi structured interviews, group meetings and purposive focus group discussions were carried out to elicit the meaningful data. The interconnectedness of the variables and reasons identified for the structural relationships were triangulated with selected PAR tools to enhance its validity and reliability. Conscientious analysis of the value chain identified in the area with respect to the variables like cost of production, marketing efficiency, market cost and price spread, cost incurred and margin obtained in the marketing channel, producers' share in consumers' price etc. were carried out in a systematic method (with the prevailing price as observed at the time of data collection as base). The quantitative analytical methods used in this study also comprised of the incremental benefit-cost ratio analysis (INCBEN) (Mc Farland *et al.,* 1983; Kuo-Lung Yang *et al.,* 2004) and Marketing efficiency index (MEI) (Acharya and Agarwal 1987). Illustrative methodology of value chain mapping (FAO 2005) was also used in the description of the analysis results.

RESULTS AND DISCUSSION

Estimate of cost of production of mango: Estimation of the production cost is the first step in obtaining

profitability approximation of any crop production practice and also the necessary prerequisite for the value chain analysis. Production cost estimate revealed that average cost of production of mango in the study area (Rs/ha) is Rs. 93100/ha with maximum share of expenditure on land rent (43%) followed by harvesting cost (24%), labour (9.67%), irrigation (6%), fertilizer (6.44%), machinery (4.29%) and plant protection (5.9%). Similarly, a study by Bhosale *et al.* (2016) also observed Rs. 81,831/ha as the production cost. Since majority of the mango farmers were not having their own land to cultivate the mango, they used to lease in the land for cultivation or taking mango orchards with premature mango tree plants for which they need to pay major portion of the production cost (Rs. 40000/ha). Detailed cost estimate is given in Table 1.

Table 1: Average cost of production of Mango (N=120)

Cost Component	Amount (Rs/ha)
Labour	09000
Machinery	04000
Fertilizer	06000
Pesticide	05500
Land rent	40000
Harvesting and marketing Cost	22600
Irrigation Cost	06000
Total cost of production Rs/ha	**93100**

Since mango is very sensitive with the post harvest losses like weight loss and bruising due to the poor harvesting and handling (FAO, 2018), farmers used to give at most care in the harvesting time. It was well evidenced from the cost structure of the present study too as after the land rent major chunk of the production cost is going in the harvesting and marketing head (RS. 22600/ ha) (Table 1).

Returns and profitability of the mango cultivation: Returns were assessed with the magnitude of the average yield and the market price as observed by the respondent of the study. According to them the average yield of the mango in the study area was 240 qt/ha (Table 2) which was higher than the state average yield reported (APEDA, 2019). Average price obtained by the farmers for the mango fruits was Rs. 19.88/kg. BC ratio which shows the profitability of mango cultivation was observed as 4.12 (Table 2) which highlighted that high economic viability nature of the venture in the study area. A study by Kerutagi and Deshetti (2018) on two system of mango planting like traditional and high density planting came out with a BC ratio estimate of 1.49 and 2.00, respectively. Profitability analysis done by Luhach *et al.* (2007) showed a very high BC ratio of 5.8:1 for the mango cultivation in Haryana. In a study by Bhosale *et al.* (2016) on economics of the mango cultivation estimated an average price of Rs. 32/kg of mango with BC ratio of 1.60:1 in Kesar mango in plain zone of western Maharashtra. Datarkar *et al.* (2014), in their study observed an average income of Rs. 1,48,956.00/ ha for the mango cultivation with a BC ratio of 2.57:1 in Gadchiroli district of Maharastra. Comparative analysis of the present study results with similar studies done previously in different region showed that, though the cost of cultivation or gross income may show variation in spatio-temporal regime, all had normalness in the profitability estimation (all results were with BC ratio more than 1). Sah et al (2010) also did the similar analysis of potato in north eastern states of India.

Value chain mapping of Mango fruit: Value chain mapping is an innovative methodology in which an illustrative way of recording the process, activities, actors and the value created in a commodity with the reformative changes in space-time-form continuum (FAO, 2014). The method consisted of in-depth analysis of qualitative and quantitative factors associated with a commodity movement from pre production to consumption stage (transformation steps) and extending to consumer services through which the worth of the product or commodity increases at each nodes (Mc Cormick and Schmitz, 2001). In the present study value chain mapping of the mango has been done in a logical framework with the collection of the information on following aspects like i) Steps of transformation (Input Supplies, production, processing, wholesaling, retailing and consumption), ii) End Markets or consumers, iii) Actors like input suppliers, wholesalers, retailers iv) 4) Support Services like money lenders, financial institutions, information providers, research institutes,

Table 2: Yield, returns and benefit cost analysis of mango cultivation

Mango (N=120)	Yield (qt/ha)	Price (Rs./qt)	Gross Income (Rs/ha)	Net Income (Rs/ha)	B:C Ratio
	240	1988	477120	384020	4.12

government agencies, insurance agencies etc. to get a comprehensive picture of the value chain. Contrary to the hypothetical expectation of coexistence of many value chains (due to the high marketing values and huge demand), the study could identify a single value chain in the present project area utilized by the producer for disposal of mango. It was C1: Producer-Whole Seller- Retailers-Consumer. Detailed description of the same has been given in Figure 1.

Divergent to this findings a study conducted by Kshirsagar *et al.* (2019) identified five different channels for the marketing of mango i.e. i) Channel-I:(Producer-Wholesaler cum commission agent-Wholesaler-Retailer - Consumer), ii) Channel-II: (Producer-Wholesaler-Retailer-Consumer), iii) Channel-III: (Producer-Village merchant-Processor), iv) Channel IV: (Producer- Retailer-Consumer), v) Channel-IV: (Producer-Consumer). Similarly, Srikanth *et al.* (2015) were also observed a multi channel marketing system in mangos. At the same time Datarkar *et al.* (2014), in their study could identify only one channel of marketing (channel1: producer - consumer (NGO)] in mango with three market functionaries and 93.59 per cent producers' share in consumer's rupee. Another scientific enquiry (Sharad *et al.,* 2018) on the supply chain management of the mangos revealed existence of three channels i.e. Channel I: Producer-Commission agent-Wholesaler- Retailer-Consumer, Channel II: Pre-Harvest Contractor-

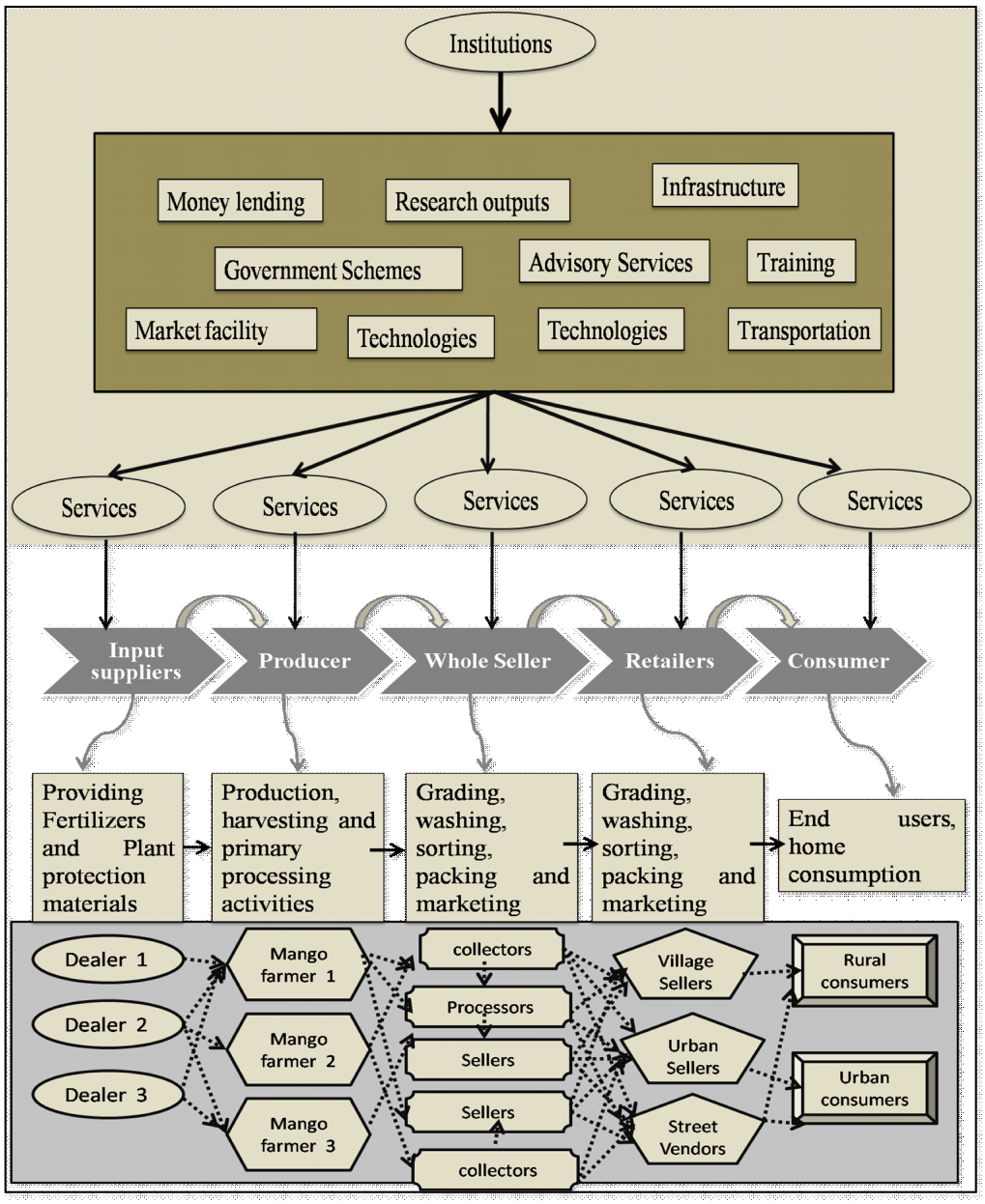


Figure 1: Comprehensive map of mango value chains in Uttar Pradesh

Commission agent- Retailer-Consumer and Channel III: Pre-Harvest contractor-Wholesaler-Retailer-Consumer. The strong linkages among all the stakeholders of marketing was felt desirable by Sah et al (2014).

Cost estimation, Economic return and Marketing margin through the mango value chain: In the identified marketing channel, component-wise marketing cost was computed and presented in Table 3. Results show that on an average, producer incurred Rs 388/qt of sold Mango as the production cum marketing cost. Whereas, whole seller incurred marketing cost of Rs. 45.80/q with maximum share on transportation (26.20%) followed by share on (22.48%) cost incurred towards grading and sorting and mandi charges (17.46%). The least proportion of marketing cost was for handling charges (5.46%) for the wholesalers. Further, from the same the table, it is evident that marketing cost incurred by the mango retailers were of relatively lesser order i.e. Rs 37.80/q with its relative proportion on different components in the same order as that for whole sellers. In the study area the retailers were selling the mango along the wayside using their own pulled carts and not using the market space. Hence they are devoid of the Mandi charges. Thus, from the table 3, it is well clear that producers bore maximum share (82.27%) of total cost incurred in the mango value chain followed by whole sellers (9.71%) and retailers (8.02%). Similarly, Datarkar *et al.* (2014), in their study identified that total marketing cost incurred by mango grower in transportation and market fees contributed higher in all among the cost components.

Table 3: Cost estimation along the value chains of mango

Particulars	C1: Producer-Whole Sellers – Retailers-Consumers	
	Amount (Rs/qt)	Proportion (%)
Producers Cost (Production cum marketing cost)	388.00	82.27
Expenditure incurred by Whole Seller/Total processing charge	45.80	9.71
Grading and sorting	10.30	22.48
Weighing cost	7.00	15.28
Transportation charges	12.00	26.20
Handling charges	2.50	5.46
Loading & unloading charges	6.00	13.10
Commission/Mandi charges	8.00	17.46
Expenditure incurred by retailers	37.80	8.02
Grading and sorting	10.30	27.24
Weighing cost	7.00	18.52
Transportation charges	12.00	31.75
Handling charges	2.50	6.61
Loading & unloading charges	6.00	15.87
Total cost	**471.60**	

Study showed that the consumer used to purchase mango in the study area at the rate of Rs 3170/q. But, mango producers were selling it at Rs 1988/q to the whole sellers with a margin of Rs 1600/q. The wholesalers were used to get an average net margin of Rs 754/q in the mango marketing chain. In that only Rs. 45.80/q was incurred to the marketing cost and a huge proportion of Rs 708.2/q is the profit to them. Retailers, were purchasing the mango at the price of Rs 2742.00 /q and they had the net margin to the extent of Rs. 428/q (Table 4).

Table 4: Return earned by the different market functionaries in Mango value chains

Particulars	Channel C1 :Producer-Whole Seller- Retailers-Consumer (Rs/qt)
Net price received by Producer	1600.00
Whole Seller Purchase price	1988.00
Whole seller net margin	754.00
Retailer purchase price	2742.00
Retailer net margin	428.00
Consumer purchase price	3170.00

Likewise, the magnitude and relative shares of net return to various marketing partners were also worked out. As indicated in Table 4 and Table 5, in terms of net margin, producers' share was found to be highest (50.47%) in consumer price followed by whole sellers (23.78%) and retailers (13.50 per cent). In absolute terms however, this trends was reverse and producer had the lowest share (62.71%) and retailers had highest (100.00%). Wholesaler was identified with a share of 86.49 per cent in consumer price in the absolute terms.

In order to get a deeper insight in to the cost benefit relationship of the value addition practices at the wholesaler and retailer level an economic analytical tool called incremental benefit cost ratio which is mathematically equivalent and powerful to Net Present Value (NPV) was employed. For the estimation and computation of the proper ratio the cost component and benefit component of main group of value addition activities were grouped

Table 5: Differential proportion of net return for various marketing elements in Consumer price paid in Mango value chain

Particulars	Channel 1 (C1)	
	In terms of net margin	In absolute value terms
Retailer share in consumer price	13.50	100.00
Wholesaler cost in consumer price	23.78	86.49
Producer share in consumer price	50.47	62.71

Table 6: Incremental cost benefit analysis of mango value chain actors by various marketing functions

Particulars	C1: Producer-Whole Seller-Retailers-Consumer	
	GSW (Rs/qt)	TLH (Rs/qt)
Expenditure incurred by whole seller	17.30	20.5
Expenditure incurred by Retailer (Rs/qt)	17.30	20.5
Proportionate Benefit accrued (Rs/qt) for wholesalers	284.86	337.49
Proportionate Benefit accrued (Rs/qt) for Retailer	195.46	232.10
Incremental B:C ratio for whole seller	16.46	16.64
Incremental B:C ratio for retailer	11.23	11.32

in to two i.e. grading, sorting and weighing (GSW) and transportation, loading/ unloading and handling (TLH) was worked out objectively and presented in Table 6.

From expenditure point of view, retailers had more share of expenditure on GSW (54.23 per cent) and TLH (45.67%) as compared to whole seller (37.78% and 44.76%, respectively for GSW and TLH) even though the cost incurred for the GSW and TLH in absolute terms in both wholesalers and retailers were Rs. 17.3/qt and Rs. 20.5/qt, respectively. This increased proportion of cost experienced by the retailers is because of the lesser total marketing cost (Rs 37.80/q) experienced by them as compared to whole seller (Rs 45.80/q). The incremental benefit cost analysis revealed that wholesalers were able to make more profit as compared with the retailers by the cost incurred in GSW as there incremental BC ratio were 16.46 and 11.23 respectively for wholesalers and retailers. Similarly, in the case of TLH also wholesaler were able to make more benefit as incremental BC Ratio observed for them is 16.64 as compared with the incremental BC Ratio of the retailers (11.32). The comparative analysis of the expenditure on GSW and TLH for the wholesalers revealed that more proportion of the total cost is observed for TLH (37.78%) than GSW (44.76%). Similar pattern was observed in case of the retailers too as cost of the GSW and TLH is estimated as 45.67 per cent and 54.23 per cent respectively. But it could be observed from the table 6 that the incremental BC Ratio for the wholesalers and retailers with respect to GSW and TLH showed very little difference (as 16.46 and 16.64 for wholesalers and 11.23 and 11.32 for retailers for GSW and TLH respectively).

CONCLUSION

Value chains analysis is gaining an increased interest from all the sectors of agriculture as it exerts the thrust in the development process. It is quiet dynamic and surprising to see the changes in it for a single commodity from time to time at particular territorial boundary and place to place at a particular temporal framework. Hence the in-depth analysis of the value chain starting from the pre production stage to post selling stage is very important to suggest market policies and implement suitable marketing strategies. As mango being a potentially important fruit crop for profit making, the present study results are assuming significance. It showed the need of creating more market facilities in the study area for utilizing better competitiveness in marketing by the producers to reach the final consumer by overcoming the persistent monopolistic marketing channel. The burden of the consumers to bear the high cost for the mangos without reflecting on the farm gate price can be reduced substantially by devising proper marketing strategies and policies. Study results indicated the huge market margin taken up by the retailers and wholesaler which can be subtracted from the consumer's price if the farmers are empowered for the creation of direct marketing strategies through capacity development and training complimented with infrastructure support from the government.

REFERENCES

Sah, Uma, Shantanu Kumar Dubey and J P Sharma 2010. An analysis of seed potato marketing in north eastern states of India. *Jour. of Community Mobilization and Sustainable Development,* 5(2): 51-56.

Sah, uma, S.K. Dubey and S.K. Singh (2014). Roles and Linkages Analysis of Stakeholders of Pulses Research and Extension in Uttar Pradesh, India. *Journal of Community Mobilization and Sustainable Development,* 9(1), 23-28.

Acharya, S.S. and N.L. Agarwal. 1987. *Agricultural Marketing in India*. Oxford and IBH Publishing Company, New Delhi.

APEDA, 2019. MANGO. http://apeda.gov.in/apedawebsite/SubHead_Products/Mango.htm

Arinloye, A.D.D.; A. Degrande; VN. Fassinou Hotegni; A.R. Ebenezar; J.B. Bockarie; J.B. Nyemeck and K. Antoine. 2017. Value chain development for mango (*Mangifera indica*) around Outamba Kilimi National Park in Sierra Leone: constraints and opportunities for smallholders. *Agriculture & Food Security*, 6(14): https://doi.org/10.1186/s40066-017-0092-x

Bhosale, S.S.; K.G. Sonawane and V.A. Shinde 2016. Economics of Kesar mango production in plain zone of Western Maharashtra. *International Journal of Agriculture Sciences,* 8(45): 1912-11915.

Datarkar, S.B.; A.S. Darekar; U.T. Dangore and K.H. Parshuramkar 2014. Economic of production and marketing of mango in Gadchiroli district of Maharashtra. *International Research Journal of Agricultural Economics and Statistics,* 5(2): 278-283.

Deependra, Y. and S.P. Singh. 2017. Mango: History origin and distribution. *Journal of Pharmacognosy and Phytochemistry*, 6(6): 1257-1262.

Dorri, M.; M.H. Yarmohammadian and M.A. Nadi. 2012. A review on value chain in higher education. *Procedia - Social and Behavioral Science*s, 46: 3842–3846. doi:10.1016/j.sbspro.2012.06.157

FAO. 2005. Commodity chain analysis; constructing the commodity chain functional analysis and flow charts. http://www.fao.org/3/a-bq645e.pdf

FAO. 2014. Developing sustainable food value chains, guiding principles. http://www.fao.org/3/a-i3953e.pdf

FAO. 2018. Post-harvest management of mango for quality and safety assurance Guidance for horticultural supply chain stakeholders. http://www.fao.org/3/I8239EN/i8239en.pdf

Gogh, Bart van; H. Boerrigter; M. Noordam; R. Ruben and T. Timmermans. 2017. Post-harvest loss reduction : A value chain perspective on the role of post-harvest management in attaining economically and environmentally sustainable food chains. *Wageningen Food & Biobased Research (Wageningen Food & Amp; Biobased Research Report,* pp 1751–35.

Goodwin, B.K. and D.C. Harper. 2000. Price transmission, threshold behaviour, and asymmetric adjustment in the U.S. pork sector. *Journal of Agricultural and Applied Economics*, 32(3): 543–553.

IFPRI. 2013. Mangoes: Understanding its Value Chain. https://southasia.ifpri.info/2013/10/22/mangoes-understanding-its-value-chain/

IIHR. 2013. Post harvest losses in selected fruits and vegetables in India (A Compilation). https://iihr.res.in/sites/default/files/post per cent20harvestfinalcolour_0.pdf

ILO. 2007. An operational guide to local value chain development. https://www.ilo.org/wcmsp5/groups/public/—ed_emp/—emp_ent/— ifp_seed/documents/instructional material/wcms_101319.pdf

ILO. 2015. A rough guide to value chain development. How to create employment and improve working conditions in targeted sectors. https://www.ilo.org/wcmsp5/groups/public/—ed_emp/—emp_ent/—ifp_seed/documents/publication/wcms_366005.pdf

Kerlinger, F.N. and N. Rint. 1986. Foundations of Behaviour Research. London, Winston, Inc

Kerutagi, M.G. and M.B. Deshetti. 2018. Comparative Economics of Traditional viz. High Density Mango Cultivation in Karnataka. *Indian Journal of Hill Farming*, Special Issue, pp 76-86.

Kshirsagar, P.J.; S.M. Shigawan; S.S. Wadkar and J.M. Talathi. 2019. Marketing efficiency of mango in South Konkan region. *International Research Journal of Agricultural Economics and Statistics,* 10(1): 51-58.

Kuo-Lung Yang; Peter Chu and Wen-Tai Chouhuang. 2004. Note on incremental benefit/cost ratios in analytic hierarchy process. *Mathematical and Computer Modelling*, 39(2-3): 279-286. https://doi.org/10.1016/S0895-7177(04)90011-8

Landman, W.A. 1988. Navorsingsmetodologiese Grondbegrippe. Pretoria: Serva.

Luhach, V.P.; R.K. Khatkar; Anil Godara and S.K. Mehta. 2007. Cost of cultivation and returns from mango orchard. *Haryana Journal of Horticultural Sciences*, 36(3/4): 266-267.

Mc Farid, F.; D.W. Johnston; C. Chen; M.A. Laverde and B.S. Rihani. 1988. Feasibility of incremental benefit-cost analysis for optimal allocation of limited budgets to maintenance, rehabilitation and replacement of bridges, report No. FHWADP-71-02, Federal Highway Administration, Washington, D.C.

McCormick, D. and H. Schmitz. 2001. Manual for value chain research on homeworkers in the garment industry. Brighton, UK: Institute of Development Studies (IDS), University of Sussex.

Moula Sab, M.B.; Ashok and S.N. Sudhakara. 2017. Estimation of post-harvest losses of mangoes at different stages from harvesting to consumption. *Int. J. Curr. Microbiol. App. Sci.*, 6(12): 310-318.

Murthy, S.D.; T.M. Gajanana; M. Sudha and K.V. Subramanyam. 2002. Post harvest loss estimation in mangoes at different stages of marketing-A methodological perspective. *Agricultural Economics Research Review*, 15(2): 188-200.

Nanda, S.K.; R.K. Vishwakarma; H.V.L. Bathla; Anil Rai and P. Chandra. 2010. Harvest and post harvest losses of major crops and livestock produce in India. All India Coordinated Research Project on Post Harvest Technology (ICAR), Ludhiana.

Pedro, R.G.; G.P. Ricardo Trippia dos; C.T.A. Juan and R.H. Humberto. 2016. Value chains for organic products in neighbouring municipalities of Rio de Janeiro, Brazil. *Agroecology and Sustainable Food Systems*, 40(4): 352–380. http://dx.doi.org/10.1080/21683565.2015.1137531

PIB, 2019. Production and Export of Mangoes. http://www.pib.nic.in/Pressreleaseshare.aspx?PRID=1562530

Pitta, D.A. and M.V. Laric. 2004. Value chains in health care. *Journal of Consumer Marketing*, 21(7): 451–464. doi:10.1108/07363760410568671

Porter, M.E.1985. Technology and competitive advantage. *Journal of Business Strategy*, 5(3): 60-78. DOI: https://doi.org/10.1108/eb039075

Priyadarsini, P. and P. Anshuman. 2014. Supply chain management of mango: A case study of South Orissa. *The International Journal of Business & Management*, 2(6): 362-364.

Rangegowda, R.; I.P. Amratraj and S. Lokesh. 2016. Value chain analysis of mango - A study in Karnataka. *Advances in Life Sciences,* 5(15): 5668-5675.

Sarada, G. 2013. Marketing System of Mangoes in India. *World Applied Sciences Journal*, 21(7): 1000-1007.

Sharad, Y.; S. Mishra and J. Rai. 2018. Economics of marketing of mango in district Lucknow, U.P., India. *Plant Archives*, 18(1): 713-716.

Sharan, A.D.; G.D. Schroeder; M.E. West and A.R. Vaccaro. 2015. Understanding a value chain in health care. *J. Spinal Disord Tech.*, 28(8): 291-293. doi: 10.1097/BSD.0000000000000319

Srikanth, H.S.; T.N. Venkata Reddy; P.S. Prasanna Kumar and G. Ranganath. 2015. Study on marketing channels for mango in Srinivasapura taluka of Kolar district. *International Research Journal of Agricultural Economics and Statistics,* 6(2): 260-266.

Srinivas, R.N.; T. Venkatesha Reddy; P.C. Ravi; Lalitha Achoth and B.V. Chinnappa Reddy. 1997. Post-harvest loss assessment in totapuri and alphonso mangoes. *Journal of Food Science and Technology*, 34(1): 70-71.

Suryavanshi, B.P.; D.V. Nagure; M.U. Yadav; A.S. Solanke and K.D. Phuke. 2006. An economic analysis of tomato marketing in Latur district of Marathwada. *Region Journal of Soils and Crops*, 16(1): 135-138.

Trond, B.; C. Anna; L. Audun and M.D. Madan. 2015. Value chain dynamics and the small-scale sector: A summary of findings and policy recommendations for fisheries and aquaculture trade. *Aquaculture Economics & Management*, 19(1): 148-173. https://www.tandfonline.com/doi/full/10.1080/13657305.2015.994241

UNIDO. 2015. Global Value Chains and Development: UNIDO's Support towards Inclusive and Sustainable Industrial Development. https://www.unido.org/sites/default/files/2016-03/GVC_REPORT_FINAL_0.PDF

WTO. 2019. Global Value Chain Development Report, Technical innovation, supply chain trade, and workers in a globalized world. https://www.wto.org/english/res_e/publications_e/gvcd_report_19_e.htm

Received on July, 2019, Revised on August 2019

Journal of Community Mobilization and Sustainable Development Vol. 14(2), 363-367, May-August, 2019

Impact of Skill Development and Transfer of Production Technologies on the Socioeconomic Status of Tribal Communities: Case of Tribal Sub Plan in Bihar

Shridhar Patil[1], R.K. Sohane[2], Ajoy Kumar Singh[3] and Dharmedra Kumar[4]

[1]Assistant Professor cum Junior Scientist, Bihar Agricultural University, Sabour

[2]Director Extension Education, Bihar Agricultural University, Sabour

[3]Vice Chancellor, Bihar Agricultural University, Sabour

[4]SMS, Animal Science, KVK, Banka

ABSTRACT

The present study was conducted to assess the impact of income source diversification efforts made under the tribal sub plan project implemented in Banka, Kishanganj and Katihar Districts of Bihar State. A random sample of 300 project beneficiaries was selected from the project area and the impact was assessed using *uncontrolled before-and-after* Research Design. It was observed that, as a result of project interventions, the income from non-farm activities has increased by 23 per cent ($p < 0.01$), proportion of severely and moderately food insecure households have reduced by 6.67 per cent each whereas food secure and moderately food insecure households have increased by 4.00 and 9.33 per cent, respectively. It was also observed that project intervention has resulted in significant increase in the milk, egg and meat productivity among beneficiary households. On the basis of findings of the study, it is suggested to promote additional income generating activities in the tribal areas and reduce their shear dependence on farming activity for livelihood security.

Keywords: Tribal Sub Plan, Impact assessment, Income source diversification

INTRODUCTION

Across the country, scheduled tribes (ST) communities are deprived of their rights, privileges and the socio-economic development from historical times (Kijima, 2006). This deprivation from socio-economic development is more prominent among scheduled tribes in the eastern region of India, especially Bihar, Jharkhand and Odisha. Bihar is one of the states having sizeable proportion of scheduled tribes in India. As per the Census of India (2013), there are 32 scheduled tribes in Bihar with a population of 1.34 million constituting 1.28 per cent of state's total population.

Socio-economic status indicators including health, education and income of tribal population in east India, especially in Bihar reflect a bad situation. According to Ministry of Tribal Affairs (2013) nearly half (49 per cent) of the ST population in Bihar is illiterate and 71 per cent of them drop out from formal education between class I and X. On the front of health and nutrition, it has been reported that maternal mortality and infant mortality rates among ST population in Bihar are as high as 30 and 77, respectively. It has been reported that, malnutrition among children and women is much prominent in the tribal communities (Sharma and Rathore, 2013). The 44 per cent of children of woman from tribal communities have stunted growth and 45 per cent are underweight (International Institute for Population Sciences (IIPS) and ICF, 2017). The incidence of anemia, iron deficiency etc. are rampant among tribal women.

The relative performance of economic indicators is also poor among the tribal communities. According to Ministry of Statistics and Programme Implementation (2016) average income of tribal households is around 9 per cent lesser as compared to average farm income. Further, it has been reported that around 40 per cent of income share is from unskilled wage labour. Recent survey on employment situation have revealed that only 8.4 per cent of tribal population is self employed in sector other than agriculture whereas nearly 47 per cent of the population works as regular wage earning or casual laborer. Among rest of 24 per cent of tribal population who are self employed in agriculture sector, 90 per cent have

marginal landholdings of less than a hectare (Ministry of Statistics and Programme Implementation, 2015). United Nations Conference on Environment and Development has put forward the idea of sustainable livelihoods which emphasizes on ensuring adequate and sustainable flows of food and cash to meet basic needs (Barua *et al.,* 2013).

These issues of low income, poor education and the consequent situations of malnutrition, livelihood insecurity and miserable standard of living are all interrelated and mutually influence each other. Conventional approaches like enhancing crop productivity of the marginal holdings or increasing opportunity to undertake unskilled wage labour activities will be inadequate in addressing these issues. Rather there is a need to develop a comprehensive approach that emphasizes not only on increasing productivity of existing economically productive assets but also emphasizes on facilitating and building capacity among tribal people to undertake additional income generating activities. Keeping this need in mind, a project under the tribal sub plan scheme was implemented in the tribal regions of Bihar.

MATERIALS AND METHODS

The project titled Enhancement of Livelihood Security of Scheduled Tribe Communities through Agro-technological was implemented under Tribal Sub Plan (TSP) scheme during the period of 2016 to 2019 in 33 villages of Banka, Kishanganj and Katihar districts of Bihar. As a part of programme interventions, the vocational skills were developed among more than 1200 tribal households for management of backyard poultry, kitchen gardening, mushroom cultivation, livestock management and bee keeping. In order to promote the skill implementation, basic inputs and technical advisories were also provided simultaneously.

After three years of project implementation, the intermediate socio-economic impact of project was studied using *uncontrolled before-and-after* Research Design. This design was selected as it is most useful in demonstrating the immediate impacts of short-term programs (Robson *et al.,* 2001). Using the semi structured interview schedule, data was collected from randomly selected 300 project beneficiary households on socio-economic indicators before and after the implementation of project. The statistical significance of change in the socioeconomic indicators was tested using paired sample t-test for proportions and paired sample t-test for sample means. Impact of project was studied in terms of income source diversification, creation of productive assets, employment generation, enhancement in livestock productivity and household food security.

Similarly, the intervention impact on household food security was measured using standardized Household Food Insecurity Access Scale developed by Coates *et al.* (2007). The measurement instrument follows a progression starting with anxiety about food supply, to quantity of food, quality of food, and finally sleeping hungry without eating (Knueppel *et al.,* 2010).

The Employment generation was measured as number of additional mandays of economically productive work generated by the additional income generating activities. Livestock productivity was measured as average body weight (kg) for goats, average milk production (gm) per day per cattle. The productivity of poultry birds was measured in terms of number of eggs laid per year per bird and the average body weight (kg) attained by the bird.

RESULTS AND DISCUSSION

It was observed that, prior to the project inception, the wage labour was major contributor to the household income (37 per cent) followed by farming (35 per cent). The income earned from allied sector activities was very low (23 per cent). This indicates poor income source diversification and heavy reliance of households on agriculture and unskilled wage labour activities for livelihood. Heavy reliance on enterprises like small holding agriculture yield uncertain and smaller incomes, making households more insecure.

As the consequence of project interventions, the income contribution of non-farming activities has increased significantly from 23 per cent to 45 per cent, reducing households' reliance on farming activities. This increment in non-farm income is expected to bring about economic stability in households by reducing the impact of uncertainties of farming. Creation of additional income generating opportunities like backyard poultry management, bee keeping, mushroom cultivation as well as improvement in livestock productivity have resulted in significant improvement of income source diversification index from 1.16 to 4.01.

Majority of the rural workforce is suffering from disguised unemployment. The additional income generating activities promoted under this project have created

Table 1: Income source diversification before and after project intervention

	Income from farming	Wage labour Activity	Income from other sources	Income source diversification (ISD) index
Before	35 %	37 %	23 %	1.16
After	22 %	33 %	45 %	4.01
p (t-test)	<.001	< 0.05	<.001	<.001

employment opportunities among scheduled tribes. These interventions are low input labour intensive activities having high potential for income generation on sustainable basis. It was observed that, in the families where beekeeping was introduced, the activity has provided 15 additional days of employment, followed by mushroom cultivation (08 days), Kitchen Gardening (05 days) and backyard Poultry (03 days).

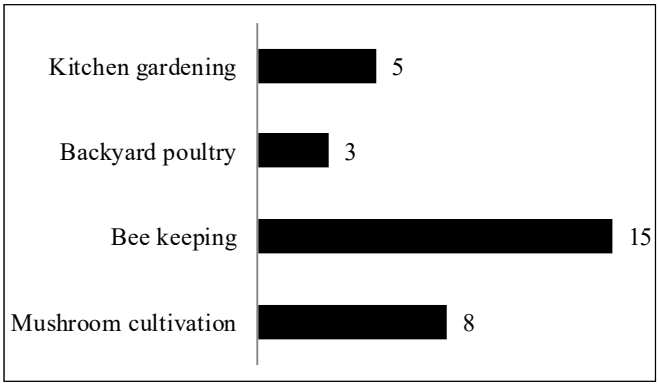


Figure 1: Average No. of employment day generated/ household

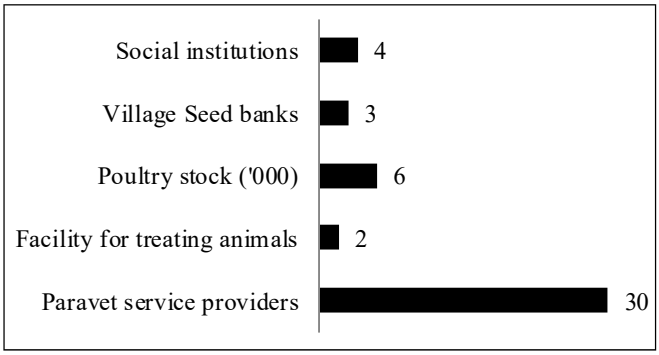


Figure 2: Creation of productive assets, Social institutions

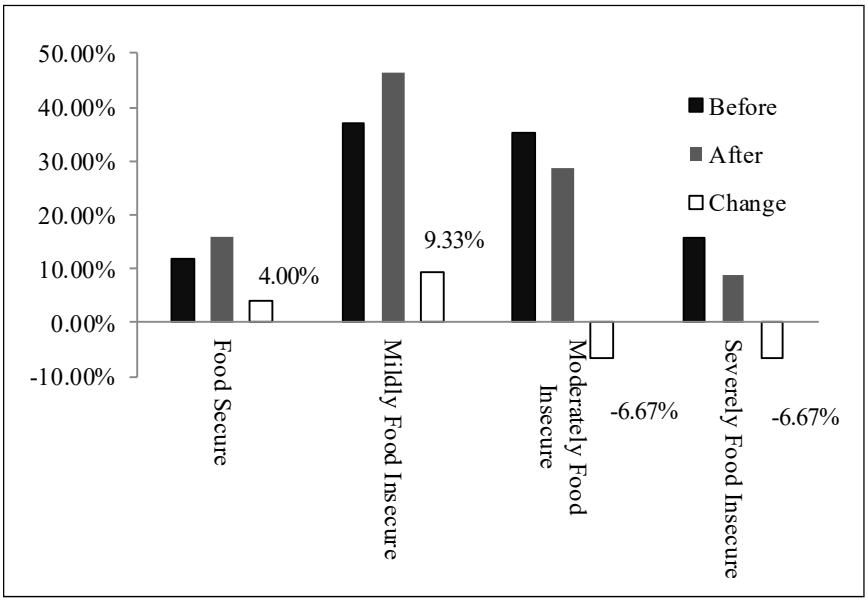
Besides creating additional income generating employment opportunities, efforts were also made under this project for mobilization of farmers into groups, creation of community based service centers and Social institutions, development of skilled local service providers and enhancement of productive assets like poultry birds, animal treatment facilities etc. As a result of this project four Self Help Groups (SHGs) were formed, three village seed banks were established, two animal health treatment facilities were created, 30 paravet service providers were developed and poultry bird population was enhanced by 6000 counts. In order to improve the productivity of livestock and poultry, a number of interventions were made under this project. Dual purpose poultry bird breeds like Giriraj and Vanraj were introduced, animal health camps and immunization drives were organized and the capacity building activities were carried out to improve animal health and nutrition management practices.

As a cumulative effect of these efforts, it was observed that, milk productivity enhanced by 301 grams among milch animals (155 per cent), average poultry bird body weight increased by 1.38 kg (156.82 per cent), egg production has increased almost by two folds (93.02 %), Goat meat productivity increased by 1.63 kg (26.94 per cent) and the proportion of animal conceived with AI has increased from mere 1.50 per cent to 27.00 per cent. It was found the increase in productivity realized among milch animals, poultry birds as well as the goats was statistically highly significant. Introduction of year round kitchen gardening (including seasonal vegetable production and planting of fruit trees like banana, papaya, mango and guava in the homestead area) and backyard poultry have ensured

Table 2: Impact on livestock and poultry productivity

Parameter	Before	After	Absolute Change	% change	*p*
Milk productivity (lit/day)	0.20	0.51	301 gm	155.00	< 0.01
Poultry body weight (kg)	0.88	2.26	1.38 kg	156.82	< 0.01
Egg production /annum/bird	43	83	40	93.02	< 0.01
Goat body weight (kg)	6.05	7.68	1.63 kg	26.94	< 0.05
% animal conceived with AI	1.50	27.00	—	25.50	< 0.01

Figure 3: Impact on Household Food Insecurity (HFI) status



year round availability of vegetables, fruits, eggs and meat which consequently has made significant contribution towards reduction of household food insecurity. In this study, contribution of project interventions in reducing household food insecurity was quantified by using the standardized Household Food Insecurity Access Scale developed by Coates Swindale and Bilinsky (2007).

It was observed, as a result of the project interventions, the proportion of severely and moderately food insecure households have reduced by 6.67 per cent each and these households have moved to mildly insecure and food secures categories. Proportion of food secure households increased by 4 per cent and the mildly food insecure households has increased by 9.33 per cent.

CONCLUSION

The large majority of working population in the tribal areas holds and operates marginal holdings. Enhancing productivity of these lands alone will be an inadequate instrument for doubling their income and improving their socio-economic condition. Rather there is a need to emphasize on reducing the dependency of tribal communities, particularly that of landless laborers, on the farming activities as a source of livelihood. Policies and strategies targeted towards such communities must emphasize on promoting low input additional income generating activities that can have holistic influence on the range of socio-economic parameters including, income, health, nutrition and social capital development. This will not only increase the households' income but also aids in reducing dependency of tribes on agriculture and wage labour activities and mitigates the adverse impact of failure of farm production activities on the livelihood of households.

REFERENCES

Barua, S.; M. Wason; P. Singh and R.N. Padaria. 2013. Impact assessment of Tribal Sub Plan (TSP) on livelihood security of the beneficiaries in West Bengal. *Journal of Community Mobilization and Sustainable Development*, 8(2): 212-217.

Census of India. 2013. *List of notified Scheduled Tribes*, 2013 Retrieved from http://censusindia.gov.in/Tables_Published/SCST/ST Lists.pdf

Coates, J.; A. Swindale and P. Bilinsky. 2007. *Household Food Insecurity Access Scale (HFIAS) for Measurement of Food Access: Indicator Guide (v. 3)*. Washington, DC: Food and Nutrition Technical Assistance Project, Academy for Educational Development.

Eccles, M.; J. Grimshaw; M. Campbell and C. Ramsay. 2003. Research designs for studies evaluating the effectiveness of change and improvement strategies. *BMJ Quality & Safety*, 12(1): 47-52.

International Institute for Population Sciences (IIPS) and ICF. 2017. National Family Health Survey (NFHS-4), 2015-16: India. Mumbai: IIPS.

Kijima, Y. 2006. Caste and tribe inequality: evidence from India, 1983–1999. *Economic Development and Cultural Change,* 54(2): 369-404.

Knueppel, D.; M. Demment and L. Kaiser. 2010. Validation of the household food insecurity access scale in rural Tanzania. *Public health nutrition*, 13(3): 360-367.

Ministry of Statistics and Programme Implementation. 2015. Employment and unemployment situation among social groups in India. Report No. 563 (68/10/4). Retrieved from http://mospi.nic.in/sites/default/files/publication_reports/nss_rep_563_13mar15.pdf

Ministry of Statistics and Programme Implementation. 2016. Income, expenditure, productive assets and indebtedness of agricultural households in India. Report No. 576 (70/33/3). Retrieved from http://mospi.nic.in/sites/default/files/publication_reports/nss_rep_576.pdf

Ministry of Tribal Affairs. 2013. Statistical Profile of Tribes in India. Retrieved from https://tribal.nic.in/ST/StatisticalProfileofSTs2013.pdf

Robson, L.S.; H.S. Shannon; L.M. Goldenhar and A.R. Hale. 2001. Before-and-after design: A simple evaluation design. *Guide to Evaluating the Effectiveness of Strategies for Preventing Work Injuries: How to Show Whether a Safety Intervention Really Works. Druid Hills: Centers for Disease Control and Prevention*.

Sharma, A. and S. Rathore. 2013. Role of Media Mix in Imparting Nutrition Education among Rural Women in Uttarakhand. *Journal of Community Mobilization and Sustainable Development*, 8(1): 113-116.

Received on May, 2019, Revised on August 2019

Journal of Community Mobilization and Sustainable Development Vol. 14(2), 368-372, May-August, 2019

The Conflict and Chaos: The Indian Agrarian Psychic

N.K. Sharma[1]*, S.K. Acharya[2], Paras Nath[3] and Mani Bhushan[4]

[1]Assistant Professor-cum-Jr. Scientist, Department of Extension Education, BPSAC, Purnea, Bihar

[2]Professor and Former Head, Department of Agricultural Extension, BCKV, Mohanpur, West Bengal

[3]Associate Dean-cum-Principal, BPSAC, Purnea, Bihar

[4]Assistant Professor-cum-Jr. Scientist, Department of Extension Education, BPSAC, Purnea, Bihar

ABSTRACT

The present research is an empirical estimation of conflict among farming community, who are constantly struggling with their inherent traditional knowledge and aspiration for modern techniques of farming with the hope of running their agricultural enterprise profitably. The research was conducted in the village, Ghoragachha in West Bengal. Face to face interview was conducted with 75 farmers with pre tested interview schedule. Major statistical tools used were, correlation, stepwise regression analysis and path analysis and data were analyzed with the help of SPSS-16. The dependent variable, conflict, was empirically estimated by using a dummy variable constructed against a set of marker statement. It was found that, independent variables *viz.* irrigation index (x_{16}), adoption leadership (x_{17}), innovation proneness (x_{12}), economic motivation (x_{22}), utilization of cosmopolite source of information (x_{28}) and information seeking behavior (x_{29}) were positively and significantly correlated with the dependent variable conflict(y). Stepwise regression analysis revealed that independent variables *viz.* utilization of cosmopolite source of information (x_{28}), family education status (x_3), occupation (x_8) and irrigation index (x_{16}) were retained at the last step of regression explaining 29 per cent variance imbedded in the dependent variable conflict. It was also found in path analysis that, annual income (x_{13}) had both highest direct as well as indirect effect on the predicted variable, conflict and family education status (x_3) had highest individual indirect effect on as many as 19 other exogenous variables, with the residual effect 0.69 explaining 31 per cent variance embedded in predicted variable. In this research, negative cognitive behavior as a conflict in the psyche of the farmers have been analyzed for it management to bring sustainable progress in a farm ecology.

Keywords: Traditional, Modernization, Conflict, Chaos, Farm Ecology, Sustainability

INTRODUCTION

India is an agricultural country, where more than half of the workforce, about 58 per cent are engaged in agriculture for their livelihood. India has the 10 largest arable land resources. Gross value added by Agriculture, forestry and fishing is estimated as Rs. 17.67 trillion, in FY 2018. India is continuously in the process of transformation from the traditional approach of agriculture to modern agriculture. This transformation has not only brought some positive changes, but also negative behavior such as conflict towards sudden and dramatic impact of modernity and innovation.

Indian farmers' psyche is crippled due to contradiction that expenditure of the farmers such as on fuel consumption, electricity consumption, their children's education occurs on regular basis but they have to wait for harvesting of their crop to meet out their regular expenditure which is further seasonal, farmers who are responsible for the food security for the burgeoning population of the country are themselves food insecured, market value generated from the produce of small and marginal farmers are greater than that of larger farmers and farmers income is uncertain despite certain cost of input they apply in their farm enterprise. Conflict connotes strong negative, but at times it can exert positive effect. Conflict is a process in which groups or individuals recognize the existence of opposing interests between them and the possibility that this will result in significant thwarting. In a farm land conflicts, there is loss of not only agricultural productivity but also, terminates the social interaction of the community. The study finds that, on an average one farm household respondent waste more than one month and birr (Ethiopia monetory unit equal to 100 cent) 2445.72 annually to execute his/her case when the farm land conflict

*Corresponding author email id: narendrashrma358@gmail.com /acharya09sankar@gmail.com

went to the court. Moreover farmers loss 18.8 per cent to 23.2 per cent agricultural productivity. Farm land conflict hampers local and national development by mainly affecting rural agricultural productivity. (Siyum *et al*., 2015).

In a global study of human conflict from 10,000 BCE to the present day, it was found that for each standard deviation change in average precipitation and temperatures, the frequency of interpersonal violence increases by four per cent and intergroup conflict by fourteen per cent. (Kemenyi *et al.,* 2014).

Agriculture dominates the planet. Yet it has many environmental costs that are unsustainable, especially global food demand rises. Evaluation in different parts of the world are succeeding in attempts to resolve conflict between agriculture and wild nature. It was envisioned that coordinated global action in conserving land most sensitive to agricultural activities and policies that internalize the environmental costs of agriculture are needed to deliver a more sustainable future (Andrew *et al.,* 2015).

Commercial afforestation of agricultural land is often associated with social conflict over the perceived environmental, economic and social impacts of the plantations being established. Small scale afforestation by farmers is argued by many to have more positive and fewer negative impacts than large scale afforestation by non-farmers (Schirmer, 2007).

Farmers-herdsman conflict resolution initiatives should incorporate a careful consideration of all conflict contributing factors. Awareness and compliance with designated stock routes (situational variables) having coefficients -0.741and -0.662 respectively were particularly crucial in farmers variables conflict. Socio-economic, production, institutional and situational factors among farmers with Eigen values of 2.6412, 1.6103, 1.2456 and 1.0348 respectively were particularly were crucial variables of conflict (Adisa, 2010).

MATERIALS AND METHODS

Ex post facto method of research design was adopted for conducting research in village from West Bengal named, Ghoragachha, selected purposely. Structured interview schedule was pretested and taken as a tool for conducting survey with the 75 farmers from the village. Data collected, tabulated and analyzed with the help of statistical tools *viz*., Coefficient of correlation, step down regression and path analysis.

Independent variables: Age (x_1), education (x_2), family education status (x_3), educational aspiration (x_4), family size (x_5), male: female ratio (x_6), urbanization index (x_7), occupation (x_8), cropping intensity (x_9), farm size (x_{10}), expenditure allotments (x_{11}), credit load (x_{12}), annual income (x_{13}) , electricity consumption (x_{14}), fuel consumption (x_{15}), irrigation index (x_{16}), adoption leadership (x_{17}), scientific orientation (x_{18}), independency (x_{19}), innovation proneness (x_{12}), risk orientation (x_{21}), economic motivation (x_{22}), orientation towards competition (x_{23}), management orientation (x_{24}), production orientation (x_{25}), market orientation (x_{26}), social participation (x_{27}), utilization of cosmopolite source of information (x_{28}), information seeking behavior (x_{29}), training received (x_{30}), distance matrix (x_{31}) and drudgeries (x_{32}).

Dependent variables: The dependent variable (y), conflict, was empirically estimated by using a dummy variable constructed against a set of marker statement which was framed up with the help of item analysis techniques.

RESULTS AND DISCUSSION

Table 1 presents the Correlation coefficient of Conflict (y) with 32 independent variables. It has been found that the following variables *viz.* irrigation index (x_{16}), adoption leadership (x_{17}), innovation proneness (x_{20}), economic motivation (x_{22}), utilization of cosmopolite source of information (x28), and information seeking behavior (x_{29}), have recorded positive and significant association with the dependent variable, conflict (y_4).

Implication: Higher level of Irrigation Index indicates that a higher level of modernization too and every process of modernization involves a conflict between modernity and traditionalism. adoption leadership (x_{17}) also implies a complex but polyhedral interaction in a social value in terms of changing life styles and the cognate social institution. With the higher adoption leadership (x_{17}) conflict increases in areas of social status, accessing higher position with respect in society and also it invites, sometimes, indiscriminate use of agricultural chemicals and its polluted effect on the natural resources base. On the other hand innovation proneness (x_{20}) here also plays positively so far as community integration is in concern. Higher economic motivation (x_{22}), utilization of cosmopolite source of information (x_{28}) and information seeking behavior (x_{29}), all have together added to a pseudo-urbanite orientation based on modernizing agricultural and enterprising social lives.

Table 1: Correlation coefficient of Conflict (y) with 32 independent variables of village Ghoragachha, West Bengal (N = 75)

Independent variables	Coefficient of Correlation (r)
Age (x_1)	0.082
Education (x_2)	-0.029
Family Education Status (x_3)	-0.154
Educational Aspiration (x_4)	0.101
Family Size (x_5)	-0.054
Gender (x_6)	0.020
Urbanization Index (x_7)	-0.025
Occupation (x_8)	0.218
Cropping Intensity (x_9)	0.015
Farm size (x_{10})	0.140
Expenditure Allotment (x_{11})	0.074
Credit Load (x_{12})	0.046
Annual Income (x_{13})	0.064
Electricity Consumption (x_{14})	-0.060
Fuel Consumption (x_{15})	0.210
Irrigation Index (x_{16})	0.248*
Adoption Leadership (x_{17})	0.301**
Scientific Orientation (x_{18})	0.100
Independency (x_{19})	-0.007
Innovation Proneness (x_{20})	0.299**
Risk Orientation (x_{21})	0.199
Economic Motivation (x_{22})	0.239*
Orientation Towards Competition (x_{23})	0.064
Management Orientation (x_{24})	0.157
Production Orientation (x_{25})	-0.106
Market Orientation (x_{26})	0.051
Social Participation (x_{27})	0.098
Utilization of Cosmopolite Source of Information (x_{28})	0.349**
Information Seeking Behavior (x_{29})	0.344**
Training Received (x_{30})	-0.125
Distance Matrix (x_{31})	0.068
Drudgeries (x_{32})	-0.031

*Significant at 0.05%; **Significant at 0.01%

The Table 2 elicited that the following variables *viz.* utilization of cosmopolite source of information (x_{28}), family education status(x_3), irrigation index (x_{16}) and occupation (x_8) have been retained at the last step of regression analysis to justify the variables having attitudinal and psychological properties along with the element of modernization like irrigation index (x_{16}), and occupation(x_8) have been the predominant factor so far in characterizing conflict (y). R^2 being 0.296 it is to conclude that all the retained variables have explained 29.6 per cent variance embedded in the predicted variable, conflict (y).

Implication: Already in advanced villages of West Bengal have started taking rates of faster urbanization to create a rurbanite social system, wherein conflict, disagreement, oral conflict or alienation are decreasing to defy the community integration as well as cultural osmosis amongst and between different groups of clans. When enterprise and investment in agriculture especially in 'controlled agriculture', having connected to assured water and power sources, marketable surpluses are generating from piece of farm to put a signature on modernization amidst rurality amidst modernizations a reality or a postmodern eventuality.

Table 3 presents the path analysis of conflict (y) versus thirty two exogenous variables of Ghoragachha, wherein it has been found that variable, annual income (x_{13}) has exerted both highest direct as well as indirect effect on predicted variable, conflict (y). Family education status (x_3) has highest individual indirect effect on as many as 19 other exogenous variables. Residual effect being 0.691, it is to conclude that the entire exogenous variable has explained 31 per cent variance embedded in the predicted variable, conflict (y).

Implication: The variable, annual income (x_{13}) has recorded both highest direct effect and highest indirect effect on conflict status and this is to imply that Income does not ensure only access to resources but also an access

Table 2: Stepwise regression analysis of Conflict (y) versus 32 independent variables of village, Ghoragachha, West Bengal: Predominating variables retained at the last Step (N = 75)

Predictors	B	S.E.	Beta	t	R	R^2	R square Adjusted	SE Estimated
Utilization of Cosmopolite Source of Information (x_{28})	-1.077	0.270	0.415	3.991**				
Family Education Status (x_3)	-0.051	0.023	-0.230	-2.205*	0.554	0.296	0.256	0.71661
Irrigation Index (x_{16})	0.061	0.024	0.258	2.558**				
Occupation (x_8)	0.184	0.078	0.239	2.355*				

*Significant at 0.05%; **Significant at 0.01%

Table 3: Path Analysis of Conflict (y) versus 32 exogenous variables of village Ghoragachha, West Bengal (N = 75)

Variables	TE	TDE	TIE	Substantial Indirect Effect		
				I	II	III
Age (x_1)	0.082	0.063	0.019	**-0.077(x_3)**	0.042(x_8)	0.025(x_{15})
Education (x_2)	-0.029	0.129	-0.158	**-0.201(x_3)**	0.090(x_4)	0.077(x_{28})
Family Education Status (x_3)	-0.154	-0.429	0.275	0.166(x_4)	0.064(x_{28})	-0.064(x_{25})
Educational Aspiration (x_4)	-0.101	0.209	-0.310	**-0.340(x_3)**	0.056(x_2)	0.049(x_{28})
Family Size (x_5)	-0.054	-0.105	0.051	**-0.106(x_3)**	0.070(x_{28})	0.053(x_4)
Gender (x_6)	0.020	-0.005	0.025	0.067(x_{13})	-0.029(x_9)	-0.022(x_{25})
Urbanization Index (x_7)	-0.025	0.016	-0.041	-0.128(x_{13})	0.055(x_{12})	0.029(x_{28})
Occupation (x_8)	0.218	0.302	-0.084	-0.065(x_{23})	**0.051(x_3)**	-0.032(x_{16})
Cropping Intensity (x_9)	0.015	0.171	-0.156	-0.047(x_{25})	-0.046(x_{28})	0.035(x_{13})
Farm size (x_{10})	0.140	0.194	-0.054	0.115(x_{15})	0.064(x_{28})	0.052(x_{11})
Expenditure Allotment (x_{11})	0.074	0.072	0.002	-0.289(x_{13})	0.140(x_{10})	0.078(x_{15})
Credit Load (x_{12})	0.046	0.120	-0.074	-0.174(x_{13})	-0.064(x_8)	0.046(x_{16})
Annual Income (x_{13})	0.064	**-0.441**	**0.505**	0.145(x_{10})	0.076(x_{15})	0.057(x_{28})
Electricity Consumption (x_{14})	-0.060	-0.111	0.051	-0.068(x_{13})	**-0.067(x_3)**	0.038(x_{15})
Fuel Consumption (x_{15})	0.210	0.200	0.010	-0.167(x_{13})	0.112(x_{10})	**-0.093(x_3)**
Irrigation Index (x_{16})	0.248*	0.316	-0.068	-0.036(x_{19})	-0.035(x_{13})	-0.031(x_8)
Adoption Leadership (x_{17})	0.301**	0.205	0.096	-0.105(x_{13})	0.093(x_{28})	**-0.045(x_3)**
Scientific Orientation (x_{18})	0.100	0.033	0.067	0.094(x_{28})	**-0.081(x_3)**	-0.069(x_{25})
Independency (x_{19})	-0.007	-0.139	0.132	0.082(x_{16})	**-0.063(x_3)**	0.056(x_{13})
Innovation Proneness (x_{20})	0.299**	0.142	0.157	0.070(x_{28})	0.050(x_{17})	0.050(x_{16})
Risk Orientation (x_{21})	0.199	0.018	0.181	0.071(x_{17})	**-0.054(x_3)**	-0.045(x_{25})
Economic Motivation (x_{22})	0.239*	-0.049	0.288	-0.086(x_{13})	0.078(x_{16})	0.077(x_{17})
Orientation Towards Competition (x_{23})	0.064	0.138	-0.074	-0.142(x_8)	**-0.063(x_3)**	0.057(x_{17})
Management Orientation (x_{24})	0.157	-0.013	0.170	0.059(x_{22})	**-0.059(x_3)**	-0.056(x_8)
Production Orientation (x_{25})	-0.106	-0.200	0.094	**-0.137(x_3)**	0.049(x_4)	0.040(x_9)
Market Orientation (x_{26})	0.051	-0.017	0.068	**-0.107(x_3)**	0.069(x_{13})	0.060(x_{20})
Social Participation (x_{27})	0.098	0.115	-0.017	**-0.133(x_3)**	0.089(x_{28})	-0.071(x_{16})
Utilization of Cosmopolite Source of Information (x_{28})	0.349**	0.245	0.104	**-0.112(x_3)**	-0.103(x_{13})	0.078(x_{17})
Information Seeking Behavior (x_{29})	0.344**	0.075	0.269	0.150(x_{28})	-0.110(x_{17})	-0.101(x_{13})
Training Received (x_{30})	-0.125	-0.119	-0.006	**-0.101(x_3)**	0.076(x_{28})	-0.046(x_8)
Distance Matrix (x_{31})	0.068	0.025	0.043	0.048(x_{28})	0.038(x_{16})	0.035(x_8)
Drudgeries (x_{32})	-0.031	-0.025	-0.006	**-0.052(x_3)**	-0.047(x_{16})	0.037(x_4)
Residual Effect			0.6901			
Highest count			Family Education Status (x_3): 19			

*Significant at 0.05%; **Significant at 0.01%

to conflict as well. The variable, family education status (x_3) has routed the highest indirect effect of as many as nineteen variables to infer that education in the indomitable reasons both for conflict (y) and modernization, since it has got an incredible property to imbibe and steer effect of companionship for characterizing the flow of influence of other variable too.

CONCLUSION

Conflict brings difficulty, when it is earlier neglected. Recognition of such difficulties is a necessary condition in their solution. Conflict encourages the consideration of new ideas, which facilitate innovation and change. Need of the hour is to manage such difficulties of conflict, so that sustainable development process of transformation can be furthered. The simmering conflicts, due to non-remunerative nature of Indian Agriculture, a staunch contradiction between increasing cost and declining return , a widening gap between promises made and promises denied, if not redressed and, either estimated for its intervention points, it will lead to a serious psychic chaos and thereby social entropy to dislodge the operating social ecology of our country.

REFERENCES

Adisa, S.R. 2010. Farmers - Herdsman Conflict: A Factor Analysis of Socio-Economic Conflict Variables among Arable Crop-Farmers in North Central Nigeria. *J. Hum. Ecol.*, 30(1): 1-9.

Andrew, J.; Tanentzap *et al.* 2015. Resolving Conflicts between Agriculture and Natural Environment. *PLOS Biology.* (13) 9: e1002242. *https://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.1002242.*

Keymenyi, M. *et al.* 2014. The Impact of Conflict and Political Instability on Agricultural Investments in Mali and Nigeria. *Africa Growth Initiatives.* Brookings. Working paper 17.

Schirmer, J. 2007. Plantation and Social Conflict: Exploring the difference between small scale and large scale plantation forestry. *Small Scale Forestry and Rural Development: The Intersection of Ecosystems, Economics and Society*. Proceedings_20060531. p-437-449.

Siyum, A.B. *et al.* 2015. Farm Land Conflict and its Socio-Economic Consequences in Tahtay Qoraro, Tigray, Ethiopia. *International Journal of African and Asian Studies*. ISSN 2409-6938. Vol. 9.

Received on July, 2019, Revised on August 2019

Journal of Community Mobilization and Sustainable Development Vol. 14(2), 373-377, May-August, 2019

Theoretical Foundations of Agripreneurship Development Process: A Study of Best Practices, Facilitative Factors and Inhibitive Factors of Achiever Farmers

M.S. Nain*, Rashmi Singh, J.R. Mishra and J.P. Sharma
Division of Agricultural Extension, ICAR-Indian Agricultural Research Institute, New Delhi-110012

ABSTRACT

Promotion of entrepreneurship development has become an essential feature in the national development plans of most countries, and those that have adopted this strategy earlier than others are now reaping some success. In order to train the farmers to be entrepreneurial to manage agriculture not as a way of life but as an enterprise having capabilities for agri entrepreneurial endeavours, availability of factors of success of an agri-enterprise may help to replicate such examples in other areas as well. The present study is an effort to delineate the success factors along with best practices for agripreneurship development. It is established that hard policies usually provide assistance in the form of finance while soft measures include enhancing capabilities, technology and access to technology, physical infrastructure, and advice after the start. From the analysis of success factors and best practices of 52 cases it may be inferred that unique needs of rural youth can be addressed through a holistic approach that places high-quality small business and life skills training alongside relevant technical training.

Keywords: Entrepreneurial competencies, Best practices, Facilitative factors and inhibitive factors

INTRODUCTION

According to the World Bank (2018), 2.4 billion people live in an extremely poor condition spending less than US$1.90 each day. Most poverty measurements are introduced based on the poverty line that distinguishes the income and expenditure between low-income, poor, and non-poor households (Hagenaars and Praag 1985). Although income is an important measurement of poverty, it is not effective to capture the poverty (Chatterjee *et al.* 2014). Poverty eradication is one of the main issues that needs to be addressed by any development policy may be through micro-credit or training programs as part of Policy reforms in order to reduce poverty and income inequality. Average size of operational holdings as per different Agricultural Census of India is decreasing steadily over the years; it has come to 1.16 ha in the year 2010-11 from 2.8 ha of 1970-71. The farming situation gets precarious with steadily increasing population with an alarming unemployment rate. Promotion of entrepreneurship development has become an essential feature in the national development plans of most countries, and those that have adopted this strategy earlier than others are now reaping some success. Malaysia is an example of how an effective entrepreneurship development strategy can translate into employment generation, poverty alleviation, and reductions in disparities in opportunities and the quality of life of urban and rural people. A clear indication of that success is the low unemployment rates of barely 3 per cent over the last decade and overall reduction in poverty from 7.5 per cent in 1999 to 5 per cent in 2005 and 0.4 per cent in 2017. This is a notable achievement when considering that in 1970, 52 per cent of the population was living below the poverty line. The success finds its footage in the holistic approach and rural development strategies of the Malaysian government where importance was placed on the development of entrepreneurs, particularly in rural areas. By creating basic facilities, utilities and services, the Government can create a facilitative set up to establish enterprises by the entrepreneurs. Development of industrial estates, export promotion zones, special economic zones, etc. aims at, among other things, to create a facilitative environment for establishing enterprises in these areas. Similarly, the policy initiatives can also encourage prospective entrepreneurs to establish enterprises by providing them various incentives and concessions to offset

*Corresponding author email id: msnain@gmail.com

the initial costs involved in establishing enterprises. For the first time in India, a separate industrial policy titled 'Policy Measures for Promoting and Strengthening Small, Tiny, and Village Enterprises 1991 to develop small enterprises in the country was launched. To mitigate the precarious situation of unemployment and low income levels, entrepreneurship has emerged as the central force of economic growth and development. Farming must move towards agribusiness management and development of entrepreneurial competencies among farmers is essential. Entrepreneurial opportunities and special government provisions are helping agri-enterprises to be developed.

Delineation of factors of success of an agri-enterprise will enable to replicate such examples in other areas as well. Documentation of the successful farmers' experiences may be used as lessons learnt for other farmers. Best practices followed by achievers need to be highlighted so as to make relevant policy changes. Farmers may be trained to be entrepreneurial to manage agriculture not as a way of life but as an enterprise and trained cadre of youth having capabilities for agri entrepreneurial endeavours. Awareness, motivation, technical skill, right assistance and support from family at extension level and government and other organizational help to the entrepreneurs at policy level can strengthen capacities besides adding to the family income and national productivity (Nain *et al*., 2013). Extension agents can be trained to contact and organise women's group and conduct extension activities based on the understanding of gender issues (Nain and Kumar 2010). Individual's motivation, aspirations and entrepreneurial competencies trigger agripreneurship development whereas adoption of best practices, dodging of inhibitive factors and facilitative socio economic factors play sequential role in reaching agripreneurial success (Singh *et al.,* 2014; Nain *et al.,* 2015; Singh *et al.,* 2016).

THEORETICAL FOUNDATION

Integrated entrepreneurship development model and plan evolved as a result of SIET's experience realized that entrepreneurship development is a multi-disciplinary task, and should include at least five main components, namely: Local organization to initiate and support potential entrepreneurs till the break-even stage, inter-disciplinary approach, strong information support, training as an important intervention for entrepreneurial development, monitoring and evaluation, and institutional financing. The concept of entrepreneurship is decorated by various factors like 'innovation' 'organization building ability', gap-filling function, input completing etc. The persons with these traits are recognized to initiate and sustain the process of entrepreneurship. (Mahmud, 1974). Hayton *et al.* (2002), conceptualized link between culture and entrepreneurship as the impact of national culture on aggregate measures of entrepreneurship such as national innovative output or new businesses creation, the association between national culture and the characteristics of individual entrepreneurs and the impact of national culture on corporate entrepreneurship. Accordingly, cultural differences across societies can be reduced to four quantifiable dimensions: uncertainty avoidance (preference for certainty and discomfort with unstructured or ambiguous situations), individualism (preference for acting in the interest of one's self and immediate family, as distinct from the dimension of collectivism), masculinity (belief in materialism and decisiveness rather than service and intuition) and power distance (acceptance of inequality in position and authority between people). Using Hofstede's (1984) concept of culture, researchers have in general hypothesized that entrepreneurship is facilitated by cultures that are high in individualism, low in uncertainty avoidance, low in power-distance and high in masculinity (Hayton *et al*., 2002).

The educational incubation theory proposes that through creation of awareness and new orientation and knowledge entrepreneurial emergence is promoted and it is for this reason that educational development has attracted increase emphasis in many societies (Kuratko and Lafollette, 1986), (Kuratko, 1996) and (Block and Stumpf, 1992). Max Weber explained that society plays a big role in developing entrepreneurs through a set of values from which personal values and thinking pattern of people are based, and these in turn influence the decision by individuals positively or negatively towards entrepreneurship. This is because the individual draws his values from the social values, mores and institutional framework within which he lives (Van de Ven, 1993). Culture has great impact on the attitude and behaviour of individuals and their disposition to life and ultimately, whether or not an individual would develop and become entrepreneur. Religious characteristics like; hard work, thrift and an ascetic life of self-denial are all prescription for entrepreneurship. The general opinion is that emergence of entrepreneurs is a function of a number of motivational factors or conditions.

Human, social and cultural capital are often antecedents to acquiring financial capital and other resources needed to start a business, an institutional approach with its broad

meta-theory holds out the promise of developing entrepreneurship. As per institutional foundation of the entrepreneurship concept, both formal and informal institutions can legitimize and delegitimize business activity as a socially valued or attractive activity - and promote and constrain the entrepreneurial spirit (Aidis *et al.,* 2008; Veciana and Urbano, 2008; Welter, 2005). Depending on the level of resource support, entrepreneurial policies can be classified as being hard or soft (Storey, 2005). Hard policies usually provide assistance in the form of finance (loans and grants) while soft measures include counselling activities to entrepreneurs before business start-up, counselling at the start-up phase, facilitating financial assistance, enhancing technology and access to technology and improving access to physical infrastructure, or advice after the start.

MATERIALS AND METHODS

This paper is based on targeted interviews with the key informants from cross-section of people and experts. Focus Group Discussion (FGD) method has been applied to collect information on different entrepreneurs' situation. In addition, case study method is used to collect in-depth information on this issue. The emphasis has been given on qualitative analysis but some quantitative data has been used to supplement the qualitative analysis. Both qualitative and quantitative research approaches and procedures have been applied to explore pertinent information for this study.

Case development using personal interviews; collecting data for delineation of ; success factors for Agrienterprise development, facilitating linkages, marketing and supply chain study and communication pattern of the successful entrepreneurs in specialization of diversified Farming, fruit and vegetable cultivation, post-harvest processing and marketing, commercial seed production, dairying , poultry production, spice export, mushroom production and processing, specialty agriculture, processing and value addition in farm produce and new niches like vermicomposting were studied. The selection of entrepreneurs for the study was conducted on the basis of available records of recognition of farm entrepreneurs from different organisation. The 52 cases covered the 12 states namely; Andhra Pradesh, Assam, Delhi, Madhya Pradesh, Gujarat, Haryana, Himachal Pradesh, J&K, Rajasthan, Uttar Pradesh, West Bengal, and Uttrakhand. The data on entrepreneurial competencies and psychological parameters were collected on standard scales and analyzed with simple tools like frequency, weighted score and their mean etc.

RESULTS AND DISCUSSION

The case analyses revealed the best practices followed by these achiever farmers as: Crop Diversification, cultivation of high yielding varieties, quality seed production, development of innovative technology / farming methods, effective linkages with other agencies, having good marketing channels and frequent interaction with researchers on their own initiative.

The most important facilitative factor was found to be acquisition of adequate knowledge by farmers followed by their ability to assess opportunity to capitalize on and farmers' own innovativeness. The third rank was attributed to farmers' self-involvement in day-to-day enterprise activities and their passion to do things in an excellent manner. Urge for excellence has earlier been reported to be one of the critical component for entrepreneurship development. Case analyses revealed the most important inhibitive factor in success of agri-enterprises was found to be the lack of entrepreneurial competencies among farmers followed by getting critical technical guidance at the opportune time. The third rank was attributed to timely availability of inputs and market information and lack of avenues. Other factors, which were found to be inhibitive were - high cost of inputs, fluctuating demand, climate fluctuation and pest- disease attack, lack of infrastructure, technical specifications and food quality standards.

The study revealed that it is possible to build entrepreneurial competencies of farmers and farm women through appropriate training interventions, mentoring and linking them with other agencies. The process of agripreneurship development was found to be a dynamic interplay of self-sphere of the individual and environmental sphere resulting in the profit making venture marked by higher profits, yields, innovative behaviour and brand establishment. It was found that possessing entrepreneurial competencies like opportunity recognition, innovativeness, quality concern & need for achievement in tandem with adequate technical knowledge gear up an entrepreneur to take advantage of available resources into a profitable venture. Inhibitive factors were identified and it was found that, who bogged down by inhibitive factors present in environment, experienced failure whereas the others who capitalized the promotional factors available

in environment and dodged the inhibitive factors accomplished their targets and achieved success. The nature of support given to potential and established entrepreneurs which acted as facilitators were : financial support in terms of loans, subsidy, sales tax waiver or special rates of interest on loans for women entrepreneurs, motivational support in terms of awareness generation programmes and entrepreneurial motivation programmes, special process and product EDPs for skill enhancement, special marketing avenues, infrastructural support in terms of priority industrial sheds and providing import licenses on priority, mentorship and handholding and recognition / awards giving a positive boost to their efforts.

Among the inhibitors in the process of entrepreneurship development; lack of critical technical guidance and infrastructure emerged as the problem number one faced by the largest number of respondents (more than 75%). Even with so many schemes launched by the government to promote entrepreneurship, entrepreneurs felt lack of guidance as well as infrastructure as major problems which inhibited their journey towards entrepreneurship and further growth after establishing their units. Gupta *et al.* (2013) also reported lack of technical guidance as major constraint for dairy and poultry entrepreneurs. The other most frequent inhibitive factor was the lack skilled labour in the market to support the enterprise. The poor family support or even resistance from the family members and surroundings sometimes inhibited taking up entrepreneurship as a career. The next in the order listed by more than half respondents was that of marketing constraints. Proper market exposure, demand analysis and linkages on the part of respondents were lacking and the fluctuations in the market and lack of mobility for marketing impeded their growth as an entrepreneur. Other problems listed were lack of awareness, nonpayment by clients and non availability of guarantors. But if we segregate sample into low profit earners and high profit earners, though the first problem was that of lack of technical guidance and infrastructural constraints, marketing concerns emerged as the second most important problem for high profit earning entrepreneurs and skilled labour ranked third of the problems they verbalized. Low profit earners listed lacking resources, lacking labour and lacking awareness as the more important problems than marketing constraints, mobility constraints and guarantor non-availability. For high profit earners problem related with lack of awareness was at lower level. Thus it could be concluded that awareness has contributed towards efficacy of the entrepreneur and has earned more profits (Table 1).

Table 1: Best Practices and facilitative & inhibiting factors for agri enterprise development

Factors	Weighted mean score/Rank
Facilitative factors	
Farming Background	4.8
Innovativeness	4.7
Expert interaction	4.6
Marketing linkages	4.4
Entrepreneurial competencies	4.2
Nearness to market	3.9
Brand establishment	3.8
Niche market	3.5
Growing high value crops	3.5
Inhibitive factors	
Lack of critical technical guidance	4.83
Lack of infrastructure	4.62
Non availability of skilled labour	4.31
Fluctuating market demand	3.90
Lack of resources	3.54
Lack of awareness	3.30
Nonpayment by clients	3.10
Non availability of guarantors	3.05
Best Practices	
Recognizing opportunities in the surrounding	II
Diversified cropping	I
Innovative varieties developed and intercultural operations	III
Strive for excellence	IV
Concern for maintaining quality of products	VI
Use of latest recommended technology	II
Developing effective marketing linkages	IV
Maintenance of standards as per marketing requirements	V
Plantation timing to meet the market demand	III
Capitalizing on previous experience and one's own strengths	V
Ability to calculate profits and keeping track of leakages	VII
Networking with all stakeholders	IV

Although most rural populace are already engaged in informal agriculture in some way, they may not see it as an attractive or viable career option in view of the obstacles encountered. Nonetheless, increasing meaningful employment opportunities along the agricultural value chain

can give rural youth the chance to engage in productive work and overcome these challenges. As a young entrants into the agricultural sector often require a mix of both technical and soft skills. The unique needs of rural youth can be addressed through a holistic approach that places high-quality small business and life skills training alongside relevant technical training. Life skills development plays a particularly important role to help youth hone competencies such as self-confidence, creative thinking, risk taking, and decision making, along with skills, such as project and money management, that let them re-think entrepreneurship and agriculture as viable, personally meaningful, income-generating options. Many would be rural entrepreneurs, come from agricultural families, but lack the advanced technical knowledge needed to get ahead either by cultivating new products or adding value to traditional raw products. Appropriate programs can play a role in training young people across the value chain for agricultural-related jobs and to better understand the opportunities available to young people. Identifying and creating synergies between agriculture and other sectors may help youth to engage and participate more proactively to have the ripple effect of creating more income generation ventures.

REFERENCES

Aidis, R.; S. Estrin and T. Mickiewicz. 2008. Institutions and entrepreneurship development in Russia: a comparative perspective. *Journal of Business Venturing*, 23(6): 656-672.

Block, Z. and S.A. Stumpf. 1992. Entrepreneurship Education Research: Experience and Challenge in The State of the Art of Entrepreneurship, ed. Sexton, D. L and Kasarda, J.D, Boston MA: PWS-Kent.

Chatterjee, A.; S. Mukherjee and S. Kar. 2014. Poverty level of households: A multidimensional approach based on fuzzy mathematics. *Fuzzy Information and Engineering*, 6: 463–487.

Gupta, B.; S.K. Kher and M.S. Nain. 2013. Entrepreneurial behaviour and constraints encountered by dairy and poultry entrepreneurs in Jammu Division of J&K State. *Indian Journal of Extension Education,* 49(3&4): 126-129.

Hagenaars, A. and P. Bernard. 1985. A synthesis of poverty line definitions. *Review of Income and Wealth*, 31: 139–154.

Hayton James C., George Gerard and Zahr Shaker A. 2002. National culture and entrepreneurship: A Review of behavioral research. *Entrepreneurship Theory and Practice*, 26(4): 33-52. Available at: http://ink.library.smu.edu.sg/lkcsb_research/4642

Hofstede, G. 1984. Culture's Consequences. Beverly Hills: Sage, CA. http://www.yourarticlelibrary.com/essay/entrepreneurship-essay/impact-of-government-actions-on-entrepreneurship-development/41135

Kuratko, D.F. 1996. Risk, challenge & innovation: The entrepreneurial experience at Ball State University. *Mid-American Journal of Business*, 11(2): 43–48.

Kuratko, D.F. and R.N. Hodgetts. 1998. Entrepreneurship: A Contemporary Approach. Orlando, U.S.A.: The Dryden Press, Harcourt Brace College Publisher.

Mahmud, A.A. 1974. Developing effective indigenous entrepreneurs. *Malaysian Management Review*, 9(1): 47.

Nain M.S.; R. Singh; V. Sangeetha; S.S. Chandel; P. Kumar and J.A. Peer. 2013 Strategies for entrepreneurship development through fruit production in J&K State. *Agricultural Science Digest,* 33(3): 165-171.

Nain, M.S. and P. Kumar. 2010. A Study of Women Participation and Decision Making in Farm Management. *Journal of Community Mobilization and Sustainable Development*, 5(1): 67-71.

Nain, M.S.; R. Singh; J.P. Sharma; R.R. Burman and V.P. Chahal. 2015. Participatory identification and prioritization of agri enterprises in national capital region of India. *Indian Journal of Agricultural Science,* 85(6): 787-791.

Singh, R.; M.S. Nain; J.P. Sharma and J.R. Mishra. 2016. Developing agripreneurship for sustainable farm income: Action research study on women farmers of Hapur District, Uttar Pradesh. *Journal of Community Mobilization and Sustainable Development,* 11(1): 127-135.

Singh, R.; M.S. Nain; J.P. Sharma; J.R. Mishra and R.R. Burman. 2014. Institutional convergence of synergistic strengths for developing women agripreneurs. *Indian Journal of Extension Education,* 50(3&4): 1-7.

Storey, D.J. 2005. Entrepreneurship, small and medium sized enterprises and public policies. In: Acs, Z.J. and Audretsch D.B. (eds.), Handbook of Entrepreneurship Research, pp. 473-511.

Van de ven, A.H. 1993. The development of an infrastructure for entrepreneurship. *Journal of Business Venturing,* 8(3): 211-230.

Veciana María and Urbano David. 2008. The institutional approach to entrepreneurship research. *International Entrepreneurship Management Journal*, 4: 365–379.

Weber, M. 1930. The protestant ethic and the spirit of capitalism. New York: Scribners.

Welter, F. 2005. Entrepreneurship in its context(s): A review Paper for the NSF-DFG Conference "Contextualizing Economic Behaviour" August 21-23, 2008, New York City.

World Bank. 2018. Understanding Poverty. Available on: http://www.worldbank.org/en/topic/poverty/overview.

Received on July, 2019, Revised on August 2019

AUTHOR GUIDELINES

1. Society for Community Mobilization for Sustainable Development (MOBILIZATION) welcomes original articles. Articles (not exceeding 25,00-3,000 words) must be typed on one side of the paper, double-spaced, with wide margins on all four sides. An abstract (not exceeding 100-120 words) must accompany the article. The format followed must be Title, Name of the author(s), their affiliation, abstract, introduction, methodology, major findings, conclusion and reference.

2. E-mail the article in original as an attachment in MS Word to *journalmobilization@yahoo.com*. The author(s) should furnish a certificate stating that the paper has neither been published nor has been submitted for publication elsewhere.

3. Within the text, adopt the author-date method of citation minus the comma, for example, (Singh 2002). If more than one work of the author is cited, separate the years of publication with a comma (Pandey 1996, 1999). When more than one author is cited, the entries should be chronological with works of different authors separated by a semicolon (Pareek 1990; Sinha 1994; Dixit 1997). If gazetteers, reports and works of governmental organizations are cited, mention the name of the organisation/institution sponsoring the publication in the citation, fully spelt out at its first occurrence (Government of India 2003), and use its abbreviation/ acronym in subsequent citations (GOI 2003).

4. Give separately the bibliographic details of all works cited in the article under References in the following sequence: (a) Article: the name(s) of the author(s); the year of publication; title of the article (within single inverted commas); the name of the journal (italicised); and the volume number, the issue number, the beginning and ending page numbers. (b) Chapter in an edited work or compilation: the names(s) of the author(s); the year of publication; title of the chapter (within single inverted commas); the name(s) of the editor(s)/compiler(s); title of the book (italicized); the beginning and ending page numbers of the chapters; place of publication; and the name of the publisher. (c) Book: the name(s) of the author(s); the year of publication; title of the book (italicized); place of publication; and the name of the publisher. The listing in References must follow the alphabetical order of the last name of the (first) author.

5. Use British, rather than American, spellings (labour, not labor; programme, not program). Similarly, use's', rather than 'z', in 'ise', 'ising', 'isation' words.

6. Write numerals between one and ninety-nine in words, and 100 and above in figures. However, the following are to be in figures only: distance: 3 km; age: 32 years old; percentage: 64 percent; century: 20th century; and years: 1990s.

7. Contributors are also required to provide on a separate sheet their name, designation, official address and E-mail ID.

8. All tables, charts and graphs should be typed on separate sheet. They should be numbered continuously in Arabic numerals as referred to in the text.

9. Author(s) should be the life member of the Society.

CONTENTS

Contd.....

Printed and Published by Dr. J.P. Sharma, President, Society for Community Mobilization for Sustainable Development, Division of Agricultural Extension, IARI, New Delhi-110012