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EDITORIAL

The broad area of food security may be usefully disaggregated into questions relating to adequacy of food availability and stability of both food availability and access as food insecurity, inadequate caring behaviors, and poor health are the primary determinants. Integrated farming systems, home gardens, organic farming, conservation technologies, water management technologies are being taken care through extension system utilizing the new and proven extension methods like ICT, FLDs, mobile delivery services, farmers' forums, field day visits, seminars, and farmer field schools and so on. Several deficiencies and strengths are observed during the application of technologies at field level and the extension research system tries to explore the economic, social, human as well as environment concerns in order to customize the tools and technologies. Present issue of Indian Journal of Extension Education is a mix of research pursuits varying from group dynamics, ICT and its application in education, application of conservation technologies including water management, oilseed and pulses improvement, soil health management, effectiveness of extension agencies, dairy service delivery system, organic farming, nutritional gardening, pisciculture, fisheries, physiological work load of workers, and integrated farming system models.

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(Rabindra Nath Padaria)

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Group Dynamics Effectiveness of Women's Groups in Raipur District of Chhattisgarh

Payal Dewangan^{1*}, S.S. Vinayagam² and K.K. Shrivastava³

ABSTRACT

Women in formal groups show certain characteristics such as fellow feeling, co-operation, cordiality, sympathy, understanding, leadership, etc. among themselves. To utilize these potential quality attempts have been made for facilitating women's overall status by organizing them into a formal group. The groups function to provide a platform for each member of the group to identify and use opportunities for their growth and empower WGs/SHGs to collaborate with other institutions. Group dynamics is a phenomenon involving the group functions, its need, and the interaction among the members of the group. The research was performed in Raipur district of Chhattisgarh. Three villages were chosen from 2 selected blocks, and five women groups were selected from each village. A hundred and twenty respondents from thirty women groups were interviewed. Majority of respondents were found in medium category of group dynamics effectiveness dimensions such as participation, membership, influence, and style of influence, decision making procedure, task functions, maintenance functions, group atmosphere, interpersonal trust, norms, feelings and achievements in women's group and most of them had empathy at lower category. Sixty five percent of the women's group had medium overall Group Dynamics Effectiveness (GDE) category.

Keywords: Group dynamics effectiveness, Women's group

INTRODUCTION

A group is a collection of two or more people who communicate with each other on a reasonably continuous basis, recognize themselves as belonging to a special unit and share certain common operations and values. Self-Help Groups (SHGs) can be defined as a small and economically homogeneous group of rural poor people who are willingly created to save and mutually contribute to a common fund to be lent to its members. Self-help groups are seen as means for a range of objectives, including empowering women, creating management skills, and providing micro-finance services to disadvantaged communities that were otherwise hard to achieve directly through banks or other institutions.

Women's organizations assist the members to overcome exploitation, build trust for the rural poor's financial self-reliance, especially among women who are mostly invisible in the social structure. These organizations allow individuals to come together for a common goal and acquire power from each other while dealing with their daily challenge and long-term problems. Formation of the group enables them to work in synchrony and gain the advantages of dynamics that follow in a group. In this respect, group dynamics relate to systemic and interactive behaviours occurring within a social group. It is an influential interpersonal process as the inclination to participate in associations with others is the most significant feature of human humans. Group behaviours, and groups, in particular, leave an overbearing imprint on

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society. Group dynamics are also at the soul of understanding many social functions and divisions. Group is regulated through group dynamics.

METHODOLOGY

The study was conducted in the Raipur district of Chhattisgarh state. Two blocks were selected from Raipur district based on the highest and lowest number of SHGs under them). The two blocks selected were, Arang and Dharsiwa. From both the blocks selected, three villages were chosen at random from each, making a total of six villages (2 blocks x 3 villages). These were Baktara, Godhi, and Gujra (from Arang block); and Tekari, Mandhar, Dande-Kurd (from Dharsiwa block). Five groups from each village were selected randomly, thus making a total of 30 groups from all six villages. From each selected women's groups, 4 respondents were selected. Thus, from each block, the total number of respondents were 60 (15*4). Making the total number of respondents from both the blocks as 120 (60*2).

Lewin (1936) introduced the word group dynamics to describe the interaction of forces between group members in a social condition. It is the organizations inner nature as to how they are formed, what their structures and systems are, how they work and influence individual members, other groups, and the organization. Vipin Kumar (1998) recognized participation, membership, influence and style of influence, decision-making procedures, task functions, maintenance functions, group atmosphere, interpersonal trust, norms, feelings, empathy and achievements in women's groups as the dimensions for analysing group dynamics and developed a scale to measure the effectiveness of group dynamics.

The group dynamics consists of 12 sub-dimensions. viz, Participation, membership, influence and style of influence, decision-making procedures, task functions, maintenance functions, group atmosphere, interpersonal trust, norms, feelings, empathy and achievements in WG. The total score of all the sub-dimensions indicates the effectiveness of group dynamics score of an individual. Considering the mean and standard deviation of different dimensions of the effectiveness of group dynamics, the women in a different category of WGs were grouped into low, medium and high categories as follows:

S.No.	Overall category of GDE Criteria
1.	Low < (Mean - SD)
2.	Medium (Mean $\pm$ SD)
3.	High > (Mean + SD)

RESULT AND DISCUSSION

Level of Different Dimensions of Group Dynamics of Women in WGs

For effective functioning of the groups, there are various dimensions played an important role. In this study, 12 dimensions were selected such as participation, membership, influence, and style of influence, decision-making procedures, task functions, maintenance functions, group atmosphere, interpersonal trust, norms, feelings, empathy and achievements in SHG and the data in this regard are presented in Table 1.

The findings of the Table 1 revealed that except empathy, the majority respondents were found in medium category of group dynamics effectiveness dimensions viz. participation (45.8%), membership (60.8%), influence (60%), and style of influence (60.8%), decision-making procedures (55%), task functions (73.3%), maintenance functions (65%), group atmosphere (59.2%), interpersonal trust (62.5%), norms (60%), empathy (59.20%), feelings (46.7%), and achievements in SHG (50.8%). This result indicated that the number of attempts made by program representatives from government institutions, banks, and NGOs to guide and motivate individuals to participate and execute well in all activities. Besides, frequent contacts and visits of the professionals involved maintained the involvement and enthusiasm among the individuals.

Another interesting information provided in the table for dimension empathy. Nearly all the respondents were in a low category and high category having 70 and 30 per cent respectively. This also concluded that the majority of the respondents were found in the lower category. This points out for necessary improvement in empathetic attitude towards each other among the members of women's groups for meticulous execution and maintenance of performance and task functions. A

Table 1: Distribution of women respondents based on their level of different dimensions of group dynamics in Women's Groups

S.No.	Dimensions of Group Dynamics and Category	Frequency (n=120)	Percentage
1.	Participation (Mean = 25.02; SD = 1.89)		
	Low <23.13	30	25.00
	Medium 23.13-26.91	55	45.80
	High >26.91	35	29.20
2.	Membership (Mean = 19.21; SD = 1.40)		
	Low <17.81	20	16.70
	Medium 17.81-20.61	73	60.80
	High >20.61	27	22.50
3(a)	Influence (Mean = 21.32; SD = 1.01)		
	Low <20.31	31	25.80
	Medium 20.31-22.33	72	60.00
	High >22.33	17	14.20
3(b)	Style of influence (Mean = 47.83; SD = 3.24)		
	Low <44.59	22	18.40
	Medium 44.59-51.07	73	60.80
	High >51.07	25	20.80
4.	Decision making procedure (Mean = 25.51; SD = 1.25)		
	Low <24.26	23	19.20
	Medium 24.26-26.76	66	55.00
	High >26.76	31	25.80
5	Task Function (Mean = 12.74; SD = 2.27)		
	Low <10.47	24	20.00
	Medium 10.47-15.01	88	73.30
	High >15.01	8	6.70
6	Maintenance Function (Mean = 22; SD = 1.72)		
	Low <20.63	21	17.50
	Medium 20.63-23.37	78	65.00
	High >23.37	21	17.50
7	Group atmosphere (Mean = 25.79; SD = 2)		
	Low <23.79	19	15.80
	Medium 23.79-27.79	71	59.20
	High >27.79	30	25.00
8	Interpersonal trust (Mean = 17.41; SD = 1)		
	Low <16.41	25	20.80
	Medium 16.41-18.41	75	62.60
	High >18.41	20	16.60
9	Norms (Mean = 21.28; SD = 1.39)		
	Low <19.89	19	15.80
	Medium 19.89-22.67	72	60.00
	High >22.67	29	24.20
10	Feeling (Mean = 15.63; SD = 1.44)		
	Low <14.49	24	20.00
	Medium 14.49-16.77	56	46.70
	High >16.77	40	33.30
11	Empathy (Mean = 4.3; SD = 0.46)		
	Low <3.84	13	10.80
	Medium 3.84-4.76	71	59.20
	High >4.76	36	30.00
12	Achievements of WG (Mean = 55.51; SD = 2.40)		
	Low <53.10	31	25.80
	Medium 53.10-57.91	61	50.80
	High >57.91	28	23.40

genuine need for the personal consideration of the activities to encourage the empathic nature of members must for efficient group dynamics and sustainable performance of the groups.

Overall Group Dynamics Effectiveness (GDE) of Women's Groups

Continuous attempts by government and NGOs, the progress in women was noted and with the creation of organizations, they began to go for education and even for the marginal industry. The participants were categorized into three groups of their general GDE rate based on mean and standard deviation. The data of which are presented in Table 2.

Table 2: Distribution of Women Respondents Based on their Level of Overall Group Dynamics Effectiveness in Women's Groups

Overall Group Dynamics Effectiveness Category	Frequency (n=120)	Percent
Low	18	15.00
Medium	78	65.00
High	24	20.00

Mean= 313.55; SD= 13.23

Data presented in Table 2 revealed that maximum number (65%) of the respondents were in the medium category for GDE, whereas 20 per cent were found in high category followed by 15 per cent of the respondents were in the low category of GDE. The viable indications may be that all the operations conducted by the women's groups must be achieved with the maximum participation of all members. Dynamics function a very significant role in achieving appropriate group participation and execution. Thus most women's groups had medium to high GDE category. Only a few of the groups that were discontent with marketing and financial assistance had low on GDE category. These findings are in route with those reported by Baron and Byrne (1995); Dighe (1996); Stoner *et al.* (1996); Ray (1996); Vipinkumar (1998); Purnima (2005) and Bhatt (2009).

CONCLUSION

Majority of women members were having a medium category of all group dynamics effectiveness dimensions

viz. participation, membership, influence, and style of influence, decision making procedure, task functions, maintenance functions, group atmosphere, interpersonal trust, norms, feelings, empathy and achievements in women's group. Majority of women's groups were distributed in the medium category of overall Group Dynamics Effectiveness (GDE). This indicates the increase in group dynamics effectiveness due to more engagement of the members of the group with other members, there by increased rate of exchange of information and potential learning abilities which leads to economic growth and success of the group in activities. In conclusion, the results advocates that enhancing the group dynamics among the members of rural women groups will lead in an increase of their work abilities, which will further result in enhancement of the efficiency of the group as a whole.

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Strategy to Overcome the Constraints of Drip Irrigation System : A Study of Panchayat Samiti, Jhotwara, District Jaipur (Rajasthan)

Krishna Yadav¹, J.P. Yadav² and Pushpa Kumawat³ Seema Yadav

ABSTRACT

The Indian population is continuously increasing which demand more food grain production to fill vagaries of population. Therefore, to meet the projected food demands of 21st century and to harvest maximum benefits from every unit of available land, resource and other critical inputs needs to be exploited. Water is the most precious natural source, vitally important for agricultural development and day-to-day living of human beings. In the changing agricultural scenario world over and shift towards precision farming, drip irrigation happens to be the technology capable of providing more efficient utilization of water. The study was conducted in Jhotwara panchayat samiti of district Jaipur (Rajasthan). Fifty per cent (8) Gram Panchayats where maximum number of drip irrigation sets installed were selected. Two villages from each selected Gram Panchayats were selected randomly. Ninety six farmers were selected from sixteen selected village by using of random sampling technique through proportional allocation to be size of sample. The study shows that the among the important suggestions offered by the drip irrigation adopters to overcome the constraints faced in adoption of recommended improved practices of drip irrigation system, "Provision of sufficient subsidy to reduce initial installation cost" (91.66%) which was prioritized at top level. Least priority was given to the appropriate strategy i.e. "Control on nepotism and favoritism in installation of drip sets on subsidized rate" (55.20%).

Keywords: Constraints, Drip irrigation system

INTRODUCTION

The drip irrigation system is, especially, suitable for saline and alkaline soil which increase water use efficiency up to 80 to 90 per cent. Bahuguna (1996) stated that by drip system of irrigation, 95 per cent of the irrigation water can be used efficiently. By this method 30 to 50 per cent production may also be increased (Yojana July, 2010).

Rajasthan has largest geographical area in India but having only 1 per cent water resources of country. Due to arid and semi-arid climate *i.e.* negative moisture index, poor soil quality and traditional agriculture practices, the food security, nutritional security, sustainability and profitability of horticulture production system is still a

distant dream in the state. The major sources of water in the state are wells and tube wells. Irrigation scenario of Rajasthan is characterized by erratic or scanty rainfall, dwindling ground water resources, increasing alternative demand of municipal and industrial sector that means less water available for agriculture. The ground water is also lowered down day by day in Rajasthan at 5 to 10 feet per year and majority of the area has become under dark zones. Therefore, drip irrigation system is become very profitable as it saves 60-70 per cent water as compared to surface irrigation and other methods and reduces labour cost, protects the plants from diseases by minimizing humidity in atmosphere. Therefore, an attempt has been made to measure the Extent of Adoption of Drip Irrigation System by the farmers in Jhotwara panchayat samiti of district Jaipur (Rajasthan).

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METHODOLOGY

The study was conducted in Jaipur district of Rajasthan. District Jaipur was selected purposively for the study. The Jaipur district consists fifteen panchayat samiti, out of which Jhotwara panchayat samiti was selected randomly. Eight gram panchayats were selected randomly from selected Jhotwara panchayat samiti. Two villages were selected from each selected gram panchayat of Jhotwara panchayat samiti having maximum number of drip irrigation sets. Thus, sixteen villages were selected purposively. Ninety six farmers were selected from sixteen selected villages on the basis of proportional allocation to the size of sample. The data were collected through developed interview schedule by face to face contact method.

The collected data pertaining to extent of adoption of drip irrigation system were analyzed and presented based on mean and standard deviation (S.D) as follows: Low adopters (Less than Mean- S.D.), Medium adopters (Between Mean- S.D. and Mean + S.D.) and High adopters (More than Mean + S.D.).

RESULTS AND DISCUSSION

Some suggestions were invited from the drip irrigation system adopters to overcome the constraints faced by the farmers and to increase the profitability of drip irrigation through open ended questions and through investigators personal experience gained by the investigator during the research work was also incorporated. The frequencies were calculated for each suggestion and converted into percentage. The suggestions along with their percentage are presented in Table 1. Among the important suggestions offered by the drip irrigation adopters to overcome the constraints faced in adoption of improved practices of drip irrigation system most of the respondents, (91.66%) were suggested about the aspect viz., “Provision of sufficient subsidy to reduce initial installation cost”, hence, it was ranked first. The second rank was accorded to the suggested aspect “Motivation of farmers for adoption of drip irrigation system” as it was suggested by 88.54 per cent farmers followed by “Demonstration of drip irrigation system as a model” (83.33%), “Provision of regular repair and

maintenance of drip irrigation system” (82.29%), “Regular training of drip set users” (80.20%), “Regular clean up of drippers in saline water areas” (77.08%), “Government or agency should regularly supply the spare parts at least cost” (76.04%), “Government should make arrangement of electricity supply, regularly” (75.00%), “Encourage the mulching to reduce evapo-transpiration at field level” (71.87%), “Increase the efficiency and usable life of drip sets” (69.79%), “Prepare a local trained resource person for operation and repairing of drip sets” (66.66%), “Regular monitoring and evaluation of the use efficiency of drip sets” (64.58%), “Encourage the local manufactures to produce low cost drip sets” (58.33%) and “Control on nepotism and favoritism in installation of drip sets on subsidized rate” (55.20%), which were ranked III, IV, V, VI, VII, VIII, IX, X, XI, XII, XIII and XIV, respectively.

Based on the findings about the appropriate strategy of individual aspects of drip irrigation system, it was noted that suggestion ‘Provision of sufficient subsidy to reduce initial installation cost’ offered by the respondents was got the top rank. This might be due to the facts that the farmers felt that initial cost of drip sets are very high, therefore, they were suggested that the bank or government should be provided the sufficient subsidy to reduce the initial cost of installation of drip irrigation system to all categories of farmers. It was followed by ‘Motivation of farmers for adoption of drip irrigation system’. This might be due to the facts that the farmers were unaware about the cost benefit ratio of drip sets. So they were suggested that they might be motivated through exposure visit and demonstration of drip sets by the experts on the farmer’s field. The third ranked appropriate suggestion was ‘Demonstration of drip irrigation system as a model’. This might be due to the facts that the agencies or dealers motto is to achieve maximum profit anyhow from the drip sets without considering the publicity of the product. So the farmers were suggested that the drip irrigation system should be popularized through the demonstration and exhibitions of drip sets at village level. The suggestion ‘Provision of regular repair and maintenance of drip irrigation system may be due to the fact that the dealers/firms were not provided repair and maintenance services after installation

of drip sets. Therefore, the farmers were suggested that the government should make easy terms and conditions of supplying and repairing of drip sets and bound the government agency or private company to repair the drip sets in time regularly. Regular training of drip set users might have been suggested due to the fact that government might have not provided the training to the drip set users. Therefore, the farmers suggested that local farmers may be educated and trained in operation and maintenance of drip irrigation system. Regular clean up of drippers in saline water areas was also suggested may be due to the fact that agencies/government/dealers might have not provided the clean-up material of drip sets. So the farmers were suggested that the companies/governments/local market should be provided the extra clean-up material at low cost specially in saline water areas.

The suggestion ‘Government or agency should regularly supply the spare parts at least cost might be due to the fact that the Government or agency might have not provided the spare parts of drip sets. So that the farmers were suggested that the government or local agency should regularly arrange and supply the spare parts of drip sets and insured that the spare parts should be available in the local market. The Government should make arrangement of electricity supply, regularly as for

proper functioning it’s the basic requirement. Therefore, the farmers were suggested that the government should be ensured to make regular supply of electricity and encourage the alternate source of electricity like solar energy etc. Encourage the mulching to reduce evapo-transpiration at field level relates the fact that the evapo-transpiration rate is very high on farmer’s field due to high temperature. Increase the efficiency and usable life of drip sets may be factually supported that the drip sets are installed at surface of the soil which directly in contact with sunlight and also harmed by rats, squirrels, an animal etc. that decreases the life and efficiency of the drip sets. Therefore, the respondents were suggested that the drip sets should be installed at the sub-surface of the soil to protect from direct sunlight and from others also increases usable life of it. Prepare a local trained resource person for operation and repairing of drip sets have relevance with the fact that the local experts of drip irrigation system might not be available as such, the farmers were suggested that the government or agency should trained the local people as a resource person in all respects like from installation to after care of the drip sets. The twelfth ranked appropriate suggestion was ‘Regular monitoring and evaluation of the use efficiency of drip sets’. This might be due to the fact that the government or private agency might have not monitored and evaluated the use efficiency of drip sets after

Table 1: Suggestions to overcome the constraints of drip irrigation system (N = 96)

Suggestions	Frequency	Percentage	Ranks
Provision of sufficient subsidy to reduce initial installation cost	88	91.66	I
Motivation of farmers for adoption of drip irrigation system	85	88.54	II
Demonstration of drip irrigation system as a model	80	83.33	III
Provision of regular repair and maintenance of drip irrigation system	79	82.29	IV
Regular training of drip set users	77	80.20	V
Regular clean up of drippers in saline water areas	74	77.08	VI
Government or agency should regularly supply the spare parts at least cost	73	76.04	VII
Government should make arrangement of electricity supply, regularly	72	75.00	VIII
Encourage the mulching to reduce evapo-transpiration at field level	69	71.87	IX
Increase the efficiency and usable life of drip sets	67	69.79	X
Prepare a local trained resource person for operation and repairing of drip sets	64	66.66	XI
Regular monitoring and evaluation of the use efficiency of drip sets	62	64.58	XII
Encourage the local manufactures to produce low cost drip sets	56	58.33	XIII
Control on nepotism and favoritism in installation of drip sets on subsidized rate	53	55.20	XIV

installation at farmer's field. Therefore, the respondents were suggested that the government should regularly monitor the drip irrigation system after installation and should also be taken the feedback from the users of drip irrigation system. The next appropriate suggestion was 'Encourage the local manufactures to produce low cost drip sets'. This might be due to the fact that the initial cost of drip set is very high. Therefore, the respondents were suggested that the local manufactures of drip set should be encouraged so that they may minimized the production cost of drip sets and supply by using of low cost technology and also may break the monopoly of the company. Control on nepotism and favoritism in installation of drip sets on subsidized rate as a constraint may be due to the fact that the respondents might have felt such problems in getting the drip set on subsidized rate and other repairing services after installation of the drip sets. Therefore, they were suggested that the government officially should regularly watch and control the

malpractices of utilization of subsidy of drip sets prevent the nepotism and favoritism.

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Demonetization of Indian Economy: A Review on the Effects and Reactions

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ABSTRACT

From slowing down the economic growth in various sectors to give people nightmares of the long queues and the inability to spend liquid cash freely, the hullabaloo created by demonetization is remembered by one and all. Demonetization was initiated with a wide array of motives like stripping the Indian economy of its black money, push people to pay taxes for the unaccounted pile of cash, curb terrorism, promote the digital India movement and make India a cashless economy. Demonetization, technically is a liquidity shock; a sudden stop in terms of currency availability. It creates a situation where lack of currencies jams consumption, investment, production, employment etc. In this context, the exercise may produce short term/long term/, consumption/investment, welfare/growth impacts on Indian economy. The intensity of demonetization effects clearly depends upon the duration of the liquidity shocks. Demonetization is a generations' memorable experience and is going to be one of the economic events of our time. Its impact is felt by every Indian citizen. Demonetization affects the economy through the liquidity side. Its effect will be a telling one because nearly 86 per cent of currency value in circulation was withdrawn without replacing bulk of it. As a result of the withdrawal of Rs 500 and Rs 1000 notes, there occurred huge gap in the currency composition as after Rs 100; Rs 2000 is and was the only denomination.

Keywords: Demonetization, Denomination, Economic growth, Indian economy

INTRODUCTION

Demonetisation means withdrawing the legal tender rights of any denomination of currency. In November 2016, the Government of India announced the demonetization of all Rs. 500 and Rs. 1,000 banknotes of the Mahatma Gandhi Series. It also announced the issuance of new Rs. 500 and Rs. 2,000 banknotes in exchange for the demonetised banknotes. The Prime minister of India Narendra Modi claimed that the action would curtail the shadow economy and reduce the use of illicit and counterfeit cash to fund illegal activity and terrorism. India has a thriving cash economy. A majority of businesses in India run on cash with no transparency or accountability. This money never enters the tax system

of the country. It is a 'leakage' from the economic cycle adversely impacting the working of the Indian economy. According to reports, two thirds of India's GDP is cash economy-around Rs 90 lakh crores. It is the honest tax-paying citizen of the country who suffers. The paper attempts to highlight the effects of the demonetization and the reactions over the world by different stakeholders.

Effects of demonetization on Indian economy

Cash shortage: The scarcity of cash due to demonetisation led to chaos, and people faced difficulties in depositing or exchanging the demonetised banknotes due to long queues outside banks and ATMs across India

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(Anonymous ^[1,2,3,4]. The ATMs were short of cash for months after demonetisation ^[5,6,7,8].

Transportation: The All India Motor Transport Congress claimed that about 800,000 truck drivers and conductors were affected with shortage of cash, with around 400,000 trucks stranded at major highways across India ^[9]. While major highway toll junctions on the Gujarat and Delhi-Mumbai highways also saw long queues as toll plaza operators refused the demonetised banknotes^[10].

Stock market: As a combined effect of demonetisation and US presidential election, the stock market indices dropped to an around six-month low in the week following the announcement. The day after the demonetisation announcement, BSE SENSEX crashed nearly 1,689 points and NIFTY 50 plunged by over 541 points ^[11]. By the end of the intraday trading session on 15 November 2016, the BSE SENSEX index was lower by 565 points and the NIFTY 50 index was below 8100 intraday ^[12]. There was a marginal effects on stock market during November–December 2016. Demonetisation had a negative impact on stock market returns evidenced from NIFTY 50 and other NIFTY sectoral indices ^[13].

Industrial output: There was a reduction in industrial output as industries were hit by the cash shortage ^[14]. The Purchasing Managers' Index (PMI) fell to 46.7 in November 2016 from 54.5 in October 2016, recording its sharpest reduction in three years ^[15]. A reading above 50 indicates growth and a reading below shows contraction. This indicates a slowdown in both, manufacturing and services industries ^[16]. The PMI report also showed that the reduction in inflation in November 2016 was due to shortage in money supply^[17].

Agriculture: The shortage of cash led to plunge in demand which in turn led to a crash in the prices of crops. Farmers were unable to recover even the costs of transportation from their fields to the market from the low prices offered ^[18,19]. Some farmers dumped their produce in protest against the government ^[20,21]. Demonetisation resulted in the relative erosion of agricultural wages and weak bargaining power of farmers for their produce ^[22].

Real GDP growth rate: The GDP growth rate for Q1'17-18 dropped to 5.7 per cent, compared to 7.9 per cent a year ago, ^[23] the lowest since March 2014. This drop was attributed to demonetisation as well as inventory drawdown by companies due to the forthcoming implementation of the Goods and Service Tax ^[144] ^[131]. The GDP started to recover from Q2'17-18 and clocked 8.2 per cent in Q2'18-19 ^[24,25,26].

Employment: According to the report prepared by Centre for Monitoring Indian Economy (CMIE), the number of employed people was 401 million in January–April 2016, 403 million during May–August 2016, 406.5 million in September–December 2016. After demonetisation in November 2016, the number fell to 405 million in January–April 2017. So there was fall of 1.5 million in number of people employed ^[27]. CMIE also reported that the number of persons employed was 406.7 million in 2016-17 which fell by 0.1 per cent to 406.2 million in 2017-18. So the employment had stagnated which resulted in employment rate decline. The employment rate fell from 42.59 per cent in 2016-17 to 41.45 per cent in 2016-17. The unemployment rate also declined from 7.51 per cent in 2016-17 to 4.66 per cent in 2017-18 because of the shrinking employed force. The number of employed force fell from 439.7 million in 2016-17 to 426.1 million in 2017-18. CMIE attributed the impact to demonetisation as well as implementation of Goods and Services Tax in July 2017 ^[28,29].

Cost to banks: Before demonetisation, the RBI had spent Rs 3,421 crore to print banknotes in 2015-2016 (July to June). The cost of printing new banknotes escalated to Rs 7,965 crore in 2016-17 and Rs 4,912 crore in 2017-18 ^[30]. This resulted in a decline in the dividend paid to the government from Rs 65,876 crore in 2015-16 to Rs 30,659 crore in 2016-17 and Rs 50,000 crore in 2017-18 ^[31,32,33,34]. It was estimated that this decrease in income for the government could cause the fiscal deficit for the financial year 2016-17 to increase from the targeted 3.2% to 3.4% ^[35]. The Indian Air Force was paid Rs. 29.41 crore to move banknotes after demonetisation.⁽³⁶⁾

Welfare schemes: Demonetisation negatively impacted the Midday Meal Scheme due to shortage of funds ^[37,38,39,40].

Deaths: Several people were reported to have died from standing in queues for hours to exchange their demonetised banknotes ^[41,42,43,44,45,46]. Deaths were also attributed to lack of medical help due to refusal of demonetised banknotes by hospitals ^[47,48,49]. By the end of December 2016, political opposition leaders claimed that over 100 people had died due to demonetisation ^[50,51,52]. In March 2017, the government stated that they received no official report on deaths connected to demonetisation ^[53]. Later in December 2018, the then Finance Minister Arun Jaitley reported in parliament that four people, three bank personnel and one customer of the State Bank of India, died during the demonetisation^[54].

Legal issues: The government had initially announced that any person who is unable to deposit the demonetised banknotes by 31 December 2016 would be given an opportunity to do so until a later date ^[55]. However, the government allowed only Non-Resident Indians (NRIs) to deposit demonetised banknotes after 31 December 2016 ^[56]. As a result, many people were left stranded with demonetised banknotes. People petitioned the courts to allow deposit of the demonetised banknotes ^[57]. In November 2017 the Supreme Court dismissed 14 petitions related to demonetization, and asked petitioners to file pleas with a constitutional bench which would deal with cases related to demonetisation ^[58].

Long term impact: In 2019, India experienced the economic slowdown which was attributed to demonetisation and several other factors ^[109].

Reactions of various stakeholders

Economists: Indian-American economist Jagdish Bhagwati praised the demonetisation ^[59]. Nobel laureate Amartya Sen, severely criticised the demonetisation move calling it a “despotic action” among other things ^[60,61,62]. Former Senior Vice-President and Chief Economist of the World Bank, Kaushik Basu, called it a ‘major mistake’ and said that the ‘damage’ is likely to be much greater than any possible benefits ^[63,64,65]. Pronab Sen, former Chief Statistician and Planning Commission of India member, called it a “hollow move” since it did not really address any of the purported

goals of tackling black money or fake currency ^[66]. Prabhat Patnaik, a former professor of economics at the Jawaharlal Nehru University, Delhi called the move ‘witless’ and ‘anti-people’. He criticised the simple way in which black money was assumed as “a hoard of cash”, saying that it would have little effect in eliminating “black activities” while “causing much hardship to common people” ^[67]. Economist and journalist, T.N. Ninan wrote in the Business Standard that demonetisation ‘looks like a bad idea, badly executed on the basis of some half-baked notions’ ^[68]. Steve Forbes described the move as ‘Sickening and Immoral’ ^[69]. He stated that “What India has done is commit a massive theft of people’s property without even the pretense of due process—a shocking move for a democratically elected government” ^[70]. Nobel laureate Paul Krugman said that it is difficult to see gains from demonetisation, while there may be significant costs to it ^[71]. Economic analyst Vivek Kaul stated in a BBC article that “demonetisation had been a failure of epic proportions” ^[72].

Industrialists: The decision met with mixed initial reactions. Several bankers like Arundhati Bhattacharya (Chairperson of State Bank of India) and Chanda Kochhar (MD & CEO of ICICI Bank) appreciated the move in the sense that it would help curb black money ^[73]. Businessmen Anand Mahindra (Mahindra Group), Sajjan Jindal (JSW Group), Kunal Bahl (Snapdeal and FreeCharge) also supported the move adding that it would also accelerate e-commerce ^[74]. Infosys founder N.R. Narayana Murthy praised the move ^[75]. Deepak Parekh (Chairman of HDFC) had initially appreciated the decision of demonetisation, but later said that the move had derailed the economy, and expressed skepticism about its outcome ^[76,77]. Industrialist Rajiv Bajaj criticised the demonetisation, saying that not just the execution, but the concept of demonetisation was wrong in itself ^[78].

Political reactions: Indian National Congress spokesperson Randeep Surjewala welcomed the move but remained skeptical on the consequences that would follow ^[79]. Chief Minister of Bihar Nitish Kumar supported the move ^[80,81,82]. The demonetisation also got support from the then Chief Minister of Andhra Pradesh Nara Chandrababu Naidu ^[83,84,85]. Former Chief Election Commissioner of India S.Y. Quraishi said

demonetisation could lead to long term electoral reforms^[86]. Indian social activist Anna Hazare hailed demonetisation as a “revolutionary step”^[87,88]. Former President of India Pranab Mukherjee welcomed the demonetisation move by calling it a “bold step”^[89, 90,91,92]. Chief Ministers of several Indian states like Mamata Banerjee,^[93] Arvind Kejriwal^[94] and Pinarayi Vijayan^[95] have criticised and led major protests against the decision in their states and in parliament. Initially, the move to demonetise and try to hinder black money was appreciated, but the manner in which it was carried out by causing hardships to common people was criticised.^[96] On 16 November 2016, Mamata Banerjee led a delegation comprising political parties of Trinamool Congress, Aam Aadmi Party, BJP ally Shiv Sena and National Conference to Rashtrapati Bhawan to protest against the decision of demonetisation. A memorandum was submitted to the President of India Pranab Mukherjee demanding rollback of the decision^[97,98]. Prem Chand Gupta, a member of the Rashtriya Janata Dal, questioned a statement of Modi from the unscheduled TV broadcast on 8 November, “If it was planned 10 months ago, how did RBI Governor Urjit Patel sign on new note?”. Praful Patel, a member of the Nationalist Congress Party, stated that “the government was not even prepared to recalibrate the ATMs while announcing the move. People’s suffering are unimaginable. Nobody is questioning the government’s intention, but you are unprepared to execute the move”. Later, the former Chief Minister of Uttar Pradesh Mayawati stated the situation to “a financial emergency”, by saying “It looks as if *Bharat* has shut down.” Also, Sitaram Yechury from Communist Party of India, questioned the government on the demonetisation move by stating “only 6 per cent of black money in India is in cash to drive his point that demonetisation won’t curb illicit wealth”^[99]. On 17 November 2016, a rally against demonetisation, led by Chief Minister of Delhi Arvind Kejriwal and his West Bengal counterpart Mamata Banerjee at Azadpur Mandi, the biggest vegetable and fruits wholesale market in New Delhi was organised^[100].

International reactions: By and large, initial international response was positive which saw the move as a bold crackdown on corruption^[101,102]. The International Monetary Fund’s spokesperson Gerry Rice

told that it supported the efforts to fight corruption and illegal finances but cautioned about the disruptions^[103]. The demonetisation also came in for sharp criticism from media outside India,^[104] with the *New York Times* saying that the demonetisation was “atrociously planned” and that it did not appear to have combatted black money,^[105] while an article in *The Guardian* stated that “Modi has brought havoc to India”^[106]. The *Harvard Business Review* called it “a case study in poor policy and even poorer execution”^[107]. The frequent change in the narrative on objectives of the demonetisation to its visible impact on the poorest of the poor made other critiques calling government’s narrative as spins in view of the “pointless suffering on India’s poorest”^[108].

CONCLUSION

The move by the government to demonetise old currency and replacing it with the new one has taken the country by surprise. The move was an effort to handle the threat of illegal money, corruption, terror funding and counterfeit currency. The decision regarding demonetising the old currency was considered as a surgical strike against the undeclared money in the history of Indian Economy, it may be a move towards the cashless economy. The demonetisation is followed by a liquidity crunch in the country, banks and ATMs across the country faced severe cash shortages with detrimental effects on various small business, agriculture and transportation. Currency ban by the government of India created chaos in short-term as most people with old currency notes faced difficulties exchanging them in long queues outside banks and ATMs across India. The total value of old currency notes in the circulation was to the tune of Rs 14.2 trillion, which constitute about 86 per cent of the total value in circulation. The black money has either been accounted by paying heavy taxes and penalties or has reached the bank accounts through direct or indirect channels. Demonetization would bring a positive impact on Indian economy as it encourages the digital mode of payment like E-wallets and apps, online transactions using E-banking, usage of plastic money etc Demonetization is beneficial for the economy in the medium to long-term.

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Assessment of Cluster Front Line Demonstrations on Rapeseed (*Brassica campestris* L.) in Tirap District of Arunachal Pradesh

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ABSTRACT

Rapeseed (*Brassica campestris* L.) is one of the important oil seed crop cultivated in Tirap district of Arunachal Pradesh. The production and productivity of rapeseed in the district is low and constant attempts are being made to improve the production and productivity, area increase, adopting high yielding varieties and improved cultivation practices. Krishi Vigyan Kendra, Tirap conducted Cluster Front Line Demonstration (CFLD) at the farmers' field in 24 villages of the district during 2017-18, 2018-19 and 2019-20. The critical inputs and constraints in existing production technology were identified. Lack of high yielding variety, inadequate input availability, pest and disease incidence and lack of technical knowhow were the predominant identified causes of low productivity of rapeseed in Tirap district. The results of three years demonstrations of variety TS-46 revealed yield increased by 30.97 per cent (2017-18), 28.61 per cent (2018-19) and 26.78 per cent (2019-20) respectively. The additional return in demonstrated plots under TS-46 ranged between Rs. 5732 to Rs. 7285 per hectare during different years. The technology index ranging from 3.6 to 12.9 per cent was found between CFLD demonstration plots and farmers' practices during the different time line. It can be concluded that rapeseed production can be enhanced by encouraging farmers through adoption of high yielding variety TS-46, improved technologies and ensuring need based inputs in due time.

Keyword: CFLD, Rapeseed, Growth, Yield, Economics, Gap

INTRODUCTION

The Cluster Front Line Demonstration (CFLD) is an applied approach to accelerate the dissemination of proven technologies at farmers' fields in a participatory mode with an objective to explore the maximum available resources of crop production and also to bridge the productivity gaps by enhancing the production in national basket (Kumar and Jakhar, 2020). Rapeseed and mustard comprising eight different species viz. Indian mustard, toria, yellow sarson, brown sarson, gobhi sarson, karan rai, black mustard and taramira, are being cultivated in 53 countries spreading all over the globe. Rapeseed (*Brassica campestris* L.) and Indian mustard (*Brassica juncea*) are the major edible oilseed crops after soybean

and accounts for about 75-80 per cent of the 6.8 m/ha rapeseed and mustard crops. In 1986 the government of India started Oilseed Technology Mission for Research and Development of oilseed crops and the productivity increased from 1262 kg/ha (2012-13) to 1397 kg/ha in the year 2017-18 at national level. Rapeseed and mustard cultivated in 5.96 m ha area with 8.32 m tones production and 1397 kg/ha productivity in 2017-18 (Agricultural statistics at a glance, 2018). Still the average productivity of rapeseed and mustard in India (1.39 t/ha) is lower than the world average (1.97 t/ha).

During 2018 the area of rapeseed cultivation in Tirap district of Arunachal Pradesh was 102 ha, producing 950

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q at an average of 768 kg/ha (Hand book of statistics, Tirap District, 2018). The productivity was quite low due to lack of high yielding varieties, lack of proper nutrient management, intercultural operations and seed treatment. The productivity of crops per unit area could be increased by adopting improved practices in a systematic manner along with high yielding varieties (Ranawat *et al.*, 2011; Rai *et al.*, 2016). The drivers of productivity of gobhi sarson (*Brassica napus*) were proper time of sowing and irrigation while use of phosphorus and irrigation at proper time were found to be significantly affecting the productivity of toria (*Brassica rapa*). The hybrid gobhi sarson productivity was affected by weed control and knowledge about different production recommendations (Kumar *et al.*, 2018). Singh *et al.* (2014) concluded that training programmes backed by the field demonstrations proved to be the most effective tool for speedy dissemination of knowledge and technical skills to the farmers whereas, Kaur *et al.* (2014) concluded that front line demonstration program was effective in changing attitude of farmers towards improved cultivation.

To full fill the domestic requirement of oil, Indian government imports a huge quantity of oilseeds. In this regard, to sustain the production and consumption system, the Department of Agriculture, Co-operation and Farmers Welfare had sanctioned the Cluster Frontline Demonstration on *Kharif* and *Rabi* oilseed to ICAR–ATARI Zone VI, Guwahati under National Food Security Mission. To implement the project the Zone VI had selected KVK Tirap for rapeseed cultivation with an objective to boost the production and productivity of oilseed. To demonstrate the need based specific technologies such as high yielding short duration varieties (TS-46), cultural practices, integrated pest management in rapeseed the cluster front line demonstrations were conducted and assessment on various parameters was performed.

MATERIALS AND METHODS

The present investigation of CFLD was conducted by KVK Tirap, Arunachal Pradesh in Deomali and Khonsa subdivision under rainfed condition for last three years during rabi season (2017-18, 2018-19 and 2019-20). An extensive survey was conducted to collect

information from selected farmers. Preferential ranking technique was utilized to identify the constraints faced by the farmers in rapeseed cultivation. The quantification of data was done by ranking the constraints and then calculating the Rank Based Quotient (RBQ) as given by Sabarathanam (1988) with the following formula.

$$RBQ = \frac{\sum f_i (n + 1 - i^{th})}{N \times n} \times 100$$

Where, f_i = number of farmers reporting a particular problem under i^{th} rank

N = Number of farmers

n = Number of problems identified

Based on the problems faced by the farmers mentioned, the cluster frontline demonstrations were designed and scientific interventions were being taken.

The extension gap, technology gap and technology index were calculated by using the formula as suggested by Samui *et al.* (2000).

Extension gap (q/ha) = DY (q/ha) – LY (q/ha)

Technology gap (q/ha) = PY (q/ha) – DY (q/ha)

$$\text{Technology index (\%)} = \frac{\text{Technology gap (q/ha)}}{\text{PY (q/ha)}} \times 100$$

Where, DY = Demonstration Yield, LY = Local Check Yield, PY = Potential Yield of the variety

The technology was demonstrated at 24 different villages of the district which lies between the latitude 26° 38' to 27° 47' N, longitudes 96°16' to 95°40' E and altitude 150-1250 m above MSL. As a whole, the soil of the demonstration sites was sandy loam in texture, acidic in reaction (pH 5.3), medium in organic carbon content (0.77%), medium in available nitrogen content (347 kg/ha), medium in available P_2O_5 (25.7 kg/ha) and low in available K_2O (120.2 kg/ha). On an average the climate of the district is hot and humid at lower altitude and cold at upper altitude. The average annual rain fall of the district is 2520.00 mm with 139 rainy days. Year wise number of farmers, number of clusters, area covered and

Table 1: Year wise details of cluster front line demonstration on rapeseed

Year	Nos. of demonstrations	Nos. of Clusters	Area (ha)	Seasonal rain fall (mm)	Nos. of rainy days	Need based input
2017-18	125	5	50	178.9	15	Improved seed of rapeseed, Variety: TS-46, uniting together of small land holder in a cluster of big size, soil testing and soil test based N, P, K application, Placement of yellow adhesive sticker, insecticide Malathion 50 EC
2018-19	75	3	30	153.9	13	
2019-20	375	15	150	109.0	10	

all the need based critical inputs provided to the farmers are presented in Table 1.

The farmers were trained to follow the package and practices for scientific cultivation of rapeseed through on and off campus training, method demonstration, group meetings, *kisan gosthies* and farmers' scientist interactions. The full package and practices like soil testing, fertilizer application, line sowing, timely weed management practices, integrated pest management etc were ensured. Seeds were sown by broadcasting method with seed rate 8 kg/ha. The cultivation of rapeseed with their own varieties under traditional practices was considered as local check or farmers' practice.

RESULTS AND DISCUSSION

Before conducting the CFLD preferential ranking techniques were utilized to identify the constraints faced by the respondent farmers in rapeseed cultivation. The findings of ranks given by different farmers (Table 2) indicated that lack of suitable high yielding varieties (83.66%), inadequate input availability (78.00%), and pest and disease problem (73.40%) were the three major constraints. Similar constraints were also reported by Sreelakshmi *et al.* (2012); Arjunkumar *et al.* (2016); Dupare *et al.* (2019).

The performance on growth parameters such as plant height, numbers of branches and yield parameters *i.e.*

Table 2: Ranks given by farmers for different constraints of rapeseed cultivation

Constraint	RBQ	Overall rank
Lack of high yielding varieties	83.66	I
Inadequate input availability	78.00	II
Pest and disease problem	73.40	III
Lack of technical knowledge	68.74	IV
Weed problem	62.30	V
Low soil fertility/problematic soil	56.28	VI
Lack of post harvest management	50.32	VII
Labour shortage	44.70	VIII
Low price of farm produce	40.58	IX
Small and fragmented land holding	33.45	X

numbers of siliqua/plant and numbers of seeds/siliqua revealed that all CFLD plots irrespective of cultivation year were found better in case of newly introduced variety of rapeseed, TS-46 along with improved practices than farmers' practices under same conditions and presented in Table 3 and Table 4. Time taken for 50 per cent flowering in CFLD plots was 45.4 days which was 13.3 days earlier than farmers' practice (58.7 days). This might be the short durational varietal characters of TS-46. The infestation of pest and disease was also found less in CFLD plots than farmers' practice which was the effect of improved scientific cultivation practices with integrated pest management and proper operations of cultural

Table 3: Growth parameters of cluster frontline demonstration on rapeseed

Treatment	Plant height (cm)	Nos. of branch/ plant	Nos. of siliqua/ plant	Nos. of seed per pod	Days to 50% flowering	Pest and disease infestation
*CFLD plots	88.53	16.65	90.85	15.54	45.4	Less
*Farmers' practice	64.8	8.7	53.2	13.47	58.7	Medium

*Average of three years

practices. Similar trend of results on pigeon pea cultivation was also reported by Kalita *et al.* (2019).

The variety TS-46 resulted superior on yield in comparison with *Jukangkon* (local check) in different years. The yield of rapeseed increased by 2.28 q/ha (2017-18), 2.18 q/ha (2018-19) and 1.84 q/ha (2019-20) over the yield obtained under farmers' practice (Table 4). These results clearly indicates that due to adoption of appropriate technology and variety TS-46, use of balanced dose of fertilizer, integrated pest management practices and timely intercultural operations, appropriate weed management practices, the yield of rapeseed could be increased between 26.78 and 30.97 per cent over the yield obtained under farmers' practice. Superior growth parameters like more number of primary branches and siliqua per plant and more numbers of seeds per siliqua in CFLD plots were the reason for higher yield.

The result is in conformity with the finding of Tiwari *et al.* (2003) and Chaudhary *et al.*, (2018). The highest yield 9.64 q/ha and 7.36 q/ha in CFLD plots and Farmers' field respectively was recorded in 2017-18 over other two years which might be due to favourable environmental condition viz. more rainfall (178.9 mm) and more rainy days (15 days) during 2017-18.

Economic returns was observed to be a function of yield and whole sale price which varied along with year.

Different variables like seed, fertilizers, pesticides etc. were considered as cash inputs for the CFLD demonstrations as well as for farmers' practice. The additional return in demonstrated plots under TS-46 ranged between Rs.5732 and Rs. 7285 per hectare during different years in comparison with farmers' practices. In CFLD plots approximately Rs.1000/ha extra expenditure was involved over farmers' practice which was very less and affordable to small and marginal farmers. Gross return, net return and BCR recorded higher in demonstrated plots over farmers' practice irrespective of year of cultivation. The highest gross return (Rs. 31,812/ha), net return (Rs. 14,938/ha) and B:C (1.88:1) was recorded during 2017-18 in CFLD plots than 2018-19 and 2019-20 which might be due to highest yield of rapeseed during 2017-18 (Table 5). Similar trends of results also reported by Dhaka *et al.* (2010); Balai *et al.* (2012); Patel *et al.* (2013).

An extension gap ranging from 1.84 to 2.28 q/ha was found in between CFLD demonstration plots and farmers' practices during the different time line. The extension gap was higher under TS-46 in the year 2017-18 than 2018-19 and 2019-20 (Table 6). Such gap might be attributed due to higher yield for favourable environmental condition along with adoption of improved technologies in demonstrations than farmers' practices. Wide technology gap was observed during these years and this

Table 4: Yield analysis of cluster front line demonstrations of rapeseed on farmers' field

Year	Technology demonstrated	Demonstration yield (q/ha)	Farmers Practice yield (q/ha)	Percent increase
2017-18	High Yielding Variety TS-46, Fertilizers application as per recommendation, IPM	9.64	7.36	30.97
2018-19	- do -	9.35	7.27	28.61
1919-20	- do -	8.71	6.87	26.78

Table 5: Economic analysis of cluster front line demonstrations of rapeseed on farmers' field

Year	Economics of Demonstration (Rs./ha)				Economics of local check (Rs./ha)			
	Gross Cost	Gross Return	Net Return	BCR	Gross Cost	Gross Return	Net Return	BCR
2017-18	16874	31812	14938	1.88	14431	23440	9206	1.62
2018-19	16488	30861	14374	1.87	15450	22537	7087	1.46
1919-20	16622	29620	12998	1.78	15620	21909	6289	1.40

Table 6: Gap analysis of cluster front line demonstrations of rapeseed on farmers' field

Year	Potential yield (q/ha)	Demonstration yield (q/ha)	Farmers' Practice yield (q/ha)	Extension gap (q/ha)	Technology gap (q/ha)	Technology index (%)
2017-18	10	9.64	7.36	2.28	0.36	3.6
2018-19	10	9.35	7.27	2.08	0.65	6.5
2019-20	10	8.71	6.87	1.84	1.29	12.9

was lowest (0.36) during 2017-18 and was highest (1.29) during 2019-20 (Table 6). The difference in gap during different years could be due to differential climatic conditions in each year. Similarly, the technology index for all the demonstrations during different years were in accordance with technology gap. The lowest and highest technology index 3.6 and 12.9 respectively recorded during 2017-18 and 2019-20. Technology index shows the feasibility of the variety at the farmers' field. Higher technology index reflected the inadequacy of technology and or insufficient extension services for transfer of technology. The results are in conformity with the findings of Singh and Kumar (2012) and Saravanakumar (2018).

CONCLUSION

The study emphasizes the need to educate the farmers in adoption of improved technology to narrow the extension gaps through various technology transfer centers. Therefore, it is suggested that these factors may be taken into consideration to increase the scientific temperament of the farmers. Potential yield of variety can be achieved by imparting scientific knowledge to the farmers, providing seeds of high yielding variety, need based quality inputs in due time and ensuring timely agricultural operations. The technologies demonstrated under cluster front line demonstrations had been exploited to obtain the maximum yield, net profit and additional income of rapeseed cultivation which lead to economic viability of the farming in the district.

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Post-adoption Behaviour of Farmers Towards Soil and Water Conservation Technologies of Watershed Management in Northern Shivalik Foothills

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ABSTRACT

The study was undertaken at Indian Institute of Soil and Water Conservation Research Centre, Chandigarh from November, 2012 to June 2015 in five watersheds developed by the Centre, with the objectives to study the post-adoption behaviour of farmers regarding watershed technologies. The watersheds selected were i) Aganpur Bhagwasi watershed located in Patiala district, (Punjab State) ii) Johranpur watershed in Solan district, (H.P) iii) Mandhala watershed in Solan district, (H.P.) iv) Kajiana watershed in Panchkula district (Haryana) (v) Sabeelpur watershed in Panchkula district (Haryana). The post-adoption behaviour of 225 beneficiary farmers who have adopted different soil and water conservation technologies for watershed management should be studied in detail regarding their present status of continue-adoption, diffusion, dis-adoption and also technological gap. Combining the data for all the five watersheds, it was concluded that 79 per cent of the farmers continued to adopt SWC technologies even after withdrawal of the project. Twenty one percent dis-continued the adoption of technologies and 23 per cent were adopting with certain technological gap. The diffusion of adopted SWC technologies also occurred, and 16 per cent of SWC technologies were diffused to other farmers' fields in nearby areas for natural resource conservation on a watershed basis. The analysis revealed that the adoption and spreading of SWC practices is not only a technical problem that can be solved by research, but also a socio-cultural and economic problem, with many constraints playing their role.

Keywords: Farmers, Management, Soil, Technologies, Water conservation, Watershed

INTRODUCTION

Transfer of technology is an important aspect of any research system that engages in generation of technologies. However, the onus of the system does not stop at mere transferring the technologies. It is very much imperative to ensure its proper adoption and accomplishment of the purpose for which it was adopted on a longer term. Rogers (1983) was one of the firsts to measure adoption and he termed adoption process as 'Innovation Decision Process' through which an individual passes from first knowledge of an innovation, to forming

an attitude towards the innovation, to a decision to adopt or reject, to implementation of the new technology or idea, and to confirmation of this decision. In case of an agricultural research system, the situation is still complex as the beneficiaries are farmers and the technologies are adopted in field conditions. They are bound to face varied circumstances in the wake of adopting a technology and continuing it on longer time period (Valera *et al.*, 1987). Post-adoption behaviour is a decision of a farmer regarding whether to continue with an adopted technology with or without a technological gap or discontinue for adoption of another new technology or his unwillingness

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to continue with adopted technology (Bagdi, 2015). Post adoption process has two basic components i.e. the continuance/discontinuance decision; and the length of continued use (Black, 1983). Ellis (1988) and Wauters *et al.* (2010) observed that in developing countries the introduction of many new technologies has met with only partial success as measured by observed rates of adoption. Discontinuance is a decision to reject an innovation after it has previously been adopted. When the farmers are satisfied with whatever new technology they have adopted, they are likely to hold on to it, but if they feel that it does not meet their needs they will discard it (Rogers, 2003). Demake (2003) assessed the factors responsible for discontinuance of soil and water conservation technologies and found that small farm size and lack of hired labour explained the majority of discontinuance. The continued use of Soil and Water Conservation (SWC) seemed mainly determined by the actual profitability and, related to that, the labour requirements for recurrent maintenance and use. Moreover, in villages with better future prospects (where SWC was promoted within an integrated development strategy) farmers also performed better maintenance of their measures and replication rates were higher (De Graaff *et al.*, 2008). If many farmers in a specific project area or village adopt a certain measure, farmers in neighbouring villages may also adopt the measures without project assistance (spontaneous diffusion), as was experienced in Mali (Bodnar, *et al.*, 2006).

It is imperative to appraise the behaviour of the farmers with regard to the continuance or discontinuance of the technologies adopted, diffusion or infusion that took place and technological gaps that occurred in due course etc. The need to examine the adoption of soil and water management technology (SWMT) options to improve agricultural production becomes imperative in order to evaluate the impact of their uptake by the resource-poor farmers (Olarinde *et al.*, 2012).

Indian Institute of Soil and Water Conservation, Research Centre Chandigarh has developed many watershed projects successfully in the country in past and implemented many soil and water conservation technologies for watershed management. Therefore, it was realized that the post-adoption behavior of beneficiary

farmers who have adopted different soil and water conservation technologies for watershed management should be studied in detail regarding their present status of continue-adoption, dis-adoption, diffusion, infusion, and also technological gap.

MATERIALS AND METHODS

The research study was carried out during 2012–2015 in five watersheds developed by Indian Institute of Soil and water Conservation, Research Centre, Chandigarh. The watersheds developed were selected purposively to study the present condition regarding watershed technologies after passing of few years. Therefore, post-adoption behaviour of beneficiary farmers was studied regarding soil and water conservation technologies adopted by them for watershed management. The watersheds selected are i) Aganpur Bhagwasi watershed located in Patiala district (Punjab State) ii) Johranpur watershed in Solan district, (H.P) iii) Mandhala watershed in Solan district, (H.P.) iv) Kajiana watershed in Panchkula district (Haryana), (v) Sabeelpur watershed in Panchkula district in Haryana State.

The farmers of selected watersheds who have adopted soil and water conservation technologies were selected as respondents in the study. At least 50 respondents were selected from each watershed from all the existing categories of farmers in the watershed. A list of SWC technologies was prepared which were implemented during each watersheds development programme. A SWC technology-wise inventory of respondent farmers, who have adopted the technologies with the help of Detailed Project Report (DPR) or by organizing meetings with farmers was prepared. The Inventory listed the names of farmers the size of land holding and the adopted technology. These were used to prepare inventories of farmers for all technologies adopted during the watershed development programmes. A stratified proportionate random sampling plan was followed to select respondents from different inventories or lists of farmers. At least 50 respondents were selected from each watershed, selected from all the existing categories of farmers in the watershed. A detailed structural interview schedule was developed by the investigators and data regarding personal, psychological

and post-adoption behaviour variables were recorded on a structured schedule by interviewing the respondents personally.

RESULTS AND DISCUSSIONS

The data in Table 1 shows the levels of continue adoption of soil and water conservation technologies by farmers in the watersheds developed by IISWC Research Centre Chandigarh in various watersheds. It was revealed that the majority of farmers have continued the adopted SWC technologies at a moderate level at Mandhala (58%) and Aganpur-Bhagwasi Datia (56%) and Kajiana (50%) watersheds, whereas the majority of farmers have continue adopted SWC technologies at low level at Sabeelpur (53.07%) watershed. Less than 27 per cent of farmers have continued the adopted SWC technologies at high levels in their fields for natural resource conservation in all the watersheds developed by IISWC Chandigarh. The overall pooled data revealed that a maximum 49.33 per cent of farmers have continued adopted SWC technologies at a moderate level for natural resource conservation for sustainable management of watersheds. Similarly, 33.77 per cent of farmers have also continued adopted SWC technologies at a low level and only 16 per cent of farmers have continued adopted SWC technologies at a high level for soil and water

conservation in various watersheds developed by the Centre.

The data in Table 2 presents the level of discontinuance of soil and water conservation technologies by farmers in the watersheds developed by IISWC Chandigarh. The majority of farmers have discontinued technologies at Aganpur (70%), Mandhala (64%) and Kajiana (54%) watersheds at a low level, while a majority of farmers discontinued SWC technologies at Sabeelpur (53%) at moderate level. A very few farmers have discontinued SWC technologies at a high level from their fields. The overall pooled data revealed that more than fifty percent of farmers have discontinued SWC technologies at a low level. About one-third (35%) of the farming population discontinued SWC technologies at a moderate level and only 10.4 per cent of farmers discontinued SWC technologies at a high level due to non-suitability to their field conditions or inability to continue the adopted technologies in various watersheds.

The Table 3 revealed that the majority of farmers have adopted SWC technologies with a technological gap at Mandhala (74%) and Aganpur- Bhagwasi (72%) at a low level. The majority of farmers of Kajiana and Johranpur watersheds adopted SWC technologies with a technological gap at a moderate level. About 57 per

Table 1: Levels of continue adoption of SWC technologies by farmers in different watersheds implemented by IISWC Research Centre Chandigarh (N =225)

Level of continue adoption of SWC technologies	Percentage farmers in different watrsheds					
	Aganpur Bhagwasi (N=50)	Johranpur (N=26)	Mandhala (N=50)	Kajiana (N=50)	Sabeelpur (N=49)	Pool (N=225)
Low	10 (20.0)	9 (34.62)	11 (22.00)	20 (40.00)	26 (53.07)	76 (33.77)
Medium	28 (56.0)	10 (38.46)	29 (58.00)	25 (50.00)	19 (38.77)	111 (49.33)
High	12 (24.0)	7 (26.92)	10 (20.00)	5 (10.00)	4 (8.16)	38 (16.88)

Table 2: Levels of discontinuance of SWC technologies by farmers in different watersheds implemented by IISWC Research Centre Chandigarh (N =225)

Level of disconti-nuance of SWC technologies	Percentage farmers in different watrsheds					
	Aganpur Bhagwasi (N=50)	Johranpur (N=26)	Mandhala (N=50)	Kajiana (N=50)	Sabeelpur (N=49)	Pool (N=225)
Low	35 (70.0)	12 (38.9)	32 (64)	27 (54)	18 (36.7)	124 (54.2)
Medium	12 (24.0)	10 (38.5)	13 (26)	19 (38)	26 (53.1)	80 (35.4)
High	3 (6.0)	4 (15.4)	5 (10)	4 (8)	5 (10.2)	21 (10.4)

Table 3: Levels of technological gap of SWC technologies by farmers in different watersheds implemented by IISWC Research Centre Chandigarh (N =225)

Level of discontinuance of SWC technologies	Percentage farmers in different watersheds					
	Aganpur Bhagwasi (N=50)	Johranpur (N=26)	Mandhala (N=50)	Kajiana (N=50)	Sabeelpur (N=49)	Pool (N=225)
Low	36 (72)	7 (26.9)	37 (74)	12 (24)	9 (18.4)	101 (44.9)
Medium	10 (20)	15 (57.7)	8 (16)	30 (60)	12 (24.5)	75 (33.3)
High	4 (8)	4 (15.4)	5 (10)	8 (16)	28 (57.1)	49 (21.8)

cent of the farmers in Sabeelpur watershed adopted SWC technologies at a high level. The overall pooled data revealed that 45 per cent of farmers adopted SWC technologies with a technological gap at a low level, 33 per cent at a moderate level and only 22 per cent have adopted SWC technologies with a technological gap at a high level in the five watersheds developed by the centre.

It was found from the levels of diffusion by a majority of farmers of Mandhala (74%), and Bhagwasi (72%), watersheds diffused SWC technologies at a low level. While the majority (60%) of farmers of Kajiana and Johranpur watersheds (57.7%) diffused SWC technologies at a moderate level from their fields to other farmers' fields for natural resource conservation from the watersheds developed by the Centre (Table 3). Similarly, the overall pooled data also revealed that a majority (44.9%) of farmers diffused SWC technologies at low level, followed by 33 per cent at moderate level and 21.8 per cent of farmers diffused SWC technologies at a low level from the watersheds developed by IISWC Chandigarh to other farmers' fields for soil and water conservation.

The data in Table 4 reveals the extent of post-adoption behaviour of farmers towards different SWC technologies implemented during various watershed development

programmes carried out by the IISWC Chandigarh Centre. The TCAI values were maximum for Mandhala watershed which meant that more than 88 per cent of SWC technologies were continued adopted by farmers in this watershed followed by Kajiana (78.6%), Aganpur (75.37) and Johranpur (70.22). The pooled TCAI value also showed that overall 79 per cent of SWC technologies were being continued adopted by farmers in the watersheds developed by the Centre for the cause of natural resources conservation. According to DTI values, less than 25 per cent of SWC technologies were discontinued or dis-adopted by farmers in the watersheds developed by the Centre except Sabeelpur (34%).

Woldeamlak Bewket (2007) also reported that the major factors that were discouraging the farmers from adopting the introduced SWC technologies on their farms were found to be labour shortage, land tenure insecurity and problem of fitness of the technologies to the farmers' requirement and to the farming system circumstances. Regarding TGI, it was found that less than one-fifth of SWC technologies were adopted along with technological gap by the farmers in the different watersheds developed except Sabeelpur (30%) and Aganpur Bhagwasi (26%). The overall pooled TGI data also revealed similar findings that 22 per cent of SWC technologies were adopted with a technological gap by farmers out of the

Table 4: Extent of post-adoption behaviour of farmers towards SWC technologies in selected watersheds

Extent of post-adoption behaviour of farmers	Percentage farmers in different watersheds					
	Aganpur Bhagwasi (N=50)	Johranpur (N=26)	Mandhala (N=50)	Kajiana (N=50)	Sabeelpur (N=49)	Pool (N=225)
TCAI	75.37	70.22	88.14	78.6	65.7	79.1
DTI	24.63	19.78	10.77	21.8	34.3	20.8
TGI	26.05	12.17	16.24	18.9	30.3	22.8
TDI	26.2	11.16	12.99	17.8	25.6	15.7

total continue adopted technologies in the watersheds developed by the Centre. Diffusion of SWC technologies was also evaluated using the Technology Diffusion Index (TDI) and it was found that less than 18 per cent of SWC technologies were diffused to other farmers' fields in near by areas from the fields of farmers who had adopted SWC technologies during the watershed development programs, except for the Aganpur Bhagwasi and Sabeelpur. Similarly, the overall pooled TDI data also revealed a similar condition, 16 per cent of SWC technologies were diffused to other farmers' fields in nearby areas from the watersheds developed by the Centre for the cause of soil and water conservation on a watershed basis.

CONCLUSION

The study results showed that 79 per cent of SWC technologies were continue adopted by beneficiary farmers in watersheds developed by IISWC Research Centre, Chandigarh in the region for the cause of natural resources conservation. The farmers discontinued 21 per cent of SWC technologies from their fields in the watersheds. It was also found out that 23 per cent of SWC technologies were adopted with a technological gap by farmers in the watersheds. The diffusion of adopted SWC technologies also occurred, and 16 per cent of SWC technologies were diffused to other farmers' fields in near by areas for natural resource conservation on a watershed basis. Therefore, it can be concluded from the study that in the government sponsored watershed development programmes about three-fourth of SWC technologies were continue adopted for natural resources conservation and about one-fourth of technologies were discontinued due to the non-suitability or the inability of farmers to continue the technologies. Out of the total continue adopted technologies, about one-fifth of the technologies were adopted with a technological gap. About one-fourth of technologies were also diffused in nearby areas fields in the developed watersheds through farmers' efforts. The study suggests that simply demonstrating technologies that improve productivity or have soil conservation value may be insufficient. Majority of farmers continued adopting the SWC structures implemented during watershed development projects with

technological gap due to lack of proper maintenance by beneficiary farmers because of their poor economic condition. The majority of farmers suggested that the subsidy should also be provided to farmers for maintenance of structures or financial provision should be made in planning of watershed projects for future maintenance of structures. Understanding farmer specific characteristics and behavior as well as production environment where farmer operate, is an essential requirement before the dissemination of any S&WC technologies at the farm level for higher adoption., the adoption and spreading of SWC practices is not only a technical problem that can be solved by research, but rather a socio-cultural and economic problem, with many constraints playing a role.

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Relationship Between Extent of Learning and ICT Module with VARK Compatibility

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ABSTRACT

The present study on the relationship between Extent of Learning and ICT Module with VARK Compatibility was conducted to identify the learning style preferences of adult learners. The size of the sample comprises of 150 respondents which are selected randomly from five adopted villages of KVK, Rudrur, in Nizamabad district. The findings revealed that extent of learning had significant positive relationship with VARK compatibility of ICT module, gender and age at 0.1 level of probability and at 0.5 levels with education and ICT usage, whereas no significant relation was found with occupation. Hence, it was concluded that irrespective of learning styles the learning through ICT modules occurred equally as the module has VARK learning compatibility. Gender, age, education and ICT usage contributes the extent of learning through ICT modules.

Keywords: Learning style, VARK-Visual, Read/write, and Kinesthetic, ICT module

INTRODUCTION

Most of the adult learners develop a preference for learning based on their childhood learning patterns. They engage themselves in systematic and sustained self-educating activities in order to gain new forms of knowledge, skills, attitudes or values. Fleming (2001) proposed VARK Model, a sensory model which is an extension of the neuro-linguistic model proposed by Eicher (1987). The acronym VARK stands for Visual (V), Aural (A), Read/Write (R), and Kinesthetic (K). He defined learning style as an individual's characteristics and preferred ways of gathering, organizing and thinking about information. VARK is in the category of instructional preference because it deals with perceptual modes. It is focused on different ways that individual take in and give out information. Individual learners have relative preferences along each one of the four perceptual modes, but can also learn in the other modes too. ICT modules

are those where the content upload in multimedia format by incorporating text and audio supported by appropriate images and animations to reach more number of users. ICT modules facilitate the learner's involvement as they can see the visuals and hear the text simultaneously. Thus multimedia module exactly supports VARK learning style, which is the most popular adult learning style. The present study was taken up to see the feasibility of the ICT modules developed on Health and Nutrition for pragmatic verification before uploading.

Kim and Gilman (2008) investigated the use of multimedia components such as visual text, spoken text and graphics in a web-based self-instruction program to increase learners' English vocabulary of school going children in Seoul, at Myung South Korea. Results revealed that participants learned better when they received visual text with graphics, spoken text and added instruction. Although the added multimedia components required

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spending more time on the instruction by learners, the extra time was not that significant. Based on the results it was concluded that an effective way to improve learning of English vocabulary is to offer graphics that illustrate what the vocabulary means.

Medhi *et al.* (2007) presented a research, leading towards an understanding of the optimal audio-visual representation for illustrating concepts for illiterate and semi-literate users of computers. A total of 200 illiterate subjects were presented 13 varieties of health symptoms in one representation randomly selected among text, static drawings, static photographs, hand-drawn animations and video, each with and without voice annotation in order to find out how comprehensible these representation types were for an illiterate audience. The results revealed that voice annotation generally helps in speed of comprehension, but bimodal audio-visual information can be confusing for the target population. Richer information is not necessarily better understood the overall and the relative value of dynamic imagery (video and animation) versus static imagery (photo and drawings) and when both were mixed.

Blank *et al.* (2003) observed through a study on adapting multimedia for diverse student learning styles, that multimedia can accommodate diverse learning styles. The samples for the study were students with visual, auditory and combination of learning styles. A user interface which is independent of both book metaphors and familiar web browser was designed for the purpose of the study. It supplied sound and animation for sensory learners, while letting verbal learners disable sound or switch altogether to a JUST THE FACTS mode. Based on non-significant statistical scores of students on the assignment, they concluded that the multimedia provides equal advantage for all the learning styles.

Ellis (2001) used an animated multimedia module to study the improvement in learning due to the effectiveness of multimedia. He observed that a tutorial with animations produced a significant improvement in adult student's ability in application of knowledge when compared to their text -based counter-parts. He further stated that meaningful results can be obtained through multimedia, only when learning, learner, subject and multimedia are adequately defined. Animation did appear to foster a

greater degree of learning at the application of knowledge level than a text -only tutorial.

METHODOLOGY

Exploratory research design was used for the present study, 150 sample was randomly selected from five villages i.e., Beerkur, Kistapur, Malkapur, Ranampally, Timmapur of KVK, Rudrur, Nizambaddistrict. Aquestionnaire was developed to gather the information from the sample. ICT modules with VARK compatibility were developed One way ANOVA, Correlation coefficient was used for statistical analysis to find out the relationship between Extent of Learning and ICT Module and VARK Compatibility.

Testing of hypothesis

Correlation between VARK compatibility and extent of learning of adult learners in five villages

Null hypothesis: There was no relation between ICT module with VARK compatibility and extent of learning of adult learners.

Empirical hypothesis: There was relation between ICT module with VARK compatibility and extent of learning of adult learners.

Difference between modals

Null hypothesis: There was no difference in learning among four types of learners

Empirical hypothesis: There was differences in learning among four types of learners

Correlation between general profile characteristics and extent of learning

Null hypothesis: There was no any relation between extent of learning and general profile characteristics of the respondents.

Empirical hypothesis: There was relation between extent of learning and general profile characteristics of the respondents.

RESULTS AND DISCUSSION

The adult learners were clientele from five adopted villages of KVK, Rudrur, Nizamabad district as part of

the studying learning style profile the general characters like Age, Gender, Education, Occupation and Nature of ICT usage were studied by collecting information through interview schedule.

Based on Erikson's (1950) categorization, the age of the respondents was categorized as Young Adult Learners in age of 20-39 years (YAL), Middle Adult Learners 40-64 years (MAL) and Older Adult Learners 65 and above years (OAL). The highest composition of youth is evident from 3/4th of clientele (76.66%) of KVK, Rudrur were under the YAL category. The composition of MAL and OAL was 15.33 per cent and 8 per cent respectively. The gender profile of the respondents includes 58.66 per cent male and 41.33 per cent female. It is interesting to note that 83 per cent of KVK clientele were educated and only 11.33 per cent had no education. Among the educated, highest composition was under graduation and above (45.33%), followed by intermediate whereas high school and upper primary education was found to be 14 per cent and 8.66 per cent respectively.

Occupation was considered as the type of work the clientele was engaged in either to earn livelihood or to acquire skill. Farming could be inferred as important livelihood from the data. Whether employed or self-employed the clientele were continuing with farming. This must be the reason, for their participation in KVK activities. Those who completed studies and preparing for competitive examinations to get employment, were considered as occupation aspirants, consists of 22 per cent of clientele group.

Whether rural or urban, the use of electronic gadgets has enlarged to a great extent with the advent of

information and communication technology. Highest use of Television (88.66%) as ICT device, followed by mobile (78%) was evident from the data. Up to a considerable account (47.33%) the apps use was existing. Use of radio was less (18.66%) than, the use of internet (26.66%), newspaper (22.66) and books (21.33%). The relation between extent of learning and VARK compatibility of ICT modules and extent of learning with general profile characteristics were computed by the correlation coefficient 'r' values. The significant differences in the extent of learning among four learning styles were analyzed through one way analysis of variance. The findings were presented in the Table 1.

A positive significant relation existed between the variables at 0.5 per cent level of probability, in all the five digital lessons thus proving empirical hypothesis by rejecting Null hypothesis. It could be inferred that as VARK compatibility of ICT module increases, the extent of learning the concepts related to nutrition among adult learners' increases due to self-engagement of the learner as his or her learning style preference existed in it.

Sujatha (2016), explored the significant positive relationship existed between learning and learning style preferences compatibility of ICT module at 0.5 per cent level of probability. This result is empirically accepting learning style preferences qualities of ICT modules to upload.

Kim and Gilman (2008) also revealed those multimedia components such as visual text, spoken text and graphics in a web-based self-instruction program effective way to improve learning of English vocabulary to school going children.

Table 1: Correlation between ICT module with VARK compatibility and extent of learning among adult learners of five villages (n=150)

Digital lesson	Beerkur	Kistapur	Malkapur	Ranampally	Timmapur
Leafy vegetables	0.36*	0.23*	0.50*	0.42*	0.40*
Millets	0.42*	0.31*	0.15*	0.32*	0.17*
Anemia	0.30*	0.31*	0.25*	0.33*	0.41*
Diabetes	0.41*	0.11*	0.31*	0.50*	0.14*
Thyroidism	0.11*	0.31*	0.30*	0.38*	0.22*

*0.5 level of probability

Table 2: Analysis of variance in learning among four learning styles of the adult learners (n=150)

Source of Variation	SS	df	MS	F	P-value	F critical
Between Groups	10.21575	3	3.405251	0.265745	0.849995	2.667887
Within Groups	1832.396	143	12.81396			
Total	1842.612	146				

Medhi *et al.* (2007) presented optimal audio-visual representation for illustrating concepts for illiterate and semi-literate comprehensible these representation types were for an illiterate audience.

Ellis (2001) used an animated multimedia module to study the improvement in learning due to the effectiveness of multimedia. Animation did appear to foster a greater degree of learning at the application of knowledge level than a text -only tutorial. The learning attained by four types of respondents *i.e.* uni, bi, tri and multi modal learning styles were compared for their significant differences by using one way ANOVA.

As per the Table 2, there was no significant differences were found in learning among four different styles of learners. Hence, null hypothesis was accepted and rejected the empirical hypothesis. Irrespective of learning styles, learning through ICT modules occurred equally. This empirical evidence also endorses VARK compatibility of ICT module.

Sujatha (2016) there was no significant difference in knowledge acquisition between four different styles of learning. Hence null hypothesis was accepted and rejected empirical hypothesis. Irrespective of learning styles, learning through ICT modules occurred equally.

Gappi (2013) explored the student's preferred styles of learning and their academic achievement. Results showed that there was no significant effect of learning style preferences on the academic program of the students. The relationship between general profile characteristics and extent of learning was analyzed by computing 'r' values and presented in the following

According to data shown in the Table 3, the extent of learning had significant positive relationship with gender, age of the learners at 0.1 level of probability and education and ICT usage at 0.5 level of significance.

Table 3. Correlation between general profile characteristics and extent of learning (n=150)

General profile characteristic	r values
Gender	0.45**
Age	0.38**
Education	0.01*
Occupation	0.107
ICT Usage	0.01*

**0.1 level of probability, *0.5 level of probability

There was no significant relation was found in case of occupation. Hence empirical hypothesis was accepted in case of gender, age, education and ICT usage and rejected null hypothesis. It can be inferred that as age increases, education level increases, Usage of ICT increases the extent of learning also increases. Extent of learning is more among males than females.

Sujatha (2016), reveled the knowledge acquisition had a significant positive relation with age, occupation and ICT usage at 0.1 level of probability. Gender and education had no significant relation with knowledge acquisition. Hence empirical hypothesis was accepted in case of age, occupation, ICT and rejected null hypothesis.

CONCLUSION

It can be concluded by the present study that extent of learning is positively significantly related with VARK compatibility of ICT module at 0.5 per cent level of probability. This result is empirically accepting VARK qualities of ICT modules are important for consideration before uploading the modules. There was no significant difference in extent of learning between four different styles of learning among adult learners. Hence, it was concluded that irrespective of learning styles, the extent of learning through ICT modules occurred equally as the learning module has VARK compatibility. Extent of learning had significant positive relation with gender and

age at 0.1 level of probability and at 0.5 level with education and ICT usage. Hence it was concluded that gender, age, education and ICT usage contributes for extent of learning among adult learners through ICT modules. Hence it can be suggested that the ICT module developed for multi users should have VARK compatibility to increase the extent of learning among the adult learners. It is also important to consider the personal variables of the learners while developing the ICT modules.

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Assessment of Utility of Mobile Based Agro-advisory Services in NCR-Delhi

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ABSTRACT

The study on assessment of mobile based agro-advisory services was conducted in four selected villages i.e. Kutbi (Muzaffarnagar, Uttar Pradesh), Khajurka (Palwal, Haryana) Rajpur (Aligarh, Uttar Pradesh) and Beenjpur (Alwar, Rajasthan) during 2017. The weather based agro-advisory messages were provided to the selected farmers. Thirty (30) registered farmers from each village were selected who were sent regular mobile advisory messages from IARI. Hence, a total of 120 respondents from the selected four villages constituted the sample of the study. The result revealed that more than 90 per cent of the respondent opined that they read the agro-advisory messages received from IARI, language of the messages were easily understandable, clear and readable and messages received were included local and familiar words for easy understanding. Also 80 per cent of the respondents expressed that information received through messages were adaptable in local field conditions and a majority (88 %) of the respondents expressed that the length of content of messages were adequate. The study has revealed that the information gathered through agro-advisory service has been found very useful and helpful to the farmers and they have started gaining interest in accessing information and decision making on the crops management by utilizing agro advisory services.

Keywords: Mobile based agro-advisory, Opinion, Need, Preferences

INTRODUCTION

India's agricultural extension system is the largest in the world. It has been the most important section working under agricultural production system. It caters to the technology needs of about 100 million farm families. Its normal task of transferring and disseminating appropriate technologies and agronomic practices would not be sufficient for the empowerment of farming community (Kumbhare *et al.*, 2015). Extension agencies, services and workers will need to exercise a more proactive and participatory role for dissemination of agricultural technology to the farming community. Information and communication technologies (ICT) have been at the heart of economic changes for more than a decade. ICT sector plays an important role, notably by contributing to rapid

technological progress and productivity growth (Ysmail, 2008). Information Technology revolution is unfolding, and has very high visibility. It plays a crucial role for the benefit of the farming community. There are numbers of initiatives taken by the government and non-government organization for the empowerment of the farming community. Among modern ICT modes, mobile phone has been the most recent and widely accepted mode of delivering information (Mittal, 2012).

In the last few decades, information and communication technologies (ICTs) have provided immense opportunities for the social and economic development of rural people. The internet and mobile networks have the potential to provide agro-information services that are (i) affordable, (ii) relevant (timely and

customized), (iii) searchable and (iv) up-to-date (Ramamritham *et al.*, 2004). Telecommunications, as a means of sharing information, is not simply a connection between people, but a link in the chain of the development process itself (Hudson, 1995). Mobile telephony is one such technology that has developed significantly in the past few years, and the subscription rate in developing countries has gone up from 22 per 100 inhabitants in 2005 to 91.8 per 100 inhabitants in 2015 (Saravanan *et al.*, 2015). Mobile technology goes beyond geographic, socioeconomic, and cultural barriers. This large increase in mobile subscriptions, along with the recent roll out of 3G and 4G technology, can play a big role in agriculture and rural development. Mobile phones are devices that can create, store, access, and share information anytime and anywhere. Nevertheless, they are more than that. When teamed with extension and advisory services, they can help improve the livelihoods of rural people by getting much needed timely information to their fingertips at potentially low cost. According to Telecom Regulatory Authority of India (2017) the number of telephone subscribers in India increased from 1,153.51 million at the end of May, 2018 to 1,168.89 million at the end of June, 2018, thereby showing a monthly growth rate of 1.33 per cent. The overall Tele-density in India increased from 88.62 at the end of May, 2018 to 89.72 at the end of June, 2018. Global attention is being directed at agriculture due to emerging challenges of food security in recent years, resulting partly from age long negligence of dissemination of appropriate technology. Smallholder farmers which dominate the landscape of developing world need to improve farming by acquiring adequate knowledge and information (UN, 2005).

To utilize mobile phones advisory services, many initiatives have been taken by private sector (Indian Farmers Fertilizer Cooperative Limited, Nokia, Airtel, mKrishi of Tata Consultancy Services, Reuters Market Limited, aAQUA etc.) and public sector (Ministry of Agriculture & Farmers Welfare, State Agricultural Universities, Indian Council of Agricultural Research, State Governments, Indian Meteorological Department and others) in agricultural advisory service for agronomic practices, weather forecasts and market price. Reuters Market Light (RML) offers Indian farmers up-to-date,

local and customized commodity pricing information, news and weather updates (Mehra, 2007). The Fisher Friend project of the M.S. Swaminathan Research Foundation (MSSRF) in Tamil Nadu and Puducherry leverages mobile technology to provide vital livelihood information to fisher folk. aAQUA was designed and developed at the Developmental Informatics Lab at IIT Bombay, offers real-time decision-support tools (aAQUA) to progressive farmers and organizations supporting progressive farming (Bahuman and Kirthi, 2007). Due to increased dependency, the mobile phone is becoming a common communication platform of the world, especially in the field of agriculture for the benefit of farming community. Keeping in pace with the current digitization initiatives, Division of Agricultural Physics, IARI has initiated location specific weather based agro-meteorological mobile advisory services on real time basis in 2013 to farmers of National Capital Region (NCR) of Delhi for agricultural operations using medium range weather forecast. Hence, the present study was carried out to see the utility of mobile based agro-advisory services in the four selected villages of NCR.

METHODOLOGY

The study was conducted in four selected villages i.e. Kutbi (Muzaffarnagar, Uttar Pradesh), Khajurka (Palwal, Haryana) Rajpur (Aligarh, Uttar Pradesh) and Binjpur (Alwar, Rajasthan) during 2017-18. The weather based agro-advisory messages were provided by the Division of Agricultural Physics to the selected farmers from 2015 to 2017. Thirty (30) farmers from each village were selected who were sent regular mobile advisory services from IARI. Hence, a total of 120 respondents from the selected four villages constituted the sample of the study. The data were collected from 120 respondents to see the farmer's feedback on weather based agro-advisory services sent through Short Message Texts (SMSs). The collected data were analyzed with the help of suitable statistical tools.

RESULTS AND DISCUSSION

The data were collected from the respondents to see the farmer's feedback on weather based agro-advisory services sent through Short Message Texts (SMSs). It

can be revealed from the data in Figure 1 that only 15 per cent of farmers were illiterate, 30 per cent were educated up to primary level and 25 per cent each were higher secondary and graduate. The data related to regularity of receiving messages on agro-advisory services (Figure 2) revealed that 84.16 per cent respondents expressed that they received mobile agro-advisory services, however 15.84 per cent respondents reported that they didn't received the messages from IARI. Hence, out of 120 respondents 101 respondents received the weather based agro-advisory services regularly. The 19 respondents didn't receive the messages because of change in new mobile numbers by the respondents during the period.

Farmers' feedback on IARI agro-advisory mobile services were collected from village Kutbi (Muzaffarnagar), Khajurka (Palwal), Rajpur (Aligarh) and Beenjpur (Alwar). The data collected from 100 farmers regarding farmers' feedback on agro-advisory services (Table 1) revealed that the mobile based agro-advisory messages provided by the IARI were in *hindi* language for the benefit of the farming community. A majority (92%) respondent opined that they read the agro-advisory messages received from IARI besides 8 per cent respondent opined that they didn't read the agro-advisory messages received from IARI. Karn and Ghosh

(2018) also found that newspaper and mobile phone are the two mass media channels of information preferred by the farmers. Also 90 per cent of the respondents expressed that the language of the messages was easily understandable, clear and readable however, 10 per cent respondents opined that messages they received were not clear and readable. A majority (91 %) of the respondent expressed that the messages they received were included local and familiar words and 9 per cent expressed that there were no local and familiar words of the messages. More than 85 per cent of the respondents expressed that mobile based advisory messages were received timely and local needs and preferences of the farmers were considered by the scientists while framing the messages. Also 80 per cent of the respondents expressed that information received through messages were adaptable in local field conditions.

The data related to frequency of receiving messages on agro-advisory services (Figure 3) revealed that 67 per cent respondents expressed that they received mobile agro-advisory services fortnightly followed by monthly (28%) and weekly (5%). These findings were in line with Singh *et al.* (2015).

The length of content of messages on agro-advisory services (Figure 4) found that a majority (88%) of the

Table 1: Farmers Feedback on Mobile Based Agro-advisory Services (N=100)

Farmers Feedback on Agro-advisory	% Respondents	
	Yes	No
Do you read the agro-advisory messages from IARI, Pusa?	92.00	08.00
Do you feel the language of these messages as easily understandable, clear and readable?	90.00	10.00
Is there use of local & familiar words and terms in the messages?	91.00	09.00
Do you feel advises are timely?	86.00	14.00
Are the local needs & preferences considered while framing the messages?	88.00	12.00
Is the information adaptable in field conditions?	80.00	20.00

Table 2: Farmers Feedback on Referring and Sharing of Agro-advisory Services

Farmers Feedback on IARI agro-advisory	% Respondents		
	Never	Sometimes	Always
Do you refer the messages while taking decisions on your farm operations?	5.00	49.00	46.00
Do you share these messages with fellow farmers?	6.00	41.00	53.00

respondents expressed that the length of content of messages were adequate and 12 per cent respondents reported that the length of content of messages were less. Further, the data related to the opinion of quality of messages depicted in Figure 5 revealed that 52 per cent respondents in the opinion that the weather based advisory messages they received were always useful to them whereas 48 per cent respondents were in the opinion that the weather based advisory messages they received were somewhat useful to them. Approximately, 95 per

cent respondents agreed that agro-advisory messages are catering the local needs and preferences of people (Figure 6). However, some farmers suggested for sending the audio weather based agro-advisory messages in *hindi* language.

The data related to farmers feedback on referring and sharing agro-advisory services (Table 2) revealed that 49 per cent respondents reported that they sometimes refer the messages while taking decision of

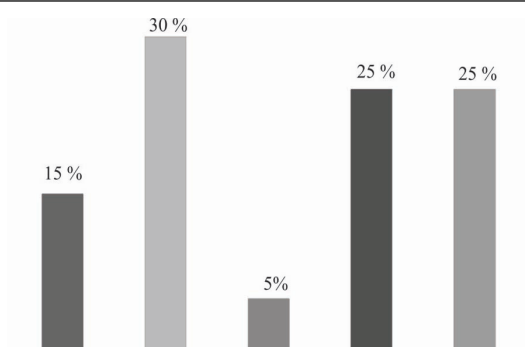


Figure 1: Educational Status of Famers

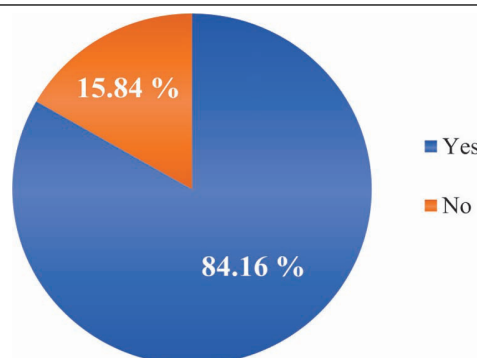


Figure 2: Regularity of Receiving the Messages

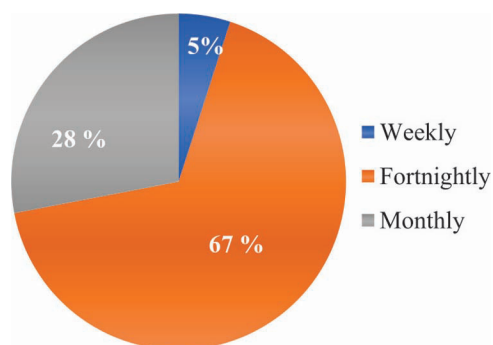


Figure 3: Frequency of Receiving Messages

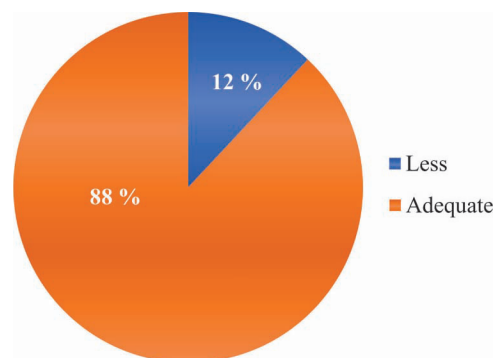


Figure 4: Length of Content of Messages

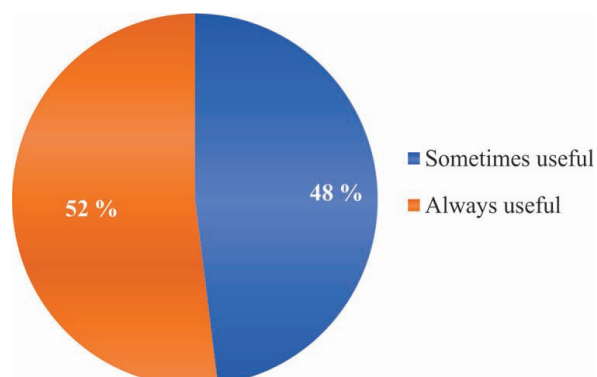


Figure 5: Opinion about Quality of Messages

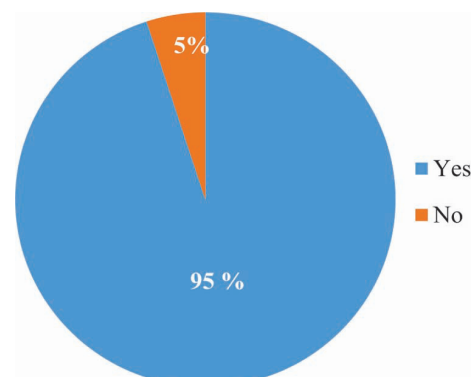


Figure 6: Local Needs and Preferences

farm operation whereas 46 per cent respondents reported that they always refer the messages while taking decision related to farm operations. Further, 53 per cent of the respondents reported that they always share these messages with the colleagues/fellow/neighboring farmers whereas 41 per cent farmers reported that they sometimes share these messages with the colleagues/fellow farmers.

CONCLUSION

Mobile phones have tremendous potential to expand the access to and reach of public services in India. It is an important tool of ICT and has reduced the communication cost, quick and the cheapest source of reliable information on different topics related to agriculture. In case of agriculture, mobiles have provided economic benefit to the farmer by providing access to the day-to-day weather forecasting and market information as it had removed intermediates from the farmer to the market. A need based advisory services need to be developed and provided to the farmers on regular basis to harness the full potential.

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Economic Effect of Soil Health Card Scheme on Farmer's Income: A Case Study of Gwalior, Madhya Pradesh

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ABSTRACT

The study was undertaken to assess the economic effect of Soil Health Card Scheme on Income of Farmer's by studying the economics of cultivation of three major *rabi* crops Wheat, Mustard and Chickpea in district Gwalior of Madhya Pradesh State during 2018-19. The samples composed of total 120 farmers of four blocks of district Gwalior. The yield of wheat, mustard and chickpea increased by 23.13 per cent, 20.01 per cent and 36.55 per cent, respectively after adoption of soil test based RDF. Further, higher net returns increased 25.22 per cent in wheat, 8.18 per cent in mustard 20.81 per cent in chickpea after soil test based fertilizer application. The B:C ratio increased from 3.92 to 4.13 in wheat, 3.09 to 3.20 in mustard and 3.34 to 3.57 in chickpea on adoption of soil test based RDF by the farmers. Thus, soil health card scheme was found highly beneficial to the farmers in term of increasing their income. However, there is a need to generate awareness about the benefits of this scheme among the farmers on one hand and strengthening of soil testing services / laboratories on the other hand for a wider adoption of soil test based RDF.

Keywords: Adoption yield, Impact, Net returns, Soil health card

INTRODUCTION

Soil is one of the elements required for farming as it provides nutrients to the plant. Healthy soil contain all the elements for growth and development of crop or the soil deprived from one or more nutrient either reduce the production or degraded quality of crops. Therefore, proportion and quantity of macro and micro nutrients altogether refer to the soil health. As far as agriculture production is concerned, soil health play vital role in ensuring sustainable production with optimizing the utilization of fertilizer and reducing its waste. Most of the farmers are using continuously larger quantities of chemical fertilizers to increase production without knowing the fertility status of the soils of their fields (Srivastava and Pandey, 1999).

Over the past five decades, the practice and use of soil testing has become widely accepted in agribusiness both by farmers and industry. The potential for increased yields and profits has been the obvious motivator for the keen interest in soil testing. Soil test reports will generally provide you with appropriate fertilizer application recommendations for nitrogen, phosphorous, potassium and soil amendments. Soil testing also allows for determining the micronutrient requirements of your crop. If you apply too little fertilizer, your crop yields and returns will be lower. Too much fertilizer will waste time and money and risk environmental damage due to nutrient runoff. Consequently, soil testing provides a farm management tool with a potential benefit to the farmer of increased yields, reduced operating costs and superior environmental risk management. Additional benefits

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include; improved crop maturity and quality, higher tolerance to disease and pest damage, and increased growth.

Regarding this Constant the Soil Health Card (SHC) is a complete evaluation of the quality of soil right from its functional characteristics to water and nutrients content and other biological properties. It contains corrective measures that a farmer should adopt to obtain a better yield. The SHC helps the farmers as the farmers get a well monitored report about the soil and they are guided by the experts to improve soil health. It also helps the farmers to get crop-wise recommendations of nutrients and fertilizers required in each type of soil. This can help in increasing the crop yield. The SHC scheme was launched in February 2015, and by July 2015, more than 34 lakh cards have been issued.

The soil testing is a proven scientific tool to evaluate soil fertility and recommending balanced nutrition to crops. However, the soil testing programme in India has failed to create the desirable impact on the farming community due to extremely poor coverage and delay in timely dissemination of fertilizers recommendation to farmers (Biswas, 2002). Considering all the above facts, the present study has analyzed the impact of soil test technology on yield and economics in cultivation of major *rabi* crops in Madhya Pradesh.

METHODOLOGY

This study was conducted in Gwalior district of Madhya Pradesh in which 120 farmers were selected from all four blocks namely Morar, Ghatiganw, Darbra and Bhitwar during *rabi* season 2018-19. In total sampled farmers, 60 farmers were done soil test before crop cultivation and remaining 60 farmers were treated as control farmers who did not done soil test before crop cultivation. Thus, from every block 30 farmers were selected from each block who reported on before and after implementation of Soil Health Card scheme. Three major *rabi* crops viz., wheat, mustard and chickpea were cultivated by the selected farmers in all blocks. The analysis of soil was done in soil-testing laboratory of KVK, Gwalior in which analysis of macro-nutrient (N, P, K) and pH but also analyzed micronutrient {Fe, Cu, Mo, Zn,

etc} and provides Soil Health Card for recommended for balanced use of fertilizer to cultivators. Thus, Study was conducted to to study the impact of soil test technology on farmers' income.

RESULTS AND DISCUSSION

Table 1 presents' very interesting and remarkable result indicates that adoption of Soil Health Card for application of recommended doses of fertilizer (RDF). The change in yield of selected *rabi* crops viz. wheat, mustard and chickpea was observed before and after getting soil tested in the area under study. The result showed that yield of wheat, mustard and chickpea increased by 23.13 per cent, 20.01 per cent and 36.55 per cent, respectively; due to application of recommended doses of fertilizer (RDF). A similar finding was reported by Sharma and Singhal (2014).

Table 1: Impact of application of recommended doses of fertilizers on crop yield in district Gwalior of Madhya Pradesh (*rabi*-2018-19)

Crop	Average yield quintal/ha		% Change
	Before soil tested	After soil tested	
Wheat	38.61	47.54	23.13
Mustard	14.20	18.32	20.01
Chickpea	14.4	19.80	36.55

The data in Table 2 revealed that most important changes observed after the application of RDF were (i) reduction in application of other inputs like seed, labour, pesticides, etc. (64.38%), (ii) improvement in soil fertility (58.20%), and (iii) increase in crop yield (54.85%). The important changes observed were (i) improvement in crop growth (68.58%) and improvement in grain filling/setting (59.25%) and (ii) the lower incidences of pest and diseases after application of RDF (63.55%) was observed among the least important changes. This finding was conformity with the findings of Chouhan *et al.* (2017).

The adoption ability of any agricultural technology depends upon its cost and return structure. Therefore, an effort was made to know the economics performance of the technology. The impact of soil testing on the economics of cultivation of selected *rabi* crops was

Table 2: Changes reported after application of recommended doses of fertilizers to *rabi* crops in Gwalior district of Madhya Pradesh (% of farmers)

Change	Most Important	Important	Least Important	Total
Increase in crop yield	54.85	12.64	32.51	100
Improvement in crop growth	15.62	68.58	15.8	100
Improvement in Grain filling/setting	12.30	59.25	28.45	100
Lower incidence of pest and diseases	11.95	24.50	63.55	100
Improvement in soil fertility	58.20	15.28	26.52	100
Reduction in application of other inputs like seed, labour, pesticide etc.	64.38	14.63	20.99	100

studied and is presented in Table 3. The result showed that total cost of cultivation of wheat crop increased by 16.87 per cent, from Rs. 22426 to Rs. 26250 ha⁻¹, but net income also increases by 25.22 per cent from Rs. 65751 to Rs. 82336 ha⁻¹. The benefit cost ratio also increased from 3.92 to 4.13 with the application of recommended dose of fertilizer after the farmers got their soil tested. The total cost of cultivation in mustard crop increased 2.8 per cent from Rs.21829 to Rs. 22394 ha⁻¹ and net income increased by 8.18 per cent from Rs. 45646 to Rs. 49426 ha⁻¹. The benefit cost ratio increased from

3.09 to 3.20 after the farmer's got their soil tested. In chickpea, the total cost of cultivation increased by 9.94 per cent from Rs.17350 to Rs.19075 ha⁻¹ and net income increased by 20.81 per cent from Rs. 40638 to Rs. 49097 ha⁻¹. The benefit cost ratio was also increased from 3.34 to 3.57 due to application of recommended dose of fertilizer after soil testing by the farmers. Similar finding reported by Shrivastva *et al.* (2012).

CONCLUSION

It can be concluded that adoption of RDF as per Soil health Card leads to reduction in the application of other inputs like seed, labour, pesticides, etc., improvement in soil fertility and increase in crop yield were observed by the majority of households after the application of RDF. At the same time, they also started adopting the recommended package of practices (RPP) for cultivation of other crops as they got the opportunity to contact officials of the department of agriculture, scientists of SAUs and KVKs and farming facilitators resulting reduction in expenditure on fertilizers and other inputs, thereby cost of cultivation. It could lead to increase in farmers' income. It is suggested that the issued SHCs need to be periodically updated so that the farmers remain aware about the changing fertility status of their land. The awareness generation regarding spraying, fertigation and drilling method of fertilizers application is also needed among the farmers. The advantages of adoption of recommendations of soil testing may be disseminated among the farmers along with strengthening of extension service delivery in the state.

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Table 3: Impact of soil testing on economics of cultivation of major *kharif* crop in Madhya Pradesh (Rs./ha)

Variable	Before soil tested	After soil tested	Difference	% Difference
Wheat				
Total Cost	22460	26250	3790	16.87
Gross Income	88211	108586	20375	23.09
Net Income	65751	82336	16585	25.22
B:C Ratio	3.92	4.13	0.21	5.35
Mustard				
Total Cost	21829	22394	565	2.58
Gross Income	67515	71820	4305	6.37
Net Income	45686	49426	3740	8.18
B:C Ratio	3.09	3.20	0.11	3.55
Chickpea				
Total Cost	17350	19075	1725	9.94
Gross Income	57988	68172	10184	17.56
Net Income	40638	49097	8459	20.81
B:C Ratio	3.34	3.57	0.23	6.88

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Effectiveness of Extension Agencies: A Case of Cotton Farmers in Akola District of Maharashtra, India

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ABSTRACT

The present study was carried out in Akola block of Akola district of Maharashtra among thirty randomly selected cotton farmers. The purpose was to identify the comparative effectiveness of selected extension agencies viz., Department of Agriculture, KVK, Input agencies and NGOs against selected indicators. Seventeen indicators under seven dimensions namely 'access', 'assurance', 'empathy', 'reliability', 'responsiveness', 'tangibility' and 'timeliness' were used for comparison of agencies using Analytical Hierarchy Process (AHP). The comparison of overall effectiveness of the selected agencies showed that input dealers were found to be most effective followed by department of agriculture and KVK. NGO was perceived to be least effective by the farmers.

Keywords: AHP, Comparative effectiveness, Extension agencies

INTRODUCTION

Agricultural extension is an important link in the agricultural innovation system for transferring the knowledge and information to the end users. Overtime the scope of extension was found to be broadening encompassing all the information and services needed and demanded by farmers and other actors in rural settings to assist them in developing their own technical, organizational, and management skills and practices so as to improve their livelihoods and well-being (Sulaiman and Davis, 2012). Addressing the varying extension needs of the farmers is a herculean task. It is imperative to understand the contribution of extension to the well being of the cultivators. Agricultural extension system in India at present is not monolithic in nature. A large numbers of agencies-in public, private NGO and civil society sectors-evolved overtime for the provision of information, advisory and support services to farming community. Weakening of public extension, diverse nature and

changing demands of farming community and the scope for new entities were the major determinants of such a transformation. Pluralism in agricultural extension *per se* acknowledges the existence and potential of all these entities (Ponnusamy and Pachaiyappan, 2018). Since the pluralism has become the norm, the next question is about their comparative effectiveness in addressing the extension priorities of the farmers. The different actors will have varying strength in diverse arenas. For example, strength of KVKs lies more in training, capacity development and frontline demonstration; but with limited out reach. So, it is important to compare the agencies on indicators which are related to quality of service provision. Such a comparison can help in identifying areas of strength and weakness of the selected agencies with respect to effectiveness of service provision.

Cotton is an important commercial crop in India. India is the second largest producer of cotton in the world contributing to 36.5 per cent of world's cotton production

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and has highest area under cotton in the world. Still there exist vast potential to improve the production and productivity of cotton in India. To sustain the momentum in cotton production there should be remunerative income for the farmers. It depends on many aspects like increase in production, decrease in cost of cultivation, better price realization, reduced transaction cost, timely availability of inputs, access to market etc. To make gains of most of it, farmers need quality information, advisory and support services in right time. Being a cash crop, cotton is an information intensive crop. Cotton farmers require information advisory and support services across the value chain. Information is required not only in relation to production, but in the context of post-harvest and marketing activities also. In Akola district of Maharashtra, where cotton is the major crop, farmers were found to access different sources to address their extension priorities. Effectiveness of these agencies in terms of their service quality is an important concern with respect to effective solution of farmers' extension needs.

METHODOLOGY

The present study was carried out among thirty randomly selected cotton farmers in Akola block of Akola district of Maharashtra. Before assessing the comparative effectiveness of extension agencies, it is important to analyse the efficiency enhancing role of extension as a whole. First, technical efficiency of cultivation was found out by data envelopment analysis (DEA) using cost of cultivation data. Then, the technical efficiency at constant return to scale was subjected to tobit regression with number of covariates including index for extension.

Data Envelopment Analysis was initiated by Charnes *et al.* (1978) to facilitate the evaluation of relative efficiencies of comparable production units. It is a non-parametric method and requires no prior assumption with respect to the relationship between inputs and outputs. In the present study the technique was used to assess the production efficiency of farmers. Further the determinants of efficiency were analyzed using tobit regression.

To assess the comparative effectiveness of extension agencies, four agencies namely Department of

Agriculture, Krishi Vigyan Kendra (KVK), Input dealers and Non Governmental Organizations (NGO) were selected. Analytical Hierarchical Process (AHP) was used for comparison of effectiveness. Indicators of extension effectiveness was used as criteria and extension agencies (Department of Agriculture, Krishi Vigyan Kendra, Non-Governmental Organizations and Input dealers) were identified as options in the prioritization calculation in AHP. The 17 items in the SERVQUAL inventory developed by Parasuraman *et al.* (1988) and further modified by Rana *et al.* (2013) for increasing their relevancy to agricultural extension were used as indicators of effectiveness. It has seven dimensions viz., access, assurance, empathy, reliability, responsiveness, tangibility and timeliness.

The Analytical Hierarchy Process (AHP) is a decision making tool in complex situations with multiple criteria. The AHP was proposed by Thomas Saaty (1980), to develop priorities for making most suitable decisions. During the process, a set of criteria are evaluated against set of options in pair-wise manner. Before pair-wise comparison, weights were generated for each criterion based on the importance perceived by the decision makers. In the next step, scores for each option is generated by pair-wise comparison of criterion. The option with higher score for a particular criterion will be the most suitable choice for that criterion. Final score for each option is calculated from criteria weight and option score. In effect, the process involves the derivation of ratio scale from pair-wise comparison through eigen vector calculation. Following Indicators (dimension) were used for comparison of the selected agencies

Access: Access involves approach, ability and ease of contact. It involves ease of approach and interaction. This measure consists of two items.

Assurance: It is the confidence of farmers in the service of agencies that agencies have required skill, expertise, resource and infrastructure to meet their requirements. It has four items.

Empathy: It is the measure of the interest and concern of the agencies towards individual needs and context of the farmers. It comprises of two items.

Reliability: It is the ability to provide relevant and quality service in an accurate and cost effective manner. It includes 4 items.

Responsiveness: It is the measure of concern and supportive service of agencies. It consists of two items.

Tangibility: It implies the physical facilities and materials for benefit of farmers. It has 2 items.

Timeliness: It is the measure of timely provision of response and service. It includes one item.

RESULT AND DISCUSSION

Initially, an effort was made to assess whether extension was contributing to the technical efficiency of crop production. For this, Data Envelopment Analysis was used to find out technical efficiency of crop production at first. Technical efficiency so calculated was subjected to tobit regression analysis with number of covariates including an index for extension which is formulated based on the number of sources accessed and frequency of contact. As per the results of the tobit analysis, extension was found to be a determinant of technical efficiency in case of Cotton cultivation in Akola. Calculation of

technical efficiency answers the question how best the technological inputs are used in terms of output generation. The present level of technical efficiency is higher (0.797) pointing out that 80 per cent of input use was efficiently utilized. Present level of production can be maintained even by reducing 20 per cent of input usage. The determinants of the technical efficiency play the role of enhancing or disenchanting the process of optimal utilization of inputs (Charnes *et al.*, 1994). Hence it can be argued that information derived from various sources has facilitated the optimal use of inputs for output maximization in both the regions. Similar findings were observed by Hussain (1999) and Amaza *et al.* (2006). In addition to extension, level of education and area under irrigation were the determinants of technical efficiency of cotton production in. Cotton being a commercial crop, adoption of scientific farming practices is inevitable to achieve the efficiency in production and obviously the level of education of farmers will have greater role in comprehension and adoption of new technologies and practices. Further, the crop being water intensive in nature, increase in the area under irrigation will substantially improve productivity and efficiency (Table 1 & 2).

It was widely observed during the survey that farmers' access to extension agencies both in public and private spheres is influencing the adoption of scientific farming practices. Glimpse at the results of Analytical Hierarchical Process for thirty randomly selected cotton farmers of Akola revealed that consistency ratio was

Table 1: Technical Efficiency of Cotton Cultivation in Akola

Cotton	Mean
TE (Constant return to scale)	0.776
TE (Variable return to scale)	0.972
Scale efficiency	0.797

Table 2: Determinants of Technical Efficiency of Cotton Cultivation in Akola

	Coef.	SE	t	P> t	[95% of C.I]	
Age	-0.00323	0.001526	-2.12	0.043	-0.00635	-0.00011
Education	-0.00518	0.002684	-1.93	0.054	-0.01067	0.000312
Farming experience	0.00118	0.001145	1.03	0.311	-0.00116	0.003521
Family size	-0.00182	0.002433	-0.75	0.462	-0.00679	0.003161
Irrigated area	0.004618	0.001656	2.79	0.009	0.00123	0.008005
Land holding	-0.01495	0.025187	-0.59	0.557	-0.06646	0.036565
Cotton area	-0.00148	0.00454	-0.33	0.746	-0.01077	0.0078
Extension Contact	0.00851	0.000987	8.62	0.01	0.006492	0.010528
_cons	0.505203	0.0932	5.42	0	0.314588	0.695819
/sigma	0.068758	0.008339			0.051704	0.085812

more than 0.2 in case of three respondents. The scores obtained for the remaining twenty seven respondents for the seventeen items were used to draw the priority for seven dimension namely reliability, assurance, access, empathy, responsiveness, tangibility and timeliness as well as final priority of the farmers with respect to various agencies. Geometric mean of individual scores was used to arrive at the dimension- wise and over all priority. In Akola District, Krishi Vigyan Kendra received the highest score for the dimensions namely Reliability and Tangibility; while for all other dimensions of input dealers obtained highest score.

In case of dimensions like reliability, access, empathy, responsiveness and timeliness second preference was for State Department of Agriculture. Input dealers were accorded second preference in case of tangibility dimensions also. Further comparison of overall effectiveness of the selected agencies showed that input dealers were most effective followed by department of agriculture and KVK. NGOs were found to be least effective by the farmers.

Highest score of KVK in 'reliability' dimension shows that the farmers have immense credibility in the Krishi Vigyan Kendra and consider the information and other services provided by KVK as authentic. It can be further attributed to the subject matter expertise of the KVK staff which is reflected in their advisories. In case of 'Tangibility' dimension also, KVKs provide tangible information products or 'take away information' like printed advisories, seeds, biofertilizers etc. Second highest score of Department of Agriculture for 'reliability' dimension further add to the human resource quality of the public extension system in terms of technical expertise. Resources and infrastructural constraints notwithstanding, the department was found reaching out to the farmers through visits of Agricultural officers and Agricultural assistants ('Krishi Sahayaks'), through weekly and fortnightly visit to the villages. Personnel of the Department make visit to each village at least once in a fortnight and interact with the farmers. They inform farmers with various schemes and input provision programmes apart from advisory provision. Further the

feedback from the farmers is passed on to the higher ups in the hierarchy. They also oversee the timely provision of inputs to the eligible farmers. This is translated to the second highest score of department in the dimensions like access, empathy, responsiveness and timeliness. Input dealers were found to be most accessible to the farmers, as the 'Krishi Seva Kendras'-accredited input suppliers were operating in the vicinity of the villages. Apart from ensuring timely provision of required inputs, they provide plant protection advisories also. Since the operators are from the locality they better understand the problems of the farmers and act in a responsive manner. But many a time, lack of subject expertise constrains them from making correct recommendations as perceived by the farmer community (Table 3).

The finding adds to the results of the Situation Assessment Survey by NSSO (2005), which have revealed that 'input dealers' were the second most important source of information for farmers following other 'progressive farmers'. Also, those received information on improved seeds/varieties from input dealers, 63 per cent were from Maharashtra. Moreover, more than half of the respondent farmer households opined that information received from input dealers, extension agents, and progressive farmers were good and most of them had in fact tried the information so received.

Situation Assessment Survey of 2013, further pointed out that private commercial agents (including input dealers) were the important source of information following progressive farmers and ICTS (both traditional and modern). They were rated high in terms of usefulness of information also along with the information received from extension agents, KVKs and progressive farmers (NSSO, 2014). Provision of extension services by input agencies is a part of their marketing activity and very often it is the marketing personnel that handle the extension related activities. Considering the importance of input dealers in the extension domain, it is very much important to orient them in respect of quality information provision. This recognition has led to the initiation of one year Diploma In Agricultural Extension Services for Input Dealers (DAESI) programme in distance education mode

Table 3: Comparative effectiveness of selected extension agencies as perceived by cotton farmers in Akola (n=30)

	DoA	KVK	NGO	Private	$\gamma_{\max}$	Consistency Index	Consistency Ratio
Reliability							
Extension services (information, advisory, training etc.) are highly relevant and suitable to the condition of the farmers.	0.961	1.085	0.353	1.749	4.148	0.05	0.055
Extension services (information, advisory, training etc.) are of high quality	0.9524	2.214	1.118	0.373	4.0796	0.0275	0.0294
Services are cost effective	1.497	1.087	1.186	0.453	4.223	0.074	0.083
Information provided are accurate	1.483	1.483	0.448	0.632	4.046	0.015	0.017
Total	1.194	1.403	0.677	0.658			
Assurance							
Extension services (information, advisory, training etc.) are highly useful to the farmers	0.834	0.912	0.318	1.98	4.043	0.014	0.016
Since the service of the agency is highly efficient and of good quality, I am willing to pay for it if needed	0.979	0.972	0.29	1.916	4.156	0.053	0.058
The agency has sufficient expertise and skill to give required service in time	0.876	1.692	0.450	1.109	4.127	0.043	0.047
Have enough capital resources and infrastructure management skills to solve the problems	0.782	1.84	0.447	1.065	4.134	0.045	0.05
Total	0.865	1.289	0.369	1.455			
Access							
Personnel of agencies are easily approachable	1.145	0.615	0.335	2.092	4.186	0.062	0.069
Quick feedback mechanism	1.119	0.5703	0.218	2.259	4.166	0.055	0.061
Total	1.132	0.592	0.27	2.174			
Empathy							
Involve regular interaction with farmers and give personalized attention	1.16	0.701	0.313	2.028	4.201	0.067	0.075
Localized solutions are given	0.943	0.125	0.502	1.483	4.053	0.018	0.02
Total	1.046	0.296	0.396	1.735			
Responsiveness							
Personnel/officers are highly service minded and always willing to support the farmers	0.852	1	1	1.209	4.061	0.0204	0.023
They inform farmers when service will be provided	0.956	0.865	0.37	1.821	4.01	0.004	0.004
Total	0.903	0.93	0.608	1.48			
Tangibility							
Physical facilities are provided	0.968	1.602	0.683	0.801	4.055	0.018	0.020
Good communication materials on usage & process of technologies are provided	0.653	1.340	0.286	1.938	4.216	0.073	0.0806
Total	0.795	1.466	0.441	1.246			
Timeliness							
Consistent response within promised time frame is provided	0.92	0.546	0.315	2.254	4.034	0.016	0.013
Total	0.92	0.546	0.315	2.254			
Overall	0.911	0.699	0.440	1.593			

by National Institute for Agricultural Extension Management (MANAGE), Hyderabad. The concept was to augment the knowledge and awareness of input dealers in agriculture and legal implications of input trading. Cotton farmers' preference for the Department of agriculture also goes in line with the findings of NSSO in various rounds information provided by the personnel was mostly related to different schemes and programmes rather than advisory services.

CONCLUSION

Farmers' preference for extension agencies depends on the perceived attributes of the agencies in relation to service provision. Along with technical expertise and resource availability, aspects like timely provision of accurate and reliable services were also perceived as important by farmers. Similarly, easiness of access and service mindedness of the agencies also matter. Farmers' preference for input agencies is the clear reflection of these facts. Even though the outreach was limited, KVK was rated high in terms of the reliability of the information and services provided. The major reason is the expertise of the subject matter specialists and facilities available with the KVK. Hence it is important to increase the outreach of KVKs through various linkage partnerships with public, private and civil society organizations. New Information and Communication Technologies like mobile phones, interactive video calls etc. could further facilitate this. Public extension agencies need to introspect and reinvent their approaches and strategies to serve the farmers more effectively. Improvement in the service quality of different actors in their respective areas of strength can add to the effectiveness of pluralistic extension system. This, in turn can promote the convergence of agencies with delineated roles and activities.

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Evaluation of Front Line Demonstration of Oilseeds in Raebareli District

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ABSTRACT

Low productivity of traditional varieties of oilseeds is a cause of concern for farmer's at large. To overcome the problem of low yield, Krishi Vigyan Kendra, Raebareli conducted front line demonstrations in the different localities of Raebareli District, Cultivation of high yielding varieties of oilseeds viz. Sesamum- (var. Tarun), Mustard- (var. CS-56 & Maya) yielded higher over local check. The cultivation practices considered under Front Line Demonstration viz. use of improved varieties, proper seed rate, integrated pest management, irrigation and spraying of weedicide along with one hand weeding gave an average higher yield of 26.75 to 57.5 per cent in case of Sesamum (variety- Tarun) and 37.3 per cent for Mustard- variety- CS-56 , 54.29 per cent higher yield in case of Mustard variety Maya as compare to farmer's practice. Yield of oilseed crops however varied in different years which might be due to the other factors like soil moisture availability, climatic conditions, disease and pest attack as well as the change in the location of trails. The productivity gain under Front Line Demonstration over farmer's practice created awareness and motivated the other farmers to adopt scientific crop production and management.

Keywords: Economics, Extension gap, Front line demonstration, Gap analysis, Mustard, Sesamum, Technology gap, Technology index

INTRODUCTION

India is world's fourth largest edible oil economy after U.S., China and Brazil. Globally, it contributes almost 6 per cent of global vegetable oil production, 14 per cent of vegetable oil imports and 10 per cent of edible oils. The total market size of the Indian oilseed sector is about Rs six hundred billion (US\$13.4 billion). Apart from this India is also the second largest importer of edible oilseed after China. Country needs to spend over Rs. 60 thousand corers annually to augment domestic supplies. Thus attaining self-sufficiency in edible oil sector is critical for reducing current account deficit and also edible oil security of a burgeoning population. This necessitates a comprehensive road map to meet the challenge of bridging the widening gap of demand and production of edible oil and oilseed crops are expected to play a major role.

However, attempts to enhance its productivity significantly are not fully successful due to their cultivation under diverse and mostly constrained ecologies. Climate change has further limited the productive potential of crops (Anonymous, 2013). In this context, Krishi Vigyan Kendra Raebareli has the responsibility in the district to meet the aspirations of farmers by conducting front line demonstrations (FLDs) with the improved package of practices in oilseed crops. The productivity of oilseed crop is far below the potential yield due to lack of knowledge and adoption about new production technologies.

METHODOLOGY

The study was carried out by the Krishi Vigyan Kendra, Raebareli during *Kharif* season 2015-16 to 2017-18 (3 years) in the farmers of 26 villages of 11 blocks in

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Raebareli district. In total 221 Front Line Demonstrations in 71 ha. area in different locations were conducted. The soil type of demonstration field was alluvial with pH ranging from 7.8 to 8.5 and average rainfalls 923 mm with mean maximum and minimum temperature 44.2°C and 2.3°C, respectively. About 90 per cent of rainfall is distributed during June to September. The component of demonstration under front line demonstration comprised high yielding varieties of Sesamum- (Tarun) and Mustard (S-56 and Maya). In case of farmer's practices, existing practices being used by farmers were followed. Before conducting the demonstration, training to the farmers of respective villages were imparted with respect to envisaged technology interventions, site selection, farmers selection, layout of demonstration, farmers participation etc. as suggested by Choudhary (1999). The farmers were selected on the criteria that they were involved in cultivation of oilseed crops since last 5 years. The data on output of oilseed crops were collected from Front Line Demonstration plots besides the data on local practices commonly adopted by the farmers of this region were also collected. The collected data were tabulated and analyzed by using statistical tools like frequency and percentage. To estimate the technology index, extension gap and technology gap the formulae were considered as suggested by Samui *et al.* (2000); Kadian *et al.* (2004); Sagar and Chandra (2004) (Table 1).

RESULTS AND DISCUSSION

Result indicates that the cultivation practices considered under Front Line Demonstration viz. use of improved varieties, proper seed rate, integrates pest management, irrigation and spraying of weedicide along with one hand weeding produced a higher average of yield i.e. Sesamum variety- Tarun 26.75 to 57.5 per cent, Mustard variety- CS-56, 37.3 per cent and Mustard Maya 54.29 per cent more yield of oilseed crops as compare to farmer's practice. The result of Front Line Demonstration led to motivation to adopt the improved agricultural technologies applied in the Front Line Demonstration plots. Yield of oilseed crops however varied in different years which might be due to the other factors like soil moisture availability, climate conditions, disease and pest attack as well as the change in the location of trials. The high yielding varieties of oilseed crops yielded higher as compare to local check.

The technology gap, the gap in the demonstration yield over potential yield were found 6.4 q/ha for Mustard variety Maya, 3.7 q/ha for CS-56, 2.7 q/ha, 3.55 q/ha and 3.8 q/ha for sesamum variety Tarun during 2015-16 to 2017-18. Hence location specific recommendation appears to be necessary to bridge the gap between the yields of different oilseed varieties. The highest extension gap of 7.6 q/ha was recorded in Mustard variety Maya

Table 1: Description of technology intervention under FLD on Oilseed

Particulars	Technological intervention (T)	Farmers Practices (T)	Gap
Variety	Sesamum- Tarun & T-78 Mustard- CS56 & Maya	Local local	Full gap
Seed rate	Sesamum-4 kg/ha Mustard-5 kg/ha	6.7 kg/ha 7-8 kg/ha	Partial gap
Integrated Nutrient Management	N:P:K:S (30:20:20:20) kg/ha for Sesamum (120:40:40:20) kg/ha for Mustard at the time of field preparation	No use of fertilizer	Full gap
Integrated Pest Management	Seed treatment with Trichoderma viridae @ 5 g/kg seed + one spray of Imidachlarpril 17.8 SL 250 ml/ha at the ETL to control plant hopper in mustard	One or Two spray of insecticide	Partial gap
Irrigation	1 st irrigation before flowering and 2 nd irrigation at pod filling stage in Mustard	No irrigation	Full gap
Weed Management	Spray of Pendimethyline 30EC @ 3.3 lt/ha as pre-emergence + One hand weeding & thinning at 20-25 Days after sowing of mustard	No spraying	Full gap

Table 2: Grain yield, technology gap, extension gap and technology index of different oilseed varieties

Year	Crop	Variety	Grain yield (q/ha)			% increase over FP	Technology gap (q/ha)	Extension gap (q/ha)	Technology index (%)
			Potential	FLD	FP				
2015-16	Sesamum	Tarun	8-9	6.3	4.0	57.5	2.7	2.3	30.00
2016-17	Sesamum	Tarun	8-9	5.45	4.3	26.74	3.55	1.15	39.44
2017-18	Sesamum	Tarun	8-9	5.2	3.4	52.94	3.8	1.8	42.22
2015-16	Mustard	CS-56	11-14	10.30	7.5	37.3	3.7	2.8	26.42
2017-18	Mustard	Maya	25-28	21.60	14.0	54.29	6.4	7.6	22.86

Table 3: Gross expenditure, gross return net return and B:C ratio of oilseed crops production under front line demonstrations

Year	Crop	Variety	Gross Expenditure (Rs/ha)		Gross Return (Rs/ha)		Net Return (Rs/ha)		B:C Ratio	
			FLD	FP	FLD	FP	FLD	FP	FLD	FP
2015-16	Sesamum	Tarun	9260	8850	28350	18000	19090	9150	3.06	2.03
2016-17	Sesamum	Tarun	10550	9200	35425	27950	24875	18750	2.35	2.04
2017-18	Seasmum	Tarun	12000	9500	36470	23940	24470	14440	3.42	2.52
2015-16	Mustard	CS-56	11780	10130	30900	22500	19120	12370	2.62	2.22
2017-18	Mustard	Maya	16500	14500	64800	43200	48300	28700	3.92	2.97

FLD = Front Line Demonstration, FP = Farmers Practice, B:C Ratio = Benefit : Cost Ratio

followed by CS-56 variety 2.8 q/ha. In case of Sesamum variety Tarun extension gap 2.3 q/ha, 1.8 q/ha and 1.15 q/ha were found. This emphasized the need to educate the farmers through various means for adoption of improved varieties and recommended practices. The technology index shows the feasibility of the evolved technology at farmer's field. The lower value of technology meter is the feasibility of the technology. The technology index for Mustard variety Maya was found lowest (22.86%), indicating the performance of this variety in Raebareli district was satisfactory

Table 2 indicates that the extension gap, technology gap and technology index of sesamum were 2.3, 1.15 & 1.8 q/ha, 2.7, 3.55 and 3.8 q/ha and 30.00, 39.44 and 42.22 per cent respectively. Yield of mustard variety-CS-56 and Maya used in demonstration were 2.8 and 7.6 q/ha, 3.7 & 6.4 q/ha and 26.42 & 22.86 per cent in variety CS-56 and Maya respectively.

The data presented in Table 3 indicates the adoption of improved technology of oilseed not only gave higher yield but also provided higher benefit cost ratio as

compared to the farmer's practices. This may be due to higher yield obtained under the recommended practices compared to farmer's practices. It was observed that front line demonstration recorded higher gross return and net return as compared to local check during different year in different oilseed crops. The additional cost per hectare in front line demonstrations yielded additional net return per hectare, showing higher profitability and economic viability of the demonstration.

CONCLUSION

The front line demonstration conducted on oilseed crops at farmers field resulted that the farmers may get increased yield by following the recommended package of practices in oilseed crops. A favorable benefit: cost ratio is self explanatory of economic viability of the demonstration. The productivity gain under front line demonstration over farmer's practice created awareness and motivated the other farmers to adopt scientific crop production and management. This study suggests strengthening extension approach to educate the farmer's for higher production and increase net return on sustainable basis.

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Perceived Effectiveness of Dairy Service Delivery Systems in Namakkal District of Tamil Nadu

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ABSTRACT

The present study was conducted in Namakkal District of Tamil Nadu to analyse the perceived effectiveness of various dairy service delivery systems like dairy co-operative, private integrators, public departments, private veterinarians, para-veterinarians, etc. and their extent of share in delivering the dairy services to farmers. A total of 120 respondents were selected for the study by proportionate random sampling method and the data were collected by personal interview method using pre-tested interview schedule. Most of the respondents predominantly availed the curative (99.17%) and preventive (95.00%) services from the private veterinarians; and medicines from the pharmacies (98.33%) than other dairy service delivery systems. The para-veterinarians are the major source for 75.83 per cent of the respondents for availing artificial insemination services. The respondents predominantly availed the services like concentrate feed (73.33%); mineral mixture (73.33%); insurance (57.78%) and training and advisory services (60.00%) from dairy co-operative, whereas fodder seeds & slips and credit facilities were mainly availed from neighbours (59.17%) and banks (12.50%) respectively. Overall it was perceived that the public department was effective in delivering health and artificial insemination services, providing insurance and mineral mixture to the dairy farmers while the dairy co-operative was perceived to be effective in supplying fodder seeds and slips, credit facilities and training and advisory services. The commercial feed agencies were perceived as the effective service provider in supplying commercial concentrate feed than others.

Keywords: Co-operative, Dairy, Effectiveness, Private, Service, Veterinarians

INTRODUCTION

India is the largest milk producing nation in the world. The growth rate of milk production in India during the year 2015-16 was 6.28 per cent with a total milk production of 155.50 million metric tonnes. Tamil Nadu produced about 7.24 million tonnes in 2015-16 contributing 4.65 per cent to the total production of India standing in 10th position. Among the co-operatives in India, Tamil Nadu holds 4th place with a daily procurement of 28.50 lakh litres per day. Dairying has emerged as an important secondary source of income for millions of rural agricultural families and has assumed the most important

role in providing employment and income generating opportunities, especially for landless, marginal and small farmers.

Dairying encompasses a chain of activities viz., milk production, processing of milk and finally marketing. For carrying out these essential activities, it requires various inputs and services which have to be delivered by external agencies. Dairy service delivery system is an agency or institution that delivers various inputs and services to the intended clientele either at free of cost or charging according to the service rendered by them. According to Umali *et al.* (1992), livestock services can be grouped

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into two major functional categories: health and production services. Health services consist of curative services, preventive services and provision of medicines; while production services include research and extension services, provision of input such as seed, feed and artificial insemination. There are various agencies which include public department like State Animal Husbandry Departments (SDAH), private integrators, dairy co-operative, private veterinary professionals, para-veterinary professionals, private milk vendors, educational institutes, etc. These agencies provide various services such as curative; preventive; distribution of medicines; supply of fodder seeds, slips, concentrate feed, mineral mixture; AI services; training and advisory services; insurance; and credit facilities. Effective and efficient delivery of services by various agencies is considered as vital for sustainable dairy development. Livestock services in developed countries are in general adequately and efficiently supplied. In India, the government maintains a large public infrastructure on livestock services, but there are limitations about the service availability and utility to the livestock producers. The extent of share in delivering the services to dairy farmers has to be explored for the betterment of delivery system. Hence there is a need to understand the existing services of the agencies and their efficiency in delivering the services to dairy farmers.

METHODOLOGY

The study was undertaken in Namakkal district of Tamil Nadu which falls under the Salem District Co-operative Milk Producers Union, which is the largest milk procuring union of Tamil Nadu Cooperative Milk Producers Federation. Apart from co-operative, various private dairies, vendors and cream separation units are also procuring milk from the farmers. All the four taluks of Namakkal district were purposively included for the study. For each taluk, the revenue villages which are having a female bovine population of above 1000 animals were listed out. From this list, one village having highest bovine population from each taluk was selected for the research study. Respondents were selected based on the criteria that the farmers should have milch animal either a cow or a buffalo in milking condition and availing services from different dairy service delivery systems.

The different milk procurement channels available in the selected villages were listed out. The number of dairy farmers in each milk procurement channel was listed out. By using proportionate random sampling method 30 respondents from each village were selected. Thus, a total of 120 respondents were selected for the study. The data were collected by personal interview method using pre-tested interview schedule.

RESULTS AND DISCUSSION

Most of the dairy farmers availed curative and preventive services from private veterinarians (99.17% and 95%) followed by private integrators (81.82% each) and dairy co-operatives (75.55% and 84.44%) (Table 1). The dairy farmers were unable to take the animals to hospital during illness and the public department veterinarians were not available after their scheduled duty hours which might be the reasons for availing the services of private veterinarians. Even though the charges of private veterinarians are expensive, the farmers seek them because they reach the farmers door step was also stated by Pallavi *et al.* (2011) and Bardhan *et al.* (2015).

Majority of the dairy farmers procured medicines from pharmacies (98.33%) followed by private veterinarians (97.50%), private integrators (81.82%) and dairy co-operatives (80.00%). Researcher observed that most of the dairy farmers initially purchased medicines from pharmacies over the counter to treat the animals. After that when the ailment continues they approached either private veterinarians or other service agencies for treatment.

More than half (59.17%) of the dairy farmers procured fodder seeds and slips from neighbours. Timely availability of quality fodder slips in sufficient quantity, easy access and visualizing the proven result in neighbours plot might be the reason for procuring from neighbours. Dairy co-operative (33.33%) is the next available source to get fodder seeds and slips. Majority of the dairy farmers purchased concentrate feed from dairy co-operative (73.33%), commercial feed agencies (63.33%) and private integrators (45.45%). Sharma (2001) also found that majority of the dairy farmers purchased concentrate feed from dairy co-operative (Table 1).

Table 1: Services availed from different Dairy Service Delivery Systems

Type of services	Dairy co-operative (n=45)	Private integrators (n=22)	Public departments (n=120)	Private veterinarians (n=120)	Para-veterinarians (n=120)	Educational institutes (n=120)	Pharmacies (n=120)	Other sources (n=120)
Curative services	34(75.55)	18(81.82)	56(46.67)	119(99.17)	56(46.67)	1(0.83)	0(0.00)	0(0.00)
Preventive services	38(84.44)	18(81.82)	80(66.67)	114(95.00)	51(42.50)	2(1.67)	8(6.67)	0(0.00)
Medicines	36(80.00)	18(81.82)	79(65.83)	117(97.50)	51(42.50)	1(0.83)	118(98.33)	0(0.00)
Fodder seeds and slips	15(33.33)	2(9.09)	2(1.67)	0(0.00)	0(0.00)	11(9.17)	0(0.00)	71(59.17)
Concentrate cattle feed	33(73.33)	10(45.45)	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)	76(63.33)
Mineral mixture and other supplements	33(73.33)	2(9.09)	19(15.83)	10(8.33)	1(0.83)	5(4.17)	69(57.50)	0(0.00)
Credit facilities	5(11.11)	1(4.54)	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)	15(12.50)
Insurance facilities	26(57.78)	1(4.54)	26(21.67)	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)
AI services	26(57.78)	15(68.18)	41(34.17)	69(57.50)	91(75.83)	0(0.00)	0(0.00)	0(0.00)
Training & advisory services	27(60.00)	4(18.18)	34(28.33)	0(0.00)	0(0.00)	7(5.83)	0(0.00)	0(0.00)

Figures in parenthesis indicate percentage

Nearly three-fourth (73.33%) of the dairy farmers purchased mineral mixture from dairy co-operative and 57.5 per cent of them purchased directly from pharmacies. Credit facilities were availed only by meager percentage of the dairy farmers. Among those availed, 12.50 per cent and 11.11 per cent were availed from commercial/co-operative banks and dairy co-operative respectively. Insurance facilities were availed by 57.78 per cent and 21.67 per cent of the dairy farmers from dairy co-operative and public department respectively, since they were the only competent agencies for extending insurance facilities among different systems. The premium charges of insurance were deducted from the payment of milk which might have motivated the farmers to avail the service from dairy co-operative society.

AI services were predominantly availed from para-veterinarians (75.83%) followed by private integrators (68.18%), dairy co-operative (57.78%) and private veterinarians (57.50%). The para-veterinarians are readily available to the clients at their door steps with nominal charges and most of them are local persons with high credibility among the farmers.

Dairy farmers are visiting the dairy co-operative daily for milk pouring and hence most of the dairy farmers (60%) are getting the advisory services from dairy co-operative. Rathod *et al.* (2012) also reported that majority of the farmers availed advisory services from dairy co-

operative. Dairy farmers are also approaching public department for availing treatment and scheme facilities, might be the reasons for 28.33 per cent acquiring training and advisory services from public department.

Effectiveness of different dairy service delivery systems as perceived by the dairy farmers

In a pluralistic environment where there are different dairy service providers, it is important to assess the effectiveness of the different possible providers on various criteria in order to identify the best among all. Accordingly, services delivered by more than one provider were evaluated by the dairy farmers for their perceived effectiveness. The indicators were measured on three point continuum viz. good, average and poor and the score 3, 2 and 1 was assigned respectively. The weighted percentage score was calculated for different indicators (Table 2).

Perceived effectiveness of dairy service delivery systems

It was perceived by the dairy farmers that the curative services, preventive services and supply of medicines by private veterinarians were effective in terms of regularity (299.16, 299.12 and 299.15) and quality (299.16, 299.12 and 299.15) (Table 2). This might be the reason for availing the services of private veterinarians by the dairy farmers in the study area, which is in

Table 2: Health services

Service provider	Regularity	Timeliness	Quality	Cost effectiveness
Curative services				
Dairy co-operative	155.88	188.24	273.53	288.24
Private integrators	166.67	177.78	283.33	222.22
Public department	292.86	296.43	289.29	300.00
Private veterinarians	299.16	247.06	299.16	142.02
Para-veterinarians	265.45	252.73	200.00	158.18
Preventive services				
Dairy co-operative	160.53	189.47	276.32	292.11
Private integrators	166.67	177.78	283.33	222.22
Public department	271.25	273.75	285.00	300.00
Private veterinarians	299.12	244.74	299.12	141.23
Para-veterinarians	264.71	252.94	200.00	160.78
Medicines				
Dairy co-operative	158.33	188.89	275.00	291.67
Private integrators	166.67	177.78	283.33	222.22
Public department	273.42	275.95	284.81	300.00
Private veterinarians	299.15	246.15	299.15	141.88
Para-veterinarians	266.67	254.90	201.96	158.82
Pharmacies	297.46	298.31	296.61	141.53

accordance with the findings of Kathiravan *et al.* (2011). Further, regular and quality services would enable the private veterinarians to retain their clients.

Dairy seed, feed and mixture services

Dairy farmers perceived that public department provided cost effective curative services, preventive services and medicines (300 each) because most of the services were provided at free of cost. Further, they perceived that the timely curative (296.43) and preventive (273.75) services were provided by public department, whereas pharmacies delivered medicines (298.31) in time as they operate within the vicinity of the dairy farmers. Dairy co-operative was perceived as effective in providing fodder seeds and slips regularly (226.67) and in time (220), whereas the educational institutes (290.91 each) were effective in providing quality and variety of fodder seeds and slips. The dairy farmers also perceived that the sufficient quantity (288.73) of fodder seeds and slips can be procured from the neighbours cost effectively

(300.00) (Table 3). Dairy co-operative maintain fodder and seed banks on contract basis so that they can provide in time regularly. The educational institutes need all varieties for academic and extension purpose and hence they maintain quality and variety of seeds and slips. In most instances, the neighbours tend to give the fodder slips to their fellow farmers at free of cost in sufficient quantity might be the reason for cost effectiveness (Table 3).

The dairy farmers perceived that commercial feed agencies were effective in terms of their regularity (297.37), timeliness (297.37), quality (298.68), quantity (298.68) and type of feed (298.68). The private integrators were perceived to be cost effective (222.22) (Table 3). The commercial feed agencies operate in complete commercial mode and they have dealers and retailers hence they supply the required quantity of feed regularly in time based upon the need of the farmer however, the cost effectiveness was low. But the private integrators were cost effective since they are supplying

Table 3: Dairy seed, feed and mixture services

Service provider	Regularity	Timeliness	Quality	Quantity	Variety	Cost effectiveness
Fodder seeds and slips						
Dairy co-operative	226.67	220.00	286.67	280.00	280.00	200.00
Educational institutes	209.09	190.91	290.91	263.64	290.91	209.09
Neighbours	197.18	191.55	259.15	288.73	256.34	300.00
Concentrate feed						
Dairy co-operative	200.00	209.09	281.82	248.48	281.82	187.88
Private integrators	270.00	280.00	270.00	290.00	270.00	222.22
Commercial feed agencies	297.37	297.37	298.68	298.68	298.68	123.68
Mineral mixture						
Dairy co-operative	130.30	124.24	236.36	215.15	-	248.48
Public department	247.37	257.89	273.68	263.16	-	294.74
Private veterinarians	120.00	130.00	290.00	180.00	-	210.00
Pharmacies	300.00	298.53	300.00	300.00	-	116.18

the concentrate feed in non-profit motive to maintain the clients. Pharmacies were perceived as highly effective in terms of their regularity (300.00), timeliness (298.53), quality (300.00) and quantity (300.00). However, the public department were perceived to be cost effective (294.74) as they were distributing the TANUVAS mineral mixture at free of cost for trial as part of schemes functioning during the study period.

All the dairy farmers perceived that the credit facilities rendered by dairy co-operative were effective than commercial and cooperative banks. The credit facilities of dairy co-operative were accessible to all the members in time at nominal interest rate with minimum administrative procedures and flexible repayment schedule. The dairy farmers perceived that dairy co-

operative and public departments were equally effective in terms of their accessibility, premium charges and administrative procedure for insurance. However, they perceived the claiming process was difficult in dairy co-operative.

Artificial insemination service provided by the public department was perceived as overwhelmingly effective for all the indicators measured viz. timeliness (297.56), semen of varied breeds (282.93), quality of service (300.00), success rate (292.68) and cost effectiveness (300.00) (Table 5). The state animal husbandry department has organised and systematic time schedule of activities with subsidized rate which resulted in delivering effective artificial insemination service to the dairy farmers.

Table 4: Services related to insurance and credit facilities

Service provider	Accessibility	Timeliness	Interest rate	Administrative procedure	Flexibility in repayment
Credit facilities					
Dairy co-operative	300.00	300.00	300.00	300.00	300.00
Banks	286.67	220.00	246.67	233.33	273.33
Insurance					
Dairy co-operative	300.00	300.00	300.00	300.00	288.89
Public department	300.00	296.15	300.00	300.00	300.00

Table 5: Artificial insemination services

Service provider	Timeliness	Semen of varied breeds	Quality of service	Success rate	Cost effectiveness
Dairy co-operative	253.85	250.00	273.08	284.62	284.62
Private integrators	246.67	260.00	293.33	280.00	260.00
Public department	297.56	282.93	300.00	292.68	300.00
Private veterinarians	284.06	257.97	297.10	286.96	136.23
Para-veterinarians	282.42	257.14	275.82	264.84	197.80

Table 6: Training and advisory services

Service provider	Knowledge and skills	Infrastructure	Staff attitude	Flexibility	Need basis
Dairy co-operative	292.59	266.67	296.30	281.48	288.89
Public department	247.06	250.00	261.76	252.94	244.12

Based on the weighted percentage scores calculated, it could be inferred that the dairy farmers perceived the training and advisory services provided by dairy co-operative was most effective in terms of knowledge and skills (292.59), infrastructure (266.67), staff attitude (296.30), flexibility (281.48) and need basis (288.89) (Table 6). While the public department deals with all livestock and poultry, the dairy co-operative concentrate only on dairying resulted in effective service delivery. Rathod *et al.* (2011) stated that significant number of competent and reliable human resource team delivered extension services effectively in the form of training, advisory service, farmers educational tour, farm visits, exhibitions etc. The respondents perceived that the relevant and need based extension services were

available from dairy co-operative was good (Tefera, 2008).

Overall perceived effectiveness of the dairy service delivery systems

The overall perceived effectiveness of dairy service delivery systems were studied based on their weighted percentage mean score. From the Table 7, it is evident that public department was ranked first in providing curative services (294.65), preventive services (282.38), medicines (283.55), mineral mixture (267.37), insurance (299.23) and artificial insemination services (294.63). It is due to the fact that public department is operating throughout the year and most of the services are rendered at free of cost which makes it more effective. Insurance

Table 7: Overall perceived effectiveness of different dairy service delivery systems

Type of services	Dairy co-operative	Private integrators	Public departments	Private veterinarians	Para-veterinarians	Educational institutes	Pharmacies (n=120)	Other sources (n=120)
Curative services	226.47(III)	212.50(V)	294.15(I)	246.85(II)	219.09(IV)	—	—	—
Preventive services	229.61(III)	212.50(V)	282.28(I)	246.05(II)	4(219.61)	—	—	—
Medicines	228.47(IV)	212.50(VI)	283.55(I)	246.58(III)	220.59(V)	—	262.80(II)	—
Fodder seeds and slips	248.89(I)	—	—	—	—	242.38(III)	—	248.83(II)
Concentrate cattle feed	234.85(III)	267.04(II)	—	—	—	—	—	269.08(I)
Mineral mixture and other supplements	190.91(III)	—	267.37(I)	186.00(IV)	—	—	262.94(II)	—
Credit facilities	300.00(I)	—	—	—	—	—	—	252.00(II)
Insurance facilities	297.78(II)	—	299.23(I)	—	—	—	—	—
AI services	269.23(II)	268.00(III)	294.63(I)	252.46(V)	255.60(IV)	—	—	—
Training & advisory services	285.19(I)	—	252.18(II)	—	—	—	—	—

for the dairy animals was partially subsidized by the government agencies might be the reason for perceiving them as most effective.

The service of dairy co-operative was perceived as effective in supplying fodder seeds and slips (248.89), rendering credit facilities to their members (300.00) and providing training and advisory services (285.19). Dairy co-operative maintained stock of good quality fodder seeds and slips of different improved varieties and it was distributed to their members regularly at nominal cost. The members of the dairy co-operative were also given periodical training in improved dairy farming and fodder cultivation and they were also taken for field visits regularly. The credit facilities were arranged by the co-operative at a nominal rate of interest and it was repaid from the payment of milk. With the weighted percentage mean score of 269.08, the commercial feed agencies were perceived as the effective service provider in supplying commercial concentrate feed to the dairy farmers which was not adequately available from other systems. Though the service was not cost effective, their regularity, quality and timeliness in supply made it as the best system in the market.

CONCLUSION

Most of the respondents predominantly availed the health services from the private veterinarians than other dairy service delivery systems. The para-veterinarians are the major source for the respondents for availing artificial insemination services. The respondents were availing the services such as fodder seeds, fodder slips, concentrate cattle feed, mineral mixture, insurance and training and advisory services from dairy co-operative. The public department was ranked first in providing curative services, preventive services, medicines, mineral mixture, insurance and artificial insemination services effectively. While the dairy co-operative was perceived to be effective in supplying fodder seeds and slips; credit facilities; and training and advisory services. The commercial feed agencies were perceived as effective service provider in supplying commercial concentrate feed than others. The private integrators and dairy co-operatives need to take necessary efforts to provide timely and cost effective services to increase the net profit by

cutting down the health and breeding expenses of the dairy farmers. Hence, there is a need to restructure the delivery mechanism of private integrators and dairy co-operatives for efficient and essential service delivery in tandem with the requirement of rural dairy farmers.

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Food and Nutritional Security Through Nutrition Gardening in Unnao District

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ABSTRACT

Malnutrition is a serious public health problem in rural areas of India. In Unnao district of Uttar Pradesh more than 90 per cent farmers have small and marginal land holdings and are unable to meet out daily recommended requirement of fruits and vegetables. Hence most of them are victims of malnutrition specially micronutrient deficiency. To overcome these problem 30 demonstrations of Nutrition Gardening during 2015-16, 2016-17 and 2017-18 were conducted in adopted villages with the objectives to assess the vegetable production from 150 m² area, availability of vegetables from nutrition garden to different family size and impact of nutrition gardening on food consumption pattern of the respondents. Planned layout was designed and year calendar was followed for round the year availability of fruits and vegetables through nutrition garden. Improved variety of seed and seedlings were provided to the beneficiaries. The results shows that the beneficiaries were growing 10-14 vegetables in planned nutrition garden at a time as compare to 3-6 vegetables in earlier practice. It was also recorded that demonstration results an increase in homestead vegetable production as compare to check and food consumption pattern of vegetables of respondents improved. The results also revealed that 150 m² area of planned nutrition garden is appropriate to medium size family. It can be concluded from the findings that Nutrition garden is one of the easiest ways of ensuring access to a healthy diet. Thus large scale promotion of Nutrition gardening is needed for nutritional security of the rural households.

Keywords: Demonstration, Malnutrition, Micronutrient deficiency, Nutrition garden, Nutritional security

INTRODUCTION

In rural areas of India malnutrition and poor health status is a common problem. It retards growth, increases the risk and duration of illness, reduces work output and slows social and mental development. For poor households vegetables and fruits are often the only sources of micronutrients in the family diet. Fruits and vegetables are major sources of vitamins, minerals and fibers; their nutritional and medicinal values in human life are well documented FAO (2017). For each small and marginal family it is not possible to consume these components in daily diet. Cultivation of these commodities by gardening in a systematic manner in small piece of land available

with almost all houses is quite possible and family can take vegetables from this nutrition garden round the year. This is especially important in rural areas, where establishment of nutritional garden is easy due to availability of space and farm families are already engaged in agricultural practices. Nutrition gardening directly provides food and nutritional security by making access to food that can be harvested instantly, prepared and fed to family members daily or whenever required. There are many social benefits that have emerged from nutritional gardening practices like better health and nutrition, increased income, employment generation, food security within the household and enhancement in

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community social life. Apart from having a good amount of production of vegetables at national level, the per capita availability in diet is quite low in our country. Many of the rural families use to grow vegetables in their backyards for their household consumption but still they lack in adequate consumption of vitamins and minerals because of unorganized cultivation of vegetables. Keeping in view the importance of nutrition garden in rural scenario, the Krishi Vigyan Kendra, Unnao has taken this as an initiative for food and nutritional security for rural community of the District.

METHODOLOGY

This research was undertaken by Krishi Vigyan Kendra in 3 adopted villages namely Dhaura, Buxikhera and Arerkala of Hasanganj block of Unnao district during the year 2015-16 to 2017-18 to investigate role of nutritional gardening in addressing food security. This research used both qualitative and quantitative approach to collect data from households and stakeholders. Purposive sampling technique was used to select beneficiaries. Those beneficiaries were selected who have 150m² areas in their backyard or nearby area of their house for development of nutrition garden and were interested in nutritional gardening to ensure food security. Every year ten families from adopted villages were selected thus making total of 30 families. The study was conducted in *Kharif*, *Rabi* and *Zaid* season of the year. Different capacity building activities including trainings, exposure visits and farmer - scientist interaction on various aspects of nutrition gardening including importance of fruits and vegetables grown in nutrition garden, their utilization, average vegetable consumption, and nutrient contribution in daily diet from garden vegetables were undertaken.

Krishi Vigyan Kendra provided seed and seedlings of improved varieties to the selected households. Planned layout was designed to utilize maximum land of the garden with effective utilization of resources and year calendar was advocated to be followed to take more vegetables per unit area. The basic functions of food and their requirement to different age group were taken into consideration while planning the nutrition garden. The beneficiaries were guided and advised about planning a

kitchen garden in scientific and organic way so that all the seasonal vegetables could be grown and made available round the year. Few plants of nutritious fruits like Guava, Lemon and Papaya etc. were also supplied and planted in the nutrition garden. The size of garden was designed to be of 150 m² area to provide sufficient vegetables to the average family. Total amount of fruits and vegetables produced were recorded from each Nutrition garden and average yield per unit area was calculated. A dietary survey was done in the selected households in order to assess their food consumption pattern before and after establishment of nutrition garden using food frequency questionnaire. The average production of nutrition garden of three consecutive years was calculated under three heads viz, Green Leafy Vegetables, Roots and Tubers and Others and was considered as amount of vegetables in kg available for consumption of family members per annum. Per day requirement of vegetables for each selected family was calculated as an individual basis as per recommended dietary allowances of ICMR and then requirement for a year was calculated. Assumed requirement of vegetables to different family size per year was calculated by taking average requirement of small, medium and large family individually.

RESULT AND DISCUSSION

Demographic distribution of families of respondents were analyzed and, presented in Table 1. The table indicates that majority (73%) of respondents belonged to nuclear family and majority (53%) with medium size. Education wise 37 per cent of the respondents were illiterate and only 20 per cent respondents were found who have educational status of High School or more. Majority (60%) belong to OBC category followed by General (27%) and SC (13%) category. Majority (67%) of the respondents belonged to income group of 50,000 to 1,00,000 per annum. Majority (67%) of the respondents had marginal land holding followed by small (27%) land holding.

Data in Table 2 depicts average production of vegetables of three selected villages from nutrition garden covering 150 m² areas. Respondents who were doing unplanned gardening were cultivating 3-6 vegetables at

Table 1: Demographic distributions of the respondents

Variable	Category	Number	Percent
Type of Family	Joint	08	27
	Nuclear	22	73
Size of the Family	Small Size (1-4 members)	08	27
	Medium Size (5-7 members)	16	53
	Big Size (>7 members)	06	20
Education	Illiterate	11	37
	Primary	08	27
	Middle	05	16
	High school and more	06	20
Caste	General	08	27
	OBC	18	60
	SC	04	13
Annual Income (Rs)	<50000	06	20
	50000-100000	20	67
	> 100000	04	13
Land Holding	Marginal (<1ha)	20	67
	Small (1-2 ha)	08	27
	Medium (2-4 ha)	02	06

a time in a season such as in *Kharif*- coriander, brinjal, pumpkin and bottle guard *etc.* where as in *Rabi* radish, cabbage, cauliflower, potato and spinach *etc.* in *Zaid*-sponge guard, pumpkin, okra *etc.* but in case of planned gardening they had grown 10-14 vegetables in a season by following proper crop rotation. Similar results were reported by Savita *et al.* (2018). From each bed 3-4 vegetables were taken in a year. Ridge of beds were used for sowing root crops like radish, carrot, onion, turnip and beet root *etc.* It is evident from the table that nutrition

gardening demonstration results an increase in homestead vegetable production as compare to check. In green leafy vegetable category 313.77 per cent increase in the production of planned nutrition gardening was found in the year 2015-2016 as compare to unplanned gardening. In the year 2016-2017 this change was 261.90 per cent and in the year 2017-2018 it was 247.33 per cent. The year wise decrease in the per cent change may be due to awareness among villagers after seeing the demonstrations being conducted in their villages. In demonstrations more focus was given to increase the production of Green Leafy Vegetables which is generally lacking in the diet. In Roots and Tubers category of vegetables, per cent increase in the average production of planned garden against unplanned garden was found in the range of 23.13 per cent to 55.02 per cent in three years. Highest average production was found in the Year 2017-2018 which was 158.09 kg/year. In other vegetable category also profound increase in the average production of vegetables from planned garden was found as compare to check. It is very clear from the table that total increase in the production of vegetables of demonstrated nutrition garden ranged from 97.28 per cent to 117.59 per cent as compare to check in the three years and average production was highest in the year 2017-2018 which was 574.99 kg/year.

Table 3 shows average production of vegetables of last three years from nutrition garden of three selected villages in kg/year and per cent availability to different family size viz. small, medium and large. The results revealed that 150 m² area of planned nutrition garden is appropriate to medium size family (average family

Table 2: Year wise average vegetable production of nutrition garden

Group of Vegetables	Year 2015-16 (N=20)			Year 2016-17 (N=20)			Year 2017-18 (N=20)		
	Average production (kg/year)		% change	Average production (kg/year)		% change	Average production (kg/year)		% change
	Demonstration	Check		Demonstration	Check		Demonstration	Check	
Green Leafy Vegetables (GLV)	233.7	56.48	313.77	229.66	63.46	261.90	248.17	71.45	247.33
Roots and tubers	150.56	97.12	55.02	140.85	114.39	23.13	158.09	124.26	27.23
Others	154.8	94.13	64.45	171.53	87.82	95.32	168.73	95.75	76.22
Total	539.06	247.7	117.59	542.04	265.68	104.02	574.99	291.46	97.28

members 6, three adults and 3 children) and it can fulfill 100 per cent requirement of vegetables as per RDA for all the three groups of vegetables. Whereas for small family (average family members 4, Two adults and 2 children) size it is too big as evident from the table that availability is near around 1.72 times more than the requirement, so some area of this can be used for fruit plants. For Large size family (average family members 7, three adults, 2 adolescents and 2 children) this size is small and only 82.87 per cent requirement of vegetables can be fulfilled by nutritional gardening. Findings of Nandal *et al.* (2009) also supported the study.

Table 4 indicates the categorization as percentage of respondents according to food frequency/ food consumption pattern. The results revealed that in both the groups, cereals (basically wheat and rice) were

included in their daily diet. In case of pulses 67 per cent respondents before establishing the nutrition garden were taking it in daily diet, 27 per cent twice a week and 6 per cent once in a week, especially in lunch time. After establishing nutrition garden slight increase in percentage was found in daily consumption of pulses which was 70 per cent. It may be due to utilization of money in purchase of pulses saved from nutrition garden.

The green leafy vegetables consumption pattern shows major shift in results. Before intervention only 7 per cent of the respondents were consuming GLV in their daily diet whereas after intervention 67 per cent of the respondents were consuming GLV in daily diet. It was due to availability of fresh, healthy GLV in the nutrition garden. It was also observed that before intervention consumption of roots and tubers was more common as

Table 3: Optimization of availability of vegetables from nutrition garden (150 m²) to different family size

Group of Vegetables	Average Production of three years (kg/year)	Small Family Size		Medium Family Size		Large Family Size	
		Assumed requirement (kg/Year)	Availability (%)	Assumed Requirement (kg/Year)	Availability (%)	Assumed Requirement (kg/Year)	Availability (%)
GLV	237.17	146	162.45	219	108.30	310.25	76.44
Roots and tubers	149.83	82.15	182.39	127.75	117.28	191.62	78.19
Other	165.02	91.25	180.84	109.5	150.70	164.25	100.47
Total	552.02	319.4	172.83	456.25	120.99	666.12	82.87

Table 4: Per cent distribution of respondents according to food consumption pattern

Food Groups	Before Establishing Nutrition Garden (n=30)				After Establishing Nutrition Garden (n=30)			
	Daily	Twice in a week	Once in a week	Occasionally	Daily	Twice in a week	Once in a week	Occasionally
Cereals	100	-	-	-	100	-	-	-
Pulses	67	27	6	-	70	30	-	-
Green Leafy Vegetables	7	53	40	-	67	13	-	-
Roots and Tubers	100	-	-	-	33	47	20	-
Other Vegetables	67	33	-	-	83	17	-	-
Fruits	-	-	33	67	10	53	37	-
Fats and Oils	100	-	-	-	100	-	-	-
Milk & Milk Products	67	33	-	-	73	27	-	-
Meat	-	7	20	17	-	13	13	17
Sugar and Jaggery	100	-	-	-	100	-	-	-

compare to green leafy vegetables and potato was the main vegetable which was included in their daily diet but after intervention, education and motivation, it was slightly replaced with GLV and other vegetables. Singh *et al.* (2018), also reported increased per capita vegetable consumption after establishment of kitchen garden under frontline demonstration in Sagar district of Madhya Pradesh.

In total it was found that after establishment of nutrition garden, there was an increase in the consumption of “protective foods” such as pulses, milk and dairy products in addition to vegetables, which while adding calories to diet, also contribute to the increase in other nutrients whose intake is particularly lacking in the diet of rural poor. Chayal *et al.* (2013) and Arya (2018) reported significant increase in daily intake of Vitamin A, Vitamin C, Energy, Calcium, Iron and Protein by respondents in a study of nutrition garden in Bundi district of Rajasthan. Findings of Bhushan *et al.* (2013) also support the study.

CONCLUSION

It may be concluded from this study that establishment of nutrition gardens can play an important role in tackling the problem of malnutrition by providing diversity in diet in rural areas. Improved consumption of green leafy vegetables from nutrition garden is a low cost sustainable approach for reducing micronutrient malnutrition. A 150 m² area of planned nutrition garden is appropriate for medium size family in terms of availability of vegetables. There is need to upscale the Nutritional Gardening in rural areas with nutrition education in order to promote increased consumption of diverse and nutrient rich food.

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Assessing Integrated Farming System Models Apropos Employment Generation Potential in Madhya Pradesh

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ABSTRACT

Integrated Farming System (IFS) approach has been identified as the way-out for providing income and employment to the millions farmers and farm women engaged in agriculture sector. It has immense potential to ensure livelihood as well as income security to the persons engaged through any component of IFS. The study was conducted in Mandla district of Madhya Pradesh to assess the IFS models in relation to employment generation of tribal farmers. The study was conducted with 250 respondents (125 respondents each from marginal and small land holdings respondents) selected randomly from 5 blocks using personal interview. Results revealed that, among the 10 IFS models in study area high employment generation was found in the category of Crop + dairy (1816 man days/year) followed by Crop + dairy + poultry (533 man days/year), Crop + dairy + goat rearing (202 man days/year), Crop + dairy + poultry + goat rearing (64 man days/year), Crop + poultry (61 man days/year), Crop + dairy + fishery (41 man days/year), Crop + poultry + Goat rearing (27 man days/year), Crop + Dairy + Goat rearing + Fishery (20 man days/year), Crop + fishery (18 man days/year) and very least in case of Crop + Goat rearing (11 man days/year). Correlation analysis reveals that out of 18 independent variables only 6 variables were significantly correlated with employment generation by IFS either at 0.05 or at 0.01 level of probability.

Keywords: Employment generation, Integrated farming system, Marginal farmers, Man days

INTRODUCTION

Agriculture plays a vital role in Indian economy and contributes 17 per cent to the total GDP and also provides employment to more than 60 per cent of the population. It seems that Indian economy is mostly rural and agricultural – based and dependent on Indian cultivable land consisting of mainly small holdings (65%) and overall 86.2 per cent farmers are small and marginal. Agriculture is the only backbone of the farmers living in this state and is characterized by a number of wide crop diversifications. In the present scenario besides agriculture farmers grow fruits cultivation, dairy, goat rearing, poultry, bee-keeping etc., Nowadays this type of

system including at least one component of farming is called the Integrated Farming System. IFS is an integrative whole farm approach and effective in solving the problems of small and marginal farmers. Aim of IFS is boosting employment and income from small-holding by integrating various farm enterprises and recycling crop residues and by products within the farm itself (Gupta *et al.*, 2020). In this way, IFS provides an opportunity to increase economic yield per unit area, per unit time by stabilizing the intensification of crop and allied enterprises. It will also provide the profitability, sustainability, balance diet, environmental safety, income and employment generation throughout the year, solving fuel demands etc., Along with the associated farmers will make their growth

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faster. Thus, the integrated farming system approach is considered to be the most powerful tool for enhancing profitability of farming system. Overall an integrated farming system fulfil the multiple objective of making farmers self-sufficient by ensuring the family members a balance diet, improving the standard of living through maximizing the total net returns and provide more employment, minimizing the risk and uncertainties and keeping harmony with environment (Mali *et al.*, 2014). The present study was considered to assess employment generation in different integrated farming systems.

METHODOLOGY

In this study, Mandla district has been selected purposively from the state as it possesses adequate population of tribal farmers. The five development blocks namely Mandla, Niwas, Nainpur, Gughari and Mawai were selected purposively from Mandla district. A random selection of five villages from each block was made and ten small and marginal tribal farmers practicing IFS were selected from each village. Thus, a total of 250 small and marginal tribal farmers were considered to study the Integrated Farming System (IFS) approach for employment generation. The selected IFS practicing farmers were interviewed personally with the help of a well structured and pre-tested interview schedule to get the appropriate information. Exploratory research design was used.

Employment generation was measured in terms of man-days for both family and hired labour in an agricultural year in different combinations. It was calculated by computing the actual time in hours devoted to all the activities of enterprise per day. One man-day is equal to eight working hours. The men, women and children labour were converted into man days by considering one man equals to one man-day, three women = two man-days and two children = one man-day. The total work hours contributed by family as well as hired labour in an agricultural year in different IFS were converted into man-day.

RESULTS AND DISCUSSION

Table 1 reveals that, in case of marginal farmers high employment generation was in the category of Crop +

Table 1: Employment generation of different IFS Models

IFS models	Marginal farmers	Small farmers	Total Employment Generation
C + D (157)	1120	696	1816
C + P (07)	23	38	61
C + G (04)	08	03	11
C + F (02)	18	00	18
C + D + P (49)	192	341	533
C + D + G (19)	89	113	202
C + D + F (02)	41	00	41
C + P + G (02)	00	27	27
C + D + P + G (06)	00	64	64
C + D + G + F (02)	00	20	20
Total	1,491	1,302	2,793

C = Crop, D = Dairy, P = Poultry, G = Goat Rearing, F = Fishery

dairy (1120 man days/ year) followed by, Crop + dairy + poultry (192 man days/ year), Crop + dairy + Goat rearing (89 man days/year), Crop + dairy + fishery (41 man days/year), Crop + poultry (23 man days/year), Crop + fishery (18 man days/year) and Crop + Goat rearing (08 man days/year), while (Crop + poultry + Goat rearing), (Crop + dairy + poultry + Goat rearing), (Crop + dairy + Goat rearing + fishery) these IFS models was not employment generation in the marginal farmers category under this study. On the other hand in case of small farmers high employment generation was found in the category of Crop + dairy (696 man days/year) followed by Crop + dairy + poultry (341 man days/year), Crop + dairy + Goat rearing (113 man days/ year), Crop + dairy + poultry + Goat rearing (64 man days/year), Crop + poultry (38 man days/year), Crop + poultry + Goat rearing (27 man days/year), Crop + dairy + goat rearing + fishery (20 man days/year), very least in case of Crop + goat rearing (03 man days/year). While Crop + fishery and Crop + dairy + fishery IFS models were not practised by any of the respondents. Thus, pooled data depicted that, high employment generation was found in the category of Crop + dairy (1816 man days/year) followed by, Crop + dairy + poultry (533 man days/year), Crop + dairy + goat rearing (202 man days/year), Crop + dairy + poultry + goat rearing (64 man days/year), Crop + poultry (61 man days/year). Where sufficient number of respondents were lacking in

any category those models also extended sufficient employment generation such as; Crop + dairy + fishery (41 man days/ years), Crop + poultry + goat rearing (27 man days/ year), Crop + Dairy + Goat rearing + Fishery (20 man days/ year), Crop + fishery (18 man days/year) and very least in case of Crop + Goat rearing (11 man days/year). Thus the total employment generation in all modals computed that 2793 man days/ year. On average in a year 11.172 person were employed by the farmers who utilized the IFS models. It is also true that the more number of enterprises in any of the farming system definitely add for generating additional employment.

Thus, it concluded that, high employment generation was found in the category of Crop + dairy (1816 man days/year). This finding are also supported by Jaiswal *et al.* (2018); Sahoo *et al.* (2019); Shwetha (2012); Singh *et al.* (2016); Singh and Burark (2016) and Tarai *et al.* (2016).

Relationship between independent variables and employment generation by IFS

In order to study the relationship between independent variables and the employment generation by IFS, the correlation co-efficient (r) values were computed and findings are furnished here under.

The results presented in Table 2 indicated that correlation coefficient of independent variables with employment generation by IFS. The study indicated that the age ($r = -0.033$) a negative and significant correlation exists between age and employment generation with decision making ($r = -0.059$) scientific orientation ($r = -0.103$), risk orientation ($r = -0.015$), economic motivation ($r = -0.051$) and innovativeness ($r = -0.075$) were found to be negative and significant correlation with employment generation by tribal farmers. These findings are in accordance with the results of Satyanarayana and Sudhakar (2013). The correlation coefficients of education ($r = 0.172$) positively and highly significant with the family income ($r = 0.322$), cropping pattern ($r = 0.184$), material possession ($r = 0.493$) and credit seeking behaviour ($r = 0.222$) were positively and highly significant (at 0.01 level of probability) correlation with employment generation by tribal farmers. Land holding ($r = 0.140$) was positively

Table 2: Relationship between independent variables and employment generation by IFS (n=250)

Characteristics	Correlation Coefficient (r)
Age	-0.033
Education	0.172**
Family Size	0.122
Occupation	0.102
Land Holding	0.140*
Family Income	0.322**
Cropping Pattern	0.184**
Material Possession	0.493**
Animal Possession	0.061
Credit seeking behaviour	0.222**
Social Participation	0.039
Information seeking behaviour towards IFS	0.077
Decision making	-0.059
Scientific orientation	-0.103
Risk orientation	-0.015
Economic motivation	-0.051
Innovativeness	-0.075
Management efficiency	0.066

** Significant at 0.01 level, * Significant at 0.05 level

and significantly correlated (at 0.05 level of probability) with employment generation by tribal farmers. The Correlation coefficients of family size ($r = 0.122$), occupation ($r = 0.102$), animal possession ($r = 0.061$), social participation ($r = 0.039$), information seeking behaviour ($r = 0.077$) and management efficiency ($r = 0.066$) were found to be non-significant. Almost similar findings were also reported by Gupta *et al.* (2018).

CONCLUSION

High employment generation was in the category of Crop + dairy (1816 mandays/year), followed by, Crop + dairy + poultry, etc. Thus, the total employment generation in all models was computed 2793 mandays/year. On average in a year 11.172 person were employed by the farmers in IFS models. It is also true that the more number of enterprises in any of the farming system definitely added additional employment but it same time the volume of scale was reduced due to paying capacity coupled

with risk – bearing ability which hindered the employment opportunity in multiple integration of enterprises. Farmers have to be very conscious and informed during adoption of the IFS models as per the resources as well as family labour support among small and marginal farmers.

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Extent of Utilization of Different ICT Tools by the Teachers of Agricultural Universities

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ABSTRACT

Information and communication technology (ICT) in education is the method of education that use information and communication technology to support, improve, and optimize the delivery of information. The study was conducted in three purposively selected agricultural universities in Rajasthan total nine constituent colleges were selected from these three agricultural universities. For the study purpose. 60 per cent of teachers were selected from every college by using simple Random sampling technique. In all the selected agricultural universities combinedly 59.04 per cent teachers were having medium utilization of selected ICT tools. Among the different ICT tools the agricultural university teachers were having highest utilization of internet (MPS 96.73) followed by e-mail (MPS 96.20). There was no significant difference between the teachers of SKNAU, Jobner, SKRAU, Bikaner and MPUAT, Udaipur with regard to their utilization of different ICT tools.

Keywords: Agricultural universities, ICT tools, Utilization, Teachers

INTRODUCTION

ICT consists of a distinct set of technological tools and resources to create, disseminate, store and manage data and information. Conventional ICT tools like T.V., radio and telephone have already established their credibility and effectiveness in promoting the developmental schemes in rural and backward areas. The modern ICT tools are computers, internet and wireless communication technology in addition of powerful software's which can process and integrate sound, text and video into electronic media. ICT has the ability to prepare learners for a rapidly changing world scenario. They may use ICT as a tool to identify, analyze, exchange and present information as per their need. Information and communication technology (ICT) in education is the method of education that use information and communication technology to support, improve, and optimize the delivery of information. Information and

communication technology can lead to improved student learning and superior teaching methods. The findings regarding utilization of ICT tools by the teachers may help the administrators and policy makers for formulating effective implementation strategy and policies regarding ICT.

METHODOLOGY

The study was conducted in three purposively selected agricultural universities in Rajasthan; namely, Sri Karan Narendra Agriculture University, Jobner, Maharana Pratap University of Agriculture and Technology, Udaipur and Swami Keshwanand Rajasthan Agricultural University, Bikaner. From the selected agricultural university separate lists of all the constituent colleges were procured, out of which three constituent colleges from each agriculture university were selected purposely on the basis of having maximum number of teachers.

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In this way a total nine constituent colleges were selected from these three agricultural universities for study purpose. The selection of teachers was made by using stratified Random sampling technique. For this purpose from the selected constituent colleges separate lists of all the teachers were prepared and out of these 60 per cent of teachers were selected from every college by using simple Random sampling technique. The extent of utilization of ICT tools by the agricultural universities teachers was measured on three point continuum as most aware, aware and less aware with a score of 3, 2 and 1 respectively. The maximum attainable score was 90 and minimum attainable score was 30. Based on the total attainable score, the respondents were classified into three categories namely low, medium and high utilization by using arbitrary method. To determine the extent of utilization of respondents about each ICT tool mean per cent score was worked out and ranked accordingly.

RESULT AND DISCUSSION

Levels of utilization of ICT tools by the teachers of agricultural universities

The levels of utilization of agricultural university teachers were calculated by using the arbitrary method and the data are presented in Table 1. The data in Table 1 indicate that 59.04 per cent agriculture university teachers were having medium utilization about selected ICT tools, 36.74 per cent agricultural universities teachers had high utilization and remaining only 4.22 per cent teachers were having less utilization about selected ICT tools combindly in all the selected 3 agriculture universities of Rajasthan.

The data in Table 1 regarding university wise distribution of agricultural university teachers shows that

majority of the teachers of SKNAU, Jobner (64.62 per cent), SKRAU, Bikaner (50.00 per cent), and MPUAT, Udaipur (59.04 per cent) had medium level utilization of ICT tools, whereas only 4.61 per cent teachers of SKNAU, Jobner, 3.57 per cent teachers of SKRAU, Bikaner and 4.11 per cent teachers of MPUAT, Udaipur were having less utilization of ICT tools.

Extent of utilization of ICT tools by the teachers

The data in Table 2 indicate that among the different ICT tools the agricultural university teachers were having highest utilization of internet (MPS 96.73) which was assigned first rank followed by e-mail (MPS 96.20), mobile phone (MPS 93.90) and desktop (MPS 91.68) which were ranked second, third and fourth, respectively. The Agril. university teachers were having least utilization of kindle (MPS 45.79) which was awarded last rank.

Table 2 regarding university wise extent of utilization of teachers about ICT tools further shows that in SKNAU, Jobner teachers were having highest utilization of mobile phone (MPS 95.89) which was assigned first rank followed by e-mail (MPS 95.38) and internet (MPS 94.87) which were assigned second and third ranks respectively. In SKRAU, Bikaner teachers were having highest utilization of internet (MPS 97.61) which was assigned first rank followed by e-mail (MPS 95.38) and desktop (MPS 95.23) which were assigned rank second and third respectively. Similarly, in MPUAT, Udaipur teachers were having highest utilization of internet (MPS 97.71) which was assigned rank first followed by e-mail (MPS 96.20) and desktop (MPS 93.15) which were assigned second and third ranks, respectively.

SKNAU, Jobner teachers were having least utilization of both digitizer and visualiser (MPS 48.71)

Table 1: Distribution of agriculture university teachers according to their utilization of ICT tools

Levels of utilization	SKNAU, Jobner (n ₁ =65)	SKRAU, Bikaner (n ₂ =28)	MPUAT, Udaipur (n ₃ =73)	Overall (n=166)
Less utilization (Up to 50 score)	03(04.61)	01(03.57)	03(04.11)	07(04.22)
Medium utilization (From 50-70 score)	42(64.62)	14(50.00)	42(57.53)	98(59.04)
Highly utilization (Above 70 score)	20(30.77)	13(46.43)	28(38.36)	61(36.74)
Total	65(100.00)	28 (100.00)	73(100.00)	166(100.00)

Figures in parentheses indicate percentage

Table 2: Extent of utilization of ICT tools by agriculture university teachers

S. No.	ICT Tools	SKNAU, Jobner (n ₁ =65)		SKRAU, Bikaner (n ₂ =28)		MPUAT, Udaipur (n ₃ =73)		Overall (n ₁ =166)	
		MPS	Rank	MPS	Rank	MPS	Rank	MPS	Rank
1	Mobile phone	95.89	I	94.04	IV	91.78	IV	93.90	III
2	Desktop	86.66	VI	95.23	III	93.15	III	91.68	IV
3	Laptop	86.15	VII	88.09	VII	83.56	VIII	85.93	VIII
4	Tablet	53.33	XVIII	55.95	XVI	51.14	XIX	53.47	XVIII
5	Office tools								
i	MS Word	93.33	i	96.42	i	96.80	i	95.52	i
ii	MS Excel	83.58	iii	88.09	iii	87.21	iii	86.29	iii
iii	MS PowerPoint	86.66	ii	89.28	ii	89.04	ii	88.33	ii
	Office tools average	87.86	V	91.26	VI	91.02	VI	90.05	VI
6	Analytic packages								
i	SPSS	65.64	i	64.28	i	63.01	i	64.31	i
ii	SAS	57.94	ii	52.38	ii	49.31	ii	53.21	ii
iii	STATA	46.15	iii	51.19	iii	39.26	iv	45.53	iii
iv	R	45.12	iv	50.00	iv	41.09	iii	45.40	iv
	Analytic packages average	53.71	XVII	54.46	XVII	48.17	XX	52.11	XXI
7	Internet	94.87	III	97.61	I	97.71	I	96.73	I
8	e-mail	95.38	II	96.42	II	96.80	II	96.20	II
9	Storage devices								
I	Video CD	70.25	iii	75.00	iv	69.86	iii	71.70	iv
Ii	DVD	70.25	iii	76.19	iii	69.86	iii	72.10	iii
Iii	Pen drive	87.69	i	95.23	i	93.15	i	92.02	i
Iv	Hard drive	82.56	ii	86.90	ii	81.27	ii	83.58	ii
	Storage devices average	77.69	XI	83.33	VIII	78.54	XI	79.85	XI
10	e-Books	78.46	X	78.57	X	81.27	X	79.43	XII
11	e-journals	79.48	IX	83.33	VIII	81.73	IX	81.51	IX
12	e-agricultural Magazines	73.84	XIII	76.19	XI	68.94	XIV	72.99	XIV
13	Kindle	50.25	XIX	42.85	XVIII	44.29	XXI	45.79	XXII
14	Web based search engine	79.48	IX	82.14	IX	81.73	IX	81.11	X
15	Web-based Agriculture Information portals	75.38	XII	71.42	XIII	74.42	XII	73.74	XIII
16	Multimedia projectors	71.79	XIV	75.00	XII	72.14	XIII	72.98	XV
17	Printer	90.25	IV	94.04	IV	90.41	V	91.57	V
18	Scanner	84.10	VIII	90.47	V	86.30	VII	86.96	VII
19	e- Podium	57.94	XV	66.66	XIV	60.27	XV	61.62	XVI
20	Digitizer	48.71	XX	55.95	XVI	52.05	XVIII	52.23	XX
21	Visualiser	48.71	XX	55.95	XVI	52.51	XVII	52.39	XIX
22	Video-conferencing	57.43	XVI	57.14	XV	55.25	XVI	56.61	XVII
	Overall MPS	73.24		76.07		73.18		74.16	

MPS= Mean per cent score

Table 3: Frequency of utilization of ICT tools by the agriculture university teachers

S. No.	ICT tools	SKNAU, Jobner (n ₁ =65)			SKRAU, Bikaner (n ₂ =28)			MPUAT, Udaipur (n ₃ =73)			Overall (n= 166)		
		Fully	Partially	Never	Fully	Partially	Never	Fully	Partially	Never	Fully	Partially	Never
1	Mobile phone	57(87.69)	8(12.31)	0000.00	23(82.14)	5(17.86)	0000.00	55(75.34)	18(24.66)	0(00.00)	135(81.33)	31(18.67)	00(00.00)
2	Desktop	3960.00	2640.00	0000.00	24(85.71)	4(14.29)	0000.00	58(79.45)	15(20.55)	000.00	121(72.89)	45(27.11)	0000.00
3	Laptop	39(60.00)	25(38.46)	1(1.54)	18(64.29)	10(35.71)	00(00.00)	44(60.27)	22(30.14)	7(9.59)	101(60.84)	57(34.34)	8(4.82)
4	Tablet	6(9.23)	27(41.54)	32(49.23)	2(7.14)	15(53.57)	11(39.29)	7(9.59)	25(34.25)	41(56.16)	15(9.04)	67(40.36)	84(50.60)
5	Office tools												
I	MS Word	52(80.00)	13(20.00)	00(00.00)	25(89.29)	3(10.71)	00(00.00)	66(90.41)	7(9.59)	00(00.00)	143(86.14)	23(13.86)	000.00
II	MS Excel	34(52.31)	30(46.15)	1(1.54)	18(64.29)	10(35.71)	00(00.00)	45(61.64)	28(38.36)	00(00.00)	97(58.44)	68(40.96)	1(0.60)
III	MS PowerPoint	39(60.00)	26(40.00)	00(00.00)	19(67.86)	9(32.14)	00(00.00)	49(67.12)	24(32.88)	00(00.00)	107(64.46)	59(35.54)	00(00.00)
6	Analytic packages												
I	SPSS	13(20.00)	37(56.92)	15(23.08)	7(25.00)	12(42.86)	9(32.14)	16(21.92)	33(45.20)	24(32.88)	36(21.69)	82(49.40)	48(28.91)
II	SAS	11(16.92)	26(40.00)	28(43.08)	4(14.29)	8(28.57)	16(57.14)	7(9.59)	21(28.77)	45(61.64)	22(13.25)	55(33.13)	89(53.62)
III	STATA	1(1.54)	23(35.38)	41(63.08)	4(14.29)	7(25.00)	17(60.71)	00(00.00)	13(17.81)	60(82.19)	5(3.01)	43(25.90)	118(71.09)
IV	R	1(1.54)	21(32.31)	43(66.15)	3(10.71)	8(28.57)	17(60.72)	2(2.74)	13(17.81)	58(79.45)	6(3.61)	42(25.30)	118(71.09)
7	Internet	55(84.61)	10(15.39)	00(00.00)	26(92.86)	2(7.14)	00(00.00)	68(93.15)	5(6.85)	00(00.00)	149(89.76)	17(10.24)	00(00.00)
8	e-mail	57(87.69)	7(10.77)	1(1.54)	25(89.29)	3(10.71)	0000.00	68(93.15)	3(4.11)	2(2.74)	150(90.36)	13(7.83)	3(1.81)
9	Storage devices												
I	Video CD	20(30.77)	32(49.23)	13(20.00)	12(42.86)	11(39.28)	5(17.86)	33(45.20)	14(19.18)	26(35.62)	65(39.16)	57(34.34)	44(26.50)
II	DVD	20(30.77)	32(49.23)	13(20.00)	13(46.43)	10(35.71)	5(17.86)	33(45.20)	14(19.18)	26(35.62)	66(39.76)	56(33.73)	44(26.51)
III	Pen drive	43(66.15)	20(30.77)	2(3.08)	24(85.71)	4(14.29)	00(00.00)	60(82.19)	11(15.07)	2(2.74)	127(76.51)	35(21.08)	4(2.41)
IV	Hard drive	33(50.77)	30(46.15)	2(3.08)	19(67.86)	7(25.00)	2(7.14)	41(56.16)	23(31.51)	9(12.33)	93(56.02)	60(36.15)	13(7.83)
10	e-Books	26(40.00)	36(55.38)	3(4.62)	11(39.29)	16(57.14)	1(3.57)	36(49.31)	33(45.21)	4(5.48)	73(43.98)	85(51.20)	8(4.82)
11	e-journals	27(41.54)	36(55.38)	2(3.08)	14(50.00)	14(50.00)	00(00.00)	36(49.31)	34(46.58)	3(4.11)	77(46.39)	84(50.60)	5(3.01)
12	e-agricultural Magazines	21(32.31)	37(56.92)	7(10.77)	11(39.29)	14(50.00)	3(10.71)	25(34.25)	28(38.35)	20(27.40)	57(34.34)	79(47.59)	30(18.07)
13	Kindle	6(9.23)	25(38.46)	34(52.31)	1(3.57)	6(21.43)	21(75.00)	7(9.59)	10(13.70)	56(76.71)	14(8.43)	41(24.70)	111(66.87)
14	Web based search engine	31(47.69)	28(43.08)	6(9.23)	15(53.57)	11(39.29)	2(7.14)	39(53.42)	28(38.36)	6(8.22)	85(51.21)	67(40.36)	14(8.43)
15	Web-based Agriculture Information portals	22(33.85)	38(58.46)	5(7.69)	8(28.57)	16(57.14)	4(14.29)	26(35.62)	38(52.05)	9(12.33)	56(33.73)	92(55.42)	18(10.85)
16	Multimedia projectors	17(26.15)	41(63.08)	7(10.77)	9(32.14)	17(60.72)	2(7.14)	24(32.88)	37(50.68)	12(16.44)	50(30.12)	95(57.23)	21(12.65)
17	Printer	47(72.31)	17(26.15)	1(1.54)	23(82.14)	5(17.86)	0000.00	55(75.34)	15(20.55)	3(4.11)	125(75.30)	37(22.29)	4(2.41)
18	Scanner	35(53.85)	29(44.61)	1(1.54)	21(75.00)	6(21.43)	1(3.57)	46(63.01)	24(32.88)	3(4.11)	102(61.45)	59(35.54)	5(3.01)
19	e- Podium	9(13.85)	30(46.15)	26(40.00)	5(17.86)	18(64.28)	5(17.86)	18(24.66)	23(31.51)	32(43.83)	32(19.28)	71(42.77)	63(37.95)
20	Digitizer	3(4.62)	24(36.92)	38(58.46)	3(10.71)	13(46.43)	12(42.86)	11(15.07)	19(26.03)	43(58.90)	17(10.24)	56(33.74)	93(56.02)
21	Visualiser	2(3.08)	26(40.00)	37(56.92)	3(10.71)	13(46.43)	12(42.86)	11(15.07)	20(27.40)	42(57.53)	16(9.64)	59(35.54)	91(54.82)
22	Video-conferencing	9(13.85)	29(44.62)	27(41.53)	3(10.71)	14(50.00)	11(39.29)	10(13.70)	28(38.35)	35(47.95)	22(13.25)	71(42.77)	73(43.98)

Figures in parentheses indicate percentage

which were assigned last rank, whereas in SKRAU, Bikaner and MPUAT, Udaipur teachers were having least utilization of kindle (MPS 42.85 and MPS 44.29) respectively, which was assigned last rank.

Frequency of utilization of ICT tools

The data in Table 3 indicate the frequency of utilization of different ICT tools by teachers of agricultural universities. Further Table 3 it is clear that the teachers of different agriculture universities combinedly were having highest utilization of e-mail, about which 90.36 per cent teachers fully used e-mail, whereas 7.83 percent teachers partially used and only 1.81 per cent teachers never used e-mail. About internet 89.76 per cent teachers there who fully used, 10.24 percent teachers partially used and not a single teacher was never used internet. About 81.33 per cent agricultural university teachers were fully used mobile phone, whereas remaining 18.67 per cent teachers partially used mobile phone and not a single teachers was that who never used mobile phone. Agricultural university teachers were having least utilization of kindle, about which 66.87 per cent teachers never used kindle, whereas 24.70 percent teachers used it partially and only 8.43 per cent teachers fully used kindle.

The data in Table 3 further indicate that regarding university wise frequency of utilization of ICT tools by teachers in different agricultural universities shows that, in MPUAT Udaipur 90.15 per cent teachers fully used internet, whereas in SKRAU, Bikaner 92.86 per cent teachers and in SKNAU, Jobner 84.61 per cent teachers fully used internet. About e-mail, in MPUAT, Udaipur 93.15 percent teachers fully used e-mail, whereas in SKRAU, Bikaner 89.29 per cent teachers and in SKNAU, Jobner 87.69 per cent teachers were fully used

e-mail. Agricultural university teachers were having least utilization of kindle about which in MPUAT, Udaipur 76.71 percent teaches never used, whereas in SKRAU, Bikaner 75.00 percent teachers never used kindle. In SKNAU, Jobner teachers were having least utilization of digitizer to which 58.46 per cent teachers never used digitizer.

Analysis of variance test was applied to see the significant difference in relation to utilization of ICT tools by the teachers of selected agriculture universities i.e. SKNAU, Jobner, SKRAU, Bikaner and MPUAT, Udaipur. The results are presented in Table 4.

Hypotheses:

H₀: There is no significant difference between teachers of SKNAU, Jobner, SKRAU, Bikaner and MPUAT, Udaipur with respect to their utilization of ICT tools

H₁: There is a significant difference between teachers SKNAU, Jobner, SKRAU, Bikaner and MPUAT, Udaipur with respect to their utilization of ICT tools

The data in Table 4 reveals that the calculated 'F' value. (0.683) is lower than the tabulated value at 5 per cent level of significance and 2 degrees of freedom. Thus, the null hypothesis (H₀) entitled "There is no significant difference between teachers of SKNAU, Jobner, SKRAU, Bikaner and MPUAT, Udaipur with respect to their utilization of ICT tools was accepted and research hypothesis (H₁) was rejected. It infers that there was no significant difference between the teachers of SKNAU, Jobner, SKRAU, Bikaner and MPUAT, Udaipur with regard to their utilization of different ICT tools. It might be due the reason that in every agriculture university there are similar works and responsibilities therefore teachers were having similarly utilization of ICT tools for their work.

Table 4: Analysis of variance of ICT utilization by the teachers of selected agriculture universities

S.No.	Source of variation	df	S.S	M.S.S	"F" cal
1.	Between the universities (SKNAU, Jobner, SKRAU, Bikaner and MPUAT, Udaipur)	2	151.1559	75.578	0.683 NS
2.	Error	163	18024.579	110.5802	
	Total	165	18175.7349		

NS= Non significant

CONCLUSION

In all the selected agricultural universities combinedly 59.04 per cent teachers were having medium utilization about selected ICT tools. Regarding university wise distribution majority of the teachers in SKNAU, Jobner (64.62%), SKRAU, Bikaner (50.00%), and MPUAT, Udaipur (59.04%) had medium level utilization of ICT tools. Among the different ICT tools the agricultural university teachers were having highest utilization of internet (MPS 96.73) followed by e-mail (MPS 96.20). As far as university wise extent of utilization of teachers about ICT tools is concerned in SKNAU, Jobner teachers were having highest utilization of mobile phone (MPS 95.89) followed by e-mail (MPS 95.38), in SKRAU, Bikaner teachers were having highest utilization of internet

(MPS 97.61) followed by e-mail (MPS 95.38) and in MPUAT, Udaipur teachers were having highest utilization of internet (MPS 97.71) followed by e-mail (MPS 96.20).

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Problems in Adoption of Scientific Fish Farming in Selected Districts of North Eastern India

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ABSTRACT

The study was carried out on 120 fish farmers in Nagaon district of Assam and East Siang District of Arunachal Pradesh focusing on the bottlenecks in adoption of scientific fish farming practices. For collection of responses from the respondents about problems of scientific fish farming and related information, a structured questionnaire comprising of 17 factors was designed based on the preliminary survey and focus group discussion was personally administered during the personal interview. Constraint index (CI) was developed and used to measure and compare the constraints expressed by different respondents and the factors were thus ranked on the basis of fish farmers' perception in the studied area. The adoption level of scientific fish farming depending on their age group were also studied and 63.33 per cent respondent belong to the medium category age group.

Keywords: Questionnaire, Constraint index, Adoption, Scientific fish farming

INTRODUCTION

Assam and Arunachal Pradesh are endowed with rich and varied inland water resources in the forms of ponds, tanks, reservoirs, rivers and lakes which have great potential for scientific fish farming practices and its aquaculture development. Assam is blessed with inland water bodies covering about 4.8 lakh ha in the form of rivers (2.05 lakh ha), *beels* (1.0 lakh ha), ponds and tanks (0.6 lakh ha), derelict water bodies (1.16 lakh ha), forest fisheries (0.05 lakh ha) etc. having a greater potentiality whereas Arunachal Pradesh, the largest of the Seven Sisters located in the North Eastern region of India. Arunachal Pradesh has abundant inland fishery resources in various forms viz. 15,560 ha of still water and 9338.80 km of flowing water. These resources are ideal for development of both culture and capture fisheries. By utilising the resources, the state can achieve landmark growth. Introduction of improved technology of scientific

fish farming and the efforts of Fish Farmers' Development Agencies (FFDAs), the national average productivity of ponds and tanks under the programme had reached to 2900 kg/ha/year (DAHDF, 2016). In spite of having vast aquatic resources and location specific carp culture technologies, fish farmers have failed to achieve potential yield of fish from pond aquaculture in both the states. The development of fisheries and aquaculture has been affected by a number of constraints in most of the developing countries which leads to lower fish production as compared to its actual potential. There is relatively greater scope for the promotion of scientific fish farming activities in Assam and Arunachal Pradesh from the perspective of both increasing fish production from existing fish farms and also by the expansion of area under scientific fish farming.

A few studies conducted on scientific fish farming business in other Indian states have also revealed some

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problems (Goswami and Sathiadhas, 2000). Although some studies have also been carried out in selected districts of Assam but no reports on such studies in Arunachal Pradesh. Goswami and Sathiadhas (2000) also found that no adequate attention has been paid on systematic analysis of perceived constraints of farmers on adoption of fish culture technologies in Assam. The present study was carried out in Nagaon district of Assam and East Siang District of Arunachal Pradesh focusing on the bottlenecks of scientific fish farming practices by the fish farmers. The main objective of the study is to find out the problems faced by the fish farmers of both the states and rank the problems according to their intensity and seriousness as perceived by the fish farmers.

METHODOLOGY

The two districts Nagaon and East Siang were selected purposively from Assam and Arunachal Pradesh respectively. Three development blocks from each of the districts were randomly selected. From each of the selected blocks a list of fish farmers was prepared in consultation with fishery officials and Krishi Vigyan Kendras of respective blocks. Out of the prepared list, 20 farmers from each of the selected blocks were finally selected through simple random sampling. Altogether 120 fish farmers had been selected as sample from all development blocks. A pilot survey was also conducted among 50 farmers following authoritative sampling (Kothari, 2004) with an open ended questionnaire to identify the problems of scientific fish farming to understand their degree of seriousness.

For collection of responses from the respondents about problems of scientific fish farming and related information, a structured questionnaire comprising of 17 factors was designed based on the preliminary survey and focus group discussion. The questionnaire was personally administered to 120 fish farmers. The degree of responsiveness to different problems in adoption of scientific fish farming practices, as perceived by the farmers was collected in the questionnaire.

Constraint index (CI) was developed based on Angral (2017). This index measured and compared the constraints expressed by different respondents.

$$CI = SC \times 2 + C \times 1/N$$

Where, SC=Severe constraints

C= Constraint

N= Total number of respondents

The constraints themselves were classified into 3 sets viz; severe, most severe and no constraints. Constraints index were recorded using a scale of 1-6 with six indicating the most severe and one the least. The relevant data collected were tabulated and analysed using different statistical tools of SPSS package (Version-16).

RESULTS AND DISCUSSION

Majority of respondents (63.33%) were found in the age group between 18-30 years. There were many problems faced by the fish farmers while practicing scientific fish farming. Various problems discussed by respondent fish farmers are discussed in descending order of severity (Table 1).

During the course of study, high cost of medicine (CI 1.65), unavailability of formulated feed (CI 1.62) and high cost of fingerlings/carried over seeds (CI 1.59) were the most common problems respectively in both Nagaon and East Siang (Table 1). It was observed that the fish farmers were not getting good quality seeds and feed from the concerned department as such the fish farmers had to purchase input from the local market on higher cost. It was also observed that, the perceived cost of medicine was very high in both Assam and Arunachal Pradesh leading to a major problem at the time of occurrence of disease.

Other major problems which were perceived by the fish farmers were low selling price at farm front (CI 1.55), exploitation by middleman (CI 1.48) and lack of proper distribution channels (CI 1.45). It was appraised that adequate marketing channels were not available in the study areas. Although in both the study area, fish has a high consumer preference and has a potential market but unavailability of organised distribution channel made it difficult for the fish farmers to sell the commodity. In both Nagaon and East Siang Districts of Assam and Arunachal Pradesh respectively, the fish farmers were marketing the fish through middlemen who took away

Table 1: Farmers perception on problems of scientific fish farming

S. No.	Constraints	Severe constraints (sc)	Constraints (C)	No constraints	Constraint index (CI) = Total score/ total respondent	Rank
1	Lack of quality fish seeds of required size and number at the time of stock	61	38	21	1.33	9 th
2	Difficult to identify good quality fish seed	58	42	20	1.31	10 th
3	Non availability of formulated feed	75	45	0	1.62	2 nd
4	Difficulty in getting good brooders during breeding	78	15	27	1.42	8 th
5	Lack of fishery input supplier in the locality	42	52	26	1.13	13 th
6	Lack of facilities for soil and water testing	83	19	18	1.54	5 th
7	High cost of fingerlings/carried over seeds	85	21	14	1.59	3 rd
8	Cost of fish medicine is high	79	41	0	1.65	1 st
9	Low Selling price at farm front	76	35	9	1.55	4 th
10	Difficulty in getting institutional credit	50	50	20	1.25	12 th
11	Inadequate number of visits of extension personnel to farm site	43	26	51	0.93	15 th
12	Exploitation by middlemen	77	24	19	1.48	6 th
13	Inadequate training programme on fish culture	14	24	82	0.43	17 th
14	Low water retention capacity of soil	49	58	13	1.30	11 th
15	Irregular Monsoon	38	54	28	1.08	14 th
16	Occurrence of flood	31	49	40	0.92	16 th
17	Lack of proper distribution channel	69	36	15	1.45	7 th

lions' share of their profits leaving a meagre amount for the fish farmers. Das and Goswami (2002) also mentioned the lack of efficient marketing structure as a major constraint perceived by the fish farmers of Nagaon and Morigaon districts of Assam. Another important observation was the lack of soil and water testing facility (CI 1.54) and absence of good quality brooders during breeding (CI 1.42) which are very important for scientific fish farming. Au and Enderwick (2000) explained that six beliefs, namely, compatibility, enhanced value, perceived benefits, adaptive experiences, perceived difficulties and suppliers' commitments, affect the cognitive process that determines the farmers' attitude towards technology adoption. The present study showed positive correlation with main occupation, scientific orientation, perceived difficulties, knowledge and problems and supplier's commitment. This study suggests a change in farmers' attitude for development of scientific fish farming in both the districts. The study further revealed that lack of good quality fish seeds of required size and number at the time of stock (CI 1.41) and difficult

to identify good quality fish seed (CI 1.31) were some other problems faced by fish farmers. Difficulty in institutional credit (CI 1.25), lack of fishery input supplier in the locality (CI 1.13) and irregular monsoon (CI 1.08) were also a matter of concern to the fish farmers. Similar constraints were reported on the perceived problems of few communities of Andhra Pradesh in adopting composite fish culture by Mandal *et al.* (2011). The banks and financial institution were not granting the institutional credit for fisheries department for the reason best known to them which correlates with the findings of Angral *et al.* (2017). As far as the irregular monsoon was concerned, the fish farmers also need to adjust the work calendar of scientific fish farming or induced breeding programme with the changing monsoon which was also observed by Bhuyan *et al.* (2017).

The factors which least bothered the fish farmers were inadequate visit of extension personnel to farm site (CI 0.93), occurrence of flood (CI 0.92), inadequate training programme on fish culture (CI.0.43). But the study

Table 2: Distribution of respondents based on their level of adoption of scientific fish farming

Adoption categories	Frequency	Percentage
Low (<18)	20	16.66
Medium (18-30)	76	63.33
High (>30)	24	20.00

Mean=20.8833; SD=4.3324 (n=120)

shows that the factor of flood occurrence is more prominent in the selected development blocks of Nagaon District of Assam than East Siang district of Arunachal Pradesh. Bhuyan *et al.* (2017) also observed that occurrence of flood contributes to the loss of fish stock in Assam. It was also observed in the two surveyed districts of Assam and Arunachal Pradesh that most fish farmers were satisfied with the extension machineries although a few percentages of them had a problem. It was perceived that training was arranged in the district headquarters where, it was not possible for them to participate due to a number of reasons.

It is also observed from Table 2 that majority of the respondents (63.33%) belonged to 'medium' category followed by 20 and 16.66 per cent in 'high' and 'low' categories of adoption of scientific fish farming, respectively. These results imply that high adopters of scientific fish farming could be characterized by their young age and higher levels of extension participation, economic motivation. It, thus, implies that those farmers, who have a tendency to maximize their earnings and strive towards this end, have higher adoption. This research finding is line with the findings of Haque and Ray (1985); Biswas *et al.* (1991); Ghosh *et al.* (1993) and Talukdar and Sontaki (2005).

CONCLUSION

It is also noted that most of the adopters are in the age group of 18-30 years who have high levels of extension participation and economic motivation. Economic benefits of scientific fish farming need to be vividly highlighted to convince fish farmers to adopt scientific fish farming. The result of the present study will help all stakeholders of the fisheries development process in both the states to take appropriate steps to motivate and help the fish

farmers and overcome the observed problems faced by them.

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Performance and Knowledge of Rural Women in Banda District About Kitchen Gardening After Training and Demonstration

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ABSTRACT

The present investigation was carried out by Krishi Vigyan Kendra, Banda, Uttar Pradesh. The aim of the study was to assess the extent of knowledge gained and changes in production of vegetables due to the intervention of establishment of model Kitchen garden, accompanied trainings (on campus as well as off campus) and demonstrations by selected farming families of Banda district. Total 50 rural women were randomly selected for the study. Kitchen garden Kit developed by Indian Institute of Vegetable Research, Varanasi was also supplied as critical input among rural women for nutritional farming. The study highlighted that after the training and demonstration on model kitchen garden, there was a significant increase in production of vegetables i.e. 145.12 percent. 47.6 percent changes in knowledge was observed and family size, land holding, experience and training were found significantly correlated with gain in knowledge. It can be concluded that Kitchen gardening has proved a feasible livelihood strategy for rural people in terms of nutrient as well as calorie intake and economic performances.

Keywords: Livelihood, Nutritional status, Kitchen garden, Nutritional Security, Crop production

INTRODUCTION

In rural areas of India malnutrition and poor health status among women and children is a common problem. It retards growth, increases the risk and duration of illness, reduces work output and slows social and mental development. For poor households, vegetables and fruits are often the only sources of micronutrients in the family diet (Chayal *et al.*, 2013). The health benefits of vegetables are well recognized by nutritional and medical communities. Vegetables occupy an important place in Indian diets as they increase their nutritive value and palatability. India is the second largest producer of vegetables and the third largest producer of the fruits in the world (Kalloo, 1998). Despite its abundance, the costs of vegetables and fruits are increasing and hence are getting out of reach of majority of Indian population. The

daily per capita intake of vegetables in India is 135g (Kalloo, 1998). For a balanced diet, an adult should have a minimum daily intake of 100g of fruit and 300g of vegetables (NIN 1999). Though this level is optimum for the prevention of deficiencies, a higher daily consumption i.e. 500-700g is required for the prevention of the life style diseases such as diabetes, obesity, cancer and cardiovascular diseases.

There has been a rapid increase in the oxidative stress associated disorders such as prevalence of diabetes, cataract and cardiovascular diseases, due to the rapid changes in diet and life style. The natural strategies such as increased intake of antioxidants rich food could be a valuable tool in coping up with the stress (FAO, 2004). To fulfill the daily requirement of fruits and vegetables, Kitchen garden is an important strategy to increase the

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production as well as the consumption of fruits and vegetables. On the basis of above facts, present study was planned to assess the performance and adoption of model nutrition garden among rural women of Banda district.

METHODOLOGY

The present investigation was carried out by Krishi Vigyan Kendra, Banda, Uttar Pradesh. Total 50 rural women were randomly selected from the various villages for the interventions. On and off campus trainings and front line demonstration were conducted to increase adoption and to assess performance of kitchen garden in rural areas. Data regarding demographic profile were collected personally, from participants. Pre-survey was conducted to obtain information regarding profile and dietary food habits of the respondents. After six months of establishment of nutritional garden, a post-survey was conducted to analyze the impact of kitchen gardening on nutritional status and dietary pattern of selected families. Knowledge test developed by Meena (2005) with some modification was used to assess the training impact. Experimental research design (before-after) has employed to test the effectiveness of training and front line demonstration through knowledge gained and pre-post score of respondents on effectiveness of kitchen garden. z-test assuming unequal variances was performed among the respondents to find out whether there is any significant difference between the pre-exposure and post-training and demonstration exposure knowledge. Statistical analysis was performed using the statistical package IBM SPSS statistics (Version =20).

RESULT AND DISCUSSION

Table 1 depicts that more than 50 per cent of the respondents were young (upto 35 years). Total 82 per cent respondents were having low level of education which shows high rates of illiteracy. Besides this, majority of the families (86%) belonged to nuclear family, 42 per cent respondents worked as labour and 38 per cent respondents were dependent on agriculture for livelihood. A large number of respondents (88%) reported that they did not get any training regarding kitchen garden previously.

Table 1: Demographic Profile of the respondents (n=50)

Variables	Categories	F	%
Age	Young (upto 35 years)	26	52.0
	Middle aged (36-50 years)	18	36.0
	Old aged (>50 years)	6	12.0
Gender	Male	-	-
	Female	50	100
Education	Low	41	82
	Medium	4	8.0
	High	5	10.0
Family Size	Small (0-4 members)	10	20.0
	Medium (5-8 members)	31	62.0
	Large (9 to above)	9	18.0
Type of Family	Nuclear	43	86.0
	Joint	7	14.0
	Extended	-	-
Land holding	Small	12	24.0
	Medium	14	28.0
	Large	24	48.0
Occupation	Agriculture	19	38.0
	Labour	21	42.0
	Animal Husbandry	6	12.0
	Job	3	6.0
	Other	1	2.0
Family Income	Up to 1 lakh	3	6.0
	1-5 lakh	20	40.0
	5-10 lakh	17	34.0
	10-15 lakh	9	18.0
	More than 15 lakh	1	2.0
Experience	Low (< 5 yrs)	15	30.0
	Medium (5-10 yrs)	29	58.0
	High (>10 yrs)	6	12.0
Training received	No training	44	88.0
	<2 training	5	10.0
	2-3 training	1	2.0
	>3 training	-	-

It is evident from Table 2 that before training and demonstration on model kitchen garden, the production rate of vegetables was very low. The major reason behind low vegetable productivity was lack of knowledge and awareness among women about the role and importance of vegetables in daily diet. Along with this, non-availability

Table 2: Percent change in production of vegetables

Vegetable crops	Pre training and demonstration (kg/150 m ²)	Post training and demonstration (kg/150 m ²)	Percent change (%)
Tomato	4.0	15.0	73.33
Lady Finger	2.5	9.0	72.22
Pumpkin	3.5	14.5	75.86
Bottle Guard	8.0	17.0	52.94
Chili	1.0	3.5	71.42
Carrot	5.0	0.10	50.00
Coriander	1.25	4.0	68.75
Reddish	3.75	9.5	60.52
Spinach	4.5	12.5	64.00
Brinjal	2.5	8.25	69.69
Cucumber	1.75	7.0	75.00
Bitter guard	2.0	5.5	63.63

of good quality seeds and seedlings of vegetables in rural areas of Banda was another reason. Locally available seed and seedlings of vegetables were used to produce vegetables which negatively affect the crop growth. But after training and demonstration the level of knowledge and awareness among women was significantly increased and they started to cultivate vegetable in effective manner. For higher productivity of vegetables, kitchen gardening kit developed from Indian Institute of Vegetable Research, Varanasi was distributed among the rural women.

The range of score of initial knowledge about kitchen gardening varied from 18-37 with an average score of 26.94 whereas as after the training and demonstration sessions about nutrition gardening the range varied from 20-45 with the mean value of 39.81. The overall percent change in knowledge after the exposure of training and demonstration was 47.60. However, the improvement was found to be significant as Z value was 18.36 which is greater than table value (Table 3).

Table 3: Gain of knowledge through training and demonstration on kitchen gardening

Particulars	Range of score obtained	Mean Score	Overall changes (%)	Z value
Impact of nutritional gardening on nutritional status and dietary pattern of selected families				
Pre training & demonstration	18-37	26.97	47.60	18.36**
Post training & demonstration	20-45	39.81		

** indicate significant at the level of 1 percent

Zero order correlation coefficient was applied between independent variables and knowledge level of the respondents. Data depicted that independent variables i.e. family size, land holding, experience and training were significantly correlated with gain in knowledge. The respondents who were having nuclear family and less number of family members were benefited more (Table 4).

Table 4: Zero order correlation coefficient between independent variables and knowledge level of the respondents

Independent Variable	Post- training and demonstration knowledge	Post-training and demonstration knowledge	Gain in knowledge
Age	0.144	0.198	0.095
Gender	0.137	0.215	0.089
Education	0.098	0.178	0.075
Family Size	0.146	0.378	0.037**
Type of Family	0.094	0.137	0.074
Land holding	0.159	0.279	0.089**
Occupation	0.142	0.158	0.042
Family Income	0.085	0.251	0.067
Experience	0.071	0.188	0.038**
Training received	0.068	0.174	0.093**

** indicate significant at the level of 1 percent

CONCLUSION

On the basis of above findings, it was concluded that there was significant impact of training and demonstration on gain in knowledge of the respondents with respect to kitchen garden. After the training and demonstration, the dietary pattern and food habits of the respondents were changed positively. The amount of fruits and vegetables in daily diet of the respondent were increased. Establishment of nutritional garden at home can easily combat the serious problem of malnutrition and micro

nutritional diseases among women and children of Banda district. Higher production of fruits and vegetables can give the opportunity of the income generation and livelihood security to the rural women.

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Causes and Consequences of Physiological Load of Workers in Grape Cultivation Activities

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ABSTRACT

The aim of this study was to find out the causes and consequences of physiological load of workers in grape cultivation activities. The study was conducted with 15 respondents who were engaged on grapes cultivation activities. Physical fitness was determined by calculating the physical parameters i.e. height, weight, BMI, Ectomorphic, Mesomorphic type body. Maximum respondents were in grape group of above 26 years. Hence, a continuous awkward standing posture and adverse environmental and working conditions increase and decrease productivity of grape orchard workers. The change in environmental temperature and physiological load greatly affect the workers. The physical characteristics comprising age, height, weight, body mass index, physical fitness index play a major role for the physical health and workload of the health of grape orchard workers. The physiological load was found highest for pruning followed by harvesting. The least physiological load was for plant protection.

Keywords: Environment condition, Fatigue, Grape cultivation, Physiological load, Workload

INTRODUCTION

Grape (*Vitis vinifera* L.) is an important fruit crop in India. Grapes are the third most widely cultivated fruit after citrus and banana. Major grape-growing states are Maharashtra, Karnataka, Andhra Pradesh, Tamil Nadu and the north-western region covering Punjab, Haryana, Delhi, western, Uttar Pradesh, Rajasthan and Madhya Pradesh (Singh, 2010). Agricultural workers carry out several strenuous activities like ploughing, spading, carrying, uprooting, planting, weeding, cutting, shafting, threshing, sweeping, etc. Women also perform such activities especially perform planting, weeding and harvesting (Ponnusamy *et al.*, 2013). Musculoskeletal disorders were common among farmers. Farmers handle heavy workloads often in awkward posture and experiencing some work related problems. They experience high rates of low back, shoulder, hand, knee and upper extremity disorders (Donald, 2006). Grape

production is very labour intensive operation i.e. Grape vineyard workers faces high stress on the hands during pruning of the grapevines under highly repetitive conditions (8 to 10 week period of intense and fast-paced work) and also the cumulated duration of exposure over the entire day was high, i.e. approximately 8 to 10 hours per day over a 4-month period. Many tasks such as dormant pruning, shoot suckering and crop harvesting were done repetitively by hand and could result in musculoskeletal disorders (MSD) among the workers. Pruning had also been associated with increased risk of developing cumulative trauma disorder of the wrist among workers. Vineyard rows (about 30 feet long each) was planted 8 to 12 feet apart, with about five vines per row. Pruning one vine takes about 60 seconds. Pruning is carried out by shifts with 8 hours, performing approximately 2400 cuts per hour i.e., about 60 vines per hour, or 480 vines per day (Roquelaure *et al.*, 2002). So keeping in mind the working pattern and working

conditions the present study was undertaken to assess the causes and consequences of physiological load of workers in grape cultivation activities.

METHODOLOGY

A sample of 32 respondents was selected purposively for the work profile and working condition of workers. A sample of 15 respondents was selected purposively from the randomly selected 2 grape orchards. Out of the six grape orchards selected in phase I Respondents who were physically fit and willing to cooperate and engaged in grape cultivation activity were selected. Physical fitness of the workers involved in grapes cultivation activity was ascertained by measuring the parameters i.e. height, weight, BMI, Ectomorphic and Mesomorphic type body. The height was measured using a stadiometer. A stadiometer is a piece of medical equipment used for measuring height. The stadiometer has a measuring range. Body weight: An accurate portable weighing machine was used for the study to take the weight of the orchards workers. The subject was asked to stand straight on the balance and the weight was recorded in kg with an accuracy of 0.1 kg. BODY MASS INDEX: The condition of the workers was assessed by specifying the different degrees of the underweight expressed as the body mass index (BMI), the weight and height measures was used to calculate the BMI of respondents. Weight in (kg)/ height in (m²) (Garrow, 1981). The Body mass index was calculated using the standard formula. Accordingly, the health status was defined as follows: i) BMI 20–24.9 (normal); ii) BMI 25–29.9 (overweight); and iii) BMI $\geq$ 30 (obesity). Body Type Quetelet's Index Score Description, Ectomorph 20 Slender, very thin body Mesomorph 20-25 Athletic type body, Endomorph 25 Abdominal physical type. Occupational risk was assessed through physiological parameters. Physiological load was assessed on the basis of (AICRP, 2013). Score sheet

was used to assess through the physiological load and time load (Table 4 and 6).

RESULTS AND DISCUSSION

Background profile of the workers of grape orchard

Age: Majority of the respondents (59.3%) in pooled sample belonged to late young age and similar trend was also observed in study districts viz., Hisar, Sirsa and Fatehabad.

Physical characteristics of workers in grape cultivation

Mean height and weight of grape workers involved in grape cultivation was 159.9 cm and 64.2 kg respectively. Body mass Index (BMI) was observed as 21.8 kg/m² exhibiting that the subjects were having good health.

Table 2: Personal profile and health status of the selected respondents (n=15)

Physical Characteristics	Mean $\pm$ SD
Height (cm)	159.9 $\pm$ 8.8
Weight (kg)	64.2 $\pm$ 4.7
BMI (kg/m ²)	21.8 $\pm$ 1.1

Body type: Majority of the workers (80%) had mesomorphic (Athletic type body) which is considered as the perfect type body type followed by 20 per cent with ectomorphic (cylindrical type thin body).

Table 3: Body type of the selected respondents (n=15)

Body Type	Q.I	F	%
Ectomorphic (Cylindrical very thin body)	<20	3	20
Mesomorphic (Athletic type body)	20-25	12	80

Table 1: Background profile of the workers of grape orchard (n=32)

Variables	Hisar (n=18)	Sirsa (n=8)	Fatehabad (n=6)	Total (N=32)
Age				
Below 18 years (adolescents)	2(11.1)	-	-	2(6.25)
19-25 years (young)	7(38.8)	2(25.0)	2(33.3)	11(34.3)
Above 25 years (late young)	9(50.0)	6(75.0)	4(66.6)	19(59.3)

Physiological load of workers in grape cultivation activities

The physiological load of workers in grape cultivation was assessed and presented in Table 4.

Land preparation: Physiological load factor during various activities land preparation was 4 for the removing of stalks and stubbles and unwanted plants and 2.47 for ploughing by country plough. Mean physiological load factor for land preparation was 3.2.

Table 4: Physiological load of workers in grapes cultivation activities (n=15)

Farm activity	Physio-logical load rating	Physio-logical load factor	Mean physio-logical load factor
Land preparation			
Removing of stalks & stubbles unwanted plants	4.00	4.00	3.2
Ploughing	2.47	2.47	
Pruning			
Cutting of undesirable vines	5.00	5.00	5
Manuring			
Transportation of manure	2.4	2.4	2.9
Mixing of manure	2.70	2.70	
Spreading of manure	3.83	3.83	
Irrigation			
Preparation of irrigation channels	4.00	4.00	4
Plant protection			
Covering with net	3.00	3.00	2.3
Spraying	2.00	2.00	
Topping	2.00	2.00	
Harvesting			
Fruit picking	4.27	4.27	3.5
Gathering and heaping	3.00	3.00	
Packaging in polythene	3.33	3.33	
Trimming	3.63	3.63	
Handling and transportation			
Loading of the product	3.67	3.67	3.67

Physiological work load rating: Very light-1, light-2, Moderately heavy- 3, Heavy-4, Very heavy-5

Pruning: Physiological load factor during pruning for cutting of undesirable vines was 5.

Manuring: During manuring transportation of manure got physiological load factor was 2.4 and mixing of manure got 2.70, spreading of manure got 3.83. The mean physiological load factor manuring was 2.9.

Irrigation: Physiological load factor during irrigation for preparation of irrigation channels was 4.

Plant protection: Activities among plant protection include spraying and topping, which got physiological load factor of 2 each. Mean physiological load factor of plant protection was 2.

Harvesting: Fruit picking got physiological load factor of 4.27, gathering and heaping got 3, packaging in polythene got 3.33 and trimming got physiological load factor of 3.63 and Mean physiological load factor of harvesting was 3.5.

Handling and transportation: Physiological load factor in handling and transportation for loading of the product was 3.67. Hannihen (1995) unfolded that excessive musculoskeletal stress at work, specially with static load, as it plays a major role in low back pain, neck and shoulder disorders. Electromyography recording during working conditions has been used to quantify muscular stresses, allowing better designing of work environment to reduce low back pain and neck shoulder tensions. Wrists and neck, shoulder, lower arms and upper back was the frequently used body part in grapes cultivation activities. Pain felt in the other body parts were 'buttocks due to adoption of poor posture for prolonged period.

Occupational risks of workers in grapes cultivation terms of physiological load

Table 5 presents the occupational risks of workers in terms of physiological load. According to physiological load, pruning got first rank and harvesting secured IInd rank. Land preparation obtained IIIrd rank followed by Irrigation which got IVth rank. Handling and transportation got (V) rank followed by manuring with VI rank. Last rank was secured by plant protection (VII rank). Hildebrandt *et al.* (1995) reported that 75 per cent of

Figure 1: Physiological load of workers in grapes cultivation activities

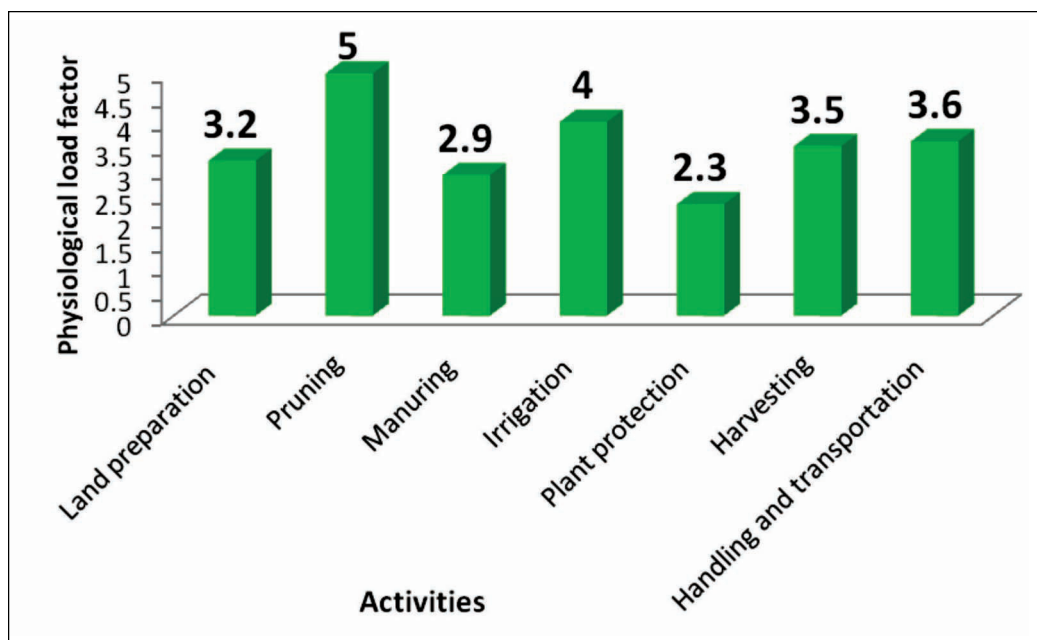
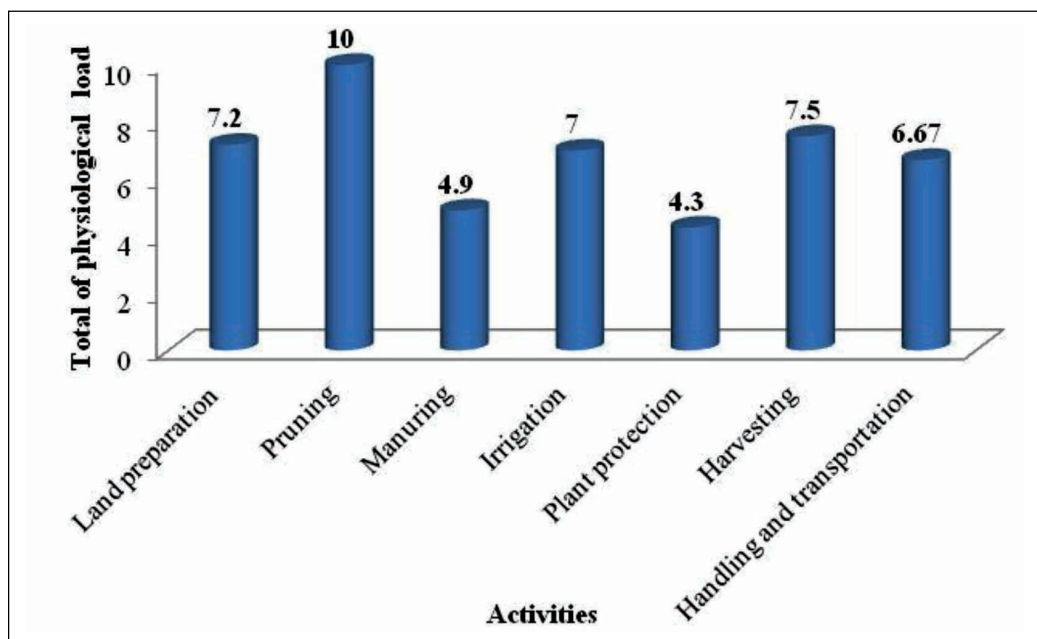


Figure 2: Occupational risks of workers in terms of physiological load



farm workers reported experiencing musculoskeletal symptoms during the previous 12 months.

Time load of workers in grape cultivation

Table 6 presents the time load factor of workers in grape cultivation activities.

Land preparation: Time load factor during various activities of land preparation was 26.5, for removing of stalks and stubbles and unwanted plants and 14 for

ploughing by country plough. Mean Time load factor for land preparation was 20.2.

Pruning: Time load factor during pruning for cutting of undersirable vines was 89.

Manuring: During manuring transportation of manure got time load factor was 11 and mixing of manure got 20, spreading of manure got 15. The Mean time load factor for manuring was 15.3.

Table 5: Occupational risks of workers in terms of physiological load

Activities	Physiological load		
	Time Load	Physiological load factor	Total
Land preparation	20.2	3.2	23.4
Pruning	89	5	94
Manuring	15.3	2.9	18.2
Irrigation	25	4	29
Plant protection	34.7	2.3	37
Harvesting	87.8	3.5	91.3
Handling and transportation	58.6	3.67	62.27

Irrigation: Time load factor during irrigation for preparation of irrigation channels was 25.

Plant protection: Activities among plant protection includes spraying and topping which got time load factor of 32.25 and 58 respectively. Mean time load factor of plant protection was 34.7.

Harvesting: Fruit picking got time load factor of 112, gathering and heaping got 65.6, packaging in polythene got 62.6 and trimming got time load factor of 111 and mean time load factor of harvesting was 87.8.

Handling & transportation: Time load factor in handling and transportation for loading of the product was 58.6.

Table 6: Time load of workers in grapes cultivation (n=15)

FarmActivity	Duration / Time						Mean
	Hours/ day	No. of days	No. of man days/ season	No. of labour employed	Work load as per time	Time load Factor (Total score)	Time load factor
Land preparation							
Removing of stalks and stubbles unwanted plants	8	7	3.5	5	3	26.5	20.2
Ploughing	8	1	1	2	2	14	
Pruning							
Cutting of undesirable vines	8	31	31	15	4	89	89
Manuring							
Transpiration of manure	2	4	1	2	2	11	15.3
Mixing of manure	4	8	4	2	2	20	
Spreading of manure	1	8	1	2	3	15	
Irrigation							
Preparation of irrigation channels	8	4	4	5	4	25	25
Plant protection							
Covering with net	4	2	1	4	3	14	34.7
Spraying	5	10	6.25	7	4	32.25	
Topping	8	20	20	6	4	58	
Harvesting							
Fruit picking	8	45	45	10	4	112	87.8
Gathering and heaping	1	45	5.6	10	4	65.6	
Packaging in polythene	1	45	5.6	8	3	62.6	
Trimming	8	45	45	10	3	111	
Handling and transportation							
Loading of the product	1	45	5.6	4	3	58.6	58.6

No. of man days: 8 hrs =1 man day

Work load as per time- Very high duration-5, High duration- 4, Moderate- 3, Less duration- 2, Very less duration-1

Conclusively, Pruning was most time consuming activity followed by harvesting Carruth (2002) reported that working on the farms and the size of the farm has found to influence injury rates. Stueland (1997) reported that injuries increased as hours worked per week increased, about 3 percent for every hour worked. Injuries are almost three-times as likely to occur when farm hires work long hours (more than 60 hrs/week) or on farms with large acreage (greater than 30 acres under tillage). Similarly Janowitz *et al.* (2000) reported that vineyard workers face high stress on the hands during pruning of the grapevines under highly repetitive conditions (8 to 10 week period of intense and fast-paced work).

CONCLUSION

Mean height and weight of grape workers in grape cultivation as assessed in three districts of Haryana were 159.9 cm and 64.2 kg respectively. Body mass Index (BMI) was observed as 21.8 kg/m². Mean height and weight of grape workers involved in grape cultivation was 159.9 cm and 64.2 kg respectively. The occupational risks of workers in terms of physiological load were highest for pruning followed by harvesting. The least physiological load was for plant protection. Accordingly, appropriate extension interventions should be deployed to increase the work efficiency of workers of grape cultivation.

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Extension Contact and Extension Participation of Livestock Farmers in Jalandhar District of Punjab- A Benchmark Analysis

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ABSTRACT

A study of the socioeconomic aspects of livestock farmers is a prerequisite for the appropriate design and successful execution of Governments' developmental programmes. The present study was conducted to assess the socio-economic status and credibility of various extension activities among the livestock farmers. For this, primary data was collected through structured interview schedule using a sample size of 150 respondents from Jalandhar district of Punjab. Most of the respondent (92.70%) have their strong linkage with Panchayat members and participation in various extension activities were found highest (19.10%) among young farmers. Majority of the farmers participated in Kisan melas (68.70%) albeit relative credibility index was found highest for demonstration activity. Hence efforts should be undertaken by the Government, Veterinary Universities and other extension agencies in providing information on improved livestock farming practices, result oriented extension activities and strong farmer-extension-research-linkages so that farmers could bring about change in their living standard and can improve their socio-economic status.

Keywords: Credibility, Extension Activities, Livestock Farmer, Socio-economic Status

INTRODUCTION

The livestock sector is one of the fastest growing segments of the agricultural economy, particularly in the developing country like India which provides nutritive food rich in animal protein and it also helps in supplementing family incomes and generating gainful employment for 70.0 million farm families of landless, marginal and small farmers. Animal husbandry is second largest economical activity in rural India next to agriculture. Livestock sector is directly related to a more balanced development of rural economy and upliftment of poorer sections of the society. Despite of rapid advances in the animal husbandry

technologies and their roles in improving livestock sector, the productivity of this sector is still very low in India (Chander *et al.*, 2010) which may be due to various reasons like poor adoption and diffusion of new technologies and poor knowledge level of farmers. Most of the farmers are not aware of scientific livestock management practices and adoption of improved animal husbandry practices which is very essential for the growth of livestock economy (Aulakh and Singh, 2015). Indian livestock industry has a unique characteristic that the bulk of animal produce is handled by small farmers who are illiterate and ignorant of commercial and economic aspects of livestock production. Thus a vigilant study of

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the socio-economic status of livestock farmers is a prerequisite and need of the hour for the legitimate design and well-tuned execution of any developmental plan at field level. Therefore, the present study was undertaken with the objective to assess the socio- economic status of livestock farmer and their approach to extension personnel for gather the information of livestock managemental practices so that further need based livestock developmental interventions can be supplemented to the end users.

MATERIAL AND METHODS

The study was conducted in Jalandhar district of Punjab state. 10 villages from two blocks were selected for the study purpose and from these villages 15 livestock farmers were randomly scrutinized for interview, thus sample size of this study was 150. A well-structured pre-tested interview schedule was used for collection of data and the data was analyzed by using appropriate statistical methods. The information on socio-economic status and extension intervention was collected through this personal interview, observation and available secondary resources. Socio-economic information comprises educational status, age, land holding, herd size, herd composition, annual income, social participation, risk orientation and decision making. Information regarding extension interventions viz; demonstration, training, awareness camp, Kisan melas and field days was also collected. Credibility index were calculated, out of given sources of information, the respondents were asked to indicate only the most and least credible activity related to animal husbandry. The relative credibility index was worked out with the following formula (Sandhu, 1973).

$$\text{Relative credibility index} = (X/Y) \times (100/N)$$

X = Number of respondents who believed a source most credible
Y = Number of respondents who believed a source least credible
N = Total number of respondents.

RESULT AND DISCUSSION

It could be observed from the Table 1 that 62.00 per cent of the farmers i belonged to middle age group, 84.00 per cent respondents had level of education in between primary to higher secondary, 31.30 per cent and 34.70

Table 1: Socio-economic characteristic of the respondents (N= 150)

Personal Characteristic	Frequency	Percentage
Age		
Young Age (<35)	19	12.70
Middle Age (35-55)	93	62.00
Old Age (>55)	38	25.30
Educational qualification		
Illiterate	04	02.70
Can read only	04	02.70
Can read and Write	08	05.30
Up to Primary	28	18.70
Middle	39	26.00
High School	35	23.30
Higher Secondary	24	16.00
Graduate and above	08	05.30
Family size		
Small (1-4)	36	24.00
Medium (5-8)	98	65.30
Large (>8)	16	10.70
Land holding		
Land less (No Land)	11	07.30
Marginal (Up to 2.5 acres)	47	31.30
Small (above 2.5 to 5 acres)	52	34.70
Medium (above 5 to 10 acres)	30	20.00
Large (above 10 acres)	10	06.70
Herd size (Dairy Animals)		
Small Herd Size (Up to 2)	20	13.30
Medium Herd Size (3 to 7)	101	67.30
Large Herd Size (8 and above)	29	19.30
Herd composition		
Indigenous Cattle	23	15.30
No descriptive Cattle	36	24.00
Cross Breed Cattle	94	62.70
Exotic cattle	47	31.30
Pure Breed Buffalo	49	32.70
Upgraded Buffalo	84	56.00
Goat	14	09.30
Poultry (Backyard)	46	30.70
Poultry (Commercial)	04	02.70
Piggery	11	07.30
Horse	04	02.70
Fisheries	03	02.00
Dog	24	16.00

Table 1: contd.....

Personal Characteristic	Frequency	Percentage
Annual income		
Low (up to 60000)	44	29.30
Medium (61000 to 150000)	76	50.70
High (151000 and above)	30	20.00
Social participation		
Low Social participation	55	36.70
Medium Social participation	64	42.70
High Social participation	32	21.30
Risk orientation		
Low (Score up to 15)	68	45.30
Medium (Score 16 to 25)	42	28.00
High Score (Score 26 and above)	40	26.70
Decision maker of the family		
Men	61	40.70
Women	12	08.00
Together	77	51.30

per cent of farmers were belongs to marginal and small land holding categories, 65.00 per cent having family size of 5 to 8 members and 65.30 per cent with medium size of herd of dairy animals. 62.70 per cent of the respondents possessed cross bred cow followed by upgraded buffalo (56.00%), pure breed buffalo (32.70%), exotic cattle (31.30%) and only 15.30 per cent and 24.30 per cent respondent possessed Indigenous cattle and non descriptive cattle, respectively. 50.70 per cent respondent

were in the medium level of income group and 42.70 per cent were in medium category of social participation . The results are well supported by Ravikumar (2005); Senthilkumar *et al.* (2006); Hanumanaikar *et al.* (2006); Kavitha and Reddi (2007); Sharma *et al.* (2009); Jagadeeswary (2009); Sathyanarayan (2009); Sathyanarayan *et al.* (2010) and Shekhawat *et al.* (2013).

In this study it has observed that farmer extension contact play important role in their livestock farming practices. Table 2 revealed that maximum number (92.70%) of farmers had had their contact with village panchayat sarpanch or members and ranked I. Out of these 46.00 per cent contacted village sarpanch in regular basis and the reason behind this is this local people can easily share their feelings with the local leaders or panchayat members. Further contact of respondent with input dealer from nearby town, Banks and insurance personnel, Animal Husbandry officials, Veterinary hospitals / A.I. Centers, KVK officials, Veterinary college/ Institutes, Dairy Mela/ Kisan Mela, NGOs and SHGs and ranked II, III, IV, V, VI, VII, VIII, IX and X rank respectively. Input dealers are mainly locally person or person from within the farmers who could approach farmer at any time and it was ranked as second highest linkage with respondents. Most of the farmers had their account in village level cooperative bank so they were able make frequently contact with the bank/insurance personnel. Farmers contact with Animal Husbandry

Table 2: Extension contact of livestock farmer in the Jalandhar district (N = 150)

Particulars	Frequency (Percentage)					Rank
	Regularly	Most often	Sometimes	Never	Total Visited	
Animal Husbandry officials	22 (14.70)	42 (28.00)	41 (27.30)	45 (30.00)	105 (70.00)	IV
Village Panchayat Members	69 (46.00)	37 (24.70)	33 (22.00)	11 (07.30)	139 (92.70)	I
Veterinary hospitals / A.I. Centers	17 (11.30)	18 (12.00)	66 (44.00)	49 (32.70)	101 (67.30)	V
KVK / ATIC officials	27 (18.00)	46 (30.70)	20 (13.30)	57 (38.00)	93 (62.00)	VI
Input Dealers from nearby town	36 (24.00)	56 (37.30)	16 (10.70)	42 (28.00)	108 (72.00)	II
Kisan Mela	6 (4.0)	7 (04.70)	41 (27.30)	96 (64.00)	54 (36.00)	VIII
Veterinary college/Institutes	23 (15.30)	9 (06.00)	27 (18.00)	91 (60.70)	59 (39.30)	VII
Banks and insurance personnel	27 (18.00)	17 (11.30)	62 (41.30)	44 (29.30)	106 (70.70)	III
Non-Government Organizations (NGOs)	0 (0.0)	0 (0.0)	4 (02.70)	146 (97.30)	4 (02.70)	X
Self Help Groups (SHGs)	0 (0.0)	0 (0.0)	6 (04.00)	144 (96.00)	6 (04.00)	XI

Figures in parenthesis indicate percentage of the respondents

officials (70.00%), Veterinary clinic (67.30%) and KVK official (62.00%) had not shown too much difference and in these mostly official make contact with the farmers for disseminate the information regarding scientific livestock farming practices or make farmers aware through various awareness programs, trainings and others extension activities due to distantly location of veterinary college/institute and place of Kisan mela and only 39.30 per cent and 36.00 per cent farmer were able to visit these two place, respectively and only 4.00 per cent and 2.70 per cent respondents had liaison with SHGs and NGOs respectively. The major reason behind few contacts with these institutes reflects the individual working attitude of the respondent as reported by Sidhu *et al.* (1997).

It is revealed from Table 3 that most of the farmers were showing enthusiasm toward Kisan melas which is organized by various government organizations and was found that 68.70 per cent of farmers have participated in Kisan melas. The least participation was observed in the field days (27.30%) activities and the possible reason behind this is the very few organization conducted such kind of activity and on some exclusive topic only thus

attract only specific participants. In between of these two activities about 41.30, 40.70 and 39.3 per cent participated in trainings, awareness camps and demonstrations respectively. Overall participation in various extension activities was found only 43.50 per cent in which maximum participation (19.10%) was shown by young generation which fall in the categories of 18–30 years of age followed by middle age (14.30%) farmers and old age (10.10%) farmers. Youth or young generation has demonstrated the keen interest in learning of new technologies thus shown maximum participation in various activities. Old group of farmers were found to have laggard attitude and not willing to take any risk, so their participation marked as least in extension activity and these findings were in-line with the results of Ravikumar (2006).

Credibility index had shown (Table 4) some different picture of reliability of various extension activities. Respondent had been perceived differently for different methods of transfer of technology. It was found that demonstration method had highest relative credibility index (0.79) which shown that maximum farmers rely on this method followed by training programs (0.71), field days

Table 3: Involvement of respondent in transfer of technology activities of livestock (N = 150)

Extension Activities	Age group of farmers in years (% of respondent)			Total
	18-30	30-45	> 45	
Demonstrations	35(23.30)	14(9.30)	10(6.70)	59(39.30)
Field days	19(12.70)	9(6.00)	13(8.70)	41(27.30)
Awareness Camp	18(12.00)	27(18.00)	16(10.70)	61(40.70)
Kisan Melas	45(30.00)	33(22.00)	25(16.70)	103(68.70)
Training programs	26(16.00)	24(16.00)	12(8.00)	62(41.30)
Overall Participation	28.6(19.10)	21.4(14.30)	15.2(10.10)	65.2(43.50)

Table 4: Relative Credibility of personal cosmopolite channel of livestock information for transfer of technology (N = 150)

Extension Activities	Relative Credibility			
	High (Score)	Low (Score)	Relative Credibility Index	Rank
Demonstrations	32	27	0.79	I
Field days	19	22	0.58	III
Awareness Camp	26	35	0.50	IV
Kisan Melas	39	64	0.41	V
Training programs	32	30	0.71	II

(0.58), awareness camps (0.50) and Kisan Melas (0.41). Higher index value of demonstrations and training programs were due to their practical and result oriented nature and these finding were the accordance with the results of Chaudhary and Khan (2017).

CONCLUSION

The socio-economic characteristics of the farmers are important for better policymaking decisions. Study revealed that more than half of the farmers involved in livestock farming belonged to middle age and medium level of income group. Due to low agricultural profitability, young people are not interested in agriculture and shift towards other allied business and service activities. Although they are having experimental nature and very keen to learn new things about scientific livestock farming practices (breeding, feeding, healthcare and management aspects) easy loan, credit facility and marketing linkage can develop their faith in the livestock related entrepreneurial ventures. Additionally, result oriented demonstration procedure would enhance the intellectuality regarding animal husbandry practices and would bring about some change in the attitude of livestock young farmers. Therefore, extension services should be more focused on skill development trainings and demonstrations of advanced proven livestock technologies at the farmer's field.

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Research Note

Correlates of Pisciculture Technology Adoption in Jagatsinghpur District of Odisha

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ABSTRACT

According to the Food and Agriculture Organization (FAO), fish output in India doubled between 1990 and 2010. Fisheries sector is a source of livelihood for people engaged in fully, partially or in subsidiary activities. It's an integral component of rural development programme and its requirement of capital investment is relatively low and short gestation period. Per hectare annual income from pisciculture is much higher than that of crop production and pisciculture may appear to be a viable proposition for small and marginal farmers. The youth entrepreneur can generate more income from a small area of land by pisciculture in comparison to other crops. Odisha ranks 10th in terms of production of fish and it produces almost 4.50 percent of the total fish production of the country. The present study conducted in Ersama, Naugaon and Tirtol blocks of Jagatsinghpur district on 110 (hundred ten) number of respondents. More than three-fourth of the respondents (73.63%) had medium level of adoption, whereas only 15.45 per cent of the respondents had high adoption. Pisciculture technology adoption was found negative and non-significant with their age and innovation proneness and found positive and significant with their education, mass media exposure, socio-economic status, annual income and risk orientation.

Keywords: Adoption, Change proneness, Pisciculture

INTRODUCTION

Fishing in India is a major industry in its coastal states, employing over 14 million people. Pisciculture in India has increased more than tenfold since its independence in 1947. Odisha is one of the major maritime States, offering vast scope for development of inland, brackish water and marine fisheries. The State's 480 km long coastline with 24,000 sq. km area within the continental shelf has ample potential for marine fisheries development. Freshwater resources of the State are estimated to be 6.76 lakh ha comprising 1.25 lakh ha of tanks/ponds, 2 lakh ha of reservoirs, 1.80 lakh ha of lakes, swamps and jheels and 1.71 lakh hectares of rivers and canals. The State ranks 10th in terms of production of fish and produced 4.50 per cent of the total fish production

in the country during 2014-15. As per India's Census 2011, Youth (15-24 years) in India constitutes one-fifth (19.1%) of total population. India is expected to have 34.33 per cent share of youth in total population by 2020. The share reached its maximum of 35.11 per cent in the year 2010. The youth entrepreneur can generate more income from a small area of land by pisciculture in comparison to other crops hence, pisciculture may appear to be a viable proposition for small and marginal farmers. Small scale pisciculture entrepreneurship can help to reduce hunger and poverty (Mishra, 2008). Fishing, which is almost everywhere an open access or free resource, may also serve as an occupation of last resort for landless and impoverished rural youth populations. Where pisciculture is concentrated and intensive, it plays an economic catalyst role, through activities that build up

around the fishing community. As such it is needed to find out the adoption status of scientific pisciculture technology.

METHODOLOGY

The study was conducted in Ersama, Naugaon and Tirtol blocks of Jagatsinghpur district. Both purposive and multistage random sampling methods were adopted for selection of the district, block, gram panchayat, village and respondents. A list of pisciculture farmers of these selected villages was obtained from the Assistant fisheries office, from the list proportionate stratified random sampling method was followed to select respondents of the study. A total of 110 (hundred ten) number of respondents were selected for the purpose of the investigation. The response was obtained from each individual respondent in a structured interview schedule which was pretested with 10 per cent samples other than the respondents of the study. The success of pisciculture depends upon adoption of basic principles of weeding, fertilizer application, liming, periodical examination, etc. Hence, it was felt necessary to know that up to what extent the pisciculture farmers had adopted pisciculture technology. To measure the level of adoption of pisciculture, adoption quotient for each individual respondent was calculated. Based on the adoption quotient respondents were categorized in to three groups, as low (Below mean - standard deviation), medium (Mean $\pm$ standard deviation) and high extent of adoption (Above mean + standard deviation).

RESULT AND DISCUSSION

The categorization depicted in Table 1 indicates that more than three-fourth of the respondents (73.63 per cent) had medium level of adoption, whereas only 15.45 per cent of the respondents had high and remaining 10.92 per cent of them had low level of adoption.

The data presented in Table 2 reflect that level of adoption of pisciculture farmers was found non-significant with their age. This indicated that age of the pisciculture farmers did not play any role in improving their level of adoption of selected technology of pisciculture farming. This finding is similar to the finding reported by Solanki

Table 1: Distribution of respondents according to their level of adoption of Pisciculture technology

Adoption Level	Pisciculture Farmer	
	Freq- uency	Percen- tage
Low score (score below 48.66)	12	10.92
Medium score (score from 48.66 to 79.34)	81	73.63
High score (score above 79.34)	17	15.45
Total	110	100

Table 2: Relationship between socio personal characteristics of pisciculture farmers and their level of adoption

Variable	Correlation Coefficient (r= value)
Age	0.0315 ^{NS}
Education	0.276*
Mass media exposure	0.274*
Socio-economic status	0.328*
Annual income	0.519*
Risk orientation	0.191
Innovation proneness	-0.004 ^{NS}

*Significant at 0.05 level of probability; NS = Non significant

(1990). The education of the pisciculture farmers was found significant and positively associated with extent of adoption of the pisciculture farming. It meant that education of the pisciculture farmers plays vital role in improving their level of adoption of pisciculture farming technology. This finding is in partially agreement with the findings of Haque and Ray (1983); Balasubramaniam and Kaul (1985) and Solanki (1990). Further mass media exposure of the pisciculture farmers was also found significantly and positively related with extent of adoption of the pisciculture farmers. It meant that mass media exposure of the pisciculture farmers plays important any role in improving their level of adoption of modern practices of pisciculture farming. Socio-economic status of the pisciculture farmers had positive and significant relationship with extent of adoption of the pisciculture farming. It can be attributed to the fact that the person who has better socio-economic status can afford the cost-intensive inputs of pisciculture, comes forward to adopt the technology on a complete basis. This finding is similar to the finding reported by Nath (1993).

Annual income of the pisciculture farmers had positive and significant relationship with level of adoption of the pisciculture farming. It meant that higher the level of annual income of fish farmers; higher would be their extent of adoption of pisciculture technology. It may be due to the fact that the farmers get direct experience of the profit obtained from pisciculture. So he becomes more interested in taking up the technology to a greater extent. The risk orientation had significant relationship with the extent of adoption of fish farmers. Risk orientation is expressed as the degree to which farmer is oriented to take risk and has courage to face uncertainties in adoption of improved technology. Such type of orientation comes as a result of good education, economic condition and positivism in many other psychological variables among the farmers. In this study, majority of the pisciculture farmers did have such type of positivism. Therefore, above result was observed. The above result is in line with the finding reported by Solanki (1990). The innovation proneness of the fish farmers had negative and non-significant relationship with level of adoption of the fish farming. It meant that innovation proneness of the fish farmers did not play any role in improving their extent of adoption of pisciculture. It can also be said that pisciculture farmers involved in pisciculture have not get expected degree of interest in getting useful information regarding new technology of pisciculture. Therefore, innovation

proneness did not play any positive role in improving their level of adoption. The above finding is opposite to the finding reported by Patel and Sangle (1993).

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Research Note

Belief Towards Organic Farming Among Farmers of Ranchi District

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Ravindra Kumar Singh⁶

ABSTRACT

Organic farming aims to produce crops using natural inputs and to eliminate toxic substances from farming system to provide healthy and toxicity free food to consumers. Of late, Government of India has promoted the organic farming at a large scale. Organic farming is not a new concept but it is a traditional farming with modern technology. In line with this, three villages of Angara block of Ranchi District have been developed as organic villages. The study was conducted to assess the belief of farmers after implementation of organic inputs on the land and produced organic foods. For the study, two villages of the Ranchi district Budhakocha and Dhurleta were selected. Questionnaire on General, Attitudinal, Practical and Normative Belief of Organic Farming (Hindi) was used along with interview for data collection. Sample size of the study was 30 (15 of each village). The findings of the study showed that 100 per cent farmers believed that organic farming is good while 60 per cent of the population practically belief that organic farming is beneficial of them. 53 per cent of the population agreed with limitations which hindered in persuading organic farming.

Keywords: Attitudinal belief, Control belief, General belief, Organic farming

INTRODUCTION

Organic farming can be defined as a system of farming practice which is based on using natural materials as fertilizer and pesticides in the place of artificial inputs. Organic farming is a part of sustainable farming which focuses on producing healthy products and keeping soil, water and environment safe. India has traditionally been a country of organic agriculture, but the growth of modern scientific, input intensive agriculture has pushed it to wall. With the increasing awareness about the safety and quality of foods, long term sustainability of the system and accumulating evidences of being equally productive, the organic farming has emerged as an alternative system of farming which not only address the quality and

sustainability concerns, but also ensures a debt free, profitable livelihood option for the most vulnerable section of Indian farming community particularly schedule tribes.

Organic agriculture is one among the broad spectrum of production methods that are supportive of the environment and healthy products. The Indian agriculture is traditionally organic and farmers were following organic cultivation till the middle of the last century (1950). The Green revolution was ushered in India during sixties and it has been the corner stone of India's agricultural achievement, transforming the country from the stage of food deficiency to self-sufficiency. The usage of chemical fertilizers on the land has terrible effect on the land and this information broadcast throughout the country. Now,

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due to health awareness in general population, people have a positive attitude regarding organic farming. Farmers of the Jharkhand (Ranchi) generally use organic substances in their agriculture along with some technical assistance. With the expansion of market and owing to the natural resources available in Jharkhand particularly tribal areas there is huge scope of socio-economic upliftment of tribal, small and marginal farmers through organic farming. Keeping this in view KVK Ranchi has made efforts for promotion of organic farming in its area of operation and surroundings. As majority of tribal farmers fall in category of small or marginal farmer and their socio-economic condition does not encourage them to adopt new production technology. Thus local resource based organic farming proved economically viable intervention in tribal villages of Ranchi and surroundings. To buildup confidence among farmers, Divyayan KVK demonstration farm has been fully transformed into an organic farm by adopting scientific technology in combination with traditional organic farming practices since the year 2015-16. With the successful adaption of organic farming at KVK farm, initially two villages Budhakocha and Dhurleta were selected under NABARD sponsored organic cluster development project on the basis of cluster of land and availability of landmass to develop model organic village based on local resources. Villagers were convinced to grow organic produce from their land by organic input. The main theme of present research was to study about current scenario and future aspects of organic farming and its impact on farmers and their families and hence, to assess the belief of farmers after implementing organic inputs on the land and procuring organic foods this study were conducted.

METHODOLOGY

This study was conducted in mainly two villages of Budhakotcha and Dhurleta of Angara block of RANCHI district. For this study the sample was selected according to the delimitations of the study such as income group, gender, and land holdings. For the present study low income group, male members of the villages, small land holders were selected. Purposive sampling method was used to sample selection. 30 villagers (15 from each) were selected from both villages i.e. Budha Kocha and Dhurleta

for the study. Data collection was done through home visits and direct interviewing of farmers. A questionnaire, which was previously used by agricultural agencies of USA in a survey in Syria, was used with few modifications (converted from English to Hindi) as per the situation. Frequency and percentage distribution were used for data analysis. For data collection two villages (Budhakocha and Dhurleta-Tirlakocha) which were prominent in organic farming were selected by Divyayan KVK. The researcher visited villages with a field staff of Divyayan KVK. This research started with PRA in a short meeting with some villagers and after that questionnaire was distributed to them. They answered that questionnaire themselves.

RESULTS AND DISCUSSION

Most of the respondents were below 40 years (64%), a greater section of respondents' (70%) falls under below-matric category and around 30 per cent of this population have done matriculation or intermediate (Table 1). Most of the families of these villages have joint family system means more than 6 family members reside in a family. Around 80 per cent of the total number of respondents were completely dependent on agriculture and allied field for their livelihood and majority (43.33%) of them have experience of farming more than 10 years. 100 per cent of the respondents showed positive attitude towards organic farming.

They believed organic farming practice helped in improving soil health of their field and does not have any adverse effect on farm, environment and their health. Most of the respondents were quite satisfied with the concept that organic farming as it was helping them in increasing their agricultural income and also health of the soil and environment. They believed that consumption of organic products helped in maintaining the health of

Table 1: Distribution of general belief of farmers towards organic

Range	<i>f</i>	<i>f</i> %
High	30	100
Medium	00	00
Low	00	00

the family members. They said their statement that “जो खेत में जाना है, वो पेट में आना है”। Rising awareness of health and environmental issues associated with the intensive use of chemical inputs has led to interest in alternate forms of agriculture in the world. They believed that organic farming is a profitable source of income. People feel that organic farming is more profitable than conventional farming higher production cost. Farmers are engaged in making organic fertilizers by the organic manure. In Jharkhand, farmers are used dairy not only for milk production but also for cow dung. Bharat has a rich history of organic farming and the increasing domestic market of organic food can provide the necessary drive to the organic movement.

Attitudinal Belief towards Organic Farming

Figure 1 represents the attitudinal belief of farmers towards organic farming and it was used to assess farmer's attitude towards organic farming practices. For this information related to investment in organic farming and income generated from organic farming as well as information's about local market availability for their produces were assessed. Figure 1 reveals that majority of population (60%) were contented with the organic farming because of low investments and comparatively high income generation from organic farming. Ecologically and economically sustainable organic farming is the pre-requisite for enabling wider adoptability,

secured livelihoods and ensuring affordability at the producers and consumer's end. Organic farming improves land fertility and it is also boon for environment. But due to less production of organic products it's cost increases which fail to attract the consumer attention. Weed is the major problems for the farmers because weeds are the negative factors which impede the growing rate of organic produces. They also feel problem in pest and disease management and it leads to crop failure. Scarcity of bio resource for compost production that forms a major bottleneck towards large scale organic conversion. Certification is another problem for the farmers. Organic certification takes long time in testing validity and reliability of organic produces. Availability of market for organic produces is also a challenge for the organic growers. Despite efforts from government and other agencies, subsidies and other schemes, organic producer still face various problems. The farmers adopting organic farming face difficulty to survive and market their products. Despite of this, the organic yield gap is also a cause of problem. Krishi Vigyan Kendra tries to cater stated problems and they believe that all problems will be shorted out soon.

Control belief refers to the limitations which hinders organic grower in producing organic products. These limitations are; information related to Organic farming, appropriate and accurate information and timely information. Fertility rate of land (soil testing), land area

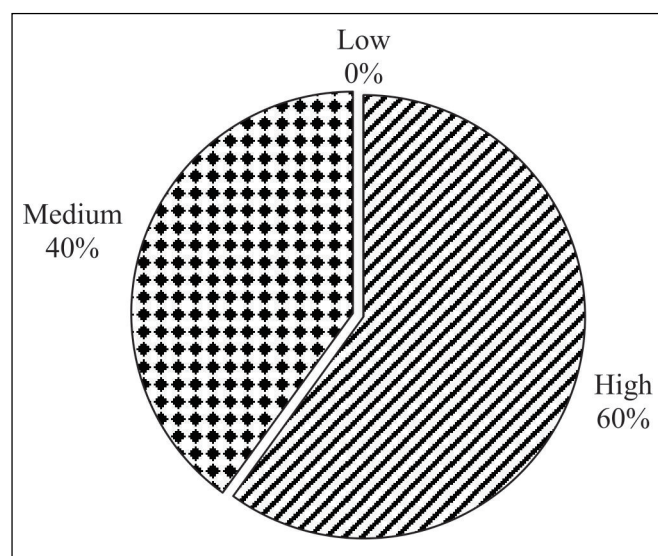


Figure 1: Attitudinal Belief Towards Organic Farming

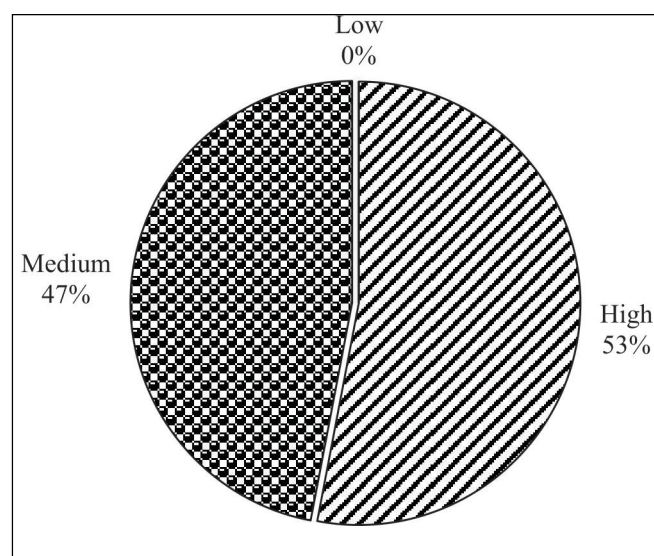


Figure 2: Control Belief towards Organic Farming

(per ha. growing land), possibility of organic farming without using pesticides, certification and marketing. Figure 2 depicts the control belief of farmers towards organic farming. 47 per cent population agreed with the controlling factors which impede their progress in organic farming. Generally farming is meant for the small and marginal farmers who are depressed with the high cost input with lower output. But organic farming gets them benefit because of low cost input. They can avail information regarding organic farming easily and for small scale they can cultivate fruits and vegetables with no trouble at all. Complexity regarding organic certification, high cost as well as time frame (3 years in most cases) are the major constraints for small land holders. There is no Minimum Support Price (MSP) for their products. Though Organic farming is labor intensive yet the price of produce is high and hence, market availability is low with inability to meet the export demand. Lack of storage, transport and organized organic marketing system are major controlling factors. Inadequate agriculture infrastructure and cold storage facility translate to loss of produce due to spoilage. In Ranchi, a plateau region, these problems are prominent. Due to unavailability of a clear guidelines regarding organic farming it's also play a controlling factor for organic farming. Government supportive policy (which is not as good as it should be) is one of the biggest controlling factors which impede the organic farming system.

CONCLUSION

On the basis of result, it is concluded that farmers believed that organic farming based on local resources is good and profitable. It is an alternate form of agriculture which can improve their income. But there is difference in thought and action. Practically they face various problems in which productivity and marketing is the major areas of concerned. Hence government should give more attention towards farmers for achieving their goal of doubling the farmer's income. A direct connection of producers and consumers should be made so that farmers produce their organic crop on the basis of contract given by customers.

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Research Note

Impact of Soil Health Card in Unnao District of Uttar Pradesh

Ratna Sahay^{1*}, A.K. Singh², Archana Singh¹, R.C. Maurya¹, D.K. Tiwari¹ and Sunil Singh¹

ABSTRACT

The impact of soil health cards (SHC) was assessed on 300 farmers in seven different villages of Unnao during the year 2017-19 on judicious use of fertilizers, bio fertilizers, organic fertilizers, soil health, cropping choice, cost reduction, farm profitability and sustainability. As per the adaptation of the SHC scheme, only 70 per cent of the farmers were able to understand the content of the SHC, of which 65 per cent farmers agreed that the recommendations were suitable for their agricultural practices and 60 per cent farmers followed the recommendations of SHC. The major reduction has been recorded in the use of urea by 23 per cent followed by DAP fertilizer by 15 per cent. The major increase was recorded in Zinc fertilizer by 21 per cent especially in paddy. Use of other micronutrients improved up to 25 per cent. Most of the farmers were not using the bio fertilizers because of lack of knowledge and awareness. After SHC scheme a remarkable increase of 50 per cent was recorded in the use of bio fertilizers as seed, root and soil treatment. Overall, the performance of SHC scheme was satisfactory and need focus on quality of soil sample collection, timely distribution and SHCs, knowledge enhancement to farmers through various awareness campaigns and training programmes. To make this scheme successful it was observed that ensuring availability of recommended fertilizers and bio-fertilizers at village level at reasonable prices is key determinant.

Keywords: Fertilizers, Knowledge, SHC, Soil test

INTRODUCTION

Soil health, fertility and productivity are the basis for profitability of the farming. Optimal and balance doses of fertilizers with proper cropping pattern as per the scientific recommendation is the main and initial step towards sustainable farming (Kanhaiya and Singh, 2014). Soil testing is a scientific tool for assessment of the soil fertility status for crop wise nutrients recommendations. It is also useful for the determination of amendments according to soil conditions. These factors play important role in improving the natural condition of soil and profitability of farmers. Soil testing is an important tool for judicious use of fertilizers which is an important component for the optimum crop production (Vedhika *et al.*, 2017). The annual consumption of fertilizers in

nutrients terms (N, P & K) has increased from 0.07 million MT in 1951-52 to more than 25.95 million MT in 2016-17 and the per hectare consumption has increased from less than 1 kg in 1951-52 to the level of 130.8 kg in 2016-17 (FPC 2016-17). In India, the current consumption of NPK ratio is 6.7:2.4:1, which is highly skewed towards nitrogen as against ideal ratio of 4:2:1. The gap between recommended fertilizer and actual use of fertilizer is huge and especially larger in case of urea (Ram Fishman *et al.*, 2016). The main factors involve in imbalance use of nutrients are the lack of knowledge among farmers, availability and cost of fertilizers in markets, apart from this most part of the applied nitrogen is being used and lower use of phosphorus and potash by the soil and plants. Excessive and imbalance use of fertilizers not only deteriorating the natural resources but also causing the

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financial losses. As per GOI 2017, the estimated subsidy for net cropped area is about Rs. 5000/ha but the excessive use of fertilizers is resulting it to about Rs. 5100/ha, especially NPK at the cost of micro-nutrients and manure.

Ministry of agriculture introduced the soil health card (SHC) scheme on 5th December 2015 with the objective to guide farmers to apply the recommended doses of nutrients based on soil test values for the improvement of soil health and fertility with low costs and higher profits. Many studies have clearly shown that farmers do adopt soil management strategies (Reddy, 2011) in addition of that adoption of SHC scheme can further improve the sustainable soil health with optimum crop production.

METHODOLOGY

This study was conducted to assess the impacts of SHC scheme on judicious use of fertilizers, bio fertilizers, organic fertilizers, soil health, cropping choice, cost reduction, farm profitability and sustainability. Study was conducted in selected seven villages of Unnao district namely- Dhaura, Buxikheda, Munshikheda, Maljha, Uchdwar, Mirzapur Ajgaon and Arerkala. The cropped area was divided in to grids of 10 ha for rain fed land and 2.5 ha for irrigated land. The soil samples were taken from each grid for soil analysis. After that soil was analysed for different parameters and soil health cards were prepared. SHC contained information regarding soil fertility and provided recommendations of chemical and bio fertilizers application on crops and soil amendments required in the case of saline or alkaline soils. Suggestions were also made regarding integrated nutrient management.

Test results were distributed before sowing season to all the farmers whose lands fall under the particular grid, so that farmers can practice recommended crop choice and fertilizers. After distributing the SHC all content were elaborated among farmers through training sessions and queries were entertained individually. Trainings were also conducted on use of specific bio fertilizers and other organic inputs on the basis of soil parameters and crop. A structured questionnaire among 300 sample farmers from selected seven villages of Unnao

was administered to receive feedback other than group discussions

RESULT AND DISCUSSION

The main finding of the study was reduction in use of fertilizer especially nitrogen and increase in the use of bio-fertilizers and micro- nutrients by the farmers. This is a good sign as N: P: K ratio was highly skewed towards nitrogen. There was remarkable increase in the use of halophilic bio fertilizers as three selected villages fall under sodic soil regions. In most of the cases, cost of production has come down due to reduction in use of fertilizer. Growth in crop production has been recorded in most of the crops. The most significant impact has been increase in the use of zinc as micronutrient fertilizer to some extent.

As per the adaptation of the SHC scheme only 70 per cent of the farmers were able to understand the content of the SHC of which 65 per cent farmers agreed that the recommendations were suitable for their agricultural practices and 60 per cent farmers followed the recommendations of SHC. The farmers who could not follow the recommendations cited personal reasons like shortage of money or resources. Other researchers also reported such problems that despite the recommendations provided in SHC farmers fail to adopt them (Fishman *et al.*, 2016).

As per the cropping pattern the main crops taken into consideration were paddy and wheat (Figure 1). The major reduction has been recorded in the use of urea by 23 per cent followed by DAP fertilizer by 15%. On the other hand the major increase has been recorded in Zinc fertilizer by 21 per cent especially in paddy. Use of other

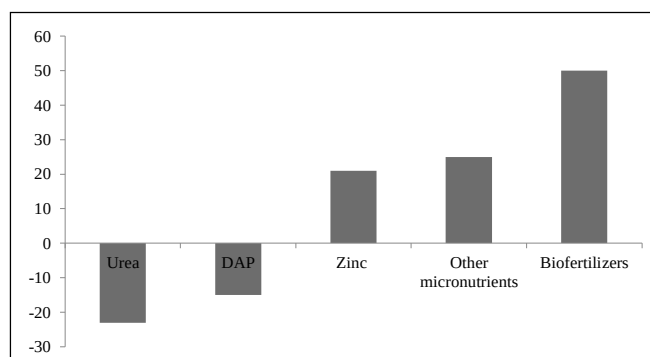


Figure 1: Change in Fertilizer use pattern

micronutrients has also been improved up to 25 per cent. Most of the farmers were not using the bio fertilizers because of lack of knowledge and awareness. After SHC scheme a remarkable increase of 50 per cent was recorded in the use of bio fertilizers as seed, root and soil treatment. Green manuring and pulses crops were also introduced by 40 per cent of farmers.

Change in fertilizer use pattern increased the crops production by 13 to 20 per cent. Chander *et al.* (2014) also reported significantly higher yield under the balanced nutrition treatment based on soil test as compared to traditional farmer's practices. With the result of adoptions of all these practices the net incomes of farmers increased between 19 to 25 per cent after SHC scheme. It was noticed that many farmers did not understand the content, hence unable to follow the recommended practices. Some farmers were not satisfied with the soil test values, whereas some farmer shown their limitation for adopting the instructions due to personal reasons such as shortage of money for buying inputs.

To overcome from the limitation of SHC scheme there is need to distribute SHC and arrange awareness campaigns before sowing seasons. To build trust, samples should be collected in presence of all GRID farmers. There is a need to give appropriate training to farmers to understand the content of SHC. Other extension workers also given such recommendations to make this scheme more effective (Sunil *et al.*, 2019). To make this scheme more popular among farmers there is need to introduce some awards for the farmers who grow green manure crops, use vermicompost and for them whose farms' soil fertility increased over the years based on Soil Health Card. Other than this the most importantly, Government should ensure availability of recommended fertilizers and bio-fertilizers at village level at reasonable prices.

CONCLUSION

Overall, the performance of SHC scheme was satisfactory and having significant impact on improving soil health. There is need of more focus on quality of soil sample collection, testing, timely distribution and SHCs knowledge enhancement for farmers is required. Regular meetings, trainings, involvement of local leaders and follow up by agriculture and extension representative on SHC can increase utility of SHC.

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