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Links between Irrigation, Agriculture, Level of Living and Poverty Scenario in West Bengal

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ABSTRACT

An analysis of irrigation, agriculture, level of living and poverty linkages in eighteen districts of West Bengal was carried out. District-wise scenario of irrigation, agriculture, livelihood and poverty revealed with the help of different indices developed for the study. The values of Groundwater Development Index and Composite Irrigation Index were found low to very low for eight districts. Six districts showed high agricultural development while seven and five districts showed medium and low Agricultural Development Index values, respectively. Level of living of eleven and six districts was found medium and low, respectively. Poverty Ratio Index values of nine districts showed very high to high poverty level. The links and/or missing links between irrigation resources, agriculture development, poverty and level of living were explored.

Key words: Agricultural development, irrigation, groundwater development, level of living, rural poverty

INTRODUCTION

Development of irrigated agriculture has been a major engine for economic growth and poverty reduction. Irrigation resources have played a major role historically in poverty alleviation by ensuring agricultural development, expanding livelihood opportunities and employment both on and off the farm. But, the growing scarcity and competition for water are putting the poor in irrigated areas at great risk (Barker *et al.*, 2000). Poverty alleviation has always been an important aim of the governments of developing countries when investing in the development of irrigation infrastructure (van Koppen *et al.*, 2002). A significant contribution (about 60%) from irrigated agriculture has always been to overall agricultural production in India (Planning Commission, 2012). Therefore, because of its yield augmenting impact, irrigation development has always been the priority area of India's agricultural development strategy in the successive five year plans (FYPs) with massive financial support in irrigation sector. Consequently, irrigation potential has increased from 22 million hectare during pre-plan period to 123 million hectare at present making India the world leader in the irrigation sector (Central Water Commission, Government of India, 2012). Irrigation has played a crucial role in agricultural growth and development due to its direct (Hasnip *et al.,* 2001; Hussain and Hanjra, 2003) as well indirect (Narayanamoorthy and Bhattarai, 2004; Narayanamoorthy, 2007) positive impact on the rural economy in India. If irrigation has the potential to produce such profound impacts on agrarian dynamism, why such impacts are not visible in eastern India, where it is needed and has the water resources to sustain intensive irrigation (Shah, 2004). Northern region of India showed better performance both in irrigation and agriculture while eastern region was found to be lagging behind inspite of rich water resource base (Srivastava *et al.*, 2014). In this backdrop, present paper analyses irrigation, agriculture, poverty and living scenario in West Bengal, an eastern Indian state.

METHODOLOGY

Different indices were constructed for assessment of district wise scenario of irrigation, agriculture, poverty and level of living, *viz.* Groundwater Development Index (GWDI), Irrigation Coverage Index (ICI), Composite Irrigation Index (CII), Agricultural Development Index (ADI), Level of Living Index (LLI), and Poverty Ration Index (PRI). Brief account of these indexes are given below:

GWDI considered district-wise gross annual draft (ha-m) out of utilisable groundwater resource (ha-m) and calculated as:

$$GWDI_j = \frac{GWD_j - \min GWD_j}{\max GWD_j - \min GWD_j}$$

Where, GWDj = (gross annual draft of j^{th} district / utilisable groundwater resource of j^{th} district)

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ICI was calculated on the basis of gross irrigated area out of gross cultivated area.

$$ICI_j = \frac{IC_j - \min IC_j}{\max IC_j - \min IC_j}$$

Where, IC_j = (gross irrigated area of j^{th} district / gross sown area of jth district)

CII was calculated averaging GWDI and ICI giving equal weight.

ADI included seven indicators *viz.* % of cultivable land to total land area, % of net sown area to total cultivable area, % of gross irrigated area, cropping intensity, yield of paddy (major crop), food grain production and per ha fertilizer consumption. To depict the district-wise agricultural development disparity scenario, composite Agricultural Development Index (ADI) was constructed by 'Deprivation Method' by using seven agricultural development indicators similar to those given in the Report Planning Commission (planningcommission. nic.in/plans/stateplan).

Composite agricultural development index was calculated as:

$$ADI_j = \frac{\sum_{i=1}^{n} I_{ij}}{\sum_{i=1}^{n} i}$$

Where, ADIj is the index of jth district and equal weight to all the indicators

$$I_{ij} = \frac{X_{ij} - \min X_{ij}}{\max X_{ij} - \min X_{ij}}$$

Where, X_{ij} is the actual value of ith indicator for jth district

min X_{ij} and max X_{ij} are the minimum and maximum value of ith indicator

LLI included 14 variables *viz.* per cent of population above poverty line, literacy rate, per capita food grain production, yield of major crop, per cent of gross irrigated area, per cent of village electrification, women work participation rate, per cent of agricultural laborers to total main workers, per cent of cultivators to total main workers, per cent of industrial workers to total main workers, per cent of main workers to total population, percentage of urban population to total population, agricultural productivity per worker, and backward class (Scheduled Class/Scheduled Tribe) population. To ensure the index values for the selected variables move in same direction the index value was calculated as follows:

Index values for the positive variables like literacy rate, agricultural productivity, *etc* were calculated as:

$$P_{ij} = \frac{Y_{ij} - \min Y_{ij}}{\max Y_{ij} - \min Y_{ij}}$$

While index values of the negative variables like backward class population, poverty ratio, etc were calculated as:

$$P_{ij} = \frac{\max Y_{ij} - Y_{ij}}{\max Y_{ij} - \min Y_{ij}}$$

Where, Y_{ij} is the actual value of i^{th} indicator for j^{th} district

min Y_{ij} and max Y_{ij} are the minimum and maximum value of i^{th} indicator

On the basis of the index value of each selected indicator a composite index was derived giving equal weight and there by district-wise LLI value was calculated as:

$$LLI_j = \frac{\sum_{i=1}^{m} P_{ij}}{\sum_{i=1}^{m} i}$$

Where, LLI_j is the index of j^{th} district and equal weight to all the indicators

PRI was calculated on the basis of percentage of families below poverty line (BPL) in the district.

$$PRI = \frac{\max PR_j - PR_j}{\max PR_j - \min PR_j}$$

Where, PR_j = (BPL families of jth district / total rural families of jth district)*100

District-wise data on selected variables were taken from various secondary data sources viz. Economic Survey, Agricultural Statistics of West Bengal, Census, BPL Survey and other published sources. District-wise values of different indices were calculated. Each index ranged from 0.0 to 1.0.

The districts were classified under each index into five categories *viz.* very low (0.0 to 0.2), low (>0.2 to 0.4), medium (>0.4 to 0.6), high (>0.6 to 0.8) and very high (>0.8 to 1.0).

RESULTS AND DISCUSSION

District-wise scenario of irrigation, agriculture, level of living and poverty is presented with the help of different indices derived for 18 districts of West Bengal along with mean and standard deviation value of each index. (Table 1). Each index was categorized into five categories under which the frequency of districts was indicated (Table 2). Categorization of districts in West Bengal on index values is presented in Table 3.

Table 1: Values of different developmental indexes in the districts of West Bengal

District	GWDI	ICI	CII	ADI	LLI	PRI
Bankura	0.242	0.885	0.582	0.482	0.471	0.196
Bardhaman	0.421	0.960	0.711	0.741	0.567	1.000
Birbhum	0.234	0.946	0.610	0.658	0.462	0.119
Coochbihar	0.061	0.028	0.045	0.444	0.314	0.021
Darjeeling	0.003	0.000	0.002	0.224	0.387	0.000
Dinajpur (N)	0.531	0.186	0.362	0.522	0.350	0.270
Dinajpur (S)	0.209	0.152	0.184	0.500	0.403	0.143
Hooghly	0.542	0.583	0.575	0.673	0.554	0.859
Howrah	0.227	0.644	0.449	0.593	0.624	0.706
Jalpaiguri	0.000	0.295	0.154	0.319	0.324	0.523
Malda	0.515	0.198	0.361	0.478	0.436	0.377
Midnapore (E)	0.483	0.216	0.354	0.364	0.423	0.968
Midnapore (W)	0.483	1.000	0.740	0.699	0.520	0.671
Murshidabad	0.867	0.203	0.539	0.641	0.458	0.155
Nadia	1.000	0.261	0.636	0.601	0.484	0.605
Purulia	0.132	0.436	0.293	0.251	0.327	0.138
24 Parganas (N)	0.985	0.151	0.571	0.513	0.470	0.432
24 Parganas (S)	0.985	0.318	0.658	0.344	0.302	0.457
Minimum Value	0.000	0.000	0.002	0.224	0.302	0.000
Maximum Value	1.000	1.000	0.740	0.741	0.624	1.000
Mean	0.440	0.415	0.435	0.503	0.438	0.424
Standard deviation	0.336	0.336	0.227	0.155	0.093	0.321

Note: Groundwater Development Index (GWDI), Irrigation Coverage Index (ICI), Composite Irrigation Index (CII), Agricultural Development Index (ADI), Level of Living Index (LLI) and Poverty Ratio Index (PRI).

Table 2: Number of districts under each developmental index in West Bengal

Categories	Frequency of the districts					
	GWDI	ICI	CII	ADI	LLI	PRI
Very low (0.0-0.20)	4	6	4	0	0	7
Low (>0.2-0.4)	4	5	4	5	6	2
Medium (>0.4-0.6)	6	2	5	7	11	3
High (>0.6-0.8)	0	1	5	6	1	3
Very high (>0.8-1.0)	4	4	0	0	0	3

Table 3: Categorization of districts in West Bengal on index values

Categories	GWDI	ICI	CII	ADI	LLI	PRI
Very high (>0.8-1.0)	Murshidabad Nadia 24 Parganas (N) 24 Parganas (S)	Bankura Bardhaman Birbhum Midnapore (W)				Bardhaman Hooghly Midnapore (E)
High (>0.6-0.8)		Howrah	Bardhaman Birbhum Midnapore (W) Nadia 24 Parganas (S)	Bardhaman Birbhum Hooghly Midnapore (W) Murshidabad Nadia	Howrah	Howrah Midnapore (W) Nadia
Medium (>0.4-0.6)	Bardhaman Dinajpur (N) Hooghly Malda Midnapore (E) Midnapore (W)	Hooghly Purulia	Bankura Hooghly Howrah Murshidabad 24 Parganas (N)	Bankura Coochbihar Dinajpur (N) Dinajpur (S) Howrah Malda 24 Parganas (N)	Bankura Bardhaman Birbhum Dinajpur (S) Hooghly Malda Midnapore (E) Midnapore (W) Murshidabad Nadia 24 Parganas (N)	Jalpaiguri 24 Parganas (N) 24 Parganas (S)
Low (>0.2-0.4)	Bankura Birbhum Dinajpur (S) Howrah	Jalpaiguri Midnapore (E) Nadia 24 Parganas (S) 24 Parganas (N)	Dinajpur (N) Malda Midnapore (E) Purulia	Darjeeling Jalpaiguri Midnapore (E) Purulia 24 Parganas (S)	Coochbihar Darjeeling Dinajpur (N) Jalpaiguri Purulia 24 Parganas (S)	Dinajpur (N) Malda
Very low (0.0-0.20)	Coochbihar Darjeeling Jalpaiguri Purulia	Coochbihar Darjeeling Dinajpur (N) Dinajpur (S) Malda Murshidabad	Coochbihar Darjeeling Dinajpur (S) Jalpaiguri			Bankura Birbhum Coochbihar Darjeeling Dinajpur (S) Murshidabad Purulia

Irrigation scenario

Groundwater development in West Bengal varied from 1 per cent (Darjeeling and Jalpaiguri dists.) to 57 per cent (Nadia dist.). The GWDI values of eight districts were found low to very low; while four districts' values were high to very high (>0.6). The irrigation utilization or irrigation coverage (ratio of gross irrigated to gross sown area) varied from 12 per cent (Darjeeling) to 91 per cent (Midnapore West dist.) with an average of 46 per cent. Five districts showed high to very high irrigation coverage index value (ICI>0.6). CII value varied from 0.002 (Darjeeling dist.) to 0.740 (Midnapore West dist.). CII values of eight districts were low to very low (< 0.4), while that of five districts each were medium (>0.4 to 0.6) and high (>0.6 to 0.8), respectively.

In most of the eastern Indian states, the surface water irrigation system is predominant as groundwater irrigation contributed to about 14 per cent, 21 per cent, 21 per cent, 46 per cent and 55 per cent share of IPC in Odisha, Jharkhand, Chhattisgarh, West Bengal and Bihar, respectively. Therefore, it is evident that relatively better groundwater development in Bihar and West Bengal has lead to better irrigation scenario in comparison to other three states in eastern India (Ghosh *et al.,* 2014). Overall the potential utilization of groundwater irrigation system is relatively less in eastern region as compared to other regions of country due to many constraints like higher energy cost, operational cost, defunct lift points, etc. In Indo-Gangetic Basin (IGB) that also covers many districts of West Bengal, energy cost and availability ranked as the top challenge to the farming (Shah *et al.*, 2006). The diesel price squeeze on small-scale irrigation is heading towards a crisis that is also visible in West Bengal, where electric tubewells are few and the ratio of

rice (major crop) to diesel price has turned adverse. In crop-sharing contracts for water sales, tubewell owners claim 1/3rd to half of the total output for pump irrigation alone when they pay for diesel (Shah *et al.*, 2009). Non-functioning of groundwater extraction devices (GEDs) has led to poor utilization of irrigation potential as about a quarter of the total GEDs were found to be nonfunctional as reported in the latest (4th) minor irrigation census (2006-07). Many of the non-functional GEDs, were not working because of mainly less discharge rate and mechanical breakdown. Thus, while several states in northern and southern part of the country witnessed over-exploitation of the groundwater, the eastern part is under-utilizing its groundwater because of poor infrastructure and unfavourable geological conditions (Srivastava *et al.*, 2014).

Agricultural scenario

ADI values of eighteen districts in West Bengal ranged from 0.741 (Bardhaman dists.) to 0.224 (Darjeeling dist.). Six districts showed high (>0.6-0.8) agricultural development while seven and five districts showed medium (>0.4-0.6) and low (>0.2-0.4) ADI values, respectively.

Rai *et al.* (2008) reported that as per the agricultural status index, districts within agro-climatic zones 3 (many districts of West Bengal) were medium status. Agricultural development in districts of West Bengal was found to be comparatively better than other eastern Indian states (Ghosh *et al.,* 2014) with relatively higher productivity of major crop paddy (about 2.5 tonne per ha), food grain production (15700 thousand tonne with productivity about 1.7 tonne per ha), cropping intensity (180%) and fertilizer consumption (145 kg per ha). Potential of irrigation development is not fully reaped in all the districts. The possible reasons hover around the issues of poor quality of irrigation rather coverage (high coverage but unreliable water supply affecting crop growth thus crop production adversely). Unreliable irrigation is also the reason for low level of uses of other complementary inputs which affect the agricultural development scenario. While more than half of the gross sown area was found irrigated in the West Bengal, low level of agricultural development in five districts reiterates the fact that performance of groundwater irrigation influences the gross irrigated area. Thus lack of assured irrigation service has bearing on low food grain productivity, cropping intensity, fertilizer consumption, etc in those districts. Smaller the irrigation systems with well managed infrastructure, relatively equitable water distribution and diversified cropping patterns, the greater impacts of irrigation. Improving the performance of irrigation systems by improving water distribution across locations and enhancing land and water productivity through diversified cropping patterns would help in improving agricultural performance in presently low productivity parts of the systems (Hussain *et al.*, 2004).

Poverty and living scenario

Level of living of eleven and six districts was found as medium (with LLI value >0.4-0.6) and low (with LLI value >0.2-0.4), respectively. PRI values of six districts were in high range (higher the value of index lower is the poverty), while nine districts showed relatively higher poverty level with PRI values <0.4. Poverty was found highest in Darjeeling and Coochbihar districts (46 % families are BPL); however, it is lowest in Bardhaman district, where 26% families are BPL, agricultural development was found maximum.

Thus the living scenario of most of the districts in West Bengal was at medium level. Rai *et al.* (2008) in their study on livelihood status of different agro-climatic zones in India reported that livelihood status index of agro-climatic zones 7 (Jharkhand, Chhattisgarh and Odisha are in this zone barring coastal districts of Odisha those are in zone 11) and 4 (all districts of Bihar) was categorized as low while agro-climatic zones 3 (many districts of West Bengal) was medium status. Task Force of Planning Commission of India (2003) had identified 150 backward districts for wage employment programme out of which about half of the districts were in eastern Indian states viz. 27, 19, 14, 7 and 6 districts of Odisha, Jharkhand, Chhattisgarh, West Bengal and Bihar, respectively.

Extent of poverty was found maximum in Odisha and minimum in West Bengal having relatively low and high level of irrigation as well as agricultural performance, respectively (Ghosh *et al.,* 2014). In a mega study to explore the links between irrigation and poverty alleviation in six Asian countries (India, Pakistan, Bangladesh, China, Vietnam and Indonesia) covering 26 irrigation systems, it was revealed that irrigation did significantly reduce poverty as measured by household income; however, poverty was still high in irrigation systems, averaging 34 per cent (varied from 6% to 65%) with significant inter- and intra-country differences in poverty incidence in irrigation systems (Hussain, 2007a). The locational differences (upstreamdownstream poverty differences in India about 11%) in poverty were more pronounced in larger irrigation systems (surface irrigation), where locational inequities in water distribution and agricultural productivity differences were also high (Hussain *et al.*, 2004; Hussain, 2007b). Impact of groundwater irrigation on agriculture and

poverty reduction is larger (Bhattarai and Narayanmoorthy, 2003; Shah, 2004; Narayanmoorthy, 2007). Mukherji (2007) in an extensive study in West Bengal reaffirmed groundwater irrigation with numerous benefits.

Link between irrigation, agricultural development, poverty and level of living

To draw relationships between irrigation resources, agricultural development, level of living and poverty, at the first step normality of CII, ADI and LLI tested using SPSS 10.0 for Windows program. As the indices' values were found to be normally distributed, correlation and regression analyses were carried out with those values. Links between irrigation, agriculture, livelihood and poverty were understood through a correlation matrix (Table 4) and regression curves (Fig. 1). It was revealed that ADI was significantly related with ICI and CII, while LLI was significantly related with ICI, CII, ADI and PRI. Correlation coefficient value between PRI and CII as well as PRI and LLI was significant; however that of PRI and ADI was not significant. Regression analyses were carried out between irrigation, agriculture and level of living indexes as they were significantly correlated with each other. CII explained about 49 per cent and 33 per cent variation in ADI and LLI, respectively. The analysis also revealed that 58 per cent ($R^2 = 0.576$) variation in living was predicted by the agricultural development in districts of West Bengal. Multiple regression analyses showed that CII and ADI together explained 58% variation in LLI; however regression coefficients of CII and ADI were found significant at 1% and 7% level of significance (Table 6).

A linkage matrix was prepared showing frequency of districts under various combinations of links between irrigation, agriculture, level of living and poverty (Table 5). The CII, ADI, LLI and PRI values of each district were considered to delineate the districts falling under index: high to very high (value>0.6), index: medium (value 0.4-0.6) and index: low to very low (value<0.4) with various combinations of links between the indexes. Number of districts having values of CII, ADI, LLI and PRI more than 0.6 counted under the index: high to very high within various combinations of links; similarly, the values of said indexes falling under 0.4 for the districts were counted under index: low to very low with various combinations of links. The districts with developmental indexes values between 0.4-0.6 for were categorized under the index: medium with various links. Thus, the values of CII and ADI were found more than 0.6 (index: high to very high) for four districts, less than 0.4 (index: low to very low) for four districts and from 0.4 to 0.6 (index: medium) for three districts; therefore, overall the 'Irrigation Agriculture' link was found in 11 districts. However, it was narrowed down to nine and eight districts in the case of 'Irrigation Level of living' and 'Agriculture Level of living' links, respectively. The 'Agriculture Poverty' and 'Irrigation Poverty' links were visible in seven and six districts, respectively. The 'Irrigation Agriculture Level of living Poverty' link was seen only in three districts, which were categorized under medium and low to very low index values. Therefore, better scenario of irrigation and agriculture in four districts could not influence the level of living in those districts showing the missing links.

Many of the districts in eastern Indian states showed both irrigation and agricultural scenario at a low level, which may be attributed to the fact of meager groundwater irrigated area due to low level of groundwater development and dependence on surface irrigation system that mainly providing irrigation during wet season with low level of efficiency where head reach farmers took extensive cultivation of paddy rather than assured productive irrigation in dry season with gap between created and utilized potential (Ghosh *et al.*, 2005; Ghosh *et al.*, 2010; Mishra *et al.*, 2011). Abundant water resources of the eastern region are not accessible to farmers at the right time and place because of poor irrigation infrastructure development making it high potential but poor performing region of the country (Narayanamoorthy 2011). The marginal impact of groundwater irrigation on poverty reduction is larger than that of canal irrigation, which is due to greater control in the application and wide spread use of groundwater irrigation than of canal irrigation (Bhattarai and Narayanmoorthy, 2003; Shah, 2004; Narayanmoorthy, 2007). In this context, lower groundwater exploitation for irrigation in many districts has bearing on the insignificant impact of irrigation development on the agricultural performance, poverty and living scenario.Here, the major challenge is to find ways of bringing down water use cost below the upper threshold beyond which abundantly available water becomes too expensive for the poor to use to maintain livelihoods and food security (Shah, 2009).

As revealed in the present study as well as past studies, the impacts of irrigation vary across settings and the magnitude of the anti-poverty impacts of irrigation depend on a number of factors like structure of land distribution, condition of the irrigation infrastructure and its management (both ground water and surface water), irrigation water management including allocation and distribution procedures, irrigation efficient production technologies, cropping patterns and crop diversification,

support measures including information, input and output marketing. There is a need for combination of sustainable irrigation development with the development of appropriate pro-poor institutions and technologies to achieve lasting and sustainable impact on poverty.

Table 4: Correlation matrix of different indicators

	GWDI	ICI	CII	ADI	LLI	PRI
GWDI	1.000					
ICI	-0.107	1.000				
CII	0.656**	0.680**	1.000			
ADI	0.343	0.586**	0.697**	1.000		
LLI	0.172	0.594**	0.579**	0.759**	1.000	
PRI	0.302	0.370	0.503*	0.399	0.569*	1.000

Note: ** significant at 0.01 per cent level and * significant at 0.05 per cent level

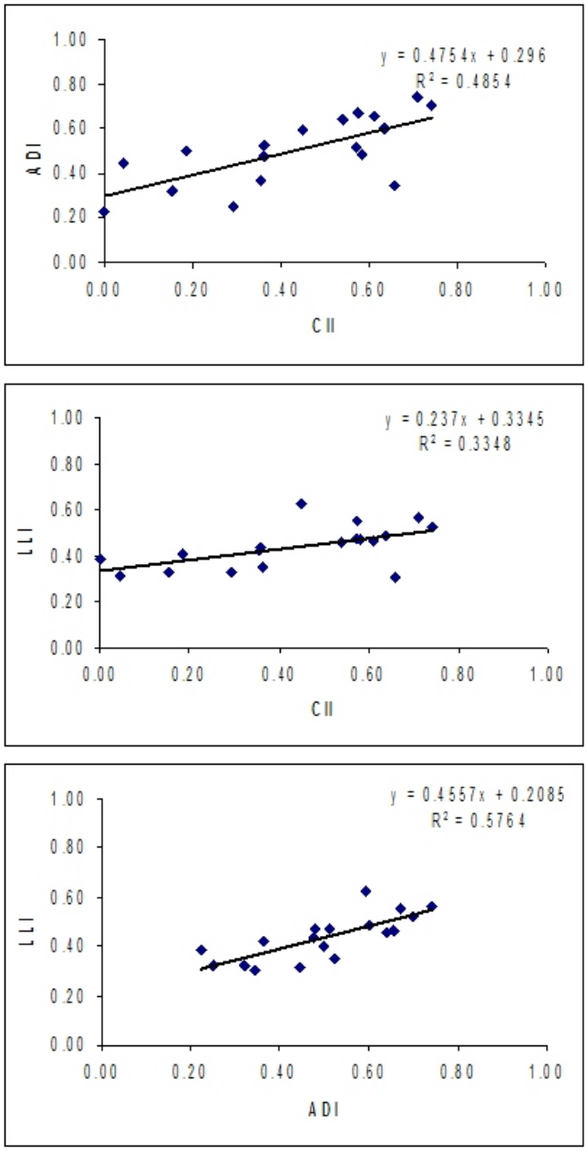

Fig. 1. Linear regression between irrigation, agriculture and level of living indexes

Table 5: Linkage matrix showing number of districts under various combinations of links between irrigation, agriculture, level of living and poverty

Types of Links	Districts (No.)			
	Index: High to very high	Index: Medium	Index: Low to very low	Total
Irrigation - Agriculture	4	3	4	11
Agriculture – Level of living	0	4	4	8
Irrigation – Level of living	0	4	5	9
Irrigation - Poverty	3	1	2	6
Agriculture - Poverty	4	1	2	7
Level of living - Poverty	1	1	4	6
Irrigation – Agriculture – Level of living	0	1	3	4
Irrigation – Agriculture – Poverty	3	1	2	6
Irrigation – Level of living - Poverty	0	1	4	5
Agriculture – Level of living – Poverty	0	1	2	3
Irrigation – Agriculture – Level of living – Poverty	0	1	2	3

Table 6: Multiple Regression between CII, ADI and LLI in West Bengal

Regression Statistics						
Multiple R	0.762					
R Square	0.581					
Adjusted R Square	0.525					
Standard Error	0.064					
Observations	18.000					
ANOVA						
	df	SS	MS	F	Significance F	
Regression	2.000	0.086	0.043	10.407	0.001	
Residual	15.000	0.062	0.004			
Total	17.000	0.148				
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	0.212	0.053	3.980	0.001	0.098	0.325
X Variable 1 (CII)	0.040	0.095	0.414	0.684	-0.164	0.243
X Variable 2 (ADI)	0.415	0.140	2.970	0.010	0.117	0.713

CONCLUSIONS

District-wise scenario of irrigation, agriculture, living and poverty was revealed with the help of different indices developed for the study. The differential influences of irrigation on agriculture as well as that of both irrigation and agriculture on living and poverty scenario were witnessed on many districts of West Bengal. Lower groundwater exploitation for irrigation has attributed to the lower impact of irrigation development on the poverty and livelihood scenario. Irrigation Agriculture link is found in many of the districts; however, it is narrowed down in case of Agriculture Livelihood and Irrigation Livelihood link. Irrigation Poverty and Agriculture Poverty link is visible in few districts. Irrigation-Agriculture-Livelihood-Poverty link is seen only in three districts of West Bengal. The links have been found more in case of poorer condition of different sectors; while betterment in one sector has not linked to betterment of other sectors in

many of the districts. Thus, the study has unveiled the links and/or missing links between irrigation resources, agricultural development, level of living and poverty which would help formulating future policies and planning for eastern India in general and West Bengal in particular for better agricultural growth and visible impact on agrarian economy and livelihood.

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REFERENCES

Barker R., van Koppen B. and Shah T. 2000. Water scarcity and poverty. http://www.iwmi.cgiar.org/pubs/WWVisn/WSandPov.htm.

Bhattarai M. and Narayanmoorthy A. 2003. Impact of irrigation on rural poverty in India: An aggregate panel-data analysis. *Water Policy*, 5 (5): 443-458.

Central Water Commission. 2012. *Water and related statistics*. CWC, Ministry of Water Resources, New Delhi, Government of India.

Ghosh Souvik, Srivastava S.K., Nayak A.K., Panda, D.K., Nanda P. and Kumar A. 2014. Why impacts of irrigation on agrarian dynamism and livelihood are contrasting: evidence from eastern Indian states. *Irrigation and Drainage*, 63: 573-583.

Ghosh Souvik, Singh R. and Kundu D. K. 2005. Evaluation of irrigation-service utility from the perspective of farmers. *Water Resources Management,* 19: 467-482.

Ghosh Souvik, Kumar A., Nanda P. and Anand P.S.B. 2010. Group dynamics effectiveness of water user associations under different irrigation systems in an eastern India state. *Irrigation and Drainage,* 59: 559574.

Hasnip N., Mandal S., Morrison J., Pradhan P. and Smith L. 2001. *Contribution of irrigation to sustaining rural livelihoods: Literature review.* HR Wallingford and Department of International Development, UK.

Hussain Intizar. 2007a. Pro-poor intervention strategies in irrigated agriculture in Asia: Issues, Lessons, Options and Guidelines. *Irrigation and Drainage*, 56: 119-126.

Hussain Intizar. 2007b. Poverty-reducing impacts of irrigation: Evidence and lessons. *Irrigation and Drainage*, 56: 147-164.

Hussain Intizar and Munir A Hanjra. 2003. Does irrigation water matter for rural poverty alleviation? Evidence from South and South-East Asia. *Water Policy*, 5 (5-6): 429-442.

Hussain Intizar and Munir A Hanjra. 2004. Irrigation and poverty alleviation: Review of the Empirical Evidence. *Irrigation and Drainage*, 53: 115.

Mishra A., Ghosh S., Nanda P. and Kumar, A. 2011. Assessing the impact of rehabilitation and irrigation management transfer in minor irrigation projects in Odisha, India: A case study. *Irrigation and Drainage,* 60: 42-56.

Mukherji A. 2007. *Political economy of groundwater markets in West Bengal, India: Evolution, extent and impacts*. Ph.D Thesis, Cambridge University, London, UK.

Narayanamoorthy A. 2007. Does groundwater irrigation reduce rural poverty? Evidence from Indian states. *Irrigation and Drainage*, 56 (2-3): 349-362.

Narayanamoorthy A. 2011. Development and composition of irrigation in India: Temporal trends and regional patterns. *Irrigation and Drainage,* 60: 431-445.

Narayanamoorthy A. and Bhattarai M. 2004. Can irrigation increase agricultural wages? An analysis across Indian districts. *Indian Journal of Labour Economics,* 47 (2):251-268.

Planning Commission. 2003. *Report of the Task Force: Identification of districts for wage and self employment programmes*. Planning Commission, Government of India, New Delhi.

Planning Commission. 2012. *Twelfth Five Year Plan 1912-2017 Vol. I&II*. Planning Commission, Government of India, New Delhi.

Rai A., Sharma S.D., Sahoo P.M. and Malhotra P.K. 2008. Development of livelihood index for different agro-climatic zones of India. *Agricultural Economics Research Review*, 21: 173-182.

van Koppen, B., Parthasarathy, R. and Safiliou, C. 2002. *Poverty Dimensions of Irrigation Management Transfer in Large-scale Canal Irrigation in Andhra Pradesh and Gujrat, India.* Research Report 61, International Water Management Institute (IWMI), Colombo, Sri Lanka. 26p.

Shah T. 2004. Water and welfare: Critical issues in India's

water future. *Economic and Political Weekly*, http://www.epw.org.in/showArticles.php?root=2004.

Shah T., Hassan M.U., Khattak M.Z., Banerjee P.S., Singh O.P. and Rehman S.U. 2009. Is Irrigation Water Free? A Reality Check. *World Development*, 37(2): 422-434.

Shah T., Singh O. P., and Mukherji A. 2006. Some aspects of South Asia's groundwater irrigation economy: Analyses from a survey in India, Pakistan,Nepal terai and Bangladesh. *Hydrogeology Journal*, 14(3), 286309.

Srivastava S.K., Ghosh Souvik, Kumar A., and Brahmanand P.S. 2014. Unraveling the spatio-temporal pattern of irrigation development and its impact on Indian agriculture. *Irrigation and Drainage*, 63: 111

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Impact of Vegetable Integrated Pest Management Farmer Field School Programme in Sub-Tropical Region of Jammu and Kashmir

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ABSTRACT

A field study was conducted to evaluate the impact of vegetable Integrated Pest Management- farmer Field School (IPM-FFS) Programme in the sub-tropical Jammu region of the state of Jammu and Kashmir (J&K). *Ex-post facto* with-without research design was employed to for conducting the impact evaluation. A sample of 80 IPM-trained and 60 non-IPM farmers were selected for the study. IPM practices namely raised nursery beds in cabbage (p=0.026), timely transplantation of cauliflower (p=0.034), collection of eggs and egg masses of insect pests (p=0.048) were adopted by significant proportion of IPM trained farmers. A logistic regression model was fitted which showed IPM training programme impacted adoption of IPM practices namely deep ploughing and collection of insect pest eggs and egg masses. IPM training did not influence adoption of other cultural and mechanical practices. IPM trained farmers decision of pesticide use was not influenced by IPM training.

Keywords: IPM, Farmer field school, Impact evaluation

INTRODUCTION

India is the second largest vegetables producing country in the world after China. Vegetable crops are grown on an area of 8.99 million hectare (m ha) with an annual production of 156.33 million tonnes (NHB, 2011). The insect pests inflict 40 percent crop losses in vegetable crops (Gaurav 2011). To counter the problem of insect pests, the vegetable growers depend on chemical pesticides. The average pesticide use in vegetable crops is 1.247 kg ha^{-1} (Peshin *et al.*2014) which is approximately 150 per cent more than the world average of 500 grams per hectare (Betne, 2011). The concerns about pesticide residues are especially important in fruits and vegetables as these are often consumed with little postharvest processing (Mullen *et al.,* 1997). The overemphasis on the use of chemical pesticides by the vegetable growers leads to the multitude of problems to human health and ecology.

In Jammu and Kashmir (J&K) state, the pesticide use was low till the last decade of the twentieth century compared to states of Punjab, Haryana (Agnihotri 2000, Peshin *et al.* 2014). However, the pesticide use in Jammu Kashmir has increased from 142 metric tons in 1994-1995 (start of IPM programmes in the state) to 1711 metric tonnes in 2011-2012(Puri 1995; MoA 2012).

To overcome the negative externalities of pesticide use in agriculture, Integrated Pest Management (IPM) is the accepted strategy of pest management all over the world. IPM is integration of different pest management practices in a compatible manner, so as to keep pest population below economic injury level, in such a way that it is not only economically viable but also ecologically sound. The objective of IPM is to reduce the pesticides use and to maintain ecological balance thereby generating sustainable agricultural growth. In India, IPM was adopted as the main strategy of plant protection by the Government of India in 1985 (Raghunathan, 1995) and its activities were intensified only since 1993 (Peshin and Kalra, 2000). All over the country, the Farmer Field School (FFS) training model for disseminating IPM technology was introduced in 1993 through Central Integrated Pest Management Centers (CIPMC) in rice, cotton and vegetable crops. Upto 2007-08, 951 vegetable IPM-FFS have been conducted in India by CIPMC (Peshin *et al.,* 2009a).

In J&K, IPM-FFS programme on pilot basis was started in 1993 in rice, vegetable and oilseed crops. The major vegetables covered under the programme in *kharif* season were cucurbits, brinjal, okra and tomato and in *rabi* season were peas, knol-khol, cauliflower and cabbage. A field study was conducted to evaluate the impact of vegetable Integrated Pest Management-Farmer Field School (IPM-FFS) Programme in the sub-tropical Jammu region of the state of Jammu and Kashmir (J&K). The impact evaluation indicators were adoption of IPM practices, pesticide use frequency, field use of the environmental impact quotient, pesticide use (a.i) by

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weight and pesticide expenditure. In this paper, the adoption of IPM practices by the farmers trained under IPM-FFS programme besides the impact of training on farmers' adoption of non-chemical IPM practices are discussed.

METHODOLOGY

1.1. Profile of the Study Area

The study was carried out in the subtropical region of the Jammu province of the J&K state. The state of Jammu and Kashmir is situated in North West Himalayan region extending over 32^0- $17^{'}$ and 36^0-$58^{'}$ North latitude and 73^0-$26^{'}$ and 80^0-$30^{'}$ East longitude. The average height of the state, above mean sea level, varies from less than 300 meters to about 9400 meters. The total geographical area of the Jammu and Kashmir State is 101387 sq. kilometers (2416000 ha). Out of which, 742000 (30.38%) is the net sown area, 658000 ha (27.24%) is under forests, 7300 ha (3.02%) is follow, 293000 ha (12.13%) under non-agricultural use, 289000 ha (11.96%) are barren plus uncultivable and 361000 ha (14.94%) under cultivable waste, permanent pastures and other grazing land etc (Statistical Digest J&K Govt. 2007-08). The sub tropical region of the Jammu province constitutes of the entire Jammu district, part of Samba, Kathua, Udhampur and Rajouri districts. The characteristic features of subtropical region are: height ranges from less than 300 meters to nearly 800 meters above mean sea level. The summers are hot and relatively dry, winters are pronounced. The favourable agro-climatic conditions, fertile soils and sub tropical climate are ideally suited for cultivation of vegetable in the subtropical Jammu province. The average holding size of the state is 0.66 hectares, and average holding size of the Jammu province is 0.94 ha. The total net sown area of the division is 392616 ha, of which 93233 ha (24.77%) is irrigated.

1.1. Research Design

Ex-post facto research design (with/without) was employed for conducting the study. Instead of actual manipulation of the treatment, *ex post facto* experimental design uses a pre-existing condition as the treatment. The pre-existing condition is the implemented IPM programme. An *ex-post facto* design uses a comparable site as the control to find the programme effects. Therefore, this design is appropriate for studying the impacts of an already conducted IPM programme (Peshin *et al.* 2009b).

Sampling Plan

The villages covered under the IPM FFS programme from 2003-04 to 2007-08 formed the population for the study. During this period, the district-wise number of villages covered in Jammu, Samba, Kathua, Udhampur and Reasi districts were 28, 10, 4, 4 and 2, respectively. Jammu, Samba and Kathua districts were selected as the maximum numbers of IPM-FFS were implemented in these three districts. From the selected districts, a total number of eight villages were selected by the proportionate random sampling method. The list of farmers trained under the IPM-FFS programme by CIPMC Jammu was used for drawing the sample of IPM farmers from the selected IPM villages. From each selected IPM village, 10 IPM trained vegetable farmers were selected randomly. For comparison, six control villages were selected, four from Jammu district and one each from Samba and Kathua districts. From non-IPM villages, a matching sample of 10 vegetable farmers from each control village was selected. In order to exclude the potential diffusion effects, the control villages were selected in the same agro-ecological zone but located 5-10 km away from the FFS villages. The total sample size was 140 farmers (80 IPM and 60 non-IPM farmers).

1.4. Data Collection

The data were collected with the help of pre-tested questionnaire. Data pertaining adoption of IPM practices was collected in two phases. In first phase, data from cabbage and cauliflower growers were collected at the end of *rabi* season from IPM and non-IPM farmers. In the second phase, data were collected from IPM and non-IPM farmers for okra and brinjal crops at the end of *kharif* season.

1.5. Data Analysis

Statistical analyses were done using computer based SPSS-16 (Statistical Package for Social Sciences) programme. 'Z' test of proportionate was used to compare the per cent difference between IPM and non-IPM farmers in adoption of IPM practices. Two sample't' test was applied to test whether the two samples differ from one another significantly in their age, education, land holding and area under vegetable crops.

1.5.1. Empirical model

Binary logistic regression model was applied to find out the impact of IPM training on the adoption/non-adoption of IPM practices namely timely plantation (Y_1), deep summer ploughing (Y_2), destruction of crop residues (Y_3), removal of crop stubbles (Y_4), use of treated seed (Y_5), collection of eggs and egg masses (Y_6), removal of damaged fruits and shoots (Y_7), timely hoeing/hand weeding (Y_8) and pesticide use (Y_9). A score of “1” for IPM trained farmers and “0” for non-IPM farmers (Table 1).

The result of this type of regression can be expressed as follows:

$$Ln\,[p/(1-p)] = b_0 + b_1 x_1 \quad \text{.....(1}$$

-where, p represents the probability of an outcome

-b_1 is the coefficients associated with the independent variable

-b_0 is the y-intercept

-x_1 represent the independent variable IPM-FFS training included in the model

Table 1: Variables used, their coding and units

Dependent variables for binary logistic regression	Code/units
Adoption of IPM Practices ($Y_1, Y_2 ... Y_9$)	1 -adoption, 0-non-adoption
Independent Variables	Code/units
Training (X)	1 for IPM trained farmers, 0 for non-IPM farmers

RESULTS AND DISCUSSION

1.1. Descriptive Statistics

The mean age of the IPM farmers was 48.4 years and non-IPM farmers were 47.3 years. The difference in mean age of the IPM and non-IPM farmers was not statistically significant (t=0.513, d.f=138, p=0.530) (Table 2). Mean education of the IPM and non-IPM farmers was same (7.3). The difference in mean education of the IPM and non-IPM farmers was not statistically significant (t=0.034, d.f=138, p=0.372). Majority of the sampled farmers in both the IPM and non-IPM villages were literate (77.6 and 80, respectively). In the IPM and non-IPM villages, 23 and 20 per cent of farmers had received no formal education while equal percentage (10%) of the IPM and non-IPM farmers had elementary primary education. Middle level education was received by 26 per cent of the IPM farmers and 33 per cent of the non-IPM farmers. The percentage of farmers in the IPM villages who were matriculates and 10+2 were 36 and 33 per cent, respectively.

Table 2: Descriptive statistics of the sampled farmers

Particular	IPM villages (n=80)	Non-IPM village (n=60)	t value	p value
Average Age (in years)	48.4	47.3	0.513	0.530
Average Education (in years)	7.3	7.3	0.034	0.372
i. Education (% farmers)				
ii. Illiterate	23.0	20.0		
iii. Up to Primary	10.0	10.0		
iv. Middle	26.0	33.0		
v. Matric	30.0	25.0		
vi. 10+2	6.0	8.0		
vii. Graduation and above	5.0	4.0		
Average operational land holding(in ha)	1.85	1.74	0.557	0.568
Operational land holding(% farmers)				
i. < 1ha (Marginal)	25.0	32.0		
ii. 1-2ha (Small)	30.0	28.0		
iii. 2-4ha (Semi-medium)	39.0	32.0		
iv. 4-10ha (Medium)	6.0	8.0		
Total Cultivable Area (in ha)	147.7	104.2		
Area under vegetable crops (ha)	21.2	16.6	0.249	0.829
Mean area under vegetable crops	0.27	0.28		

In the non-IPM villages, 25 per cent of the farmers were matriculate and eight per cent were 10+2. Only five per cent of the IPM and four per cent of the non-IPM farmers had graduation or above degrees. The data in the Table 2 reveals that a majority, 55 per cent of the IPM farmers and 60 per cent of the non-IPM farmers had less than 2 hectares of landholding. Semi-medium land holdings were possessed by 39 per cent of the IPM farmers and 32 per cent of the non-IPM farmers. Only six per cent of the IPM farmer and eight per cent of the non-IPM farmers possesses medium land holdings. The mean farm size of the selected IPM and non-IPM farmers was 1.85 ha and 1.74 ha, respectively. There were no significant difference in the mean farm size of the IPM and non-IPM farmers (t=0.557, d.f=138, p=0.568).

1.1. Adoption of Non-chemical Pest Management Practices

One of the impact indicators of the IPM programme evaluation is the adoption of IPM practices by the trained farmers after acquiring knowledge and skills (Peshin *et al.* 2009b). The cultural practices which play an important role in reducing the pest build-up involve crop husbandry practices that have dual purpose of crop production and insect pest suppression (Litsinger, 1994). In cauliflower crop, there was significant difference between the IPM and non-IPM farmers in adoption of timely plantation and use of treated seed. More than half (57%) of the IPM farmers and about one third (33%) of the non-IPM farmers had adopted timely plantation practice. The difference of 24 per cent between the IPM and non-IPM farmers was statistically significant (z=1.832, p=0.034). Treated seeds were used by 60 and 30 per cent of the IPM and non-IPM farmers, respectively and the difference of 30 per cent was statistically significant (z=2.246, p=0.025). There was no significant difference between the IPM and non-IPM farmers in adoption of any of the other cultural practices (Table 3). In cabbage crop, the practice of raising nursery beds for draining excess water was adopted by 67 per cent of the IPM farmers and 20 per cent of the non-IPM farmers (Table 3) and difference of 47 per cent was statistically significant (z=2.229, p=0.026). The percentage of the IPM and non-IPM farmers removing plant stubbles from cabbage field were 13 and 7 per cent, respectively. However, the difference

of 6 per cent was not statistically significant (z=0.061, p = 0.951). In case of brinjal and okra crops there was no significant difference between the IPM trained and non-IPM farmers in the adoption of different cultural practices namely timely plantation, deep ploughing, destruction of crop residues, removal of plant stubbles and use of treated seed. The results showed that there was no significant impact of IPM training on farmers' adoption of cultural practices namely raised nursery beds, deep ploughing, destruction of crop residues and removal of plant stubbles of previous crops to avoid pest build-up or/and pest suppression. There was significant impact in case of timely plantation and use of treated seeds in cauliflower, and using raised nursery beds to avoid damping of the seedling disease in nursery in cabbage crops.

This reflects that IPM programmes implemented in vegetable crops have not achieved the objectives of popularizing and extensive adoption of cultural practices. The results are in agreement with studies conducted by Maraddi *et al.* (2007) and Peshin *et al.* (2009c) who reported that IPM programmes have not achieved scaling up of non-chemical practices among IPM trained farmers. Sharma *et al.* 2012 reported that CIPMC trainers were not able to convince the vegetable growers to adopted non-chemical pest management practices.

Table 3: Extent of adoption of cultural practices by vegetable growers (percent farmers)

Cultural Practices	Percentage of IPM farmers	Percentage of non-IPM farmers	Difference with/without	Z-value
Cauliflower	n=40	n=30		
Raised nursery beds	35	33	02	0.184
Timely plantation	58	33	25	1.832* (0.034)
Deep ploughing	50	33	17	1.178
Destruction of crop residues	30	10	20	1.108
Removal of plant stubbles	30	20	10	0.671
Use of treated seed	60	30	30	2.246* (0.025)
Cabbage	n=15	n=15		
Raised nursery beds	67	20	47	2.229* (0.026)
Timely plantation	67	53	14	0.410
Deep ploughing	73	40	33	1.455
Destruction of crop residues	20	13	07	0.478
Removal of plant stubbles	13	07	06	0.061
Use of treated seed	73	67	06	0.382
Okra	n=25	n=14		
Timely plantation	40	21	19	0.853
Deep ploughing	60	50	10	0.268
Destruction of crop residues	12	14	-02	0.320
Removal of plant stubbles	12	21	09	0.285
Use of treated seed	68	67	01	0.291
Brinjal	n=13	n=11		
Raised nursery beds	08	18	-10	0.119
Timely plantation	39	27	12	1.187
Deep ploughing	77	46	31	1.140
Destruction of crop residues	23	18	05	0.204
Removal of plant stubbles	23	18	05	0.204
Use of treated seed	69	64	05	0.176

Figures in the parentheses are p values. Decimals have been rounded off to the nearest whole numbers in case of percent farmers

The reduction or suppression of insect pest populations by means of manual devices is covered under mechanical control methods. The findings regarding the extent of adoption of manual mechanical practices reflects that a significant percentage of farmers in the IPM villages collected eggs and egg masses of the insect pests. In cauliflower crop, 30 per cent of the IPM farmers and 7 per cent of the non-IPM farmers collected eggs of insect pests, and the difference of 23 per cent was statistically significant (z=2.700, p=0.048). None of the non-IPM farmer collected eggs and egg masses in cabbage and brinjal crops (Table 4). There was no significant difference between the IPM and non-IPM farmers in the adoption of manual mechanical practice namely removal of damaged fruits and shoots and burying them in soil. The farmers reported that it was a cumbersome process and time and labour requirement was more which will increase cost of production. Moreover, collection and destruction of insect pests is effective for small plots, where farmers can easily and frequently inspect insect pests and apply this method. The non-IPM farmers also agreed that the practice namely collection of eggs and egg masses of insect pests and removal of damaged fruits and shoots from the field increased cost of cultivation of vegetable crops. Thus time and labour were the limiting factors for widespread non-adoption of manual mechanical practices in vegetable crops. The results are in agreement with findings reported by Moser *et al.* 2008; Timprasert *et al.* 2014. Adoption of timely hoeing or intercultural operations was high as majority of the farmers had gone for this practice even before the implementation of the IPM-FFS programme. None of the IPM and non-IPM farmers had installed pheromone traps.

Table 4: Extent of adoption of manual mechanical practices by vegetable growers

Cultural Practices	Percentage of IPM farmers	Percentage of non-IPM farmers	Difference with/without	Z-value
Cauliflower	n=40	n=30		
Collection of eggs and egg masses	30	07	23	2.700* (0.048)
Removal of damaged fruits and shoots	30	23	07	0.380
Timely hoeing/ hand weeding	65	63	02	0.079
Cabbage	n=15	n=15		
Collection of eggs and egg masses	20	13	07	0.478
Removal of damaged fruits and shoots	13	13	00	0.537
Timely hoeing/ hand weeding	80	80	00	0.456
Okra	n=25	n=14		
Collection of eggs and egg masses	16	00	16.0	1.03
Removal of damaged fruits and shoots	08	14	-06	0.42
Timely hoeing/ hand weeding	76	86	-01	0.329
Brinjal	n=13	n=11		
Collection of eggs and egg masses	23.0	00	23	1.078
Removal of damaged fruits and shoots	15	18	-03	0.353
Timely hoeing/ hand weeding	77	73	05	0.248

Figures in the parentheses are p values. Decimals have been rounded off to the nearest whole numbers in case of percent farmers

Impact of IPM FFS Training Programme on the Adoption of IPM Practices

To find out whether IPM-FFS programme had any impact on farmers adoption of IPM practices and pesticide use binary logistic regression was run. The "Forward Stepwise" method was followed to select the best predicting variables as the main aim was to select the best group of predictors. Forward selection starts with no variables in the model. At each step the predictor which contributes most to prediction is added. For the entry of the predictors in the model, a default value of 5% significance level was adopted. For the validation of each model, model Chi-square, Hosmer and Lameshow goodness of fit and cases correctly classified were taken into account. The Nagelkerke's R^2 was used as a measure of determination of variation caused by predictors. The significance of model Chi-square indicates that all independent variables in model jointly cause significant variation in dependent variable. Non-significance of Hosmer and Lameshow goodness fit confirms that there is no significant difference between observed and predicted frequencies of respective categories.

The model applied has log likelihood value of 205.355 and chi-squared value of 5.245 which is significant at 0.022. The prediction rate for the model is 63.2 per cent and the Nagelkerke R^2 value is 0.136 which indicates that 13.6 per cent variation in the adoption is the impact of training. The Hosmer and Lameshow test was non-significant (p=0.945) confirming that there is no significant difference between observed and predicted frequencies of respective categories. The IPM programme significantly impacted the adoption IPM practices namely deep summer ploughing and collection and destruction of eggs and egg masses (Table 5). Singh *et al.* (2008) also reported similar type of findings that IPM programme has significant impact on the adoption of IPM technology. There was no significant impact of the IPM-FFS on farmers' decision to apply pesticides for control of insect pests and diseases. Sharma *et al.* (2015) reported that farmers' decision of pesticide use was influenced by factors/variables other than IPM training.

Table 5: Impact of IPM training on adoption of IPM practices

Variable	Coefficient (B)	S.E	Wald	p-value
Constant	-0.312	0.241	1.674	0.196
Deep summer ploughing	0.756	0.333	5.154	0.023
Collection of eggs and egg masses	1.869	0.646	8.374	0.004

Nagelkerke R^2=0.136 Observations=163, X^2=5.245 p=0.022 -2log likelihood= 205.355

CONCLUSION

The objectives of IPM-FFS programmes are to enhance the analytical skills of the farmers so that they observe and discover the activities of pests, natural enemies, effect of pesticides on natural enemies, effect of other agronomic practices to reduce the pest build-up and so on to make them analyze and comprehend the principle behind such practices and use pesticide as a last resort. In vegetable crops pesticide use is high and the farmers do not observe pre-harvest waiting period thus putting consumers at risk. The results reflected that practices namely raised nursery beds, deep ploughing, destruction of crop residues and removal of plant stubbles, collecting eggs and egg masses of insect pests, removal of damaged fruits and shoots and installing of pheromone traps were not widely adopted by the IPM farmers which can be attributed to the FFS programmes conducted not implemented as envisaged. Therefore, much needs to be done with improving the quality of IPM trainings conducted by different extension agencies to achieve the goals of IPM programme in educating farmers and reducing pesticide use and adverse environmental impact. There should be institutionalisation of evaluation research to quantify the outcomes /impacts of agricultural research and development programmes for generating empirical feedback.

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REFERENCES

Agnihotri, N.P. 2000. Pesticide consumption in agriculture in India: An update. *Pesticide Research Journal,* 12:150- 155.

Betne, R. 2011. Indian Vegetables: Nutrition Pack with Toxic Cocktail. *Published in Toxics Link, 12th of January ,2011.*

Gaurav, S. 2011. Studies on Lepidopterous Insects Associated with Vegetables in Aravali Range, Rajasthan, India. *Biological Forum- An International Journal*, 3(1): 21-26.

Litsinger, J.A. 1994. Cultural, mechanical and physical control of rice insects. In Heinriches, E.A. (ed) *Biology and Management of Rice Insects.* Pp 549-584. Wiley Eastern Limited, New Delhi, India.

Maraddi, G.N., Hirevenkanagagoudar, L.V., Angadi, J.G. and Kunnal, L.B. 2007. Extent of adoption of integrated pest management practices by sugarcane growers. *Karnataka Journal of Agricultural Sciences*, 20:564-567.

MOA. 2012. *Agriculture Statistics at a Glance*. Directorate of Economics and Statistics, Department of

Agriculture and Cooperation, Ministry of Agriculture, Government of India. http://eands.dacnet.nic.in/

Moser, R., Pertot, I., Elad, Y. and Raffaelli, R. 2008. Farmers' attitudes towards the use of Bio-control agents in IPM strawberry production in three countries. *Biological Control* 47, 125132.

Mullen, D.J., Norton, W. and Reaves, W.D. 1997. Economic analysis of environmental benefits of integrated pest management. *Journal of Agricultural and Applied Economics*. 29: 243-253.

NHB. 2011. Indian Horticulture Database. National Horticulture Board, Ministry of Agriculture, Government of India. nhb.gov.in/area-pro/database

Peshin, R. and Kalra, R. 2000. *Integrated Pest Management: Adoption and its Impact on Agriculture*. Classical Publishing Company, New Delhi.

Peshin, R. and Kalra, R. 2000. *Integrated Pest Management: Adoption and its Impact on Agriculture*. Classical Publishing Company, New Delhi.

Peshin, R., Bandral, R.S., Zhang, W., Wilson, L. and Dhawan, A.K., 2009a. Integrated pest management: A global overview of history, programs and adoption, in: Peshin, R., Dhawan, A. K., (Eds.). *Integrated Pest Management: Innovation-Development Process, Vol. 1,* Springer, The Netherlands. pp1-49.

Peshin, R., Jayaratne, K.S.U. and Singh, G. 2009b. Evaluation research: methodologies for evaluation of IPM programmes, In: Peshin, R and Dhawan, A.K.(Eds.). *Integrated Pest Management: Dissemination and Impact, Vol 2,* Springer, The Netherlands. pp 31-78.

Peshin, R., Dhawan A.K. , Kranthi, K.R. and Singh, K. 2009c. Evaluation of the benefits of an insecticide resistance management programme in Punjab in India. *International Journal of Pest Management*. 55:207-220.

Peshin, R., Kranthi, K. R. and Sharma, R. 2014. Pesticide use and experiences with Integrated Pest Management Programs and Bt cotton in India. In: Peshin, R. and Pimentel, D. (Eds.) *Integrated Pest Management: Experiences with Implementation: Global Overview Vol. 4*, Springer, Dordrecht The Netherlands. pp 269-306.

Puri, S. N. 1995. Present status of IPM in India. National Seminar on Integrated Pest Management in Agriculture. December 2930, 1995, Nagpur Maharashtra, India 3. 20032004: Directorate of Plant Protection Quarantine and Storage, Government of India, Zonal Conference 2007. http://ppqs.gov.in/IpmPesticides.htm. Accessed 26 March 2013.

Raghunathan, V. 1995. Integrated pest management: Eco sound plant protection. *The Hindu: Survey of Indian Agriculture,* Chennai, India. Pp 154-155.

Sharma, R., Peshin, R., and Shankar, U. 2012. Process evaluation of the vegetable integrated pest management farmers field school (IPM FFS) program in the Jammu region of J & K State. *Journal of Community Mobilization and Sustainable Development*, 7(1), 1220.

Sharma, R., Peshin, R., Shankar, U., Kaul. V. and Sharma, S. 2015. Impact evaluation indicators of an Integrated Pest Management program in vegetable crops in the subtropical region of Jammu and Kashmir, India. *Crop Protection.* 67:191-199.

Singh, A., Vasisht, A.K., Kumar, R. and Das, D.K. 2008. Adoption of integrated pest management practices in paddy and cotton: A case study in Haryana and Punjab. *Agricultural Economics Research Review.* 21:221-226.

Sujatha P. 1995. Input utilization as determinant of the adoption behavior of farmers in North-eastern zone of Tamil Nadu. MSc. Thesis, Tamil Nadu Agricultural University, Coimbatore; 1995.

Timprasert, S., Datta, A. and Ranamukhaarachchi, S. L. 2014. Factors determining adoption of integrated pest management practice by the vegetable growers in Nakhon Ratchasima Province, Thailand. *Crop Protection,* 62:32-39.

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Experimenting with Farmers' Capacity and Social Institutions Building for ensuring Village Level Seed Sufficiency: A Case of Chickpea (*Cicer arietinum* L) in India

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ABSTRACT

Building farmers' capacity to experiment with the recommended technologies and at the same time facilitating them for institutionalizing their efforts requires constant validation, consolidation and upscaling. An action research was conducted to empirically probe how the recommended and improved seed varieties may appear if looked with farmers' lens and how to a large extent the farmers' preferred varieties may reach, while using the interventions of institutional backstopping, capacity building, hand holding and enabling. Chickpea is a major pulse crop of India. However, its productivity is restricted around 896 kg/ha, over the past several decades. Local landraces and varietal admixture are influencing the chickpea cultivation in the country. One of the major reasons for low productivity of chickpea is the non-availability of quality seed of improved varieties among the farmers. In the present paper, the experiences of farmer-participatory chickpea seed production in districts of Fatehpur and Kanpur Dehat in Uttar Pradesh state of India have been shared. Through farmer-participatory varietal selection trials, farmers identified DCP 92-3 and JG 16 varieties, as their preferred choices. These varieties were preferred because of its high yield, attractive seed size, seed color, better taste and cooking quality. Farmers were organized to form cooperative societies to undertake seed production, processing and marketing at the local level. They were also linked with the public sector seed producing agencies to participate in the formal seed production program. The B:C ratio of seed production of DCP 92-3 and JG 16 variety was 2.94 and 3.18 as compared to 2.15 of the local chickpea variety sold as grain. Village level seed production not only addressed the issue of shortage of quality seeds but also brought higher incomes to farmers leading to their improved livelihood.

Keywords: Participatory approach, Institutional linkages, Seed delivery, Farmer association

INTRODUCTION

Despite the fact that farmers in developing countries being much interested in testing and acquiring new crop varieties to respond to the ever changing production situations (Rubyogo *et al.*, 2007), they continue to grow local varieties, particularly in pulse crops, for various reasons. Some of these reasons include inadequate exposure to new cultivars, new varieties failing to meet farmers' aspirations, non-availability of seed of improved varieties and lack of resources with small holder farmers to invest in seeds, among others. The need of participatory breeding (Nigam, 2009) and farmer-participatory varietal selection (Singh *et al*, 2008; Singh *et al*, 2013) in legume has been aptly envisaged in the Indian context to promote adoption of improved varieties of pulses to raise their productivity. If adoption rates are to be improved, farmers need to try a wide range of novel cultivars in their fields through their involvement in Farmers' Participate Varieties selection (FPVS) programs. In the present FPVS trials, only released varieties were included. In the event of any one of these varieties being selected by the farmers, the large-scale provision of seed will be easier through formal and informal seed sectors (Witcombe *et al,* 1996). In case a farmer-preferred variety is not released by the state/national authorities, the formal seed sector will not include it in its seed production program.

Good seed is the foundation of good agriculture. The quality seed of improved, farmer-preferred varieties contributes to the improved agricultural productivity as it responds to farmers' needs and situations (Pelmer, 2005). Sperling and Cooper (2003) conceptualized farmer level seed security as the situation in which a farmer has access to the sufficient quantities of seeds of their preferred varieties with desired physical qualities. They further reiterated that as majority of small scale farmers operate in low input system; their seed security is guaranteed when they produce enough food and put some in reserve to be used as seed for the next season. However, many a time, farmers are forced to sell their total produce in the market due to immediate cash requirement to clear debt and attend to other social obligations. The own-saved seed is akin to blocking that much capital for the next 6-8 months which becomes uneconomical to farmers as they have immediate cash requirement. Small scale farmers,

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however, are encountered with manifold challenges of biotic and abiotic stresses putting, thereby, the village level seed sufficiency at stake (Rubyogo *et al*, 2005). To ensure seed sufficiency at village level, not only the cultivation and multiplication of farmer-preferred varieties is important, formation of producers' association and developing their capacity to initiate seed based micro-enterprises is equally important (Penrrose-Buckley, 2007). Jones *et al* (2001) empirically reported that farmer-to-farmer informal dissemination of preferred seed was quicker through such associations and farmers' group particularly in pigeonpea in semi-arid regions of Kenya.

The productivity of pulses in India has remained stagnant over the past several decades. In case of chickpea, which is a major pulse crop of the country (area 9.21 million ha and production 8.25 million tonnes; http:// dacnet.nic.in / eands/At_A_Glance_2011/4.13 (a), (b).xls), the per unit production is hovering around 786 kg/ha for the last five decades (Rao *et al.,* 2010). Non-availability of quality seeds of improved varieties, poor crop management practices followed by the farmers, damage by insect pests and diseases, drought and frost are some of the factors responsible for low pulses productivity in India. Uttar Pradesh (UP) ranks sixth in terms of chickpea area in the country after Madhya Pradesh (MP), Maharashtra, Karnataka, Rajasthan and Andhra Pradesh (AP) and also holds same rank in production after MP, Maharashtra, AP, Karnataka and Rajasthanwith an average productivity of 824 kg/ha. Statistically, chickpea is grown on 0.62 million ha area with a total production of 0.51 million tonnes in the state of UP The major biotic constraints to chickpea production in the state include heavy damage by pod borer (*Helicoverpa armigera* L.) among the insect. A constraint analysis of low productivity of rainfed chickpea in India by Maruthi Shankar *et al.* (2004) identified shortage of quality seed as one of the major factors limiting chickpea production in the country. Genetically pure seed alone can increase productivity of the crop by 10-15 per cent (Saxena, 2006). However, despite release of several improved varieties of chickpea, local landraces and varietal mixture dominate the cultivation of this crop in the country. Most of the farmers procure their chickpea seed from local traders else they rely on their 'own-saved' or 'neighbor's saved' seed, which in most cases are unspecified. Private seed sector showed little interest in production and marketing of chickpea seed due to several reasons. On the other hand, public sector seed producing agencies have not been very effective in meeting the seed requirement of pulse crops. Thus, there is a need to evolve innovative approaches to address the issue of non-availability of quality seed of chickpea at farmers' level.

The present paper analyzes the experiences gained in on-farm chickpea seed production with community participation in the districts of Fatehpur and Kanpur Dehat in Uttar Pradesh state of India. Experiments also emanated how farmers can participate in on-farm experimentation for assessing the new varieties on their own preferred traits and how effective could farmers' interest group in ensuring seed sufficiency at the community level if they are adequate facilitated and capacitated.

METHODOLOGY

The action research was conducted in two districts, Fatehpur and Kanpur Dehat, in UP, state India for three years during 2007-08 to 2009-10. These two districts represented partially irrigated and fully irrigated production situations, respectively. These two distinct agro-ecologies allowed us to undertake farmer-participatory research on chickpea in the identified districts. Six villages in Kanpur Dehat and seven villages in Fatehpur, which were traditional chickpea-growing villages in the past, were selected. Before actually initiating the project, a baseline survey was conducted in partner villages of Fatehpur and Kanpur Dehat districts to appraise chickpea situation from production to marketing. Data were collected using a semi-structured personal interview schedule devised for the purpose. This was triangulated with participatory observation, group discussion, farmers' feedback, etc. Collected data were analyzed using the descriptive and inferential statistics. The major interventions in terms of on-farm participatory varietal selection (FPVS) trials, capacity building, forging partnership, strengthening farmers' organizations, etc were implemented in the project villages. Farmer-participatory varietal selection (FPVS) trial were conducted using five improved varieties DCP 92-3, KWR 108, JG 16, BG 256, JG 315 and two local varieties large seeded and small seeded were laid out under two micro farming situation was constituted to identify farmer-preferred variety (ies). Ten such FPVS trials (non-replicated, with full set of varieties) each in the 2007-08*Rabi* (post rainy) season were conducted in 10 farmers' fields in Godharauli village in Fatehpur and Barhapur and KuitKheda villages in Kanpur Dehat. Each farmer was assigned one trial with 100 sq m plot size for each variety. The varieties were evaluated for grain yield and other economic parameters besides taking into consideration the farmer's perception on their performance using a 10-point rating scale, where 1 is the lowest and 9 the highest for preference. Farmers' groups were alo formed with proper intuitional structures and they were facilitated to hold the responsibilities of input management, production management and marketing

management. The association were linked with Indian Institute of Pulses Research (IIPR) as well as the Uttar Pradesh (UP) State Seed Certification Agency (UPSSCA) for seed certification and the public sector seed agencies such as National Seeds Corporation Ltd. (NSC Ltd.), State Farm Corporation of India (SFCI) and Uttar Pradesh Seed Development Corporation (UPSDC) for supplementing with formal seed sector for pulses seed production. The promotional activities such as diagnostic field visits, field days and participatory evaluation visits, which were organized on a regular basis to develop functional linkages. Data were generated on agro-ecosystem related parameters, production parameters, preference indicators and economic indices. The collected data were analyzed using descriptive statistics and inter-relational approaches of case study were utilized to draw meaningful conclusions.

RESULTS AND DISCUSSION

Agro-ecosystem analysis of the project areas

Further, with particular respect to chickpea cultivation in Fatehpur and Kanpur Dehat districts of Uttar Pradesh, India where the present study was conducted, it is a matter of fact that before irrigation became available through canals and bore wells in 1975, the cropping systems in these two districts were highly diversified with legumes occupying a prominent place. After 1975, the farmers shifted mainly to rice (in rainy season) and wheat (post rainy season) cultivation. Pulses now occupy only 16-23 per cent of the total arable area in these districts (Fatehpur - 3,99,367 ha and Kanpur Dehat - 3,14,984 ha). Chickpea is grown in 18-20% of the pulses area. Chickpea is the important rabi pulse crop grown in about 46662 ha of area in Fatehpur and 25 071 ha in Kanpur Dehat with productivity of 979 and 1201 Kg ha^{-1}. Farmers mainly cultivate chickpea either in kharif fallow or after harvesting of *Til* and paddy in the project villages. However, the chickpea productivity in both the districts is much higher than the average productivity in U.P. and at the national level. The average yield of chickpea in Fatehpur is 1201 kg ha^{-1} and in Kanpur Dehat it is 1309 kg ha^{-1}.

The average annual rainfall in Fatehpur is about 760 mm and the farmers grow pulses in clay loam, loam and sandy loam soils. In Kanpur Dehat, the average annual rainfall is 630 mm and the pulses are grown in loam and sandy loam soils. Almost 87 - 90 per cent arable area in both the districts has access to full or partial irrigation. Most of the chickpea growers in these two districts normally grow local varieties of unspecified pedigrees, which are genetically inferior, usually a mixture of many varieties, susceptible to diseases and insect pests and have low productivity potential.

Performance of varieties in FPVS trials

The results of Farmer Participatory Varietal Selection (FPVS) have been presented in Table 1. Average performance of five improved chickpea varieties, DCP 92-3, KWR 108, JG 16, BG 256, JG 315 and two local varieties (large seeded and small seeded) were laid out under two micro farming situations. Under clay loam and loam soils having partially irrigated double cropping system included in the FPVS trials in Fatehpur district, results are given in Table 1. Of the five improved chickpea varieties along with two local varieties evaluated on ten farmers' fields, DCP 92-3 produced the highest (Range: 2030 and 1765 kg/ha) seed yield followed by JG 16 (1895 and 1635 kg/ha), KWR 108 (1795 and 1585kg/ha), local large seeded (1395 and 1145 kg/ha) JG 315 (1320 and 1050 kg/ha). The yield of local small seeded was 1020 and 845 kg/ha under both the micro-farming situation.

Table 1: Average performance of chickpea varieties included in FPVS trials in Fatehpur districts

Variety	Grain yield (kg ha^{-1})					
	Micro-farming situation I*			Micro-farming situation II**		
	Max	Min	Average	Max	Min	Average
DCP 92-3	2030	1500	1765	1765	1395	1580
JG 16	1895	1450	1672	1635	1292	1463
KWR 108	1795	1350	1572	1585	1245	1415
JG 315	1320	1000	1155	1050	865	945
BG 256	1520	1235	1377	1292	1050	1171
Local (Large seeded)	1395	1100	1200	1145	900	1025
Local (Small seeded)	1020	650	835	845	500	672

*Clay loam and loam soil, partially irrigated, double cropping system (sown 15th Oct. to 10th Nov.)
**Loam soil, double cropping system and full-irrigated condition
(Average of 10 non-replicated trials with 100 m^2 plot size for each variety.)

Ten on-farm participatory varietal selection trials involving six improved varieties *viz*., KWR108, JG 16, DCP 92-3, KGD 1168, PG 186 and JKG 1(Kabuli) along with local varieties in Kanpur Dehat district under two micro farming situations. On the basis of yield data of FPVS trials of six improved varieties along with two local varieties, it was revealed that DCP 92-3 produced the highest seed yield (2960 kg/ha) followed by JG 16 (2630 kg/ha), KWR 108 (2130 kg/ha), PG186 (1910 kg/ha), Local large seeded (1890 kg/ha), JKG 1 (1600kg/ha) , KGD 1168 (1460 kg/ha) and local small seeded (1160 kg/ha) under clay loam and double cropping System.

Under loam soil with full irrigation facility and double-cropped situation same improved varieties along with two local varieties were evaluated at farmer's field. DCP 92-3 had been rated as highest yielder (2770kg/ha) followed by JG 16 (2580kg/ha), PG 186 (2510 kg/ha), KGD 1168

(2320kg/ha) and KWR 108 (1860 kg/ha). Overall assessment indicates that farmers preferred DCP 92-3 and JG 16 for their high yield and its yellowish color and adaptability to the late sowing (last week of November) condition. Variety wise performance is given in Table 2.

Table 2: Average performance of chickpea varieties included in FPVS trials in Kanpur Dehat districts

Variety	Grain yield (kg ha^{-1})					
	Micro-farming situation I*			Micro-farming situation II**		
	Maximum	Minimum	Average	Maximum	Minimum	Average
DCP 92-3	2960	2740	2850	2770	2200	2490
JG 16	2630	2460	2550	2580	2140	2360
KWR 108	2130	1790	2010	1860	1410	1640
PG 186	1910	1600	1750	2510	1980	2250
KGD 1168	1460	1210	1340	2320	1740	2030
JKG 1	1600	1280	1440	980	780	880
Local (Large seeded)	1890	1340	1620	1580	1200	1390
Local (Small seeded)	1160	940	1050	1170	790	980

*Clay loam and loam soil, partially irrigated, double cropping system (sown 15th Oct. to 10th Nov.)
**Loam soil, double cropping system and full-irrigated condition
(Average of 10 non-replicated trials with 100 m^2 plot sizefor each variety.)

In addition to grain yield, farmers also evaluated these varieties for the following traits: duration, resistance to diseases and insect pests, tolerance to drought, seed size and color, taste and potential for high market price (Table 3). Based on the aforementioned traits, the farmers in both the districts unequivocally selected DCP 92-3 and JG 16 for large-scale seed production and popularization.

Table 3: Farmers' assessment of chickpea varieties for various traits and their over all rank.

Variety	Average trait score[a]								Total score	Over all rank
	Grain yield	Short-duration	Market price[b]	Taste	Disease resistance[c]	Drought toleranced	Frost tolerance	Tolerance of insect pests[c]		
DCP 92-3	8.2	8.0	9.5	8.4	7.2	6.5	9.0	8.0	64.8	I
KWR 108	8.8	6.5	7.9	8.4	8.2	7.6	8.2	5.9	61.5	III
JG 16	8.8	7.8	7.9	8.4	8.2	7.6	8.2	5.9	62.8	II
PG 186	7.6	7.5	8.2	7.8	7.9	6.2	7.5	7.3	60.0	IV
KGD 1168	6.2	6.8	7.0	8.0	5.4	4.4	7.1	7.6	52.5	VIII
JKG 1	6.9	7.5	7.5	6.2	7.0	7.2	6.1	7.2	55.6	VI
JG 315	6.2	6.8	7.0	8.0	5.6	3.4	7.1	7.6	51.7	IX
BG 256	6.5	8.0	7.9	7.1	7.0	4.5	6.5	7.1	54.6	VII
Local (small seeded)	7.1	7.3	7.8	6.4	7.0	7.6	6.2	7.4	56.8	V
Local (large seeded)	6.2	6.8	7.2	7.1	5.8	4.1	6.0	7.0	50.2	X

a=Scored on a 1 - 10 scale, where 1 = the lowest, and 10 = the highest for preference;
b= scored based on seed size and color preferred by growers, traders and millers;
c= assessed at initiation of secondary branches and flowering and at pod formation stage;
d= assessed at flower initiation stage, and e= assessed at flowering and pod formation stage.

Farmers' feedback and market demand favored DCP 92-3 over JG 16 because of the better taste and yellow grain color. Yield is not always the paramount consideration in farmers' choice of a variety (Joshi and Witcombe, 1996). This clearly brought the need of production system's perspective while developing new varieties and technologies in agriculture. Farmers' participation in trials and their evaluation process generated a lot of enthusiasm among them and many farmers have started conducting their own simple experiments before accepting any new variety/ technology in different crops. For a large scale adoption of a variety, it must be owned by the farmers. Active participation and a role in decision making while evaluating overall performance of varieties in FPVS trials, give farmers' a sense of ownership of the selected variety.

Farmer-participatory varietal selection provides an effective vehicle to identify farmer-preferred variety (ies) and hastens the process of varietal replacement (Witcombe *et al,* 1996). Sometimes farmer-participatory varietal selection and associated data can come in handy to get a better performing advanced breeding line released through fast track bypassing the formal variety release protocol (Ref: ICGV 91114 groundnut variety in Andhra Pradesh, Karnataka and Orissa; SN Nigam personnel communication).

Seed production and its marketing

With enhanced knowledge and skills in ICM and seed production technology through training, farmers were well prepared to take up quality seed production. In addition to monetary benefits, farmers also developed a culture to 'work together' through the formation of cooperative societies. While the FPVS trials were in progress, seed production of potential chickpea varieties, DCP 92-3 and JG 16 in Fatehpur and Kanpur Dehat, was simultaneously initiated. Over a period of four years (2006/07-2009/10), a total of 3,18,590 kg seed of DCP 92-3 and JG 16 was produced from 210.31 ha involving 855 member and non-member farmers in both the districts (Table 4).

Table 4: Year-wise seed production and disposal pattern of chickpea variety (DCP 92-3 & JG 16) in Fatehpur and Kanpur Dehat districts, U.P.

Particulars	2006-07	2007-08		2008-09		2009-10	
	Fatehpur	Fatehpur	Kanpur Dehat	Fatehpur	Kanpur Dehat	Fatehpur	Kanpur Dehat
No. of village	06	07	05	08	06	12	06
No. of farmers	93	96	113	192	123	148	90
Area (ha)	18.6	22	18	40.88	27.1	48.0	35.73
Production (kg)	16 200*	36 990	16 000#	84870	47 430	62 100	55 000
Procurement by NSC (kg)	5 000**	20 590	10 200##	40 030	26080	37 800	30 500
Quantity sold in the market as a seed (kg)	-	5 200	2000	2 810	850	600	500
Quantity sold as grain in market (kg)	3 000	1280	2 000	18 850	13 350	2 500	10 000
Saved for 'Own use' (kg)	5 200	4430	1 000	4 730	3150	8 550	7 000
Kept for next year distribution (kg)	3 000	4 000	800	20 000	4 000	8 550	7 000

*[D.C.P. 92-3 (6 100 kg) + J.G. 16 (5 000 kg) + K.W.R. 108 (5100 kg)]
**[D.C.P. 92-3 (2 000 kg) + J.G. 16 (2 000 kg) + K.W.R. 108 (1 000 kg) procurement by IIPR, Kanpur
- 4000kg of quality seed of chickpea (2 000 kg DCP 92-3 and 2 000 kg J. G. 16) was purchased by IIPR, Kanpur during 2009-10
#[D.C.P. 92-3 (4 200 kg) + J.G. 16 (3 800 kg) + K.W.R. 108 (6200 kg) + P.G. 186 (1800 kg)]
##[D.C.P. 92-3 (3 000 kg) + J.G. 16 (2200 kg) + K.W.R. 108 (4 000 kg) + P.G. 186 (1 000 kg)]

i. Cost of seed production

The cost of production of chickpea was worked out ₹ 15 450/ ha (Table 6). In case of certified seed production plots, the additional costs also incurred which included registration fee (₹ 28/), inspection fee (₹ 337/ ha) and seed testing fee (₹169/ sample).

Table 6: Cost of seed production of chickpea

Operation/Activity	Expenditure (₹ ha^{-1})	Percent share
Land preparation	2320	14.87
Seed and sowing*	2500	16.02
Fertilizers	0580	03.71
Interculture	1880	12.05
Irrigation	3360	21.54
Insecticide	2460	15.76
Harvesting, threshing, winnowing, packaging etc.	2500	16.05
Total	15 600	-

* Chickpea seed rate 8-10 kg ha^{-1}.

ii. Economic analysis of seed production

Instead of growing chickpea for food use and selling it as grains, growing it for seed use was highly remunerative. The C:B ratio for seed crop was 2.94 and 3.18 as compared to 2.15 of the commercial crop (Table 7).

Table 7: Economics of seed production of chickpea variety (2009-10)

Indicator	Variety		
	Local	DCP 92-3	JG 16
Average seed yield (kg ha^{-1})	1475	2050	2175
Increase in yield over control (%)	-	28.05	32.18
Cost of cultivation (₹ ha^{-1})	10 300	15 600	15 600
Prevailing market price (₹ t^{-1})	2 200	3 000	3 000
Gross income (₹ha^{-1})	32 450	61 500	65 250
Net income (₹ ha^{-1})	22 150*	45 900**	49 650
C:B ratio	1:2.15	1:2.94	1:3.18

*prevailing market grain price, **NSC procurement rate

iii. Marketing of seed

Out of the total quantity of seed (63% in Fatehpur and 37% in Kanpur Dehat) of DCP 92-3 and JG 16 produced in different years, about 18 per cent in Fatehpur and 10 per cent in Kanpur Dehat were retained by the farmers for sowing the crop in the next season.

On an overall basis, about 21per cent of the seed produced by farmers was retained by them as indicated in Table 4. A large proportion of farmers preferred to save their own seed rather than buying new seed each year. This highlighted the need for safe seed storage practices at the household level.

Table 5: Details of seed production of DCP 92-3 and JG 16 chickpea varieties by farmers' cooperative societies ('*samitis*') in Fatehpur and Kanpur Dehat districts, U.P.

Particular	*Chaudgra Kisan Sewa Samiti (CKSS),* Chaudgra, Fatehpur				*Krishak Beej Vikas Samiti (KBVS),* Kuit Kheda, Kanpur Dehat			
Year	2008/09		2009/10		2008/09		2009/10	
Variety	DCP 92-3	JG 16	DCP 92-3	JG 16	DCP 92-3	JG 16	DCP 92-3	JG 16
Area (ha)	32.32	8.56	39.82	8.00	23.40	3.70	28.63	7.10
Production (t)	61 540	23 330	48 050	14 050	31 100	16 330	42 900	12 100

Both institutional and non-institutional marketing channels were utilized to dispose off the produce. National Seed Corporation (NSC) was the main institutional stakeholder in purchasing the chickpea seed produced at farmers' level. The non-institutional channels included local traders and neighboring and other farmers who were instrumental in diffusion the quality chickpea seed on larger areas. As farmers' cooperative societies came up later, the mechanism of seed marketing became more systematic. The details of seed produced and disposed by these farmers' cooperative societies are furnished in Table 5. A total of 2,49,400 kg seed was produced from 151.53 ha.

CONCLUSION

Based on the findings and experiences of the study, a functional 'seed system model' depicting roles of various stakeholders, related institutional linkages and anticipated outcomes has been evolved which is depicted as in Fig 1. The model highlights how the farmers, their village based local bodies, research institutions and Government institutions may converge for the specific purpose of on-farm technological backstopping, capacity building, on-farm assessment of the improved varieties, seed production, marketing and profit sharing and thus leading overall economic empowerment.

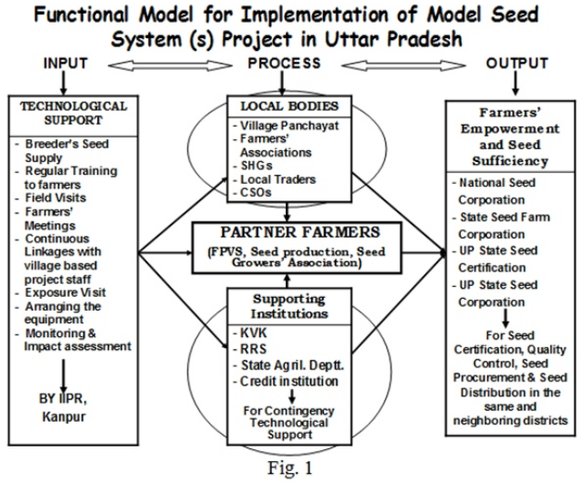

Fig. 1

Fig1: Empirical model of community-led seed sufficiency in rural India

The experiences have far reaching implications for extension education researches in terms of identifying the newer area, methodologies and indicators for executing more meaningful on-farm researches with validated methodologies. Also, the successful experiment on farmers' institution building in farm sector as deliberated as above may build the confidence of extension professionals in very fabric of extension education philosophy and action.

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REFERENCES

Ali M. (2004). Role of pulses in crop diversification in India.In *Role of legumes in crop diversification and poverty reduction in Asia*, 42-56 (Eds. CLL Gowda and S Pande). Proceedings of the Joint CLAN Steering Meeting, 10-12 Nov 2003, Patancheru, India: International Crops Research Institute for the Semi-Arid Tropics.

Almekinders CJM, Thiele G and Daniel DL. (2007). Can cultivars from participatory plant breeding improve seed provision to small scale farmers? *Euphytica,* 153, PP: 363-3372.

David S and Sperling L. (1999). Improving the technology delivery mechanisms: Lessons from bean seed system research in east and central Africa. *Agriculture and Human values,* 16, PP: 381-388.

Dhar V, Singh NB, Singh F and Majumdar N D. (2002.) Pigeonpea: Package of practices. Indian Institute of Pulses Research, Kanpur.

Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Govt. of India. 2010. Area, production and yield of chickpea during 2007/08 and 2008/09 in major producing states along with coverage under irrigation. http://dacnet.nic.in/eands/At_Glance_2014/4.14(B).xls

Jones R B, Audi P A and Tripp R. (2001). The role of informal seed systems in disseminating modern varieties: example of pigeonpea in semi-arid areas of Kenya. *Experimental Agriculture*, 37, PP: 539-548.

Joshi A and Witcombe JR. (1996). Farmer participatory crop improvement. II. Participatory varietal selection, a case study in India. *Experimental Agriculture*, 32, PP: 461-477.

Maruthi Shankar GR, Yadav IPS, Dharmraj PS, Gupta GP, Antkar VN, Ghajbiye KS, Thyagaraju CR, Girija A, Vittal KPR and Chary GR. (2004). Constraint analysis of low productivity of rainfed chickpea and pigeonpea in India. *Indian Journal of Pulses Research,* 17 (2), PP: 162-166.

Nigam S N. (2009). Designing farmer-participatory varietal selection in legumes.*In Legumes for Ecological Sustainability*, 519-528 (Ed. M. Ali, S. Gupta, P. S. Basu and Naimuddin). Proceedings of the national symposium on legumes for ecological sustainability: emerging challenges and opportunities, 3-5 Nov 2007, IIPR, Kanpur. Indian Society of Pulses Research and Development.

Parthasarathi Rao P, Birthal PS, Bhagavatula S and Bantilan MCS. (20100. Chickpea and pigeonpea economies in Asia: Facts, trends and outlook. Patancheru 502 324, Andhra Pradesh, India: International Crops Research Institute for the Semi-Arid Tropics.

Pelmer DP. (2005). Agriculture in the developing world: Connecting innovations in plant breeding research to down stream applications. *PNAS* 102 (44) 15739-15746.

Penrrose-Buckley C. (2007). Producer organization: A guide to developing collective rural enterprises. Oxfam GB, Oxford, UK.

Ravinder Reddy Ch, Nigam SN, Parthasarathy Rao P, Ahmed S, Ratnakar R, Ashok A, Ashok Kumar A, Reddy BVS and Gowda CLL. (2010). Village seed banks: An integrated seed system for improved seed production and supply A case study. Information Bulletin No. 87. Patancheru 502 324, Andhra Pradesh, India: International Crops Research Institute for the Semi-Arid Tropics.

Rubyogo J C, Remington T and Jones R. (2005). Seed systems for reaching a broad range of users quickly and efficiently. Proceeding of the Harvest Plus Reaching End Users Meeting, 5-7 May 2004, Rome, Italy (IPGRI-Macaresse).

Rubyogo J C, Sperling, L and Assefa T. 2007. A new approach for facilitating farmers' access to bean seed. *LEISA Magazine,* 23 (2), PP: 27-29.

Saxena KB. (2006). Seed production systems in pigeonpea. Patancheru 502 324, Andhra Pradesh, India: International Crops Research Institute for the Semi-Arid Tropics.

Singh SK, Kumar Shantanu, Singh AK and Sah Uma.

(2008). Sustainable improvement in pulses productivity in Hamirpur district of Uttar Pradesh: An approach of farmer participatory varietal evaluation. *Indian Research Journal of Extension Education* 8 (2&3), PP: 32-37.

S. K. Singh, S. K. Dubey , M. Ali, S. N. Nigam, R. K. Srivastava, K. B. Saxena, A. S. Yadav & A. Kumar (2013). Development and Promotion of an Informal and Formal Seed System through Farmer Participatory Seed Production of Pigeonpea (*Cajanus cajan* L.) in Uttar Pradesh, India. *Agroecology and Sustainable Food Systems*, 37:5; PP:531-549

.

Sperling L and Cooper HD. (2003). Understanding seed systems in seed security.In *Improving the effectiveness and sustainability of seed relief*. Proceedings of a stakeholders' workshop in Rome 26-28 May 2003: Food and Agricultural Organization.

Witcombe JR, Joshi A, Joshi K D and Sthapit B R. (1996). Farmer participatory crop improvement. I. Varietal selection and breeding methods and their impact on biodiversity. *Experimental Agriculture* 32, PP: 445-460.

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Gender Mainstreaming and Technology Application: An Appraisal of TANWA Project

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ABSTRACT

The project "Tamil Nadu Women in Agriculture" (TANWA) was launched in 1986 aimed at technological empowerment of farm women. An impact study was conducted in 2013 to understand the technology application and gender empowerment in Kancheepuram district of Tamil Nadu after more than 10 years of project termination. TANWA built up an effective system for the training of farm women with help of specially recruited female extension staff. Farm women groups widened the scope of their work by taking up savings and other income generating activities. The trained farm women adopted a range of agricultural skills leading to increase the yields of main crops, greater marketable surplus and savings on chemical fertilizers. The influence of women in farm matters goes more or less hand in hand with an increase in their influence over family matters. The project had brought a good degree of gender sensitization at household level while building women's capacities as skillful and self-confident farmers. The formation of farm women groups had contributed greatly to the continued viability of some of the income generating activities as well as providing a forum for learning, innovating and extending mutual support among them. Similar attempts elsewhere could enhance the performance of farm women from small and marginal farms in their roles as agricultural producers leading to increased productivity, income and food security.

Key words: Gender mainstreaming, Technology application, TANWA, Women empowerment

INTRODUCTION

Farm households are mainly dependent on the income of the male members. Involvement of women in decision making regarding choice of crops, purchase of inputs and marketing of produce is occasional. The project on The Tamil Nadu Women in Agriculture (TANWA) was signed between Government of India and Royal Danish Government in June, 1986. The project was implemented in a phased manner (Danida, 1991; Danida, 2000; Folke, 2002 and Royal Danish Embassy, 2001). The project was terminated in March, 2003.

The main focus of TANWA was on training of farm women and forming them into groups with an aim to enhance the performance of small scale farms in order to increase productivity, income and food security. TANWA trained nearly one lakh farm women in the State and they were later made into small viable groups to address their economical, social and technical needs and the programme has explicitly demonstrated advantages of the group approach in technology transfer. A study has been taken up in 2013 to analyse the overall improvement in social, economical and political empowerment of farm women in the process of development.

METHODOLOGY

The study was conduceled in Avalur village of Wallajabad block of in Kancheepuram district of Tamil Nadu where the farm women had undergone interventions under TANWA. Randomly 40 respondents were selected from the trainees. Quantitative and qualitative data were collected through focused group discussion and individual interaction. A semi structured interview schedule was developed for data collection.

Information was collected on socio-economic profile, changes in technical knowledge, level of adoption of improved practices, changes in saving habits, utilization pattern of credit and personal experiences on TANWA training as well as constraints in utilising the knowledge acquired through TANWA training.

RESULTS AND DISCUSSION

The village Avalur is composed of 1000 households with a population of near about 4500. One third of the population of the village depend upon agriculture for their livelihood. Paddy is grown in 121.36 ha, sugarcane in 14.60 ha, groundnut in 30.70 ha and sesame in 6.58 ha. The women of Avalur help men counterpart in carrying out the agricultural operations. After getting the training

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under TANWA, women became conscious about their importance in the farming sector. They got exposure to entrepreneurship development, improved package of practices of different crops and preservation and post harvest technologies of agricultural produce. They no longer felt subordination, rather believed they could go hand in hand with their male counterparts and can complement and supplement to their farming system. Women could experience a slow transition for labour to manager.

Since the average age is 47 years and most of the respondents being literate, it was possible to convince them about the new technologies and carry out the interventions to bring out the proposed changes in a feasible manner.

Majority of the respondents had farming as their main occupation and only 12.5 per cent of the respondents maintained their livelihood through wage labour. About 87.5 per cent of the respondents had annual income upto ₹ 60,000/- and 12.5 per cent of the respondents have annual income more than ₹ 60,000/-. About 37.5 per cent of the respondents had 3-5 acres of land followed by 27.5 per cent with 5-10 acres of land. Only 10 per cent of the respondents had more than 10 acres of land. Maximum number of the respondents had backyard poultry units, followed by cows and buffaloes and only half of the respondents had goats. It is inferred that the respondents' economic status is playing a crucial role in technology adoption.

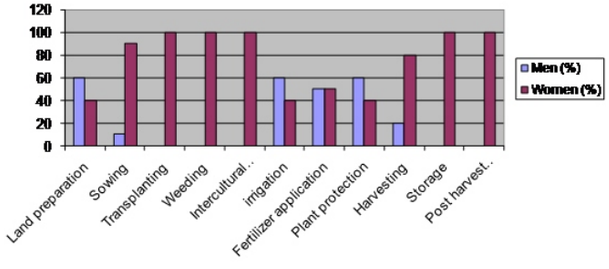

Fig -1: Involvement of men and women in crop production

The activities like transplanting, weeding, intercultural operation, storage and post harvest were exclusively done by women while land preparation, sowing, irrigation, fertilizer application, plant protection and harvesting were done jointly with men (Fig.1). It is very interesting to know that the tasks especially land preparation and plant protection exclusively performed by man in many of the Indian villages are also being performed by women in this village showing that complementary and supplementary roles of both men and women will contribute significantly to higher farm production. After sowing, men leave for other jobs and return only for harvest and the rest of the tasks are performed and managed by women (Jayasree, 1993 and Saravanakumar, 2000).

Saving habit of the TANWA trainees had shown a definite improvement (Table 1).

Table 1: Changes in savings before and after TANWA programme (%)
n=40

Changes	Before	After
More than ₹ 500/-	7.5	27.5
₹ 300-500/-	15.0	40
₹ 100-300/-	27.5	32.5
Less than ₹ 100/-	50.0	-

Before undergoing the training, half of the trainees saved less than ₹ 100/- per month but now none of the members saved less than this. Now 40 per cent of the members saved an amount of ₹ 300-500/- per month and 27.5 per cent of the members saved more than ₹ 500/- per month, but before it was only 7.5 percent. TANWA helped to change the behaviour of the trainees towards the importance of savings and paved the way for improved economic conditions.

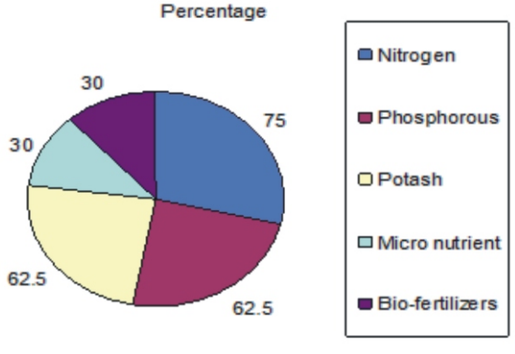

Fig- 2: Knowledge regarding fertilizer application

More than 60 per cent of the trainees were aware about the doses of NPK in the crops and 30 per cent of the trainees were aware about the importance and applicability of micro nutrients and bio fertilizers (Fig.2).

It is interesting to know that the trainees did not even seek the help of the male counterparts at the time of fertilizer application. They knew the exact duration and doses of fertilizer application. This shows how the women had been empowered technically by TANWA.

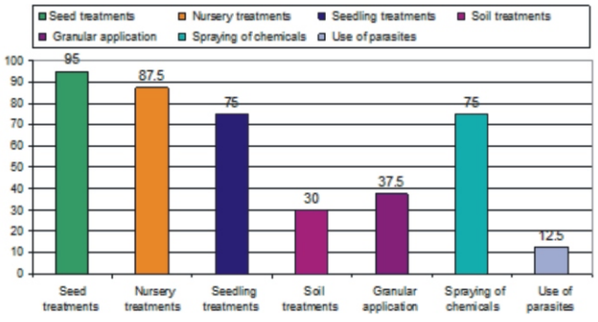

Fig- 3: Knowledge regarding plant protection measures

More than 80 per cent of the trainees were conscious about the importance of seed treatment and nursery treatment, while 7 per cent of the trainees were aware about the application of seedling treatments and spraying of chemicals. Almost 30 per cent of the respondents were aware about the applicability of soil treatment and granular application, while only 12.5 per cent respondents were aware about the importance and utility of parasites in the crop as a biological pest control measure (Fig.3). Over all, the respondents were attentive about the major plant protection treatments like soil treatment, nursery treatment, seedling and use of chemicals in the plant.

Level of adoption of different farming practices indicates the progressiveness of a farmer. Adoption level of different important practices was measured through a semi structural schedule, to know the progress rate of the trainees. The trainees were asked about the adoption of improved seed variety and the results were expressed in Fig- 4

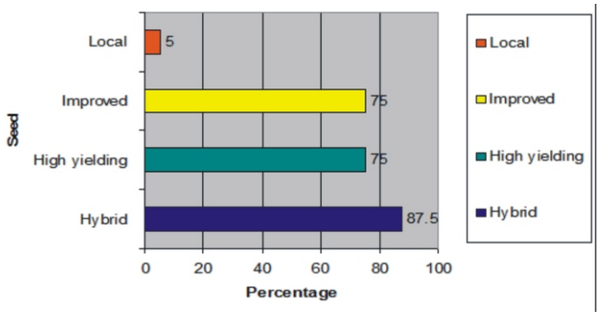

Fig-4: Rate of adoption of improved seed variety

It is quite interesting to know that almost 75 per cent of the respondents were adopting hybrid, high yielding and improved variety of seeds whereas only 5 per cent used only local seeds indicating that trainees were aware about the importance and usefulness of the improved variety. Some of the respondents stated that the production of the improved variety is more than double of the local variety.

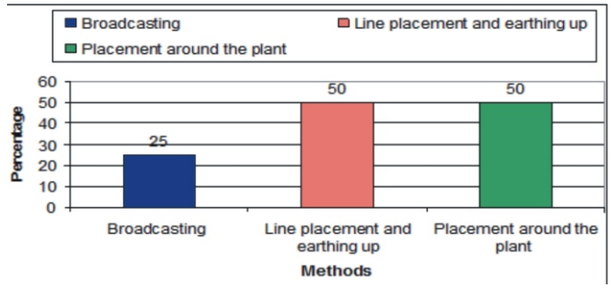

Fig- 5: Adoption of improved methods of fertilizers application

Half of the respondents were following line placement and earthing up and placement around the plant method while only 20 per cent were following broadcasting method of applying fertilizers (Fig.5).

The interaction with group members of TANWA revealed the following changes in adoption of package of practices in crops like rice, groundnut and vegetables.

Table 2: Change in the level of adoption of package of practices

n=40

Name of the practice	Before TANWA	After TANWA
Rice Seed treatment	Nil	Treatment with carbendazin and pseudomonas bacteria
Biofertilizer application	Only green manure	Biofertilizer + green manure
Balanced fertilization	Only urea on 25th day	Neem cake + NPK, split application
Nursery treatment	Nil	Azospirillum
Ferilizer in nursery	Only urea	DAP application
Weeding	Only hand weeding	Weedicides like butachlor, anilophos round up
Identification of beneficial and harmful insects	Nil	Beneficial insects could be easily identified after farmer field school training.
Pest management	No idea	Economic threshold level (ETL) based insect control
Varietal selection	Only local varieties cultivated but susceptible to blast disease	ADT-43,47,36,37,45
Harvest	Manually using sickle	Machine cutting

There is no doubt that the trainees have set a good example of women empowerment and gender mainstreaming, but apart from that there are certain obstacles which hindered them to obtain the full fledged profit. Cumbersome process of getting monetary help from the financial organization and non-availability of cooperative bank, heavy competition on marketing of agricultural produce, lack of timely technical advice due to lack of mobility to distance places, lack of family enthusiasm and cooperation, distant location of veterinary hospital, scarcity of farm labour during peak agricultural season leading to payment of higher wages, natural calamities and non-availability of relief in time, fast spreading of real estate business engulfing vast farm

land were some of the problems prominently expressed by farm women.

The success of the project can be assessed from which is the impact of training and skill demonstration continues to be visible with respect to technology adoption, skill acquisition, development of communication skills, increase in yield of crops and animals *etc.* The gender bias is greatly removed due to women to women programme which helped in learning and follow-up. The women farmers became technologically sound in farming methods and skills. The training strategy was designed in such a way that it suits the farm women of different agro climatic conditions. Most of the agricultural technologies and methods were need based, low cost or no-cost and environment friendly. The farm women formed a TANWA FWG (Farm Women Group) which is a typical model for sharing knowledge of technology with fellow women and co-farmers (Kokate, 2012) and contributed greatly to the continued viability of the some of the income generating activities (Danida, 2004). Total intellectual and physical participation of women is essential to popularise alternative system of land management (Ponnusamy *et al,* 2014). The kind of model that helped in technical, economic and social empowerment of farm women should be replicated in any part of the developing countries in executing any technical programme.

CONCLUSION

Tamil Nadu women in Agriculture (TANWA) project funded by Royal Danish Government made sustainable impact in terms of knowledge retention and technology application among farm women. The study at Avalur village in Kancheepuram district of Tamil Nadu indicated that farm women continued to adopt scientific farming practices even after 10 years of project completion. Women were able to recall the important learnt skills, tried out new methods in their farms resulting in higher yields and savings in respect of chemical pesticides and fertilizers. The typical TANWA FWG (Farm Women Group) model has been found to be effective in technology transfer such models need to be promoted throughout the length and breadth of the country in order to bring women led profitable and sustainable farming.

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REFERENCES

Danida. 1991. Evaluation Report of WYTEP, TANWA and TEWA. MFA, Copenhagen.

Danida. 2000. Tamil Nadu Women in Agriculture (TANWA), Phase II, Final Review Report. MFA, Copenhagen.

Danida, 2004. Farm women in development- impact study of four training projects in India. Danish Institute for International Studies, Department of Development Research, Denmark.

Folke, Steen. 2002. Evaluation/impact study of four training projects for farm women in India (WYTEP, TANWA, TEWA, MAPWA). Approach Paper. Centre for Development Research. Copenhagen.

Jayasree. 1993. Impact of TANWA training on farm women. M.Sc thesis, TNAU, Madurai.

Kokate, K.D. 2012. Women Empowerment in Agriculture: An Overview, Lessons learnt and Way Forward. *Indian Farming*. 61 (12):1-4.

Ponnusamy, K., Manju Dutta Das, Binoo P. Bonny and Sabita Mishra. 2014. PPP and Gender Mainstreaming in Agriculture: Lessons from Field Studies. *Agricultural Economics Research Review.* 27 (147-155).

Royal Danish Embassy. 2001. Strategies for Change: Gender Issues & Poverty Reduction in Danida Supported Activities in India. RDE, New Delhi.

Saravanakumar, M. 2000. Impact of TANWA in the empowerment of farm women. M.Sc thesis, TNAU, Coimbatore.

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Perceived Effectiveness of Self Help Groups in Dairy Sector

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ABSTRACT

A study was conducted among members of SHGs in Chittoor district of Andhra Pradesh to assess the perceived effectiveness of SHGs in dairy sector in terms of resource, technology, extension, marketing and capacity development. Considerable improvement was observed in all the aspects studied, indicating that group mobilization have potential to overcome the multiple constraints faced by small farmers at individual level. Major factors affecting the effectiveness of dairy SHGs were found to be functional linkage, support from promoting institution and amount of credit availed.

Keywords: Self Help Groups, Effectiveness, Dairy sector

INTRODUCTION

Collective action is often hailed as an important strategy to overcome the multiple constraints faced by the small and marginal farmers at individual level. In recent years Self Help Groups (SHGs) have emerged as an important form of collective action especially in the rural settings. Though the original intention of SHG mobilization was financial intermediation between formal financial system and those who did not have access to financial institutions, its developmental potential was soon realised by various developmental agencies and practitioners. Pathak (1992) observed that the SHG, being group of persons, gets empowered to solve most of their problems of non-financial nature like, raw materials and input supply, marketing, better adoption of technology, education and training for realizing the human potential for development. When several members are able to share their empowering experiences, a collective self-efficacy emerges. Goals that are visualized by community members as external to their control are then viewed as within the grasp of their collective force (internalised).

In Andhra Pradesh, SHGs were formed under Indira Kranthi Patham Programme as a strategy for livelihood improvement of small and marginal dairy farmers. Indira Kranthi Patham is a Self Help Group based women oriented initiative launched in 2005 by the Society for Elimination of Rural Poverty (SERP), a State Government agency in Andhra Pradesh, by converging erstwhile poverty eradication projects, central and state sector schemes. Chittoor district of Andhra Pradesh has a long history of livestock farming since ages. Dairying is practiced by small and marginal farmers as means to sustain their livelihood in the wake of unstable income from agriculture, since it was easier for them to access the resources for dairy production than for crop production. Important institutional development related to dairy farming in Chittoor district was the formation of the Chittoor District Milk Producers' Cooperative Union (CCDU), commonly known as Chittoor dairy in 1969. The Chittoor dairy became defunct in 2002 owing to various socio-political, governance and marketing constraints. This in turn left the dairy farmers to the clutches of private dairies, which syndicated to exploit the dairy farmers by offering only minimal remuneration. The predicament continued up to 2005, till the DRDA intervened with a novel partnership model. An Agreement has been reached between 'Zilla Mahila Samakhya'(SHG federation at district level), DRDA and Balaji dairy, an outfit of National Dairy Development Board. Later on, Vijaya dairy (Andhra Pradesh Dairy Development Cooperative Federation; APDDCF) was also got involved in this partnership. Bulk Milk Cooling Units (BMCUs) were established at selected mandals with DRDA assistance. Maintenance and operational aspects of BMCUs were handed over to 'Mandal Mahila Samakhyas' (federation of SHGs at mandal level). Initially two BMCUs established in Gangavaram and V. Kota mandals during March, 2005 and the number was increased to eighteen by 2006. Presently, there are twenty eight BMCUs operated by 'Mandal Mahila Samakhyas'. For each BMCU, milk was collected from villages within 9-10KM radius by “palmitras”, in stainless steel milk cans and transported to BMCUs through small tempos. Under each BMCU 25 to 40 Palamitras are working in the villages. At village level, milk producers from various SHGs were organised under milk producers' institution (MPI). The milk collected from villages was cooled at 4^0C at BMCUs at mandal level and then transported to the Balaji dairy and APDDCF by the road tanker. From Balaji dairy milk is further transported to mother dairy outlets in different cities. The present study was undertaken to assess the effectiveness of dairy SHGs in terms of resource, technology, extension, market and capacity building.

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METHODOLOGY

The study was conducted in Chittoor district of Andhra Pradesh. The units of analysis of the study were individual members of exclusive women Self Help Group under Indira Kranthi Patham project involved in dairy activities. From the district fifty SHGs and from each SHG five members were selected following a multi stage random sampling procedure. The method of personal interview with structured questionnaire was used for collection of primary data. To assess the perceived effectiveness of SHGs, before-and-after research design was used and effectiveness was assessed for both the periods by using effectiveness index. In before-and-after design, effect of the treatment (SHG mobilization) would be equal to the level of the phenomenon after the treatment minus level of the phenomenon before treatment (Kothari, 2004) The effectiveness index was developed for the study based on five components which were selected based on literature review and expert opinion and are discussed below.

(i) Resource mobilization: Resource mobilization was opertionalised as the extent to which various resources like credit, inputs and animals were available to the respondent

(ii) Extension orientation: Extension orientation was measured as the extent to which the respondent was aware of various extension programmes, access to and availability of public and private extension services and participation in extension activities.

(iii) Marketing effectiveness: Marketing effectiveness refers to respondents' perception about availability of market information, presence of intermediaries, collective marketing facilities, bargaining power of producers, transparency in marketing operation and marketing transaction cost.

(iv) Capacity development: Capacity development refers to the extent to which respondent have knowledge and skill to undertake diversified activities, to diagnose and solve the problems and to learn and use innovations. In case of the four components mentioned above, respondents were categorized into following categories based on their responses using an ordinal scale of measurement.

Response	Score
Nil	0
Low	1
Medium	2
High	3

(v) Technology adoption: Technology adoption was evaluated as the degree to which the respondent has adopted various dairy technologies. Adoption of dairy technologies by the respondent was measured on a nominal scale based on the responses; as below:

Response	Score
Yes	1
No	0

For each of these components separate index was calculated as follows for both periods (before and after SHG formation):

$$\text{Effectiveness index} = \frac{\text{Actual score obtained for that component}}{\text{Maximum possible score for that component}} \times 100$$

Combined effectiveness index was also calculated for both the periods by taking equal weight for all the sub components *viz.* resource mobilization, technology adoption, extension orientation, marketing effectiveness and capacity development.

Factors which are significantly related to the effectiveness of SHGs were analysed by simple correlation analysis. Discriminant function analysis (DFA) was used to find out the factors which discriminate the SHGs as less effective and more effective. Discriminant function analysis (DFA) is a statistical technique to study difference between two or more groups with respect to many variables at the same time (Klecka,1980). Zibaei and Bakhshoodeh (2008) have used DFA to find out the determinants of sprinkler irrigation technology discontinuance in Iran. Jayaram and Indumati (2010) used DFA to analyse the determinats of adoption of sericulture technologies. Self Help Groups were classified into two groups of almost equal number based on the value of the combined effectiveness index (high and low) and coded as 1 and 2.

Socio economic and psychological variables considered for analysis include age, education, annual income, land holding, livestock holding, social status, social participation, economic motivation, support from IKP, group dynamics, functional linkage, credit availed, self reliance and risk taking ability.

A linear discriminant equation, $D=v1_{X1}+v2_{X2}+v3_{X3}+\ldots+vi_{Xi}+a$, is constructed such that the two groups differ as much as possible on D.

Where D = combined effectiveness index after SHG introduction

$_{X}$ = respondent's score for the socio economic and psychological variable as discussed above

v = the discriminant coefficient or weight for that variable

a = a constant

i = the number of predictor variables.

Those variables with the largest standardized discriminant coefficients are the ones that contribute most to effectiveness of SHGs.

Perceived effectiveness of dairy SHGs

Perceived effectiveness of dairy SHGs was studied at individual level. Five components were identified and improvement in these components was analysed and mean score for all the components was presented in table 1. The results of the paired t-test showed that difference in the mean score for all the components of effectiveness index were statistically significant at 1 per cent level of significant. There was considerable difference between the mean score of components in both the periods. All the SHG members perceived a significant improvement in their access to and availability of various resources like milch animals, credit and other inputs. The score for resource mobilization has increased from 37.88 in pre SHG period to 74.15 during SHG period. Hassle free access to required finance made through group saving and SHG-bank linkage played an important role in easing the resource constraints of SHG members. The score for extension orientation has increased to 80.08, which was 59.15 before SHG.

Table 1: Mean score obtained by SHG members on the components of effectiveness index.

Components of SHG effectiveness index	Score		Paired difference	t-value
	Pre-SHG	SHG		
Resource mobilization	37.88	74.15	36.2696**	16.9587
Extension orientation	59.15	80.08	20.935**	8.6449
Marketing effectiveness	51.58	76.33	24.8419**	10.0089
Technology adoption	38.46	68.86	30.4029**	6.59434
Capacity development	46.34	80.97	34.6341**	10.4874

**Significant at the 0.01 level of the probability.

It was observed that SHG members' awareness about and access to public extension service as well as the participation in extension activities have increased. There was no considerable improvement in the access to private extension service mainly due to marginal presence of private service providers.

The effectiveness in marketing of milk considerably improved due to the coordinated efforts of SHG federations, DRDA and NDDB. This is evident from the increase in mean score of marketing effectiveness from 51.58 to 76.33. Mean score for capacity development, which include knowledge and skills of SHG members was improved from 46.34 to 80.97. It can be attributed to the trainings provided on clean milk production, collection and transportation of milk and operation of BMCUs. It was also observed that there was considerable improvement in the awareness about and adoption of various dairy technologies and practices by SHG members like washing udder before milking, timely vaccination, artificial insemination, balance feeding and use of milking machine.The effectiveness of Dairy SHGs was reflected in the economic condition of SHG members. Before SHG, 10 percent of members were in low income group and 68 percent of members were in medium income group (Table 2). After SHG intervention most of them (66%) were found to be in high income group and none was found in low category. On an average, annual income of the members have increased by 79.82 percent. Factors like availability of credit at lower interest rate, lesser dependence on money lenders, better remuneration from dairying, better planning of activities and economies of scale achieved through group mobilization have contributed significantly to the economic empowerment of SHG members. These factors are the outcome of effective functioning of SHGs.

Table 2: Impact of Dairy SHGs on the income of the members

Category	Before	After
Low	10	0
Medium	68	34
High	22	66
Mean	40975.61	
S.D	23392.83	

Influence of socio economic and psychological characteristics on the effectiveness of SHGs

To analyse the correlation between socio economic and psychological variables and SHG effectiveness, Karl Pearson's correlation analysis was carried out. Among the fourteen variables identified, seven variables namely economic motivation, group dynamics, support of promoting institution (IKP), functional linkage, risk taking ability, self-reliance and credit availed were found to be positively and significantly correlated with effectiveness of dairy SHGs.

Table 3: Correlation of characteristics of SHG members with SHG effectiveness

Independent Variables	r value
Age	0.017
Education	0.016
Annual Income	0.039
Land Holding	0.043
Livestock holding	0.065
Social Status	0.132
Social Participation	0.177
Economic Motivation	0.385*
Group dynamics	0.508**
Support of SHPI	0.766**
Functional Linkage	0.727**
Risk Taking Ability	0.358*
Self Reliance	0.448**
Credit availed	0.443**

* Significant at the 0.05 level of probability. **Significant at the 0.01 level of the probability.

It can be inferred from the correlation analysis that SHG members' personal traits as well as group and social activities were the major correlates of effectiveness (Table 3). The profile characteristics like age, education, annual income, land holding and social status were not significantly related to the effective functioning of SHGs. This results are in line with observation of Singh *et al.,*(2007) that the individual and the group characteristics had positive and significant relationships with their group performance. Joy *et al.,* (2008) have also observed that variables like market perception, economic motivation, risk-orientation, attitude towards self-employment, management-orientation, innovativeness and information-seeking behaviour influence the group performance of SHGs. SHG members with higher level of personal attributes like economic motivation, risk taking ability, and self reliance could better interact with relevant institutions, organizations and people to articulate their needs as well as were able to better participate in the social sphere, when facilitated by congenial group functioning and supported by promoting intuition. This, in turn was reflected in their higher level of effectiveness.

Discriminating factors of SHG effectiveness

Discriminant function analysis was used to find out the factors which discriminate SHGs as high and low effective. Respondents were classified into two groups based on their perceived effectiveness score (High and Low). Appropriateness of this classification was verified using classification table results. The classification results revealed that 98 per cent of original grouped cases correctly classified and 92 per cent of cross validated groups are correctly classified (Table 4).

Table 4: Classification results of discriminant function analysis.

		Effectiveness Index	Predicted Group Membership		
			High	Low	Total
Original	Count	High	25	0	25
		Low	1	24	25
	%	High	100.0	0	100.0
		Low	4.0	96.0	100.0
Cross-validated	Count	High	23	2	25
		Low	2	23	25
	%	High	92.0	8.0	100.0
		Low	8.0	92.0	100.0

The major factors discriminating the SHGs into high and low effective as revealed from results of discriminant function analysis are functional linkage, support from promoting institution (IKP) and amount of credit availed (Table 5). Other variables like economic motivation, group dynamics, risk taking ability and self-reliance were also found to be positively and significantly correlated with effectiveness of dairy SHGs. But lack of statistical significance for the discriminant function coefficients of these variables implies that they did not discriminate SHGs as high and low effective.

Functional linkage with relevant institutions and stake holders like District Rural Development Agency (DRDA), Balaji dairy, financial institutions, veterinary service providers, feed and other inputs dealers, other SHGs, and SHG federations at different levels was very crucial for the effective functioning of dairy SHGs in Chittoor district.

Table 5: Results of discriminant function analysis of factors affecting effectiveness of dairy SHGs.

Variables	Discriminant function coefficient	Significance.
Age	.092	.231
Education	.372	.162
Annual Income	.565	.189
Land Holding	-.561	.168
Livestock holding	-.068	.239
Social Status	.187	.593
Social Participation	.106	.691
Economic Motivation	.147	.686
Group dynamics	.132	.259
Support of Promoting Institution	.308**	.001

Functional Linkage	.463**	.001
Risk Taking Ability	.642	.796
Self Reliance	.072	.680
Credit Availed	.403**	.001

**Significant at the 0.01 level of the probability.

This observation is in line with the findings of Narainaswami *et al.,* (2007), who have reported that functional linkage of SHGs along with other variables like economic activity, social status and conflict management is positively related to the performance of SHGs at community level. They also have observed that degree of functional linkage depends on the existence of various agencies in the proximity and the exposure of SHG member to the existence and use of various agencies. Efforts of the concerned Self Help Promoting Institution, Indira Kranti Patham (IKP), were instrumental in group mobilization as well as forging these linkages. This finding was substantiated by various studies like Namboodiri and Shiyani (2001), and Satish (2001) who have highlighted the importance of constant and regular assistance from promoting agencies along with other factors like social cohesion among group members and lower transaction costs for effective performance of SHGs. Sukhdeep Kaur Mann *et al.,* (2011) also have pointed out that the self help group's performance, to a large extent, is dependent on the promoting agency in the initial stages and in the long run on the resources that its members generate and accumulate for the group.

Amount of credit availed has also contributed significantly to the effectiveness of SHGs by easing the capital constraints faced by the small and marginal dairy farmers. Access to credit, the core objective of SHG mobilization, has facilitated the timely access to productive resources and development of required infrastructure. Such a relationship was corroborated by Lalitha and Nagarajan (2002) who have noed positive profit levels and short payback periods with increase in loan amount in case of groups dealing with dairy farming. In this context of relation between credit and SHG performance, Bharamappanavara *et al*., (2011) have observed that effectiveness of the SHGs was related to the purpose for which the loan amount was utilized. If loan amount was utilized for income-generating activities like animal husbandry, which earns more income for the members, the performances of respective SHGs were found to be good in terms of loan repayment and income improvement. But, if the loans by members were taken to meet their emergency needs like meeting education expenditures of children, for marriages, for hospital expenditures, and less for production activities then performance was found to be deteriorating.

To sum up, the major factors discriminating the dairy SHGs as high and low effective as revealed by discriminant function analysis (Functional linkage, support from promoting institution and amount of credit availed) points to the need for strong support system to facilitate and network the SHGs, especially in the initial phase.

CONCLUSIONS

The assessment of effectiveness of dairy SHGs in Chittoor district revealed that dairy SHGs in Chittoor district could prove considerable effectiveness in terms of resource, technology, extension, marketing and capacity development. Significant improvement was observed in the income of the dairy SHG members also. Scope for further improvement still exists. Seven variables namely economic motivation, group dynamics, support of promoting institution (IKP), functional linkage, risk taking ability, self-reliance and credit availed were found to be positively and significantly correlated with effectiveness of dairy SHG. Out of these seven variables, three variables namely functional linkage, amount of credit availed and support from the promoting institution were found to discriminating the SHGs as high and low effective. The coordination with other agencies and institutions like DRDA, NDDB, Balaji dairy, financial institutions, veterinary service providers, feed and other inputs dealers, other SHGs, and SHG federations at different levels played an important role in realizing the potential of group mobilization. Role of concerned promoting institution (Indira Kranti Patham) was found to be instrumental in forging these linkages. These linkages facilitated the SHGs in accessing resources and market as well as developing the capacities of SHG members in handling the dairy related activities. Hassle free access to required finance made through group saving and SHG-bank linkage played an important role in easing the resource constraints of SHG members. Potential of SHGs should be harnessed in agriculture and allied activities to address the multiple constraints faced by small, marginal, women and tenant farmers. Also it should be noted that, to achieve inclusive development, groups of women and other disadvantaged sections of society should be extended hand holding in the initial phase, and later on focus should be on the development of their own institutions.

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REFERENCES

Bharamappanavara, Saikumar C. Hanisch, M. Shetty, N.K and Kumar, P.N.O. 2011 Self-Help Group

Microcredit Delivery Models In Karnataka (India): An Econometric Study of Factors Influencing Performance. *International Journal of Microfinance Institutions* 1(1), 90-101.

Joy Lina, Prema A and Krishnan S (2008) Determinants of Group Performance of Women-led Agro-processing Self-help Groups in Kerala, *Agricultural Economics Research Review*, Vol. 21 (Conference Number), 2008, pp 355-362

Klecka,W.R (1980) *Discriminant Analysis*. SAGE publications, California.

Kothari,C.R (2004) *Research Methodology: Methods and Techniques*, New Age International Publishers, New Delhi

Lalitha, N. and Nagarajan. B.S. (2002) *Self-help Groups in Rural Development,* Dominant Publishers and Distributors, New Delhi.

Sukhdeep Kaur Mann, Varinder Randhawa and Kanwaljit Kaur (2011) Role Performance and Associated Problems of SHG Leaders, *Journal of Community Mobilization and Sustainable Development* Vol. 6(1), 050-054, January-June, 2011

Namboodiri,N.V and Shiyani (2001). Potential Role of Self·Help Groups in Rural Financial Deepening. *Indian Journal of Agricultural Economics*, 56 (3): ·W 1-09.

Narayanaswamy, B., Narayana Gowda, K., and Nagaraja, G.N.(2007) Performance of Self Help Groups of Karnataka in farm activities. *Karnataka Journal of Agricultural Sciences*, 20(1): 8588.

Pathak, P.A. (1992). Self help groups and their linkages with banks. *National Bank News Review*. pp 9-10.

Satish, P. (2001). Some Issues in the Formation of Self-Help Groups. *Indian Journal of Agricultural Economics*, 56 (3): 410-18.

Singh, Y.K., Kaushal, S.K., and Gautham, S.S.(2007) Performance of women's Self Help Groups (SHGs) in Moradabad district, Uttara Pradesh. *International Journal of Rural Studies*. 14(2).

Zibaei,M and Bakhshoodeh (2008). Investigating determinants of sprinkler irrigation technology discontinuance in Iran: Comparison of logistic regression and discriminant analysis, American-Eurasian Journal of Agricultural and Environmental Sciences, 2 (Supple 1), 2008

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Effectiveness of Mobile based Agro-Advisory Services in Addressing Information Need of the Stakeholders: A Case of m KRISHI®

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ABSTRACT

Many information and communication technology (ICT) projects in Indian agriculture have emerged, either substituting or supporting extension services by providing access to agricultural information to the farmers, but its access to the farmers in remote villages is restricted due to the lack of infrastructure. It creates information asymmetry among farmers. Telecommunication, especially mobile phones have the potential to provide solution to the existing information asymmetry in various lagging sectors like agriculture. mKRISHI® is one such project which made significant contribution in information dissemination in some parts of India. The present study was undertaken for assessing its effectiveness in information dissemination to the farmers in two districts of Maharashtra and Tamil Nadu where mKRISHI® was working for the last six years. Data were collected from 60 respondents from the mKRISHI® member farmers. The effectiveness was measured by effectiveness index developed for the purpose. The study revealed that the extension services rendered by mKRISHI® were found to be highly effective by majority of the farmers (46.66 %).

Key words: Effectiveness, Information need, mKRISHI® poverty, employment generation

INTRODUCTION

The contribution of information and knowledge in bringing about social and economic development has been well recognized globally. However, communicating this relevant knowledge and information to rural communities continues to remain as a major challenge even today, though the world has been better connected than ever before. The advent of new age Information and Communication Technologies (ICTs), especially, personal computers, the internet and mobile telephone during the last two decades has provided a much wider choice in collection, storage, processing, transmission and presentation of information in multiple formats to meet the diverse requirement and skills of users. Society is currently witnessing a revolution in both the media as well as the ICTs. There is a vast literature on the potential and benefits of using these technologies for wider rural development. However, the contradiction between the potential for ICTs to address the challenges faced by rural development and the current failure to harness them for this purpose is striking (Chapman and Slaymaker, 2002). There is an increasing realization of digital divide, which is the gap between those who have access to technology and those who do not access technology, digital gap between women and men in society and a social divide among the information rich and poor in societies(Huyer and Mitter, 2003). ICT is one of these solutions, and has recently unleashed incredible potential to improve agriculture in developing countries specifically.

Among modern ICT modes, mobile phone has been most recent and widely accepted mode of delivering information (Mittal, 2012). Increasing mobile phone based services enhances the availability to knowledge and information in agriculture and meets the increasing information demand of the farmers. It further helps in improving awareness, education, better adoption of technology, better health and efficiency, reduced transaction costs, better market efficiencies, *etc.*

Hence, the policy framework for agricultural extension (Ministry of Agriculture, Govt. of India, 2000) highlights the opportunity for information and communication technology (ICT) to improve the quality and accelerate the transfer and exchange of information to farmers, and ICT is consequently given a high priority, particularly as a tool for improving the marketing aspects of farm enterprises. At present, in India, there are a number of ICT initiatives in agriculture. The modes for providing information vary in different ICT projects. The approach adopted by mKRISHI® is different from all other projects. mKRISHI® is a research project that seeks to disseminate targeted agricultural information to small and marginal farmers in India through mobile phone. The mKRISHI® (m = mobile; krishi = agriculture) platform, developed by Tata Consultancy Services in 2006, enables farmers to access best-practice information and

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agricultural experts through low-cost mobile phones using SMS. The mKRISHI® disseminates a wide range of personalized information; the critical difference from others is that experts can respond to farmers' queries. Farmer looks for specific, actionable information. Farmers are not just interested in remotely sent SMS, market information or agro advisory. Farmer wants an end-to-end service and expects personal attention and occasional visit by expert once in a while. It was visualized to increase income, improve the efficiency of markets, reduce transaction costs, and offer a great opportunity for innovative interventions, especially in service delivery. Keeping these points in view, the present study was conducted to assess the effectiveness of mKRISHI® in information and technology dissemination to the farmers.

METHODOLOGY

Two districts, one from each of the states of Maharashtra and Tamil Nadu were selected purposively since these were states where mKRISHI® was started in 2006. The districts were Nasik in Maharashtra and Kanchipuuram in Tamil Nadu. An *ex-post facto* research design was used for the study. The data were collected from 60 respondents from the mKRISHI® subscriber farmers. The information was obtained with the help of structured interview schedule.

The effectiveness was measured by effectiveness index developed for this purpose. To measure the effectiveness of mKRISHI®, an index was developed, which contains five dimensions, *i.e.*, timeliness of information, quality of information, utility of information, satisfaction of farmers and ease of understanding. The formula used for this index was as follows:

$$\text{Effectiveness Index} = \frac{T1 \times W1 + Q1 \times W2 + U1 \times W3 + SF \times W4 + EU \times W5}{W1 + W2 + W3 + W4 + W5} \times 100$$

Where, TI=Timeliness of information, QI=Quality of information, UI=Utility of information, SF=Satisfaction of farmers, EU= Ease of understanding, W_1= Weightage for the timeliness of information as given by the judges, W_2= Weightage for quality of information as given by the judges, W_3= Weightage for utility of information as given by the judges, W_4= Weightage for satisfaction of farmers as given by the judges, W_5= Weightage for ease of understanding as given by the judges

RESULTS AND DISCUSSION

Effectiveness of mKRISHI®

The perceptions of the farmers were taken on all the dimensions of the effectiveness index. The parameters of the effectiveness index are timeliness of information (TI), quality of information (QI), utility of information (UI), satisfaction of farmers (SF), and ease of understanding (EU).

Timeliness of the information

It referred to the availability of the technology and the services provided by mKRISHI® at the appropriate time to the farmers in terms of seasonality of the crops grown in that particular area. The perceptions of the farmers were collected through the interview schedule. The data obtained were presented in Table 1.

Table1:Distribution of respondents on effectiveness: Timeliness of the information

n=60

Type of services	VT		T		NAT	
	f	%	*f*	%	*f*	%
Agronomic information	7	11.7	51	85.0	2	3.3
Varietal information	12	20.0	43	71.7	5	8.3
Pest and disease management information	7	11.7	49	81.7	4	6.7
Weather related information	6	10.0	48	80.0	6	10.0
Post-Harvest Technology related information.	8	13.3	42	70.0	10	16.7
Information related to soil and water conservation	6	10.0	50	83.3	4	6.7
Information about credit	12	20.0	46	76.7	2	3.3
Marketing information	13	21.7	39	65.0	8	13.3
Information about Govt. schemes and policies	7	11.7	29	48.3	24	40.0

VT=Very Timely, T=Timely, NAT=Not at all timely

Table 1 represented the response of the farmers to the timeliness of the services of the mKRISHI®. It showed that eighty five per cent farmers perceived that information regarding the agronomic information was provided timely while, 11.7 per cent farmers perceived that it was provided very timely and3.3 per cent farmers perceived that it was not at timely. Almost 72 per cent farmers assumed that varietal information of crop was provided timely while 20 per cent farmers felt that it was provided very timely. In case of pest and disease management information 81.7 per cent farmers perceived that it was provided timely while, 11.7 per cent farmers said that it was very timely. Eighty per cent farmers assumed that information regarding the weather was provided in time while 10 per cent farmers felt that it was provided very timely. In case of post-harvest technology related information 70 per cent farmers said that it was timely provided while 13.3 per cent farmer felt that it was very timely. Regarding the soil and water conservation information 83.3 per cent farmers felt that the information was provided timely and 10 per cent farmers felt that it was provided very timely. Regarding credit 76.7 per cent farmers assumed that information was provided in time

while twenty per cent farmers felt that it was very timely. In case of marketing information 65 per cent farmers perceived that it was timely while 21.7 per cent farmers said that it was very timely.

Table 2: Descriptive statistics of timeliness of the information provided by mKRISHI®

Statistics	AI	VI	MPI	WR	PHT	SW	CRE	MI	IGS
Mean	2.08	2.11	2.05	2.0	1.96	2.03	2.16	2.08	1.7
Standard deviation	0.38	0.52	0.42	0.45	0.55	0.41	0.45	0.59	0.66
C. V (%)	18.31	24.74	20.91	22.5	28.03	20.18	21.10	28.35	38.8

AI= Agronomic information, VI = Varietal information, MPI = Management practices Information, WR = Weather related information, PHT = Post-Harvest Technology related information, SW = Information related to soil and water conservation, CRE = Information about credit, MI = Marketing Information about price, quantity demand, IGS = Information about Govt. schemes and policies.

Table 2 depicted the mean, standard deviation and coefficient of variation with regard to the timeliness of the information provided by the mKRISHI®. The mean score for the varietal information was 2.11, which denoted that farmers were getting the advisory information regarding the cultivation at the time of cropping season followed by agronomic information (2.083), which signified that the information was available on time. The coefficient of variation for information about Government schemes and policies was high (38.80%) which signified that it was highly inconsistent among the farmers. But the other parameters were consistent because of low coefficient of variation.

Categorization of farmers based on timeliness of the information provided by mKRISHI®

Table 3 showed that the 55 per cent of the total farmers believed that they got timely information about the crop followed by 43.33 per cent of the farmers who believed that they received information very timely in case of the crops.

Table 3: Distribution of farmers based on timeliness of the information

n=60

Timeliness Category	Class Score	*f*	%
Not at timely	9-15	1	1.66
Timely	15-21	33	55
Very Timely	21-27	26	43.33
Mean		18.21	
Standard Deviation		3.41	

Quality of information

It was operationally defined as the degree or level of excellence of the information provided by mKRISHI® expert as perceived by the farmers according to their farming conditions and climate in particular region. The perceptions of the farmers were collected through the schedule. The data obtained were presented in the following table.

Table 4: Distribution of respondents on effectiveness: Quality of information

n=60

Type of services	Excellent		Very good		Good		Moderate		Not at all good	
	f	%	*f*	%	*f*	%	*f*	%	*f*	%
Advisories issued for mKRISHI® on the following aspects										
Crop protection	0	0.0	25	41.7	29	48.3	6	10.0	0	0.0
Weather related information	8	13.3	21	35.0	27	45.0	4	6.7	0	0.0
Soil and water conservation	5	8.3	25	41.7	25	41.7	5	8.3	0	0.0
Marketing information	4	6.7	21	35.0	28	46.7	7	11.7	0	0.0
Post-harvest technology	2	3.3	20	33.3	29	48.3	9	15.0	0	0.0
Varietal information	0	0.0	21	35.0	31	51.7	8	13.3	0	0.0
Information about Govt. schemes and polices	0	0.0	22	36.7	27	45.0	11	18.3	0	0.0

Table 4 represented the response of the farmers to the quality of information provided by mKRISHI®. It showed that 48.3 per cent farmers perceived that quality of information regarding crop protection was good while 41.7 per cent farmers perceived that it was very good followed by weather related information, 45 per cent farmer said that quality of information was good, 35 per cent farmers said it was very good while 13.3 per cent farmers felt that it was excellent.

Table 5: Descriptive statistics of quality of information provided by mKRISHI®

Statistics	CP	WR	SWC	MI	PHT	VI	IGP
Mean	3.33	3.51	3.50	3.36	3.23	3.21	3.11
Standard deviation	0.68	0.77	0.77	0.78	0.69	0.66	0.69
C.V (%)	20.43	21.93	22.05	21.66	21.60	20.70	22.22

CP = Crop protection, WR = Weather related information, SWC = Information related to soil and water conservation, MI = Marketing Information, PHT = Post-Harvest Technology related information, VI = Varietal information, IGS = Information about Govt. Schemes and policies

Table 5 depicted the mean, standard deviation and coefficient of variation in the quality of the information provided by mKRISHI®. The mean score for weather related information was 3.51 which signified that the quality of information was excellent followed by soil and water conservation related information for which mean score was the 3.50 which signified that the quality information was very good. The mean score about Govt. schemes and policies was 3.11 which indicated that quality of information is not at all good. The coefficient of variation for Govt. schemes and policies was high (22.22 %) which signified that it was highly inconsistent among the farmers. But the other parameters were consistent because of low coefficient of variation.

Categorization of respondents based on quality of the information provided by mKRISHI®

Table 6 showed that the 70 per cent of the total farmers believed that quality of information was very good followed by 23.33 per cent of the total farmers who believed that quality of information was excellent.

Table 6: Distribution of respondents based on quality of the information

n=60

Quality Category	Class Score	Frequency	(%)
Good	17-23	4	6.66
Very good	23-29	42	70
Excellent	29-35	14	23.33
Mean		23.28	
Standard Deviation		4.14	

Utility of the information

It was operationally defined as the degree to which the information provided by mKRISHI® expert is useful in resolving farmer problem according to their farming needs. The perceptions of the farmers were collected through the schedule. The data obtained were presented in the following table.

Table 7: Distribution of respondents on effectiveness: Utility of information

n=60

Type of services	SA		A		U		D		SD	
	f	%	*f*	%	*f*	%	*f*	%	*f*	%
Technological information provided by mKRISHI® is highly relevant to your farming system.	11	18.3	42	70.0	7	11.7	0	0.0	0	0.0
Technological information provided by mKRISHI® is suited for both big and small farmer.	8	13.3	41	68.3	5	8.3	6	10.0	0	0.0
Technological information provided by mKRISHI® has increased yield.	9	15	37	61.7	12	20.0	2	3.3	0	0.0
Soil testing facilities provided by mKRISHI® increased soil fertility	10	16.7	31	51.7	16	26.7	3	5.0	0	0.0
Marketing information provided by mKRISHI® has increased price of your produce	7	11.7	39	65.0	10	16.7	4	6.7	0	0.0
Technological information provided by mKRISHI® reduced pest incidence	16	26.7	37	61.7	4	6.7	3	5.0	0	0.0
Technological information provided by mKRISHI® reduced disease incidence	20	33.3	36	60.0	2	3.3	2	3.3	0	0.0

SA-Strongly Agree, A-Agree, U- Undecided, D- Disagree, SD-Strongly Disagree

Table 7 presented the response of the farmers to the utility of information provided by the mKRISHI®. It showed that 70 per cent farmers agreed with the statement that technological information provided by mKRISHI® is highly relevant to farming system, 18.3 per cent farmers strongly agreed with it and 11.7 per cent were undecided about it. Regarding information being suitable for both big and small farmer that 68.3 per cent farmers agreed with it, 13.3 per cent farmers strongly agreed with it and 8.3 per cent farmers were undecided while 10 per cent farmers disagreed with it.

Table 8: Descriptive statistics of utility of information provided by mKRISHI®

Statistics	TFS	TBS	TY	STF	MI	TIP	TID
Mean	4.06	3.85	3.88	3.80	3.81	4.10	4.31
Standard deviation	0.54	0.77	0.69	0.77	0.72	0.72	0.53
C. V (%)	13.48	20.19	17.81	20.43	18.98	17.80	12.45

TFS= technological information provided by mKRISHI® is highly relevant to your farming system, TBS= technological information provided by mKRISHI® is suited for both big and small farmer, TY= technological information provided by mKRISHI® has increased your yield, STF= soil testing facilities provided by mKRISHI® is increased soil fertility, MI= marketing information provided by mKRISHI® has increased price of your produce, TIP= technological information provided by mKRISHI® reduced pest incidence, TID= technological information provided by mKRISHI® reduced disease incidence

Table 8 depicted the mean, standard deviation and coefficient of variation for the responses of the farmers regarding the utility of the technology provided by mKRISHI®. The mean score for disease management information was 4.31, followed by pest management information was 4.10 which signified that this information was highly useful to the farmer. The coefficient of variation for soil testing facilities was high (20.43%) which signified that it was highly inconsistent among the farmers. But the other parameters were consistent because of low coefficient of variation.

Categorization of farmers based on utility of the information provided by mKRISHI®

Table 9 showed that 75 per cent farmers perceived that information provided by mKRISHI® was useful to their field situation followed by 20 per cent farmers who perceived that information provided by mKRISHI® was highly useful to their field situation.

Table 9: Distribution of farmers based on utility of the information

n=60

Category of Utility	Class Score	*f*	%
Moderately useful	17-23	3	5
Useful	23-29	45	75
Highly useful	29-35	12	20
Mean		27.75	
Standard Deviation		4.98	

Satisfaction of farmers

The farmer's satisfaction was operationally defined as the degree to which information is able to meet the information need of the users. The data obtained is presented in the following table.

Table 10: Distribution of respondents on effectiveness: Satisfaction level

n=60

Statements	SA		A		U		D		SD	
	f	%	*f*	%	*f*	%	*f*	%	*f*	%
Technology provided by mKRISHI® is cost effective.	12	20.0	48	80.0	0	0.0	0	0.0	0	0.0
mKRISHI® platform provides all the needed inputs through its partners.	3	5.0	38	63.3	12	20.0	7	11.7	0	0.0
Advisory services are specific to your field.	5	8.3	34	56.7	15	25.0	6	10.0	0	0.0
mKRISHI® provides proper marketing linkage.	6	10.0	36	60.0	14	23.3	4	6.7	0	0.0
mKRISHI® personnel have enough knowledge to solve farmers field problems	5	8.3	28	46.7	12	20.0	15	25.0	0	0.0
Services provided by mKRISHI® are helpful in increase in yield, reduction in cost.	7	11.7	42	70.0	11	18.3	0	0.0	0	0.0
Field personnel are fair and do not show any favours to specific farmers during their field visit while solving farmer problem.	3	5.0	29	48.3	18	30.0	10	16.7	0	0.0

SA-Strongly Agree, A-Agree, U- Undecided, D- Disagree, SD-Strongly Disagree

Table 10 presented the satisfaction of the farmers toward information provided by the mKRISHI®. It revealed that 80 per cent farmers agreed with the technological information provided by mKRISHI® is cost effective while 20 per cent farmers strongly agreed with it. Regarding mKRISHI® platform provides all the needed inputs through its partnersshowed that 63.3 per cent farmers agreed with it, 5 per cent farmers strongly agreed with it, 20 per cent farmers undecided about it and11.7 per cent farmers disagreed with it.

Table 11: Descriptive statistics of satisfaction level of farmers provided by mKRISHI®

Statistics	Cost	Inp	Advi	ML	Know	Help	FP
Mean	4.20	3.61	3.63	3.73	3.38	3.93	3.41
Standard deviation	0.40	0.76	0.78	0.73	0.95	0.548	0.82
C. V (%)	9.60	21.04	21.49	19.65	28.35	13.94	24.31

Cost= Technology provided by mKRISHI® is cost effective, Inp= mKRISHI® platform provides all the needed inputs through its partners, Advi= The advisory services are specific to your field, ML= mKRISHI® provides proper marketing linkage, Know= mKRISHI® personnel have enough knowledge to solve farmers field problems, Help=Services provided by mKRISHI® are helpful in increase in yield, reduction in cost, FP= Field personnel are fair and do not show any favours to specific farmers during their field visit while solving farmer problem.

Table 11 depicted the mean, standard deviation and coefficient of variation for the responses of the farmers regarding satisfaction toward technology provided by mKRISHI®. The mean score for the 'technology provided by mKRISHI® was cost effective' was 4.2, followed by the services provided by mKRISHI® were helpful in increasing in yield 3.93 and marketing linkage 3.73 which signified that most of farmers strongly agreed with it. The coefficient of variation for mKRISHI® personnel have enough knowledge to solve farmers field problems was high (28.35%) which signified that it were high inconsistent among the farmers. But the other parameters were consistent because of low coefficient of variation.

Categorization of farmers based on satisfaction of the information provided by mKRISHI®

Table 12 showed that 66.66 per cent of the total farmers had high level of satisfaction whereas 33.66 per cent of farmers had very high level of satisfaction towards mKRISHI® extension services.

Table 12: Distribution of farmers based on satisfaction of the information

n=60

Category of Satisfaction	Class Score	*f*	%
Medium	17-23	0	0.0
High	23-29	40	66.66
Very high	29-35	20	33.66
Mean		29.3	
Standard Deviation		3.03	

Ease of understanding of information

The ease of understandingwas operationally defined as the degree to which the message conveyed by mKRISHI® system is clear and understandable by farmers. The data obtained was presented in the following table.

Table 13: Distribution of respondents on effectiveness: Ease of understanding of information

n=60

Statements	SA		A		U		D		SD	
	f	%	*f*	%	*f*	%	*F*	%	*f*	%
Language of text message is very clear and understandable.	9	15.0	49	81.7	2	3.3	0	0.0	0	0.0
Technical term used in text message easy to understand.	6	10.0	30	50.0	11	18.3	13	21.7	0	0.0
Content of text message provided by mKRISHI® is clear and understandable	8	13.3	41	68.3	5	8.3	6	10.0	0	0.0
Information about weather and market is easy to understand, adopt and helps in taking decision.	7	11.7	34	56.7	9	15.0	10	16.7	0	0.0
Voice message delivered by mKRISHI® is clear	5	8.3	49	81.7	6	10.0	0	0.0	0	0.0

SA-Strongly Agree, A-Agree, U- Undecided, D- Disagree, SD-Strongly Disagree

Table 13 represented the response of the farmers to the ease of understanding of information provided by the mKRISHI® that 'language of text message is very clear and understandable' about 81.7 per cent farmers agreed while15 per cent farmers strongly agreed with it and 3.3

per cent farmers undecided about it. Regarding 'technical term used in text message was easy to understand' showed about 50 per cent farmers agreed while10 per cent farmers strongly agreed with it and18.3 per cent farmers were undecided about it and 21.7 per cent farmers disagreed with it.

Table14:Descriptive statistics of ease of understanding of information provided by mKRISHI®

Statistics	Lan	Tech	Cont	Inf	Voice
Mean	4.12	3.48	3.85	3.630	3.98
Standard deviation	0.41	0.94	0.77	0.90	0.43
C. V (%)	10.09	27.20	20.18	24.81	10.83

Lan= language of text message is clear and understandable, Tech= Technical term used in text message easy to understand, Cont= Content of text message provided by mKRISHI® is clear and understandable, Inf= Information about weather, market, is easy to understand, adopt and helps in taking decision, Voice=Voice message delivered by mKRISHI® clear

Table 14 depicted the mean, standard deviation and coefficient of variation for the responses of the farmers regarding the ease of understanding of information provided by mKRISHI®. The mean score for the 'language of text message is very clear and understandable' was 4.12 which signified that most of farmers strongly agreed with it followed by followed by 'voice message delivered by mKRISHI® is clear' 3.98. The coefficient of variation for 'technical term used in text message is easy to understand' was high (27.20%) which signified that it was highly inconsistent among the farmers. But the other parameters were consistent because of low coefficient of variation.

Categorization of farmers based on ease of understanding of the information provided by mKRISHI®

Table 15 showed that 83.33 per cent farmers had easily understood the information provided by mKRISHI® whereas 15 per cent farmers had moderately understood the information provided by mKRISHI®.

Table 15: Distribution of farmers based on ease of understanding of the information

n=60

Category of Satisfaction	Class Score	*f*	%
Moderately understood	13-17	9	15
Easily understood	17-21	50	83.33
Very easily understood	21-25	1	1.66
Mean		19.78	
Standard Deviation		2.23	

Overall effectiveness of mKRISHI® Services:

Effectiveness of the services of mKRISHI® referred to its ability to meet the farmer needs in providing the new technology which suits to their conditions and results in better production. It were operationalized in term of five components, i.e. a) timeliness of information, b) quality of information, c) utility of information, d) satisfaction of farmers and e) ease of understanding.

The overall effectiveness of mKRISHI® was obtained by developing the effectiveness index based on the above all five components. The obtained scores were divided into five equal groups ranging from very low effectiveness to very highly effectiveness of the mKRISHI® services. Table 16 revealed that 46.66 per cent of the total farmers perceived that the mKRISHI® was highly effective as a means of getting information followed by 21.66 per cent farmers who perceived it very highly effective in obtaining the information regarding their farming needs.

The services of mKRISHI® can be considered as highly effective for information dissemination for improving the farming situation. It is in accordance with the findings of Afroz and Singh (2013), who reported that effectiveness of information dissemination of Digital Green. Similar findings were also reported by Hanumankar (2005) who concluded that *Kisan Call Centre* is highly effective in addressing information need of farmers. It is in contrast with the findings of Meera (2002) who reported effectiveness of the services of *Gyandoot* is medium in effectiveness by majority of the farmers.

Table 16: Distribution of farmers based on effectiveness index scores

n=60

Category of Effectiveness	Class Score	*f*	%
Very Low	63.06-66.62	2	3.33
Low	66.62-70.16	5	8.33
Medium	70.16-73.72	12	20
High	73.72-77.27	28	46.66
Very High	77.27-80.82	13	21.66
Mean		73.97	
Standard Deviation		3.47	

Comparison of mKRISHI® services in Maharashtra and Tamil Nadu

To assess the effectiveness of mKRISHI® services in Maharashtra and Tamil Nadu independent two-sample test was done. The calculated *t*-value (3.89) was greater than the tabulated *t*-value (1.645) at 0.05 per cent level of significance. So it can be inferred that mKRISHI® services are more effective in Maharashtra compared to Tamil Nadu.

Table 17: Group Statistics of independent two sample *t* test

Group	N	Mean	Std. Deviation
Maharashtra	30	75.5814	2.79314
Tamil Nadu	30	72.3734	3.53606
Total	60		

Table 18: Computed value of independent two-sample *t* test

Category	Value
Calculated *t* value	3.89
Degree of freedom	58
Sig. (2-tailed)	.001

* *t*-value 1.645(58,.005)

CONCLUSION

The mKRISHI® has been playing a vital role in availing different information and services need of the farmers. They provide timely information which help in solving many problem of farmers. The KRISHI® is quite efficient in delivering advisory service, weather service, market support and diagnostic services. Due to intervention of mKRISHI® in both the districts of Maharashtra and Tamil Nadu has changed the scenario of farming by providing appropriate technology, market, input and information support which resulted in increase in yields and income of the farmers to a great extent. This led to high, level of farmer's satisfaction. The effectiveness of mKRISHI® can be further increased by making partnership with govt. and other local agencies.

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REFERENCES

Afroz and Singh, 2013. Effectiveness of participatory video in dissemination of farm technology: A case of Digital Green. M.Sc. Thesis, Division of Agricultural Extension, IARI, New Delhi-12.

Chapman, R., and Slaymaker,T. 2002 ICTs and Rural Development: Review of the Literature, Current Interventions, and Opportunities for Action.ODI Working Paper 192. London: Overseas Development Institute.

Hanumankar 2005 Effectiveness of Kisan Call Centre for Agricultural Information Delivery Edited Book By Sarvanan C and Indira Devi T, New India Publishing Agency, New Delhi.P143-150.

Huyer and Mitter 2003 "ICTs, Globalisation and Poverty Reduction: Gender Dimensions of the Knowledge Society",2003Available at http://www.idrc.ca/uploads/userS/10859366311partI_ICT_MitterHuyer.

Meera, S.N., Jhamtani, A. and Rao, D.U.M. 2004 Information and Communication Technology in Agricultural Development: A comparative analysis of three projects from India. AgREN Network Paper No.135, ODI, January 2004.20p. Available at: www.odi.org.uk/agren/papers/agrenpaper_135.pdf

Ministry of Agriculture, India 2000 *Policy framework for agricultural extension*. New Delhi: Ministry of Agriculture, Department of Agriculture and Cooperation, Extension Division. http://agricoop.nic.in/policy_framework.html

Mittal,S. 2012.Modern ICT for Agricultural Development and Risk Management in Smallholder Agriculture in India. CIMMYT. SocioEconomics Working Paper 3Mexico, D.F.: CIMMYT. http://ageconsearch.umn.edu/handle

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Perception of Farmers and Kisan Call Centre Professionals towards Kisan Call Centre services in Agriculture: A Case of Guntur District, Andhra Pradesh, India

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ABSTRACT

Kisan Call Centre (KCC) is one of the most successful and innovative efforts in utilising Mobile based ICT's in rural areas. After its nationwide launch by Department of Agriculture and Cooperation, Ministry of Agriculture, G.O.I in the year 2004, it has effectively reduced the gap between farmer and farm information by narrowing the mobility constraints of technical staff of various agricultural organisations. The present study has been done to assess the impact and effectiveness of KCC services and to identify the problems of farmers regarding services of KCC. This study has also analyzed the existing perceptions of farmers and agricultural graduates working at level I in KCC about KCC services. Level of knowledge gained by farmers on package of practices has been analyzed to show the effectiveness of KCC services.

Keywords: KCC, ICT's and knowledge gain

INTRODUCTION

Indian agriculture is dominated by small and marginal farmers whose educational background is weak. Majority of Indian farmers are often unable to access information that could increase yields and lead to better prices for their crops. The government of India has set up a huge research and development infrastructure in the form of institutions such as the Indian Council of Agricultural Research (ICAR), State Agricultural Universities (SAUs) and *Krishi Vigyan Kendras* (KVKs). The biggest challenge these institutions are facing is of mobility of technical staff for transfer of technological information at village level. Adhiguru *et al.* (2009) concluded that the information requirement of farmers now is demand driven which is different from supply led approach of green revolution. These problems of mobility and demand driven can be narrowed down by efficient use of Information and Communication Technologies (ICT) for providing accurate, timely, relevant information and services to farmers. Farmers in rural areas have to deal with failed crops and animal illness frequently and due to limited communication facilities, solutions to their problems remain out of reach. Keniston (2002); Dossani *et al.* (2005) and Saravanan (2010) found that in agriculture, despite the rapid spread and potential of ICTs to facilitate farmers' access to information, many of the initiatives face common challenges, such as issues of sustainability, affordability, ease of use, accessibility, scalability, and availability of relevant and localized content in an appropriate language. Hudson (1995) concluded that telecommunication, as a means of sharing information, is not simply a connection between people, but a link in the chain of the development process itself. Meera *et al.* (2004) found that the ICTs in extension can lead to the emergence of knowledge workers that will result in the realisation of a bottom-up, demand driven paradigm for technology generation, assessment, refinement and transfer. According to department of Telecommunication, New Delhi, at the beginning of 2011, there were 282.29 million rural connections (most of which are wireless) as compared to mere 4.84 million (only landline) phones in the year 2000.

One of the most successful and innovative efforts in utilising Mobile based ICT's in rural areas is Kisan Call Centre. Department of Agriculture and Cooperation launched Kisan Call Centre scheme nationwide in the year 2004 with an objective to deliver knowledge and information exactly as per the requirements of the farming community at free of cost. This system also keeps a record of what is being delivered to the farmers in terms of knowledge and information. The Call Centres can be accessed by farmers all over the country on common Toll Free Number 18001801551 from 6 A.M. to 10 P.M. except on Sundays and gazetted holidays, and beyond these hours the calls are attended in the IVRS mode. This scheme has an in-built system of monitoring and continuous evaluation for modifications and improvements. Figure 1 shows the working of a Kisan Call Centres at its three levels.

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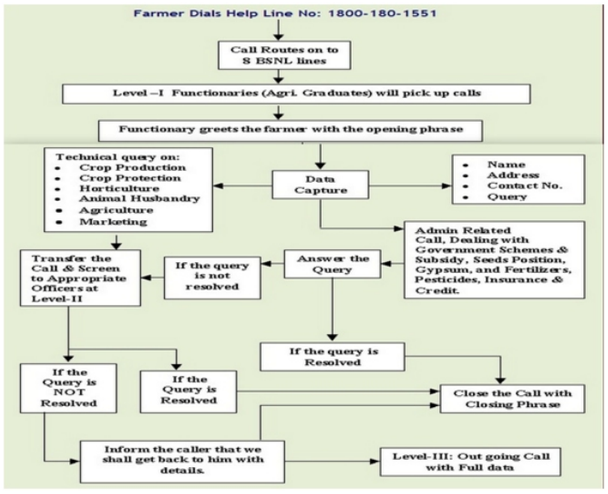

Fig.1 Working of Kisan Call Centre at its three levels (Source: http://www.manage.gov.in/kcc/schematic.htm)

Area of Study: On the basis of high frequency of calls at Kisan Call Centre from farmers of Guntur district, the present study was done at Guntur District of Andhra Pradesh. hundred farmers were selected who had made calls in KCC at least once (25 each from 4 villages of Guntur district). Table 1 summarises details of villages from which farmers were selected.

Table 1: Details of villages from which farmers were selected

District	Name of Village	Name of the Mandal	Numberof framers selected	Crops Grown
Guntur	Nallpadu	Guntur	25	Paddy, tobacco,
	Karlapudi	Amaravathi	25	cotton and
	Dondapadu	Tullar	25	chillies
	Gudivada	Tenali	25	

Objectives of the study: The present study was done to fulfil the following objectives:

1. To compare and contrast the level of attitudes of farmers and Graduates (working at first level in Kisan Call Centres) on Kisan Call Centre services in Agriculture.

2. To study the opinion of farmers on the impact of Kisan Call Centre services in Agriculture.

3. To study the level of knowledge gain of farmers after adopting the Kisan Call Centre services and to find out relationship between level of knowledge gain due to KCC services and selected independent variables

4. To study opinion of farmers on problems associated with Kisan Call Centre services

METHODOLOGY

Using an interview schedule, the primary data was collected. To compare and contrast the level of attitudes of farmers and Graduates (working at first level in Kisan Call Centres) on Kisan Call Centre services in Agriculture, Likert's five-point scale was used.

To study the opinion of farmers on the impact of Kisan Call Centre services in Agriculture and to study the level of knowledge gain of farmers after adopting the Kisan Call Centre services, before and after experiment research design was adopted for the study of parameters, which are improvement in productivity, improvement in production, improvement in farm wealth, improvement in pesticide and fertilizer application, improvement in Agriculture produce marketing and knowledge gain of farmers in package of practices. Knowledge index was calculated for farmers using following formula

$$\text{Knowledge index} = \frac{\text{Score obtained by individual respondents}}{\text{Maximum obtainable score}} \times 100$$

To study the opinion of farmers on problems associated with Kisan call centre services, ranking system was adopted by researchers. In order to collect the primary data, the survey was conducted from May 2014 to August 2014 with the help of pre-designed interview schedule.

RESULTS AND DISCUSSION

Level of attitudes of farmers and Graduates (working at first level in Kisan Call Centres) on Kisan Call Centre services in Agriculture

In order to analyze the perceptions of the selected farmers and KCC graduates (level I), they were asked to respond to 10 different statement on Kisan Call Centre services using Likert's Five-Point Scale : Highly satisfied (5) Satisfied (4) Neither Satisfied Nor Dissatisfied (3) Dissatisfied (2) and Highly Dissatisfied (1).

On the basis of the perception score, mean and rank have been calculated for each statement for the purpose of analysis. Table 2 shows the perception of graduates working at level I in KCC about the services of KCC and Table 3 shows perception of selected farmers about the services of KCC.

Table 2: Perception of Agricultural Graduates (level I) on services of KCC

n= 20

Statement	No. of graduates(level I)					Total Score	Mean Score	Rank
	HA	A	NAD	DA	HDA			
KCC is a cheap source of information to the farmers	75	20	0	0	0	95	4.75	3
KCC number is easily accessible	65	16	0	6	0	81	4.05	6
KCC has made farmers knowledgeable	60	20	0	6	0	86	4.30	4
KCC fulfils the various informational needs of the farmers	90	8	0	0	0	98	4.90	1
KCC is efficient system of solving farmer's problem	85	12	0	0	0	97	4.85	2
KCC has changed the concept of traditional method of agriculture	50	16	0	12	0	78	3.90	7
KCC has improved wealth of farmers	40	28	0	10	0	78	3.90	7
KCC has improved the innovativeness of the farmers	35	32	0	10	0	77	3.85	8
KCC has created employment opportunities	50	24	0	8	0	82	4.10	5
Farmers implements the recommendations of KCC	60	20	0	6	0	86	4.30	4

Table 3: Perception of selected farmers on services of KCC

n=100

Statement	No. of farmers					Total Score	Mean Score	Rank
	HA	A	NAD	DA	HDA			
KCC is a cheap source of information to the farmers	300	120	0	16	2	438	4.38	2
KCC number is easily accessible	150	128	24	34	17	353	3.53	6
KCC has made farmers knowledgeable	205	84	24	36	12	361	3.61	5
KCC fulfils the various informational needs of the farmers	275	116	18	20	0	429	4.29	3
KCC is efficient system of solving farmer's problem	245	84	57	10	6	402	4.02	4
KCC has changed the concept of traditional method of agriculture	75	140	36	16	30	297	2.97	8
KCC has improved wealth of farmers	125	96	60	22	11	314	3.14	7
KCC has improved the innovativeness of the farmers	130	96	120	10	5	361	3.61	5
KCC has created employment opportunities	75	40	60	80	10	265	2.65	9
Farmers implements the recommendations of KCC	325	100	0	16	2	443	4.43	1

It is evident from Table 2 that all Agricultural graduates (level I) have shown 100 per cent positive attitude (highly agreed and agreed) on the statements 'KCC is a cheap source of information to the farmers', 'KCC fulfils the various informational needs of the farmers' and 'KCC is efficient system of solving farmer's problem'. Among all Agricultural graduates (level I) 85 per cent (highly agreed and agreed) has shown positive attitude and 15 per cent negative attitude (disagreed) for the statements 'KCC number is easily accessible by farmers' and 'KCC has made farmers knowledgeable'. For the statement 'KCC has changed the concept of traditional method of agriculture', agricultural graduates (level I) has shown 70 per cent positive attitude and 30 per cent negative attitude, while for statement 'KCC has created employment opportunities' agricultural graduates has shown 80 per cent positive and 20 per cent negative attitude. Overall agricultural graduates (level I) has shown a high positive attitude towards the services of KCC with ranking the statement 'KCC fulfils the various informational needs of the farmers' as first. It is evident from table 3 that the positive and negative attitude level of selected farmers for the statements 'KCC is a cheap source of information to the farmers', 'KCC number is easily accessible by farmers', 'KCC has made farmers knowledgeable', 'KCC fulfils the various informational needs of the farmers', 'KCC is efficient system of solving farmer's problem', 'KCC has changed the concept of traditional method of agriculture', 'KCC has improved wealth of farmers', 'KCC has improved the innovativeness of the farmers', 'KCC has created employment opportunities', 'Farmers implements the recommendations of KCC' is 90 per cent, 62 per cent, 62 per cent, 84 per cent, 70 per cent, 50 per cent, 49 per cent, 50 per cent, 25 per cent, 90 per cent and 10 per cent, 38 per cent, 38 per cent, 16 per cent, 30 per cent, 50 per cent, 51per cent, 50 per cent, 75 per cent, 10 per cent respectively. Overall selected farmers have shown positive attitude (>50%) towards all statements except 'KCC has changed the concept of traditional method of agriculture', 'KCC has improved wealth of farmers', 'KCC has improved the innovativeness of the farmers' and 'KCC has created employment opportunities'. From table 2 and table 3 it can be concluded that famers and agricultural graduates (level I) perception for the services of KCC is matching for the statements 'KCC is a cheap source of information to the farmers', 'KCC number is easily accessible by farmers', 'KCC has made farmers knowledgeable', 'KCC has changed the concept of traditional method of agriculture', and 'KCC has improved wealth of farmers'. There is a contrast between the perception of famers and agricultural graduates (level I) for the services of KCC on the statements 'KCC fulfils the various informational needs of the farmers', 'KCC is efficient system of solving farmer's problem', 'KCC has improved the innovativeness of the farmers', 'KCC has created employment opportunities', 'Farmers implements the recommendations of KCC'.

Opinion of farmers on improvement in productivity before and after adopting KCC services

Table 4: Distribution of the selected farmers based on their opinion about improvement in productivity before and after adopting KCC services

Before adopting KCC Services	After adopting KCC Services (Number of farmers)		Total
	Improvement in Productivity	No Improvement in Productivity	
Improvement in Productivity	0	12	12 (12.00%)
No Improvement in Productivity	67	21	88 (88.00%)
Total	67 (67.00%)	33 (33.00%)	100

Table 4 shows that 67.00 per cent of selected farmers are of the perception that after adopting KCC services, there is improvement in their agricultural productivity. 21.00 per cent of farmers stated that, there was no improvement in agricultural productivity after adopting KCC services, rather 12.00 per cent of selected farmers are of the opinion that their productivity has declined after adopting KCC services.

Opinion of farmers on improvement in production before and after adopting KCC services

Table 5: Distribution of the selected farmers based on their opinion about improvement in production before and after adopting KCC services

Before adopting KCC Services	After adopting KCC Services (Number of farmers)		Total
	Improvement in Production	No Improvement in Production	
Improvement in Production	0	6	06 (06.00%)
No Improvement in Production	74	20	94 (88.00%)
Total	74 (74.00%)	26 (26.00%)	100

Table 5 shows that 74.00 per cent of selected farmers are of the perception that after adopting KCC services, there is improvement in their agricultural production. Twenty per cent of farmers stated that, there was no improvement in agricultural production after adopting KCC services, rather 06.00 per cent of selected farmers are of the opinion that their production has been declined after adopting KCC services.

Opinion of farmers on improvement in farm income before and after adopting KCC services

Table 6: Distribution of the selected farmers based on their opinion about improvement in Farm income before and after adopting KCC services

Before adopting KCC Services	After adopting KCC Services (Number of farmers)		Total
	Improvement in Farmincome	No Improvement in Farmincome	
Improvement in Farm income	0	12	12 (12.00%)
No Improvement in Farm income	47	41	88 (88.00%)
Total	47 (47.00%)	53 (53.00%)	100

Table 6 shows that 47.00 per cent of selected farmers are of the perception that after adopting KCC services, there is improvement in their farm income, which is quite less than the numbers of farmers who stated that KCC services has improved production and productivity (table 4 and table 5). 41.00 per cent of farmers stated that, there is no improvement in farm income after adopting KCC services, rather 12.00 per cent of selected farmers are of the opinion that their farm income has been declined after adopting KCC services.

Opinion of farmers on improvement in pesticide and fertilizer application outcome before and after adopting KCC services

Table 7: Distribution of the selected farmers based on their opinion about improvement in pesticide & fertilizer application outcome before and after adopting KCC services

Before adopting KCC Services	After adopting KCC Services (Number of farmers)		Total
	Improvement in pesticide & fertilizer application outcome	No Improvement in pesticide & fertilizer application outcome	
Improvement in pesticide & fertilizer application outcome	0	4	4 (04.00%)
No Improvement in pesticide & fertilizer application outcome	89	7	96 (96.00%)
Total	89 (89.00%)	11 (11.00%)	100

Table 7 shows that 89.00 per cent of selected farmers are of the perception that after adopting KCC services, there is improvement in their pesticide and fertilizer application outcome, which is quite high than the numbers of farmers who stated that KCC services has improved production, productivity and farm income (table 4, table 5 and table 6). Only 07.00 per cent of farmers stated that, there is no improvement in pesticide and fertilizer application outcome after adopting KCC services, while 04.00 per cent of selected farmers are of the opinion that their pesticide and fertilizer application outcome has been declined after adopting KCC services.

Opinion of farmers on improvement in agricultural produce marketing outcome before and after adopting KCC services

Table 8: Distribution of the selected farmers based on their opinion about improvement in agricultural produce marketing before and after adopting KCC services

Before adopting KCC Services	After adopting KCC Services (Number of farmers)		Total
	Improvement in agricultural produce marketing	No Improvement in agricultural produce marketing	
Improvement in agricultural produce marketing	0	3	3 (03.00%)
No Improvement in agricultural produce marketing	56	41	97 (87.00%)
Total	56 (56.00%)	44 (44.00%)	100

Table 8 shows that 56.00 per cent of selected farmers are of the perception that after adopting KCC services, there is improvement in agricultural produce marketing, 41.00 per cent of farmers stated that, there is no improvement in pesticide and fertilizer application outcome after adopting KCC services which is quite high than the numbers of farmers who stated that KCC services has not improved production, productivity and pesticide & fertilizer application outcome (table 4, table 5 and table 7), while 03.00 per cent of selected farmers are of the

opinion that agricultural produce marketing has declined after adopting KCC services.

Knowledge gain of farmers in package of practices

Knowledge of the farmers regarding timely best crop practices was measured by using structured schedule containing 30 questions divided in 6 categories.

The farmers were asked to fill the questionnaire for his knowledge before and after adopting kisan call centre services. An individual knowledge index was calculated by the following formula for both before and after situations.

Table 9: Distribution of farmers on the basis of knowledge regarding the whole cultivation practices before and after the adoption of kisan call centre

n=100

Category	High		Medium		Low	
	Before	After	Before	After	Before	After
Land Preparation	26	38	42	45	32	17
Seed & Sowing	29	42	37	46	34	12
Fertilizer Mgt	27	57	31	36	42	7
Irrigation Mgt	32	47	39	41	29	12
Plant Protection	19	43	27	35	54	22
Harvesting, threshing & Marketing	23	31	47	45	30	24

Table 9 reveals that among selected farmers there is increase of 12 per cent, 13 per cent, 30 per cent, 15 per cent, 24 per cent and 8 per cent under high category in land preparation, seed and sowing, fertilizer management, irrigation management, plant protection measures and harvesting, threshing marketing, respectively.

It is evident from table 9 that KCC services are most effective in delivering information regarding fertilizer management and plant protection, where there is 30 per cent and 24 per cent increase in high category respectively and decrease of 35 per cent and 32 per cent in low category, respectively.

Medium and low category has shown a decrease because farmers have moved to high category which shows the significance of KCC services.

Overall services of KCC have pushed the knowledge level of farmers upward regarding proper package of practices. Table 10 shows the relationship between the level of knowledge gain due to KCC services and selected independent variables.

Table 10: Relationship between level of knowledge gain due to KCC sevices and selected independent variables

Independent variables	Package of practices					
	LP	SS	FM	IM	PPM	HM
Age	0.122^{NS}	0.120^{NS}	0.121^{NS}	0.129^{NS}	0.117^{NS}	0.142^{NS}
Education	0.224^{**}	0.267^{**}	0.210^{**}	0.212^{**}	0.266^{**}	0.221^{**}
Extension agency contact	0.227^{**}	0.246^{**}	0.222^{**}	0.288^{**}	0.229^{**}	0.231^{**}
Mass media exposure	0.122^{NS}	0.171^{NS}	0.152^{NS}	0.114^{NS}	0.122^{NS}	0.128^{NS}
Innovativeness	0.233^{**}	0.232^{**}	0.213^{**}	0.217^{**}	0.230^{**}	0.239^{**}

*Significant at 5% level, **Significant at 1% level, NS-Non-significant

The selected socio-personal characteristics of farmers namely, age and mass media exposure were found non-significant with level of knowledge gain of farmers in land preparation, seed and sowing, fertilizer management, irrigation management, plant protection measures and harvesting and marketing due KCC services. While selected socio-personal characteristics namely education, extension agency contact and innovativeness of farmers was found significant at the one percent level based on t-test with level knowledge gain of farmers in land preparation, seed and sowing, fertilizer management, irrigation management, plant protection measures and harvesting and marketing due KCC services.

Opinion of farmers on problems associated with Kisan Call Centre services

Table 11: Opinion of selected farmers on problems associated with Kisan Call Centre services

n=100

Problems	Ranks given by farmers (n=100)						Total Score	Mean Score	Final Rank
	1	2	3	4	5	6			
KCC number needs repeated dialling	16	11	5	21	17	30	298	2.98	6
Recommendations given by KCC are not new and farmers know them already	27	8	13	17	4	31	344	3.44	4
Recommended chemical/variety/ instrument is not available to farmers practically	45	21	5	15	6	8	460	4.60	1
There is lack of awareness regarding KCC among farmers	29	27	9	8	7	20	407	4.07	2
Farmers are not receiving solutions from level II and III, if level I is unable to solve the query	11	13	17	31	9	19	329	3.29	5
Mobile services on agro advisory offered by other organisations (KVK, NGO, private) are more effective than KCC	14	12	33	21	9	11	368	3.68	3

Table 11 shows that majority of farmers have opined that 'Recommended chemical/variety/ instrument is not available to farmers practically' is the major problem related with KCC services and thus farmers put this problem in first place (rank 1) followed by the problem

'There is lack of awareness regarding KCC among farmers'(rank 2). The third ranked problem is 'Mobile services on agro advisory offered by other organisations (KVK, NGO, private) are more effective than KCC', however the problems 'Recommendations given by KCC are not new and farmers know them already', 'Farmers are not receiving solutions from level II and III, if level I is unable to solve the query' and 'KCC number needs repeated dialling' were ranked fourth, fifth and sixth respectively. It is evident from the table 11 that, the problem 'Recommended chemical/variety/ instrument is not available to farmers practically', was ranked first by 45 farmers which indicate that it is the major problem faced by farmers using KCC services and recommended chemicals/ variety/instrument is not available to farmers practically in agricultural shops or agricultural universities. Table 11 shows that the problem 'There is lack of awareness regarding KCC among farmers' was ranked first by 29 farmers which shows that it is one of the basic problems regarding KCC. Also the problem 'Recommendations given by KCC are not new and farmers know them already' was ranked first by 27 farmers which shows the prevalence of this problem regarding KCC. The problem 'KCC number needs repeated dialling' was ranked sixth by highest number of farmers (30) and also rated sixth overall, which indicates that this problem is not perceived as a major problem by farmers in comparison to other problems.

CONCLUSION

The present study has been done to assess the impact and effectiveness of KCC services and to identify the problems of farmers regarding services of KCC. This study has also analyzed the existing perceptions of farmers and agricultural graduates working at level I in KCC. The study has shown that overall agricultural graduates (level I) have shown a high positive attitude towards the services of KCC with ranking the statement 'KCC fulfils the various informational needs of the farmers' as first, while farmers have shown high positive attitude towards the implementation of recommendations of KCC with ranking the statement 'Farmers implements the recommendations of KCC' as first. The study reveals that 67 per cent, 74 per cent, 89 per cent, 47 per cent and 56 per cent of farmers has opined that there is improvement in productivity, production, fertilizer and pesticide application outcome, farm income and agricultural produce marketing after adopting KCC services respectively. KCC services have been found most effective in 'fertilizer and pesticide application outcome'. The study has reflected that there is knowledge gain by farmers after adopting KCC services as there is increase of 12 per cent, 13 per cent, 30 per cent, 15 per cent, 24 per cent and 8 per cent under high category in land preparation, seed and sowing, fertilizer management, irrigation management, plant protection measures and harvesting, threshing marketing respectively. Also selected socio-personal characteristics namely education, extension agency contact and innovativeness of farmers were found significant with level knowledge gain of farmers in land preparation, seed and sowing, fertilizer management, irrigation management, plant protection measures and harvesting and marketing due to KCC services. The study has also evaluated that 'Recommended chemical/variety/ instrument is not available to farmers practically' is the major problem related with KCC services and thus farmers put this problem in first place (rank 1) followed by the problem 'There is lack of awareness regarding KCC among farmers'(rank 2). The third ranked problem is 'Mobile services on agro advisory offered by other organisations (KVK, NGO, private) are more effective than KCC'. Overall it can be concluded that KCC is playing a vital role in agricultural knowledge transfer to farmers and its efficiency can be increased further by matching the recommendations of KCC with their availability to farmers.

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REFERENCES

Adhiguru, P., P. S. Birthal, and B. Ganesh Kumar. 2009, Strengthening Pluralistic Agricultural Information Delivery Systems in India. *Agricultural Economics Research Review* 22: pp.71-79, 2009.

Dossani, R., D. C. Misra, and R. Jhaveri. 2005, *Enabling ICT for Rural India*. Stanford, CA: Asia Pacific Research Center, National Informatics Center, 2005

Hudson, H. E. 1995, "Economic and social benefits of rural telecommunications": A report to the World Bank. Washington DC, USA, 1995

Keniston, K. 2002, "Grassroots ICT Projects in India: Some Preliminary Hypotheses". *ASCI Journal of Management,* 31 (1&2).

Meera, Shaik N., A. Jhamtani, and D.U.M. Rao, 2004, Information and communication technology in agricultural development: a comparative analysis of three projects from India. AgREN Network Paper No.135, pp20, 2004

Saravanan, R. 2010, *ICTs for Agricultural Extension. Global Experiments, Innovations and Experiences*, edited by R. Saravanan. New Delhi: New India Publishing Agency, 2010

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Co-management of Reservoir Fisheries for Sustainable Livelihoods: Insights for Fishery Managers and Extension Professionals from Field Studies in India

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ABSTRACT

Reservoirs hold tremendous potential for inland fisheries development and offer ample scope for fish yield optimization through adoption of appropriate management measures. H owever, there are several socio-economic issues involved in their management as communities displaced due to creation of these reservoirs depend upon them for earning livelihoods.Reservoirs hold tremendous potential for inland fisheries development and offer ample scope for fish yield optimization through adoption of appropriate management measures. Governance and management pattern of these reservoirs varies in different states of India and faces several challenges including the twin pressures, to increase the production and productivity, and ensure sustainable livelihoods for communities dependent upon these resources. The present paper while discussing these issues elaborates upon the co-management approach to address them. Citing synthesized overall summary of the major findings of the field studies done in Northern, Central and Eastern India, the paper elaborates upon the performance of fishing cooperative societies in co-management and conservation of reservoir fishery resources and roles played by various stakeholders and their linkages in this endeavor. The paper is based on review of literature, secondary data from various records, and primary data gathered and detail interactions had with several stakeholders during field studies in four states of India namely, Madhya Pradesh, Himachal Pradesh, Uttar Pradesh and Orissa covering 57 fishing cooperative societies and 875 respondents. The findings indicated that local communities and their organizations (fishing cooperative societies/federations) can play important role in collective management of reservoir fisheries under the situations where some of the facilitating conditions for promoting collective action are present. The paper concludes that governance and management of reservoir fisheries need to be viewed in light of the recent developments and empirical evidences made available by the social scientists in natural resource management. There is tremendous scope for innovation in their governance. Lessons drawn from successes achieved in various forms of co-management fisheries resources, such as reported here and elsewhere across the globe, need to be incorporated in devising policies and programmes for management of reservoir fisheries. The field of fisheries management and conservation presents enormous possibilities for the extension professionals to broaden their canvas and contribute policy oriented studies to help the fisheries managers and policy makers in further improving the sector.

Keywords: Reservoir fisheries, co-management, fishing cooperative societies, sustainable livelihoods

INTRODUCTION

Institutional arrangements play a significant role in determining the efficiency and effectiveness of policy or technological interventions. Therefore, institutional arrangements in natural resource management have been a major focal area of studies for social scientists across the globe in last two decades. The institutional arrangements mean the set of rights and rules by which a group of resource users and government organises governance, management and use of resources in collective action situations. If we scan global literature on management of natural resources across different geographies, socio-economic conditions and ecosystems diversity, we find that a variety of approaches and combinations have been tried at various places for improving the management of various natural resources like forests, mangroves, coral reefs, wetlands, fisheries, etc. There have been increasing efforts towards conceptualization, experimentation, analysis and evaluation of different forms of resource management approaches with varying degrees of stakeholders' participation in decision making. In general, user groups and local organizations are now increasingly considered as a valuable asset in improving the natural resource management and their sustainable use for posterity. Several studies have shown that when people are well connected in groups and networks, organizations, and when their knowledge is sought, incorporated and built upon during planning and implementation of conservation and development activities, then they are more likely to sustain stewardship and protection over the long term (Cernea, 1991; Pretty 1995; Singh and Ballabh, 1997; Krishna, 2002; Uphoff, 2002; McNeely and Scherr, 2003).

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Challenges in Management of Fisheries Resources for Sustainable Utilization

Fisheries resources are under strong and increasing pressure due to several natural and anthropogenic stresses. The depletion of natural resources has become a universal phenomenon, irrespective of the region or the type of resource. However, the impact on the aquatic resources has been very severe. Therefore, sustainable utilisation, conservation and development of fishery resources, particularly freshwater fishery resources, have become a priority concern. Fisheries are complex and interdependent ecological and social systems that require integrated management approaches. The actions of one person or group of users affect the availability of the resource for others. Managing such common pool requires conscious efforts by a broad range of stakeholders to organize and craft rules enabling equitable and sustainable use of the resources for everyone's benefit. Some of the key challenges that have emerged for fisheries managers in recent times are: 1. Increasing the production and productivity of fisheries resources, 2. Ensuring sustainable and equitable livelihoods for communities dependent upon fisheries resources, 3. Lack of awareness among users about legislations and rules for sustainable management of fisheries resources, 4. Need of a resource enhancement and resource use monitoring system for sustainable utilization on long-term basis, and 5. Great demand on the limited man-power of the state fisheries agencies

Co-management in Fisheries: The Approach and its Advantages

A realization that centralised fisheries management approaches have proven inadequate to deal with the above issues, has led to the growing attention towards a broader approach that recognizes fishers' participation, local stewardship and shared decision-making in the management of fisheries globally. This approach is known as co-management of fisheries. The co-management concept has gained increasing acceptance among governments, development agencies and researchers as an important aspect of future fisheries management systems. 'Co-management' in fisheries is basically meant to denote the sharing of management responsibility for fisheries by resource users and governments. Co-management has been broadly defined as a partnership arrangement in which the community of local resource users (fishers), government, other stakeholders (boat owners, fish traders, boat builders, business people, etc.) and external agents (non-government organizations, academic and research institutions) share the responsibility and authority for the management of the fishery. The basic concern in co-management is with reshaping state interventions so as to institutionalize collaboration between administration and resource users (Baland and Platteau 1996).

Co-management, has several advantages: a more autonomous, democratic, participatory, accountable and transparent resource management system; more economical then centralized management system, taking of responsibility by fishers for various managerial functions by involvement in management; a sense of ownership over the resource by the fishers improves stewardship of fisheries resources, provides a powerful incentive for fishers to view the resource as a long-term; more localized solutions to local problems in resource use, various interests and stakeholders are brought together to provide a more comprehensive understanding of the resource; higher degree of acceptability, legitimacy and compliance to plans and regulations can be expected, because the community is involved in the formulation and implementation and community members can enforce standards of behavior more effectively than outside officials.

Policy makers need empirical inputs on issues related to the institutional aspects of management of fishery resources, including roles of different stakeholders, so as to formulate policies for optimising their conservation and development. Therefore, several scholars have contributed in reorienting the fisheries governance paradigm over the past two decades (Berkes 1989, 2003; Jentoft 1989; Lawry 1989; Pinkerton 1989; Ostrom 1990; Oakerson 1992; Pomeroy and Williams 1994; Bavinck 1996; Pomeroy and Berks 1997; Jentoft et.al. 1998; Jentoft and McCay 1995; Sen and Nielsen 1996; Nielsen and Vedsmand 1999; Karlsen 2001; Pomeroy 2001; Pomeroy et.al. 2001; Almeida et.al. 2002; Allison and Badjeck 2004; Nielsen et.al. 2004; Jentoft 2004; Pomeroy and Rivera-Guieb 2005; Makino and Matsuda 2005; Bene and Neiland, 2006; Thomson 2006, 2008; Jyotishi and Parthasarathy 2007; Kearney et.al. 2007; Bavinck and Salagrama 2008; Pinkerton and John 2008; Townsend et.al. 2008; Thomson and Gray 2009; Gutiérrez et.al. 2011; Jyotishi 2011; Bavinck et.al. 2012). The policy consensus in favour of fisheries decentralization in the form of co-management or community-based management has now been recognized and accepted not only in large number of developed countries (Denmark, Netherlands, Canada), but also in an increasingly large number of developing countries (Uganda, Mali, Malawi, Mozambique, Senegal, Ghana, Philippines, Malaysia, Fiji Islands) (Sen and Nielsen 1996; Norman et.al. 1998; Sverdrup-Jensen and Nielsen 1998) [Modified and quoted from Bene and Neiland 2006].

Reservoir Fisheries in India: Management Issues for Sustainable Livelihoods

Since independence, harnessing nation's various rivers for power generation and irrigation has been the main focus of development activities in India. This has resulted in emergence of a number of river-valley projects with primary objectives of using river water for irrigation, power generation and other activities. One of the direct results of these projects is the creation of several man-made water bodies in different parts of the country. Such man-made reservoirs hold tremendous potential for inland fisheries development and offer ample scope for fish yield optimisation through adoption of appropriate management measures. There are, however, several socio-economic and governance issues involved in the management of these reservoirs.

A large number of villages were submerged and communities displaced due to creation of these reservoirs. This created huge challenges to the state agencies for settlement of these communities and provide livelihood to families uprooted due to the impoundment. Earlier majority of these families were engaged in agriculture, however, with their lands being submerged in the reservoir, they had no option but to depend upon these reservoirs for earning their livelihoods. Prior to the impoundment of the rivers a subsistence fishery existed in the rivers and streams and the average catches per fishermen per day were very low, but with the formation of reservoir, a lucrative fishery started attracting large number of fishermen and the dam displaced oustees who had no other viable means of livelihood. This, however, was not easy as it needed to inspire a large number of oustees of various communities, mainly agriculturists and tribals depending upon forest produce, to adopt fishing as a profession. Even the local fishermen who used to fish in shallow rivers and streams with primitive gears, prior to formation of these reservoirs, found them ineffective in the deeper waters of the reservoir.

Recognising the need for development of these reservoirs as potential fish producing centres for providing livelihood to dam displaced communities, thus, came as a by-product of these river-valley projects. Governance and management pattern of these reservoirs varies in different states of India and a variety of management arrangements can be seen ranging from auctioning to contractors, giving on lease to fishing cooperative organizations, giving licences for fishing to registered fishermen, etc. Various policies and rules have been framed and mechanisms for implementation put in place by different states with varying degree of success. The state agencies earn revenue from fishing activities in these reservoirs by way of royalty from lease, license fees, fines collected from defaulters/ or those violating rules.

Maintaining a high sustained yield is, however, the backbone of the reservoir fisheries management which requires continuous efforts for sustainable utilization and resource enhancement. Thus, the state agencies are facing twin challenges of increasing the production and productivity of these reservoirs, and ensuring sustainable and equitable livelihoods for communities dependent upon these resources. This needs a resource development monitoring and surveillance system of the reservoir and places a great demand on the limited man-power of the state agencies. There are other related functions like record keeping, assuring best price of the fish to the fishing communities dependent upon these resources, *etc*.

There are several roles to be played in management of fisheries resources in the reservoirs including production-oriented and regulatory functions, educational roles and organizational roles, and there are challenges on each front which the state agencies alone are not adequately equipped to meet all. It is here that the idea of co-management of reservoir fisheries by active involvement of stakeholders and their organizations who depend upon these resources for their livelihood comes into picture.

Field studies in Northern, Central and Eastern India

In this perspective, case studies were undertaken in selected reservoirs of four states of India namely, Himachal Pradesh (H.P.), Madhya Pradesh (M.P.), Uttar Pradesh (U.P.) and Orissa. Some aspects of these studies were published in details as individual papers during 2007-2014 (Tyagi et.al. 2007, 2008[1], 2008[2], 2009, 2011, 2013, 2014). However, in this paper, a synthesised overall summary of the major findings of these studies is presented, in view of the issues and challenges mentioned above, with a focus on drawing insights and implications for extension professionals and fisheries managers in the country. In these studies, the institutions of collective action participating in co-management of fisheries resources are represented by the fishing cooperative societies a village level primary institution of the rural people displaced due to construction of dam on rivers and their federations. In India, fishing cooperative societies have been viewed in a narrow perspective of production-oriented and/or political organizations limited to and interested in only furthering their economic/commercial interests. The possibility of these organizations becoming important partners in resource enhancement and effective and efficient co-management of resources, have not been adequately explored. Policy makers, however, need empirical inputs on issues related to the organisational

and institutional aspects of management of fishery resources, including roles of different stakeholders, so as to formulate policies for optimising their conservation and development. Therefore, these field studies were undertaken to study the performance of fishing cooperative societies in co-management and conservation of reservoir fishery resources.

METHODOLOGY

The studies were undertaken at two sites each in H.P (a. Gobind Sagar and b. Pong reservoirs); M.P. (a. Tawa and b. Bergi reservoirs), Orissa (a. Hirakud and b. Surada reservoirs) and U.P (a. Small lakes in Faizabad, Jhansi and Lalitpur districts and b. Matatila reservoir). The studies covered total 57 fishing cooperative societies and 875 respondents represented by members and office bearers of fishing cooperative societies (table 1). A variety of data sources were used.

The methodology included a combination of quantitative and qualitative approaches. Roles played by cooperative societies and their federations were documented through interview schedule qualitatively, where as quantitative indices were prepared to measure the orientation and performance of fishing cooperative societies and their members with respect to conservation and resource management.

Similarly, quantitative indices were also prepared to measure other independent variables including extension contact of respondents, their cosmopolitness, awareness & involvement in government schemes, perceived effectiveness of state fisheries agencies, NGOs and panchayats, internal functioning of cooperative societies and linkages with state agencies. The information collection for the study was enriched by in-depth informal interviews with key informants, office bearers, state fisheries department officials, NGOs. and observations of activities in the selected societies. Finally, a qualitative assessment was done to assess the impact of roles played by cooperative societies on resource management and generation of sustainable livelihoods.

Major findings

Major findings coming from these studies are summarized in tables 2-6. Based on the analysis of data about above variables, a qualitative analysis was done across the locations to assess the roles, awareness, linkages and potential of fishing cooperative societies in co-management of fishery resources.

Management patterns for fisheries resources at selected locations:

A brief mention about the prevalent management pattern for fisheries resources at the selected locations during the time of study is in order here, so as to understand the situation in proper perspective. In Tawa and Bergi reservoirs (M.P.), fisheries was managed by the federations of fishermen cooperative societies for 10 and 6 years, respectively (Tawa reservoir: 19962006 and Bergi reservoir: 1994-2000), which were given on lease to these organizations by the state governments after sustained collective mobilization and agitation by the people displaced by these reservoirs. This lease was discontinued from year 2007 (for Tawa reservoir) and 2001 (for Bergi reservoir) However, in case of Tawa reservoir, the responses about roles played by cooperative institutions in collective management refers to the period when the fisheries in the reservoir were managed by these institutions. A mention need to be made here that in Bergi reservoir, the respondent's opinion and experiences were sought for the two periods separately *i.e.* earlier period when the fishing cooperative societies and their federation were collectively managing the reservoir fisheries, and at the time of study when the reservoir was auctioned to contractor for fishing. The results had come out interesting.

In H.P., on the other hand, the state fisheries department acts as the major regulatory authority and cooperative societies work closely under the supervision and control of the state department in management and utilization of the reservoirs and lakes on lease to the fishing cooperative societies for fisheries management. In U.P., state fisheries department gives small reservoirs and lakes on lease to the fishing cooperative societies for fisheries management, whereas, large reservoirs are managed by the state fisheries development corporation by auctioning to contractors through open biding. In Odisha, both the reservoirs were given to the fishing cooperative societies (Hirakud - five societies and Surada - one society) on lease.

Table 1: Sample of the study

State	Location	No. of fishing cooperative societies studied	No. of respondents
HP	Gobind Sagar reservoir	11	110
	Pong reservoir	9	90
MP	Tawa reservoir	10	100
	Bergi reservoir	15	150
Odisha	Hirakud reservoir	2	200
	Surada reservoir	1	100
UP	Small reservoirs/ Lakes	9	90
	Matatila reservoir (Open auctioning to contractor)	No society functioning	35
	Total	57	875

Profile of fisherfolk members and other independent variables:

Majority of fisherfolk members were middle aged and had very low level of education (Table 2). Socio-economic status of fisherfolk members was medium in reservoirs studied in H.P. whereas; it was low at studied sites in M.P. and U.P. and Odisha. Similarly, respondents from H.P. sites had high level of contacts with extension agencies, their cosmopoliteness level and awareness & involvement in government schemes was high and they had high perceived effectiveness of state fisheries agencies. On the other hand, respondents from M.P. and U.P. sites and Hirakud reservoir of Odisha, scored from very low to medium on these aspects where as at Surada reservoir, respondents had medium level on these parameters. Perceived effectiveness of NGOs was low in H.P. and Odisha, whereas, it was high in M.P. In UP, involvement of NGO with fisherfolk at the studied sites was non-existent. Perceived effectiveness of panchayats (a village level democratic body) was medium at majority of the locations. Internal functioning of their own societies was perceived as high by the fisherfolk members at both the reservoirs of H.P., Tawa reservoir of M.P. and Surada reservoir of Odisha. At Bergi reservoir of M.P., members expressed that societies functioning was very effective during the period when they had lease of the reservoir and were managing the fisheries, however, now it is low. Discontinuation of their active involvement in management of the reservoir fisheries has led to the lack of interest and incentive among members to take part in functioning of the societies. On the other hand, in U.P, functioning of fishing cooperative societies was very low, even where they were existing. Interestingly, linkages with state agencies were perceived as high in H.P. and Surada reservoir, Odisha where as in M.P., U.P. and at Hirakud reservoir, Odisha, linkages were perceived to be low.

Table 2: Profile of fisherfolk members and other variables

Variables	Gobind Sagar, HP	Pong, HP	Tawa, MP	Bergi, MP	Hirakud, Odisha	Surada, Odisha	Small lakes UP	Matatila reservoir UP
Age	Majority Middle aged	Majority middle aged	Majority middle aged	Majority middle aged	Majority middle aged	Majority middle aged	Majority middle aged	Majority middle aged
Education	L	L	VL	L	L	L	VL	VL
Socio-economic status	M	M	L	L	L	L	L	L
Extension contact	H	H	L	L	L	M	L	VL
Cosmopoliteness	H	H	L	L	L	M	H	VL
Awareness & involvement in Govt. schemes	H	H	L	M	L	M	L	VL
Perceived effectiveness of state fisheries agencies	H	H	L	L	L	M	M	VL
Perceived effectiveness of NGOs	L	L	H	M	L	L	NONE	NONE
Perceived effectiveness of Panchayats	M	M	M	M	L	M	M	L
Internal functioning of societies	H	H	H	(Earlier) H (Now) L	L	H	L	No society
Linkages with state agencies	H	H	VL	(Earlier) L (Now) M	M	M	L	L

H = High;M = Medium;L = Low;VL = Very Low

Roles played by fishing cooperative societies in collective management of reservoir fisheries:

Roles played by fishing cooperative societies and their federations documented through interview schedule qualitatively are presented in table 3.

It is clear from the data that fishing cooperative societies in H.P. and M.P., and Surada reservoir of Odisha, besides playing routine production-marketing oriented and regulatory functions like coordinating and regulating the collection and marketing of fishery of their members, providing a structural base for state agencies to collect royalty form fish production, facilitating equitable sharing of benefits among their members, maintaining proper records, etc; also played a number of socio-organisational, educational roles and. resources enhancement roles.

These roles included: providing an organizational base at grass- root level for state fish agencies to implement resource enhancement measures, Facilitate equitable sharing of benefits among its members, Provide moral support to their members, Serve as a social & organizational force for making members to abide by conservation rules, Offer suggestions to state agencies and eager to innovate for improving resource, Undertake resource enhancement measures, taking innovative steps (like developing low cost fish seed rearing by society members) as local solutions in resource management.

In Hirakud reservoir, fishing cooperative societies were just the subject of facilitating implementation of state welfare schemes, and were not playing other important socio-organisational, educational roles and. resources enhancement roles.

In U.P., however, the situation was altogether different. The cooperative institutions were mostly dormant, controlled by influential people without much involvement of members. They were formed for taking advantage of government schemes.

The element of social & organizational force for members was not there in fishing cooperative societies of U.P. Therefore, they were not found playing active role even in production-oriented regulatory functions. Similarly, no educational and organizational roles in resource management were played by such institutions in U.P.

Table 3: Roles played by the cooperative institutions in co-management of resources

Type of role	Role played	Gobind Sagar, HP	Pong, HP	Tawa, MP	Bergi, MP (Earlier)	Hirakud, Odisha	Surada, Odisha	Small lakes, UP	Matatila UP
Production and marketing management	Devise mechanisms & procedure, and coordinate the fishing efforts of their members	√	√	√	√	x	√	x	
	Manage the marketing of fishes of the members	√	√	√	√	x	√	x	
	Maintain proper records	√	√	√	√	√	√	x	
Subject of state schemes	Provide an organizational base at grass - root level for state fish agencies to implement revenue collection	√	√	√	√	√	√	√	Societies were not functioning as the reservoir was given on lease to the contractor
	Facilitate implementation of state welfare schemes	√	√	√	√	√	√	√	
Socio - organisational and educational	Provide moral s upport to their members	√	√	√	√	√	√	x	
	Organise collective action to get the fishing rights	x	x	√	√	x	x	x	
	Facilitate equitable sharing of benefits among its members	√	√	√	√	x	√	x	
	Serve as a social & organizational force for making members to abide by the conservation rules	√	√	√	√	x	√	x	
Resource enhancement/ conservation	Offer suggestions to state agencies & eager to innovate for improving resource	√	√	√	√	x	√	x	
	Undertake resource enhancement measu res (e.g. stocking of fish seed)	√	√	√	√	x	√	x	
	Take innovative steps as solutions for local limitations in resource management	x	x	√	√	x	x	x	

Qualitative analysis of roles and linkages in collective management of fishery resources

Based on the documentation of roles played by fishing cooperative societies and state fisheries agencies, and detailed interactions had with key informants during field work, a qualitative analysis of roles and linkages between these two important stakeholders in co-management of fishery resources was carried out and is summarized in table 4. At both the reservoirs of H.P. and Surada reservoir of Odisha, the state fisheries agencies and fishing cooperative societies, both played active role in management of fisheries resources and their mutual linkage was well understood and accepted by each other. However, at Hirakud reservoir of Odisha, fishing cooperative societies and state fisheries agencies both were passive and there was lack of effective functional linkages between them.

In M.P., state fisheries agencies did not play active role at Tawa and Bergi reservoirs when the reservoir fisheries was actively managed by the fishing cooperative societies. However, when the management of fisheries at Bergi reservoir was taken back from the fishing cooperative societies (due to non-renewal of lease that followed a long legal conflict too), and auctioned to the contractor; the state agencies became the dominant regulator, consequently, involvement of cooperative societies gradually faded away at Bergi reservoir. In M.P., the linkages between fishing cooperative societies and state agencies at the selected reservoirs was very weak and that of mutually antagonistic type wherein each party was contradicting other's claims/views. In U.P., while the state fisheries agencies played passive roles of advisor, regulator and revenue collector; fishing cooperative societies were also not functioning at the studied sites. Thus, there was lack of effective functional linkages between these two stakeholders in management of reservoir fisheries.

Table 4: A qualitative analysis of roles and linkages in Co-management of fishery resources

Variables	Gobind Sagar and Pong, HP	Tawa, MP	Bergi, MP	Hirakud, Orissa	Surada, Orissa	Matatila, UP	Small Lakes, UP
Role played by state agencies	Active	Inactive	*(Earlier)* Passive *(Now)* Dominant	Passive	Active	Passive	Passive
Role played by fishing cooperative societies	Active	Very active	*(Earlier)* Very active *(Now)* Less active	Passive	Very active	Not functional	Very Weak functioning
Strength & Quality of linkages between the two	Mutually understood, accepted & respected	Mutually antagonistic, contradicted	Mutually antagonistic, contradicted	Lack of effective functional relationship	Mutually understood, accepted & respected	Lack of effective functional relationship	Lack of effective functional relationship

Performance of fishing cooperative institutions in co-management of reservoir fisheries resources

The performance of fishing cooperative institutions in co-management and conservation of reservoir fisheries resources was assessed in terms of three variables: orientation of their members towards conservation of fishery resources, involvement of cooperative institutions in implementation and enforcement of management rules, and conservation performance of cooperative societies measured in terms of the degree to which their members followed/abided by conservation rules for utilization of resources. Separate quantitative indices were developed for each variable. It is clear from the data (Table 5) that at the studied locations in H.P., M.P. and Surada reservoir of Odisha; the orientation of the members of fishing cooperative societies towards resource conservation was

high whereas, it was low in U.P. and Hirakud reservoir of Odisha. Involvement of cooperative institutions in implementation and enforcement of management rules was medium in H.P.; and high at Tawa reservoir of M.P. and Surada reservoir, and very high at Bergi reservoir of M.P. (when the societies were managing the reservoir) but, it became low when the lease was taken from them and auctioned to contractor. It was low at Hirakud reservoir and very low in U.P. Similarly, performance of cooperative institutions, in terms of observing/abiding by resource conservation rules as set forth by the state government agencies, was high to very high in Surada reservoir of Odisha, H.P. and M.P. (when the societies were managing the reservoir) but, it became low (at Bergi reservoir) when the lease was taken from them and auctioned to contractor. At Hirakud reservoir, Odisha and in U.P., again it was very low.

Table 5: Comparative assessment of performance of cooperative institutions in co-management of fisheries resources across different locations

Variables	Gobind Sagar, HP	Pong, HP	Tawa, MP	Bergi, MP	Hirakud, Odisha	Surada, Odisha	Matatila, UP	Small Lakes, UP
Conservation orientation of members	H	H	H	H	L	H	VL	L
Rule enforcement by societies	M	M	H	(Earlier) VH (Now) L	VL	H	NA	No
Conservation performance of societies	VH	VH	VH	(Earlier) VH (Now) L	VL	H	L	VL

VH = Very High; H = High;M = Medium;L = Low;VL = Very Low

Discussion and Implications for Fisheries Managers:

Based on the above analysis and further insights added from interactions held during field work, five scenarios of fisheries management were discernible at the studied locations as summarized in table 6.

The findings indicated that local communities and their organizations (fishing cooperative societies/ federations) can play important role in co-management of reservoir fisheries under the situations where some of the facilitating conditions for promoting collective action and taking part in resource management are present. There were some common conditions found at all the sites (both sites of H.P. and M.P. and Surada reservoir of Odisha) where fishing cooperative societies were playing active roles in management of the resources, like high level of orientation of fisherfolks towards resource conservation; effective internal functioning of their organizations and willingness to contribute towards improvement of resource.

There were, however, conditions which varied from site to site depending upon the local circumstances. For example, at both the locations of H.P. these were: effective structural & functional linkages with, and high perceived effectiveness of state fisheries agencies and strong controlling and regulatory powers held and exercised, along with the facilitating role played by the state fisheries department; which could have contributed towards the success of fishing cooperative societies. These conditions, however, were missing at the two sites of M.P. On the other hand, there were effective linkages with, and regular support of NGOs; and strong collective action and mass organization for common good, at M.P. sites which could have been instrumental in making the cooperative societies and their federation an effective partner in co-management.

This study brought out that at locations where cooperative institutions of fishermen were active and effectively played important roles having socio-educational value, they were able to contribute towards resource conservation and management parameters. This could have been possible because of the educational value and the socio-organizational and moral authority that such institutions had over their members, at locations where they were active (H.P. and M.P. and Surada, Odisha).

The studies give enough pointers to view cooperative institutions of fisherfolks as social organizations having dormant capabilities (beyond production motives), which could be sincerely and effectively identified, promoted and utilized for resource conservation and management goals in fishery resources. However, mere existence of cooperative institutions is no guarantee (as the case of U.P. and Hirakud reservoir make it clear) that these will serve educational and managerial purposes among the fisherfolks. Their effectiveness and vibrancy may be determined by the dynamics of several location-specific socio-economic and political factors.

The study also reaffirms that involvement of resource users through their organizations and institutions not only supplements the managerial efforts of the state agencies, but, also improves the prospects of sustainable utilization of the resource due to dynamic impact of users' organizations on the resource-use behavior of their members and a sense of ownership of the resource among the users. However, when such a 'system' of collective or co-management collapses, the sustainability of the resource suffers as users revert back to their unsustainable practices (as the case of Bergi reservoir clearly indicates) because they no longer feel the ownership of the resource

coupled by the absence of the social & organizational force for making members to abide by conservation rules.

The policy makers, fishery administrators and conservation professionals can utilize these findings towards formulating strategies for harnessing and promoting organizational and institutional support for promoting sustainable management of reservoir fisheries at the grass roots level. There is tremendous scope for innovation in their governance of reservoir fisheries. Lessons drawn from successes achieved in various forms of co-management fisheries resources, such as reported here and elsewhere across the globe, need to be incorporated in devising policies and programmes for management of reservoir fisheries.

Research Priorities for Extension Professionals

These studies were preliminary attempts to look at the fishing cooperative societies as a potential partner, alongwith the state agencies, in co-management of fisheries resources, with special focus on their roles in implementation of resources enhancement and conservation measures. The studies have succeeded in highlighting this line of study in Indian context and the potential contributions these institutions can make under certain conditions. However, these findings, coming out of such preliminary work need to be considered mere trends of few specific case studies which need further more rigorous investigations in detail at other locations.

Success and failures of attempts to co-manage different types of fisheries resources under various circumstances, both need to be studied in detail by extension professionals and accordingly awareness creation strategies and capability development programmes can then be planned, implemented and evaluated.

There are several aspects which need detailed empirical investigations by extension scientists. Some of these could be: analysis of constraints in effective functioning of fishing cooperative societies/federations/ self-help groups/associations, etc.; estimation of the impact of fishing cooperative societies on fishing communities and fishery resources; assessment of the adequacy and preparedness of the selected fishing cooperative societies to include conservation in their agenda; identification of interventions necessary to strengthen and utilize fishing cooperative societies and other forms of fisherfolk organizations for resource management and conservation purposes, etc.

Table 6: Five scenarios depicting varying degree of co-management of reservoir fisheries at different locations

Scenario	Major factors	Represented by
• High orientation of fisherfolks towards resource conservation • High degree of compliance towards conservation rules • Effective sharing (complementing) of responsibilities between state and fisherfolks • Equitable sharing of benefits • Willingness to contribute towards improvement of resource	• High level of extension contacts, cosmopoliteness and involvement in government schemes by fisherfolks; • Effective internal functioning of societies • Effective structural & functional linkages with, and high perceived effectiveness of, state fisheries agencies • Strong controlling and regulatory powers held and exercised, and facilitating role played by the state fisheries deptt.	Pong and Gobind sagar reservoirs, HP
• High orientation of fisherfolks towards resource conservation • High degree of compliance towards conservation rules • Equitable sharing of benefits • Management of fishery resources by cooperative federation • Willingness to contribute towards improvement of resource. • Own efforts to improve production and productivity	• Low level of extension contacts, cosmopoliteness and involvement in government schemes by fisherfolks; • Effective internal functioning of societies • Large catches, regular income to support organization • Weak and antagonistic linkages with state fisheries agencies • Effective linkages with, and regular support of, NGOs • Strong collective action and mass organization for common good	Tawa reservoir, MP
• High orientation of fisherfolks towards resource conservation (Earlier, as well as, now) • (Earlier) High degree of compliance towards conservation rules (Now) Low degree of compliance • Equitable sharing of benefits • (Earlier) Management of fishery resources by coop. fed. (Now) By state agencies • (Earlier) High willingness to contribute towards improvement of resources (Now) Very low willingness to contribute	(Earlier) • Initial motivation, collective action, mass organization • Large catches, regular income to support organization • Strong support of a NGO (Narmada Bachao Andolan) activists • Effective control of federation • Effective functioning of societies (Now) • Declining catches, low income, declining interest of NGO • Declining authority/ control of federation • More temptations for fishermen to violate the rules • Declining social & moral control of societies • Antagonistic attitude between state agencies & fishers	Bergi reservoir, MP
• High orientation of fisherfolks towards resource conservation • High degree of compliance towards conservation rules • Equitable sharing of benefits • Management of fishery resources by cooperative society • Willingness to contribute towards improvement of resource. • Own efforts to improve production and productivity	• Medium level of extension contacts, cosmopoliteness and involvement in government schemes by fisherfolks; • Effective internal functioning of societies • Regular catches and regular income to support organization • Strong linkages with state fisheries agencies	Surada reservoir, Orissa
• Low orientation of fisherfolks towards resource conservation • Low awareness and compliance towards conservation rules • Inequitable sharing of benefits • No efforts to contribute towards management and improvement of resources	• Low level of extension contacts and involvement in government schemes by fisherfolks; • Poor/ low internal functioning of societies • Passive & ineffective linkages with state fisheries agencies • No linkage with NGOs	Small lakes and Matatila reservoir, UP Hirakud reservoir, Orissa

CONCLUSION

The policy makers, fishery administrators and conservation professionals can utilize these findings towards formulating strategies for harnessing and promoting organizational and institutional support for promoting sustainable management of reservoir fisheries at the grass roots level. There is tremendous scope for innovation in their governance of reservoir fisheries. Lessons drawn from successes achieved in various forms of co-management fisheries resources, such as reported here and elsewhere across the globe, need to be incorporated in devising policies and programmes for management of reservoir fisheries. The field of fisheries management and conservation presents enormous possibilities for the extension professionals to broaden their canvas and contribute policy oriented studies to help the fisheries managers and policy makers in further improving the sector.

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REFERENCES

Allison, Edward H. and Marie-Caroline Badjeck, 2004. Fisheries Co-Management in Inland Waters: A Review of International Experience. Sustainable Fisheries Livelihoods Programme (SFLP) (GCP/INT/735/UK). FAO/DFID. 116 p.

Almeida, O.T.; K. Lorenzen and D. McGrath. 2002. Impact of co-management agreements on the exploitation and productivity of floodplain lake fisheries in the Lower Amazon. Paper presented at the 9th Biennial Conference of the International Association for Study of Commons (IASCP). Victoria falls, Zimbabwe. June, 17-21.

Baland J. and J. Platteau, 1996. Halting degradation of natural resources: is there a role for communities? Oxford, Eng. Clarendon Press.

Bavinck, M., (1996) Fisher Regulations along the Coromandel Coast: A Case of Collective Control of Common Pool Resources. *Marine Policy*, 20 (6), pp 475-482.

Bavinck, M., and Venkatesh, Salagrama., (2008) Assessing the Governability of Capture Fisheries in the Bay of Bengal A Conceptual Enquiry. The Journal of Transdisciplinary Environmental Studies ,7 (1), pp: 13.

Bavinck, M., Derek Johnson., Oscar Amarsinghe., et.al (2012) From Indifference to Mutual Support A comparative Analysis of Legal Pluralism in the Governing of South Asian Fisheries. European Journal of Development Research, pp: 1-20.

Bene, C. and A.E Neiland. 2006. From Participation to Governance. A critical review of the concepts of governance, co-management and participation and their implementation in small-scale inland fisheries in developing countries. WorldFish Center Studies and Reviews 29, The WorldFish Center, Penang, Malaysia and the CGIAR Challenge Program on Water and Food, Colombo, Sri Lanka 72p.

Berkes, F. (ed.) 1989. Common property resources; ecology and community-based sustainable development. Belhaven Press, London.

Berkes F. 2003. Alternatives to Conventional Management: Lessons from Small-scale Fisheries, Environments, 31 (1): 5-19.

Cernea, M.M. 1991. Putting people first (2nd Ed.) Oxford; Oxford University Press.

Gutiérrez, Nicolás L.; Ray Hilborn and Omar Defeo, 2011. Leadership, social capital and incentives promote successful fisheries. *Nature* 470, 386389.

Jentoft, S. 1989. Fisheries co-management: Delegating government responsibility to fishermen's organizations. *Marine Policy*.13:137-154.

Jentoft, S. 2004. Fisheries co-management as empowerment. *Marine Policy*. 29(1): 1-7.Jentoft, S.; B.J. Mc Cay and D.C. Wilson. 1998. Social theory and fisheries co-management. *Marine Policy*. 22(4-5): 423-436.

Jentoft, S. and B.J. Mc Cay.1995. User participation in fisheries management lessons drawn from international experiences. *Marine Policy*. 19(3): 227-246.

Jyotishi, A. and R. Parthasarathy 2007. Reservoir Fisheries Management: Experiences of Tawa in Madhya Pradesh. *Economic and Political Weekly*. XLII (5): 409-415.

Jyotishi, Amalendu, 2011. Institutionalizing Common Pool Resources: Insights from Tawa Fisheries Cooperative. Paper presented in the Thirteenth Biennial Conference of the International Association for the Study of Commons, Hyderabad India, January 10-14, 2011.

Karlsen, G.R. 2001. Can formalization help? The

introduction of fisheries co-management in the inshore fisheries of Dingle, Co. Kerry, Ireland. *Marine Policy.* 25(1): 83-89.

Kearney, J., F. Berkes, A. Charles, E. Pinkerton and M. Wiber, 2007. The role of participatory governance and community-based management in integrated coastal and ocean management in Canada. *Coastal Management.* **35,** 79104.

Krishna, A. 2002. Active Social Capital: Tracing the roots of development and democracy. Oxford University Press; New Delhi.

Lawry, S.W. 1989. Fisheries co-management: Delegating government responsibility to fishermen's organizations. *Marine Policy*. April: 137-154.

Makino, M. and H. Matsuda, 2005. Co-management in Japanese coastal fisheries: institutional features and transaction costs. *Marine Policy.* 29, 441450.

Mc Neely, J.A. and S.J. Scherr. 2003. Ecoagriculture: strategies to feed the world and save biodiversity. Island Press, Washington, D. C.

Norman, A.K.; J. R. Nielsen and S. Sverdrup-Jensen. (eds.). 1998. Fisheries Co-management in Africa. Proceedings from a Regional Workshop on Fisheries Co-management Research. Fisheries Co-management Research Project ICLARM, IFM. Mangochi, Malawi, 18-20 March 1997.

Nielsen, Raakjær, J. and T. Vedsmand, 1999. User participation and institutional change in fisheries management: a viable alternative to the failures of 'top-down' driven control? *Ocean Coastal Management*. **42**, 1937.

Nielson, J.R.; P. Degnbol; K.K. Viswanathan; M. Ahmed; M. Hara and N.M.R. Abdullah. 2004. Fisheries co-management an institutional innovation? Lessons from South East Asia and Southern Africa. *Marine Policy*. 28(2): 151-160.

Ostrom, E. 1990. Governing the Commons. The Evolution of Institutions for Collective Action. Cambridge University Press, Cambridge.

Oakerson, R.J .1992. Analysing the commons: A framework. *In*: Bromley, D.W. (Ed.). 1992. Making the Commons Work. Theory, Practice and Policy. ICS Press, San Francisco,CA.

Pomeroy, R.S. and M.J. Williams. 1994. Fisheries co-management and small-scale fisheries: A policy brief, 1-15. ICLARM, Manila.

Pomeroy, R.S.; B.M. Katon and I. Harkes. 2001. Conditions affecting the success of fisheries co-management: Lessons from Asia. *Marine Policy*. 25(3): 197-208.

Pomeroy, R. and F. Berkes. 1997. Two to tango: The role of government in fisheries co-management. *Marine Policy* 21(5): 465-480.

Pomeroy R.S. and Rivera-Guieb R. 2005. Fishery co-management: a practical handbook. CAB International, in association with the International Development Research Centre. 264p.

Pretty, Jules 1995. Participatory learning for sustainable agriculture. *World Development*. 23 (8) 1247-1263.

Pinkerton, E. (ed.) 1989. Cooperative Management of Local Fisheries. NewDirections for Improved Management and Community Development. University of British Columbia Press, Vancouver.

Pinkerton, E. and L. John, 2008. Creating local management legitimacy. *Marine Policy.* **32**, 680691.

Sen, S. and J.R. Nielsen. 1996. Fisheries co-management: A comparative analysis. *Marine Policy* 20(5):405-418.

Singh, K. and V. Ballabh. 1997. Cooperative management of natural resources. Sage, New Delhi.

Sverdrup-Jansen, S. and J.R. Nielsen. 1998. Co-management in Small-scale Fisheries: A Synthesis of Southern and West African Experiences.

Thomson, K.T. 2006. The role of public-private cooperation in the management of estuarine fisheries: Learning from the Kerala model of co-management. Paper presented at the 11th biennial conference of the International Association for the Study of Common Property, Bali, Indonesia, June 19-23.

Thomson, K. 2008. Management anarchy in complex commons: a study of Cochin Lagoon fisheries in Kerala, India. Paper presented at the IASC Conference, Cheltenham, England, 18 July.

Thomson, K. and T. Gray, 2009. From community-based to co-management: improvement or deterioration in

fisheries governance in the Cherai Poyil fishery in the Cochin Estuary, Kerala, India? *Marine Policy*. 33, 537543.

Townsend, R., R. Shotton and H. Uchida (eds.), 2008. *Case Studies in Fisheries Self-governance* FAO Fisheries Technical Paper No 504, FAO Rome.

Tyagi, L.K., Amar Pal and W.S. Lakra. 2007. Mobilization of collective action for fishing rights and management of fishery resources: A case study. *Indian Research J. of Extension Education*, 7 (2&3), pp 26-29.

Tyagi, L.K., Amar Pal; A.S. Bisht and W.S. Lakra. 2008. Conservation orientation about fishes in Northern India. *Indian Research J. of Extension Education*, 8 (2&3): 46-50.

Tyagi, Lalit Kumar; Amar Pal, S.K. Paul, A.S. Bisht and W.S. Lakra. 2008. Development of Sustainable Fisheries in Himachal Pradesh through Fishing Cooperative Societies (*Himachal Pradesh mein matsya jeevi sahkari samitiyon ke madhyam se tikaau matsyiki ka vikas*) (in Hindi). *In: Uttar Parvatiya Rajyon Ki Matsya Vividhata: Sanrakshan evam Prabandhan.* Published by NBFGR, Lucknow, India, pp. 236-244.

Tyagi, Lalit Kumar, 2009. Role and potential of fisherfolk/ community organizations in conservation and management of fishery resources. *In*: De, H.K., M. Kumaran and G.S. Saha. New Initiatives in Aquaculture Extension. Narendra Publishing, New Delhi, 2009. pp 161-176

Tyagi, L.K, Amar Pal and W.S. Lakra. 2011. Capacity building of local groups for fish seed rearing An institutional innovation of tribal fisherfolks at Tawa reservoir, M.P., India. *Indian J. of Extension Education*, 46 (1&2), pp 46-49.

Tyagi, L.K.; A.S. Bisht; Amar Pal and K.K. Lal. 2013. Functioning of Fishing Cooperative Societies in Selected States of India. *J. Community Mobilization and Sustainable Development*, 8(1), 90-93.

Tyagi, L.K.; A.S. Bisht and Amar Pal. 2014. Performance of Fishing Cooperative Societies in Implementing Fish Conservation Measures: Case Studies from Two Reservoirs of Orissa. *J. Community Mobilization and Sustainable Development*, 9(1), 48-51.

Uphoff, N. (ed.).2002. Agroecological innovations. Earthscan, London.

World Bank, 1993. Small-scale fisheries: Research needs. Technical paper 152, Fisheries Series, World Bank, Washington DC.

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Impact of Improved Vegetable Technologies in Disadvantaged Districts of Uttar Pradesh

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ABSTRACT

Mirzapur and Sonbhadra, two disadvantaged districts in Uttar Pradesh, were the target area under the NAIP sub project component-3 during 2008-14. Both these districts are situated far south-east region of U.P. in the Vindhyan mountain range. The baseline survey made during 2008-09 in the selected districts clearly indicated the lack of efficient agricultural technology in the region and economic gap among the farmers. Intervention of various high yielding varieties along with improved production and protection technologies in different vegetable crops not only increased the average productivity of the crops from 2.48 to 27.54 per cent but also enhanced the average annual income of the households. The increased productivity of vegetables has resulted in enhanced net return of ₹ 10298 to ₹ 34703 per hectare and the average annual income of commercial vegetable growers was recorded as ₹ 59,695/- per household per year which is an improvement of 50.7 per cent per household per year.

Key words: Disadvantaged district, improved vegetable varieties, productivity, farm income, impact

INTRODUCTION

Mirzapur and Sonbhadra districts in *Vindhyan* region are among 150 disadvantaged districts of the country identified by Planning Commission, Govt. of India. These two districts are on the extreme South East corner of Uttar Pradesh. Large area is rainfed with undulating topography. Sizeable population of these two districts, more particularly the Sonbhadra comprise of tribal people living mostly below the poverty line. The major area is rainfed, with little assured irrigation. Annual rainfall in the area is slightly above 1100 mm but about 87% of the precipitation is received only during monsoon season (June to October). A large number of rivulets flow in the area; however, most of the rain water remains untapped as surface run off is very high, soil moisture retention capacity is low and proper soil and water conservation practices are not followed.

The majority of farm households are marginal and small; they are resource poor and the literacy rate is low. Owing to use of low yielding varieties, poor seed replacement rate, imbalanced nutrient application and inefficient production technology, the crop yields are low. The average family size is large with 6 to 8 members and the level of crop production is not sufficient for the subsistence of most of the farm households. The situation in some of the tribal areas of Sonbhadra is so pity that the people survive on mahua *(Madhuca longifolia)*, obtained from forest, for at least two to three months in a year. The food available to the majority of landless, marginal and small farm households is not balanced and nutritive as it mostly comprised of cereals, millets and minor millets with little vegetables & pulses.

Vegetables are important constituents of Indian agriculture and nutritional security due to their short duration, high yield, nutritional richness, economic viability and ability to generate on-farm and off-farm employment. Ample research evidence is available suggesting that improved technologies in vegetables, wherever adopted, have lead to increased yield, increased marketable surpluses, increased income and employment and over all welfare of the farm families (Reddy, 2002; Kalloo and Singh, 2000; Attawar,2000). Mirzapur and Sonbhadra districts are also blessed with diverse agro-climates with distinct seasons, making it possible to grow wide array of vegetables with the adoption of improved production technologies.

The present study is a result of NAIP Sub-Project (2008-14) "Ensuring livelihood security through watershed based farming system modules in disadvantaged districts of Mirzapur and Sonbhadra in Vindhyan region" to see how adoption of improved technologies not only enhance crop production per unit area but also opens a new window for nutritional security with better returns from vegetables particularly to small and marginal farmers in the regions.

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METHODOLOGY

Desired data were collected with the help of structured questionnaire developed for the purpose and first hand information from massive demonstrations given during the NAIP Sub-Project "Ensuring livelihood security through watershed based farming system modules in disadvantaged districts of Mirzapur and Sonbhadra in Vindhyan region" and further analysis were done by using appropriate statistical tools. The data were collected from randomly selected 200 project beneficiaries across 20 villages of Madhihan & Pahari blocks of Mirzapur and Myorepur block of Sonbhadra districts of Uttar Pradesh.

RESULTS AND DISCUSSION

Initially a baseline survey was done during 2008-09 and the results obtained revealed that Myorepur block of Sonbhadra district was dominated by SC/ST population of 87.3 per cent whereas Pahari and Madhihan block of Mirzapur had 39.9 per cent and 44.8 per cent SC/ST respectively. In all the clusters, the male population was higher than female. The average land holdings were small (1.27 ha) and majority of farmers in all the clusters were marginal and small. The literacy rate in the area is low; however, Pahari block of Mirzapur with 39 per cent male and 21.5 per cent female it was better than Madhihan block of Mirzapur (male 33.2 %, female 14.9%) and Myorepur block of Sonbhadra (male 13.9%, female 3.9).

Availability of irrigation water is the major constraint of crop production in the area particularly in Myorepur block in Sonbhadra that had only 12.4 per cent area under irrigation compare to Pahari and Madhihan blocks of Mirzapur where 36.6 per cent and 28 per cent irrigated area were recorded. In the selected clusters with cropping intensity of 151.7 per cent, the average area under vegetables was 0.07 ha with a productivity of merely 17.46 t/ha which was even lower than the state productivity.

Large variations were noticed in income of household in different clusters. The annual household income of even the 'medium & big' farmers of Myorepur in Sonbhadra was far below the income of landless and marginal farm households of other clusters of Mirzapur. Nevertheless, the average annual income of Cluster Myorepur, Pahari and Mad hihan blocks were found to be ₹ 26,859, ₹ 54,241 and ₹ 38,160, respectively. In spite of low household income, farmers of Myorepur keep them engaged for more number of days (225) as compared to other two clusters/blocks.

Technology Intervention & Impact

The promotion of improved production and protection technologies including high yielding vegetable varieties developed by ICAR-Indian Institute of Vegetable Research (ICAR-IIVR), Varanasi improved the growth rates in vegetable supplies and per capita availability, checked the increase in vegetable prices, and reduced seasonality in selected clusters of Mirzapur and Sonbhadra districts of Uttar Pradesh. Caswell (2001) also suggested that the availability and use of technical assistance have helped the farmers in determining the choices made to use specific practices. Extension and education efforts are considered to be important tools for promoting the adoption of new production practices.

The farmers were motivated for commercial vegetable growing in the project area and by the performance of improved varieties and production technology demonstrated under field demonstrations, the average area under commercial vegetable has enhanced considerably from 0.07 ha to 0.56 ha. The increased productivity of vegetables was recorded from 16.7% (sponge gourd) to 42 per cent (vegetable pea) and this resulted in enhanced net return of ₹ 10298/- to 34703/- per hectare from commercial vegetable growing as compared to the traditional practice (Table 1). At household level, the average income of commercial vegetable growers using improved varieties and technology was ₹ 59,695/- per year/household which was ₹ 20,090/- higher than control that was equivalent to 50.7 per cent . The additional income helped to boost savings, to increase expenditures on purchased food, and to improve farm implements and children's education (Ali and Hau, 2001)

Table 1: Effect of improved vegetable technology on productivity, net return and household income

Parameters	Crop	Traditional practice	Improved practice	Increase over traditional practice	% Increase over traditional practice
Productivity (q/ha)	Brinjal	345	408	63	18.3
	Bottle gourd	265	368	103	38.9
	Sponge gourd	90	105	15	16.7
	Bitter gourd	87.5	115	27.5	31.4
	Okra	98	136	38	38.8
	Cowpea	110	144	34	30.9
	Pumpkin	285	352	67	23.5
	Cucumber	222	273	51	23.0
	Pea	69	98	29	42.0
Net return (₹/ha)	-	35312.00 - 75165.00	45610.00 - 109868.00	10298.00 - 34703.00	29.2 - 46.2
Annual Household income (₹/HH)	-	39605	59695	20090	50.7

Efforts made in this direction significantly improved the yield performance of various vegetable crops like okra, cowpea, chilli, brinjal, pea, pumpkin etc. and opens a path of seed replacement by the improved vegetable varieties developed by various organizations. The adoption of improved technologies varied from crop to crop. While in crops like pea, cowpea and okra, the shift from local variety to improved variety was more while in others the adoption percentage was less. It has been observed that by and large, farmers do not adopt complete package of practices and do not cover the whole area, under the new practice being introduced to them for the first time (Subrahmanyam and Sudha, 1996). The data were further analyzed to evaluate the performance of some vegetable varieties developed by ICAR-IIVR and the results obtained herewith revealed that varieties of garden pea (Kashi Udai) and cowpea (Kashi Kanchan) were most successful which fetched higher yield of more than 20 per cent when compared to other cultivars. However, sponge gourd (Kashi Divya), chilli (Kashi Anmol) and okra (Kashi Pragati) were also successful in which an increase of more than 15 per cent productivity were recorded (Table-2). Here, comparatives were made with other crop varieties performing successfully in the area.

Table 2: Yield Performance of Demonstrated ICAR-IIVR Vegetable Varieties

Vegetable	Varieties	Yield (q/ha) FLD	Yield (q/ha) Control	% Increase in Productivity
Cowpea	Kashi Kanchan	135.44	106.19	**27.54**
Okra	Kashi Pragati	138.43	116.01	**19.33**
Sponge gourd	Kashi Divya	108.82	92.07	**18.20**
Pumpkin	Kashi Harit	347.29	318.99	**8.87**
Tomato	Kashi Vishesh	490.23	478.35	**2.48**
Brinjal	Kashi Uttam	394.42	358.17	**10.12**
Chilli	Kashi Anmol	213.04	184.80	**15.28**
Garden pea	Kashi Udai	93.05	76.93	**20.95**

Further, data reported in Table-3 revealed that the ICAR-IIVR developed improved varieties in certain vegetable crops like okra, cowpea, chilli and pea gave higher benefit cost ratio than the other farmers practicing cultivars. Technology index of below 10 per cent in Kashi Pragati in okra, Kashi Kanchan in cowpea, Kashi Anmol in chilli and Kashi Harit in pumpkin indicates a greater adoption perspective by the growers in this region. Singh *et al,* 2007 reported the perception of farmers towards the new technology as an important factor for its adoption. In cowpea, Kashi Unnati and Kashi Kanchan varieties were widely adopted by the growers because the perception index was as high as 73.05. However, in case of tomato, brinjal and sponge gourd farmers preferred to grow hybrids for higher productivity but, more technology gap *i.e,* 59.77 per cent in tomato, 55.98 per cent in brinjal and 41.18 per cent in sponge gourd indicates the possibility of more yield enhancement and adoption. In case of Kashi Udai in pea though the technology index is 22.46 per cent but still the demand of this variety is increasing as potential of this variety is still to increase the productivity by 26.95 per cent.

Table 3: Technology impact of ICAR-IIVR vegetable varieties in selected districts of Uttar Pradesh

Crop	ICAR-IIVR Variety	Potential Yield (q/ha)	Technology Gap	Technology Index	BC Ratio at farmers' field	
					ICAR-IIVR Variety	Practicing Cultivar
Okra	Kashi Pragati	150.00	11.57	7.71	3.01	1.89
Cowpea	Kashi Kanchan	140.00	04.56	3.26	2.38	1.64
Tomato	Kashi Vishesh	550.00	59.77	10.87	1.70	1.65
Chilli	Kashi Anmol	220.00	06.96	3.16	2.03	1.66
Brinjal	Kashi Uttam	450.00	55.98	12.44	4.00	3.66
Sponge Gourd	Kashi Divya	150.00	41.18	27.45	1.68	1.40
Pumpkin	Kashi Harit	350.00	02.71	0.77	3.24	3.03
Pea	Kashi Udai	120.00	26.95	22.46	3.46	2.82

CONCLUSION

It is being concluded that even in disadvantaged districts like Mirzapur & Sonbhadra crop diversification through vegetables is certainly a remunerative agricultural practices especially for marginal and small farmers as they had reaped maximum profit upto 46.2 per cent increase in net return by following improved production techniques in vegetable over traditional practices despite of various physical and natural constraints. The productivity of demonstrated crops increased from 2.4827.54 per cent mainly because of introduction of high yielding new varieties along with improved production and protection technologies. Therefore, target oriented training programme on improved vegetable production technology along with multiple demonstrations is required to enhance level of knowledge and skills of growers which ultimately led to adoption of technologies. Farmers (especially large ones) were also suggested to throw away the traditional methods of marketing in local places and move for distant marketing, super-markets in nearby cities, value addition with standard packaging *etc*. by forming cooperatives and farmers' interest group.

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REFERENCES

Ali, Mubarik, and Hau, Vu Thi Bich. 2001. Vegetables in Bangladesh: Economic and Nutritional Impact of New

Varieties and Technologies. Asian Vegetable Research and Development Center, Technical Bulletin No. 25, 55 p.
Attawar Manmohan, 2000, Hybrid Vegetables, Tool for productivity gains, The Hindu Survey of Agriculture, 2000. 145-149.

Byerlee, D., and Polanco, H.E. 1986. Farmers' stepwise adoption of technological packages: Evidence from the Mexican Altiplano. *American Journal of Agricultural Economics*, 68(3), 519-527

Caswell, M. (2001). The change to conservation : moving farmers towards new production practices. *Agricultural Outlook*, No. 281, pp. 32-34.

Jagdish Singh and G. Kalloo, 2000, Vegetable crops: Nutritional Security, In Emerging Scenario in Vegetable research and development. [Ed: G. Kalloo and Kirthi Singh] RPB publishing house. Pp: 181-196

Reddy, P.P, 2002, Impact of vegetable research, constraints and strategies An IIHR perspective, Paper presented at the Workshop on Impact of vegetable Research in India, held at IIVR, Varanasi, 1-2 March, 2002;

Singh Neeraj, Suvedi Murari and Rai Mathura, 2007, Varietal evaluation of cowpea in eastern Uttar Pradesh, *Indian Journal of Extension Education*, 43(1 &2):12-15

Subrahmanyam, K.V.and M. Sudha, 1997, Impact of Time and technology on cultivation of Horticultural crops. Final project report submitted to IIHR, Bangalore-89.

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Attitude of Agricultural Stakeholders on Use of Short Message Service (SMS) in Transfer of Technology

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ABSTRACT

The goal of Information and Communication Technology (ICT) is to provide the benefits of information revolution to the rural masses by enhancing farming efficiency, farm productivity and farmers' income. In order to bring knowledge empowerment of rural people and to increase agricultural productivity, cyber extension centers were established in Sidhauli and Kasmanda blocks of Sitapur district of Uttar Pradesh under "Cyber Extension Model for Agricultural Development: An Action Research project". In order to strengthen the information base of the farmers and to bridge the information gap, SMS was sent to the farmers from project location. In this background, a study was conducted in Sidhauli and Kasmanda block of Sitapur district of Uttar Pradesh among 80 farmers (40 in each block), 20 *Krishi Vigyan Kendra* (KVK) and State Agriculture Department (SAD) officials and 20 post office personnel to find out ease of use, usefulness and attitude towards SMS. The findings revealed that seventy per cent farmers, 100 per cent KVK and 100 per cent post office personnel were having mobile phones. It was also found that 55 per cent of farmers and all post office and KVK personnel strongly agreed with the point that SMS was fast, easy to understand and follow. Action taken results showed that 80 per cent of the farmers and 100 per cent of post office and KVK personnel opened the message up, 80 per cent of the farmers, 100 per cent of post office and KVK personnel read the contents of the message, 60 per cent of the farmers utilized the message and 30 per cent of the farmers and 90 per cent of post office and KVK personnel spread the message among the farmers. The findings had shown that SMS played a substantial role in bridging the agricultural information gap in the rural area.

Key words: Mobile phone, SMS, ease of use, attitude towards SMS

INTRODUCTION

Addressing the information need of the farmers is a major concern especially for the developing countries due to insufficient rural infrastructure, inaccessible terrain, lack of funds and other reasons as well. Many farmers often need the information when they are in the field far away from ad-hoc information sources. Many management decisions in modern farming require up-to-date and local information, for example regarding weather forecasts and regional recordings of crop diseases and pests (Jensen *et al*., 2000). To hasten the communication process, there are many innovative communication channels are available now. The advent of new age Information and Communication Technologies (ICTs), like personal computers, the internet and mobile telephones have provided a much wider choice in collection, storage, processing, transmission and presentation of information in multiple formats to meet the diverse information requirements and skills of people. Especially mobile phones provide a new platform through which rural communities will be able to access government schemes and services, crop related information like weather, soil, water, fertilizers and pesticides that are specific to their plot of land and availability of seeds, local market prices *etc.*, using text, data, and audio browsing techniques. Around the world, penetration of mobile communication devices reaching very high rates India has the world's second-largest mobile phone user base with over 904 million users as of October, 2013 (TRAI, 2013). The high penetration of mobile phones and text messaging combined with the low cost of text messaging make this an interesting medium for information dissemination. Muk (2007) argues that mobile phones increase the accessibility, frequency and speed of communication through which timely mobile ads can be delivered to consumers based on their demographic characteristics and geographic information. Short Message Service (SMS) is widely used to spread information from individual to individual, especially in the developing world to reach out to rural populations that could not previously be contacted. According to Leung (2007), there are some who believe that SMS may develop into a major form of interpersonal mediated communication, replacing many phone uses and SMS messaging will become as big as e-mail. Allan Leck Jensen and Iver Thysen (2003) have stated that simple SMSs are used as a medium for communication between

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suppliers and users of information and decision support. SMS can be used for various types of communication, according to their intended effect on the receiver. These types include the following:

Information. The SMS contains all the relevant information about the topic. The user needs not to do anything further.

Notice. The SMS notifies that some information is available. It cannot contain all the relevant information, but may contain a reference (e.g. url) to further information. The user decides whether or not it is necessary to act.

Alarm. The SMS notifies by its arrival alone that some event has occurred to which the receiver must take action.

Dialogue. A sequence of related SMSs consisting of requests and responds between user and supplier.

The objective of this paper is to study the ease of use, attitude and action taken towards SMS on wheat and mustard cultivation practices by farmers, *Krishi Vigyan Kendra* (KVK) / State Agriculture Department (SAD) personnel and post office personnel.

METHODOLOGY

In order to provide agricultural extension services through Information and Communication Technologies (ICTs), cyber extension centers were established in Sidhauli and Kasmanda blocks of Sitapur district of Uttar Pradesh, India under the project "Cyber Extension Model for Agricultural Development: An Action Research". In addition to cyber extension centres, to strengthen the information base of the farmers and to bridge the information gap among agricultural stakeholders, it was decided to send SMS about the improved cultivation practices of wheat and mustard crops. From the above mentioned two blocks, two villages were selected purposively in Sitapur district of U.P. In selecting the sample for this research, mobile phone ownership and SMS agro advisory were kept in mind. Hence, the sample consisted of eighty farmers, twenty KVK/SAD officials and twenty post office personnel from two villages.

This study adopted an exploratory approach to find out the perception about SMS i.e. ease of use, usefulness and attitude towards SMS. Data was collected by using a structured interview schedule. To measure the variables in this study, the respondents were asked to rate their agreement on five statements related to ease of use of SMS and four statements related to attitude towards SMS. The rating on all statements was based on a 5-point Likert scale, 1932. Likert scale is a tool used in questionnaires in which participants are asked to respond to statements on a scale ranging from "strongly agree" to "strongly disagree". The responses were scored from '5' to '1' for strongly agree to strongly disagree statements.

Operationalization of variables

Samsudin, Nor Azila and Al-Momani (2010: 369) defined ease-of-use as "the degree to which a person believes that using an information system would be free of effort". Perceived ease-of-use is more important for the information gathering task (Gefen and Straub, 2000). Effort is a finite resource that a person may allocate to the various activities for which he or she is responsible (Radner and Rothschild, 1975). Rogers (1995) has mentioned that some innovations are readily understood by most members of a social system because of its less complexity. He also mentioned that less complex innovations will be adopted more rapidly than other innovations.

Attitude is defined as a predisposition or a tendency to respond positively or negatively towards a certain idea, object, person, or situation, and it influences an individual's choice of action, and response to challenges, incentives, and rewards.

Data analysis

Descriptive statistics were the main tool used to explore the questionnaire data, summarize and describe observations. In this research, descriptive statistics in the form of frequency and percentage were used to obtain summary statistics of respondents including mobile phones ownership, ease of use, usefulness, attitude towards receiving SMS and action taken after receiving SMS.

H_1: Ease of use factor, which includes easy access, and simple language and positive attitude towards SMS has greatly influenced the farmers in using mobile phones and SMS for accessing information.

RESULTS AND DISCUSSION

Initially, a preliminary survey was conducted to find out how many farmers were having mobile phones. For that, from two villages, 80 farmers were selected randomly.

Table 1: Mobile phones ownership by farmers, KVK/SAD and Post office personnel

n=120

Affordability (to buy mobile phones and send SMS related problems)	Farmers (n=80)		KVK/SAD officials (n=20)		Post office personnel (n=20)	
	f	%	*f*	%	*f*	%
Yes	55	68.75	20	100.00	20	100.00
No	25	31.25	0	0.00	0	0.00
Total	**55**	**100.00**	**20**	**100.00**	**20**	**100.00**

From the table 1, it was found that out of 80 farmers, 55 farmers (68.75%) had possession of mobile phones whereas 25 (31.25%) of them did not have it. The full details of SMS based agro-advisory is given in Table 2.

Table 2: Information on SMS based Agro-advisory

Crops	Wheat and Mustard
Content	❑ Land preparation ❑ Seed treatment and sowing ❑ Fertiliser application (top dressing) ❑ Irrigation ❑ Weeding ❑ Crop protection ❑ Harvesting
Recipients	❑ Farmers (55) ❑ Extension personnel (20) ❑ Post Office Staff (20)

After receiving SMS, data was collected to know the perception of the farmers about SMS. Our analysis revealed that three main factors determine the use of SMS as an information source: ease of use, usefulness and attitude towards receiving SMS.

The following table 3 shows the perception of the farmers, SAD and KVK personnel regarding SMS. Generally, the result was under high frequency.

Table 3: Ease of use, usefulness and attitude of farmers towards receiving SMS

n=55

Category of respondents	Farmers									
	SA		A		N		DA		SAD	
	f	%	*f*	%	*f*	%	*f*	%	*f*	%
Ease of use										
SMS is easy to use	1	2.0	25	45.0	2	4.0	19	35.0	6	10.0
Can access SMS at anytime and from anywhere	3	5.0	6	10.0	3	5.0	39	70.0	6	10.0
The design of mobile phone improves access to SMS	5	9.0	25	46.0	4	8.0	15	27.0	6	10.0
SMS is fast, easy to understand and follow	4	8.0	34	62.0	3	5.0	8	15.0	6	10.0
The language is not complicated	8	15.0	39	70.0	6	10.0	3	5.0	0	0.0
Attitude of the farmers who think										
SMS is a good idea	0	0.00	8	15.00	0	0.0	44	80.0	3	5.0
Receiving SMS is an wastage of time	3	5.00	45	82.00	3	5.0	4	8.0	0	0.0
Respond to the SMS after receiving it	0	0.00	0	0	0	0.0	55	100.0	0	0.0
Receiving SMS is an interruption during daily activities	8	15.0	30	55.0	6	10.0	8	15.0	3	5.0

SA=Strongly Agree; A= Agree; N= Neutral; DA= Disagree; SDA= Strongly Disagree

In the five-point continuum of scale, most of the farmers were in the positive side. They perceived that SMS is easy to use (47.00 %), design of mobile phone improve access to SMS (54.00%), SMS is fast & easy to understand (70.00%), and language is not complicated (85.00%). Rogers (1995) has mentioned that it does not matter so much if an innovation has a great deal of objective advantage. What does matter is whether an individual perceives the innovation as advantageous. This was well evidenced in the study that farmers perceived mobile phone is an innovative and useful tool. More than 70 per cent of the farmers were having positive attitude that SMS is not wastage of time and not an interruption during daily activity. Rittippant *et al*. (2009) had given in their findings of the study that of the 300 respondents, 80 per cent agree that the ease of use factor, which includes easy access, convenience and fun elements has greatly influenced mobile users in using SMS for voting.

Table 4: Ease of use, usefulness and attitude of KVK/SAD personnel towards receiving SMS

n=20

Category of respondents	KVK/SAD officials									
	SA		A		N		DA		SAD	
	f	%	*f*	%	*f*	%	*f*	%	*f*	%
Ease of use										
SMS is easy to use	12	60.0	4	20.0	0	0.0	3	15.0	1	5.0
Can access SMS at anytime and from anywhere	3	15.0	16	80.0	0	0.0	1	5.0	0	0.0
The design of mobile phone improves access to SMS	3	15.0	13	65.0	1	5.0	2	10.0	1	4.0
SMS is fast, easy to understand and follow	6	30.0	14	70.0	0	0.0	0	0.0	0	0.0
The language is not complicated	8	40.0	12	60.0	0	0.0	0	0.0	0	0.0
Attitude of the farmers who think										
SMS is a good idea	2	10.0	16	80.0	0	0.0	2	10.0	0	0.0
Receiving SMS is an wastage of time	0	0.00	2	10.0	2	8.0	6	30.0	10	50.0
Respond to the SMS after receiving it	0	0.00	0	0.00	0	0.0	16	80.0	4	20.0
Receiving SMS is an interruption during daily activities	0	0.00	0	0.00	3	15.0	14	70.0	3	15.0

From the table 4, it was found that 80 per cent of KVK personnel had agreed that SMS is easy to use followed by accessing SMS at anytime and from anywhere (95.00%), design of mobile phone improves access to SMS (80.00%), and language is not complicated (100.00%). Most of the KVK personnel (90.00%) had positive attitude in receiving SMS (80.00%), respond to SMS followed by receiving SMS (80.00%). This in line with the findings of Sin *et al.,* (2008). They reported that there is no need to explain the voting process in detail as almost 80 per cent of the mobile users know how to use the SMS service.

Table 5: Ease of use, usefulness and attitude of post office personnel towards receiving SMS

n=20

Category of respondents	KVK/SAD official									
	SA		A		N		DA		SAD	
	f	%	*f*	%	*f*	%	*f*	%	*f*	%
Ease of use										
SMS is easy to use	12	60.0	4	20.0	1	4.0	2	10.0	1	6.0
SMS can be accessed at anytime and from anywhere	5	25.0	11	55.0	0	0.0	3	15.0	1	5.0
The design of mobile phone improves access to SMS	3	15.0	10	50.0	2	10.0	3	15.0	2	10.0
SMS is fast, easy to understand and follow	9	45.0	11	55.0	0	0.0	0	0.0	0	0.0
The language is not complicated	11	55.0	9	45.0	0	0.0	0	0.0	0	0.0
Attitude of the farmers who think										
SMS is a good idea	1	5.0	15	75.0	1	5.0	3	15.0	0	0.0
Receiving SMS is an wastage of time	0	0.0	3	15.0	1	5.0	16	80.0	0	0.0
Respond to the SMS after receiving it	0	0.0	0	0.0	0	0.0	20	100.0	0	0.0
Receiving SMS is an interruption during daily activities	0	0.0	2	10.0	3	15.0	13	65.0	2	10.0

Most of the post office personnel had favourable attitude about SMS. They had the attitude that receiving SMS is not wastage of time (80.00%) and not an interruption (75.00%). Waldt *et al.,* (2009) found in their study that consumers' perceptions of the entertainment value, informativeness and credibility of SMS advertisements were positively correlated to consumers' overall attitude towards SMS advertisements. After asking about their attitude towards SMS, ease of use, usefulness and language *etc*. what the actions were taken by farmers, KVK/SAD personnel and post office personnel were studied and the results are furnished in table 6, 7 and 8.

Table 6: Action taken by farmers after receiving SMS

n=55

Activities undertaken by the farmers	*f*	%
Opening the message up	44	80.00
Read the contents of the message	44	80.00
Utilising the information	33	60.00
Just ignore it	11	20.00
Spreading the message with the fellow farmers	17	30.00
Discussing about the SMS with the fellow farmers	30	55.00

This table shows that 80.00 per cent of the farmers opened the message and read the contents of the message. Out of this 80.00 per cent, only 60.00 per cent utilized the information followed by 55.00% discussed about the SMS with the fellow farmers. Word-of-mouth is another effective conduit for informing a target audience about a new SMS or phone service - though it is also often the most difficult to tap into. Some 50 per cent of low income respondents and 57 percent of those with a primary education said they get news and information from other people in their community (outside their friends and family) at least weekly.

Table 7: Action taken by KVK/SAD personnel after receiving SMS

n=20

Action taken by KVK/SAD personnel	*f*	%
Opening the message up	20	100.00
Read the contents of the message	20	100.00
Utilising the information	0	0.00
Just ignore it	5	25.00
Spreading the message to the farmers	18	90.00
Discussing about the SMS with the farmers	13	68.00

From the table 7, it was found that all the KVK/SAD personnel (100.00 %) opened the message and read the contents of the message. Out of this 100.00 per cent, only 90.00 per cent spread the message followed by 68.00 per cent discussed about the SMS in detail.

Table 8. Action taken by post office personnel after receiving SMS

n=20

Action taken by post office personnel	*f*	%
Opening the message up	20	100.00
Read the contents of the message	20	100.00
Utilising the information	0	0.00
Just ignore it	3	15.00
Spreading the message to farmers	18	90.00
Discussing about the SMS with the farmers	20	100.00

This table shows that all the post office personnel (100.00 %) opened the message and read the contents of the message. Out of this 100.00 per cent, only 90.00 per cent spread the message followed by 68.00% discussed about the SMS in detail.

DISCUSSION

It is not the innovation *per se*, instrument *per se* and technology *per se*, which affects the desirable behaviour. The desirable behaviour is the influence of both extrinsic as well as intrinsic factors. Both extrinsic factors such as, characteristics of an innovation and intrinsic factors such as individual perception and attitude, decide the action from an individual. Festinger (1950) argued that people depend on social reality to determine the subjective validity of their attitudes and opinions, and that they look to their reference group to establish social reality; an opinion or attitude is therefore valid to the extent that it is similar to that of the reference group. This factor may be the reason that majority of the respondents had favourable attitude towards SMS. Mitra (2014) in his study reported that computers are used for several different activities and the level of use is related to attitudes toward computers. He further reported that respondents who reported higher use of computers indicated a more positive attitude toward computers on all the different attitude scales. David (1989) in his study put it in a different way that an application perceived to be easier to use than another is more likely to be accepted by users. Meijer *et al*., (2014) in their study reported that although the intrinsic factors are important, these factors receive relatively little attention due to methodological challenges in measuring them. Even though, the best agriculture practices are available, disseminating it determine the accessibility and utility of such information. ICT is having lot of potential to deliver better farm extension services. Scherr (1992) in his study reported that media-based extension is one of the five basic models for extension available for agricultural practices. Meijer *et al*. (2014) in their study reported that the role of extension and training is crucial in the development of knowledge, perceptions and attitudes about agricultural innovations. The respondents faced following difficulties in receiving SMS; some of the handsets like Sony Ericson, Samsung *etc*. were not supporting hindi language; hence, farmers were not able to read the content of the SMS. The respondents who were having Nokia set did not have any problem in receiving SMS. Farmers were not carrying the mobile phone all the time and then, they were not having a habit to check the messages in inbox often. If the SMS is received at the time when the mobile phones were in the farmers' hand, then they opened the message and read the content. Where access to technology is a problem, using alternative media and or alternative technology such as voice message may bring the possible solution. Apart from this, because of poor electricity supply, farmers faced problems in charging the handset.

CONCLUSION

This study concludes that mobile phone is becoming very popular tool as it bring the world within reach for the general public especially for agricultural scientists, farmers and extension workers in delivering and sharing critical crop information including weather, pest and disease management practices. This is clear from the fact that majority of the respondents had favourable attitude towards SMS. However, there were certain constraints in receiving SMS by the stakeholders. These constraints need to be taken into consideration in mobile based agro-advisory services sent to the farmers and other agricultural stakeholders. This study is helpful from a strategic point of view to know whether farmers access information via SMS or not, what is their attitude about receiving SMS, what are all the constraints involved in it and whether they are utilizing the information and are disseminating to others. The unique characteristics of mobile users, along with the increasing trend for mobile SMS usage, have led to a need for further studies on mobile SMS communications.

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REFERENCES

Mitra, A. 2014. Categories of Computer Use and Their Relationships with Attitudes Toward Computers. *Journal of Research on Computing in Education,* 30 (3), 281-295.

D. L. R Van der Waldt, T. M. Rebello and W. J. Brown. 2009. Attitudes of young consumers towards SMS advertising. *African Journal of Business Management,* 3(9), 444-452.

Davis, F. 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology, *MIS Quarterly.* (13:3), 319-40.

Festinger, L. 1950. *Informal social communication. Psychological Review,* 57(5), 271282.

Gefen, D. and D. Straub. 2000. The relative use of perceived ease of use in adoption: A study of e-commerce adoption. Journal of the *Association for Information Systems,* 1(8), 128.

Jensen, A.L., and Thysen, I. 2003. Agricultural Information and Decision Support by SMS, EFITA 2003 Conference, 5-9 July, 2003. Debrecen, Hungary.

Jensen, A.L., Boll, P.S., Thysen, I. & Pathak, B.K. 2000. Pl@nteInfo A web-based system for personalized decision support in crop management. *Computers and Electronics in Agriculture,* 25, 271-293.

Leung, L. 2007. "Unwillingness-to-communicate and college students' motives in SMS mobile messaging", *Telematics and Informatics,* 24(2), 115-129.

Likert, Rensis. 1932. "A Technique for the Measurement of Attitudes". *Archives of Psychology.* 140: 155.

Muk, A. 2007. "Consumers' intentions to opt in to SMS advertising A cross-national study of young Americans and Koreans", *International Journal of Advertising,* 26(2), 177198.

Ng Kai Sin, Sulaiman, A., and Zolait, A.H.S. 2008. Analysis of Mobile Users' Perception towards SMS Voting purposes. Communications of the IBIMA,1, 182-190.

Radner, R. and M. Rothschild. 1975. On the allocation of effort. *Journal of Economic Theory,* 10,358-376.

Rittippant. N., Witthayawarakul,J., Limpiti,P., and Lertdejdecha, N. 2009. Consumers' Perception of the Effectiveness of Short Message Service (SMS) and Multimedia Message Service (MMS) as Marketing Tools. World Academy of Science, Engineering and Technology, 53, 815-821.

Rogers, Everett M. 1995. Diffusion of Innovations New York: Free Press

Samsudin Wahab, Nor Azila Mohd. Nor and K. Al-Momani. 2010. The relationship between e-service quality and ease of use on electronic customer relationship management performance: An empirical investigation in Jordan mobile phone services. Paper presented at the International Conference on e-Education, e- Business, e-Management and e-Learning, 2010. (IC4E '10). Sanya, China. 2224 January, 2010.

Scherr, S.J. 1992. The role of extension in agroforestry development: evidence from western Kenya. *Agroforestry systems,* 18 (1), 47 68.

Meijer, S.S Delia Catacutan, Oluyede C. Ajayi, Gudeta W. Sileshi & Maarten Nieuwenhuis. 2014. The role of knowledge, attitudes and perceptions in the uptake of agricultural and agroforestry innovations among smallholder farmers in sub-Saharan Africa, International *Journal of Agricultural Sustainability,* DOI:10.1080/ 14735903.2014.912493

TRAI, Press Release No. 92/2013. Information Note to the Press. Telecom Regulatory Authority of India. New Delhi, 13th December, 2013.

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Production Recommendations and Information Source Utilization of Rapeseed Mustard Growers in Sub-tropics of Kathua District in Jammu Division.

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ABSTRACT

Oilseed plays an important role in agriculture economy in many regions of the world. Oilseed is a major source of protein and contributes considerably to the export earnings. Major oilseed producing countries in the world are USA, Brazil, Argentina, China and India and account for 82 per cent of oilseed production in the world. In the category of oilseed crops, rapeseed mustard is grown in both the regions of J&K state. In Jammu division, rapeseed mustard is grown in Sub-tropical and temperate agro-climatic zones. The present investigation was carried out to study the adoption of production recommendations of rapeseed mustard in the subtropical zone of Kathua district. A list of 522 mustard growers was procured from Department of Agriculture of Kathua district and 95 respondents were selected randomly with the help of random number generator. A comprehensive data collection tool was devised for collection of data. After pretesting and needful modifications the data was collected from selected 95 respondents. It has been concluded from the study that toria is the main rapeseed mustard crop grown by the farmers of the study area and all the respondents were using their own seed and they were of the view that toria crop raised by using own seed attains early maturity which does not hamper the timely sowing of wheat crop. It has been observed that farmers of the study area are not adopting the recommended seed rate and none of the farmers are adopting seed treatment. Regarding chemical fertilizers, farmers are not using potassic fertilizer for growing rapeseed mustard crops. Department of agriculture and co-farmers are the main sources of agri-input information.

Key words: Adoption, rapeseed, mustard, Information source

INTRODUCTION

Rape seed mustard is an important edible oilseed crop among nine major oilseed crops *i.e.* Soybean, Groundnut, Sun-flower Safflower, Castor, Sesame, Linseed, Rapeseed mustard& Niger. Rapeseed-mustard group of crops has diversified domestic and industrial uses. Rapeseed mustard is the third most important source of vegetable oil in the world and is grown in more than 50 countries across the globe. The world production of rapeseed mustard has been increasing at a rapid rate in several countries largely in response to the continuing increase in demand for edible oils and its products.The production of rapeseed mustard at global level is about 63.09mt (million ton) from an area of 34.1mha and world productivity is about 18.50qts/ha (Directorate of Rapeseed Mustard Research,2012-13). Rapeseed mustard comprises of two words rapeseed and mustard. Rapeseed comprises of mainly *Brassica rapa* (Toria) & *Brassica napus* (Gobhisarson) and mustard comprises of *Brassica juncea* (Indian Mustard). *Brassica rapa*, *B. napus* and *B. juncea* are grown predominantly for oil and seed meal. In India, *Brassica juncea* (Indian Mustard) covers about 85 per cent area of the total rapeseed mustard area,(Yadav,2012). It is an important source of edible oil, condiment and vegetable in the Indian diets. These crops play an important role in Indian oil economy. India is one of the largest rapeseed-mustard growing countries in the world, occupying the first position in area and third position in production. The rapeseed-mustard, which contributes nearly 80 percent of the total rabi oil seed production, is a vital component in edible oil sector in India. Indian contribution to the world acreage and production is 19.29 per cent and 11.12 percent respectively, area under rapeseed mustard crop in India is 6.3mha with production of 7.4mt and productivity is 11.76 qts/ha. (Directorate of Rapeseed Mustard Research, 2012-13).In terms of rapeseed mustard productivity global ranking of India is 28th (Bhardwaj,2013).The leading rapeseed mustard growing states in India are Rajasthan,U.P, Haryana and West Bengal. The projected demand for oilseeds in India is around 34 million tonnes by 2020, of which about 14 million tonnes (41%) is to be met by rapeseed mustard. Rapeseed-mustard is the second most important edible oilseed crop in India after groundnut. In Jammu & Kashmir rapeseed mustard is mainly grown as rabi oilseed crop both as sole crop as well as mixed crop with wheat & berseem. In J&K, productivity of rapeseed mustard is about 6.98qts/ha

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which is about 37.72 per cent of global productivity and 67.85 per cent of national productivity. Lack of knowledge about production recommendations may be the reason for low productivity of rapeseed mustard in J&K as compared to national productivity. In Jammu province, the total area under rapeseed mustard crop is about 11751 ha which comprises of both temperate and sub-tropical area with maximum area under district Kathua followed by Doda. (Directorate of Agriculture, Jammu 2012-13).The researchable problem is "why rapeseed productivity is low in the state?" The presumed reasons could be : i) low or no use of chemical fertilizers, iii) lack of adoption of recommended rapeseed mustard cultivation practices, iv) resource poor farmers, and v) small land holdings. Thus, to empirically test these the research pursuit was carried out to study the"Production recommendations and information source utilization pattern of rapeseed mustard growers in sub-tropics of Kathua district in Jammu Division" with the following objectives: to study the adoption of production recommendations of rape seed mustard by the farmers and to study the utilization pattern of information sources by the farmers regarding rape seed mustard crop

METHODOLOGY

A list of rapeseed mustard growers in sub-tropical belt of Kathua district was obtained from Department of Agriculture. Ninety five rapeseed mustard growers were selected randomly by using Random Number Generator. The selected respondents were from the villages of Merath, Thanon, Naryanpur, Budhi, Chapaki, Rehni, Koungani, Manglore, Nanan, Jhakhol, Dhani, Bakhta, of the Kathua district. Data collecting tool was devised and pre-testing was exercised on 15 non-sampled respondents. On the basis of pre-testing, the data collection tool was refined and administered to the selected respondents. Data so collected was analyzed using SPSS software.

RESULTS AND DISCUSSION

Table 1: Distribution of respondents growing different rape seed mustard crops

n=95

Crop	*f*	Percent
Toria	91.00*	96.80
Raya	6.00*	6.38
Gobi sarson	20.00*	21.27
Toria only	68	72.34
Raya only	2	2.13
Toria and Gobi sarson	19	20.22
Toria and raya	3	3.19
Toria, raya and gobisarson	1	1.06
Not grown any rapeseed crop this time	1	1.06

(multiple response)

Analysis of table 1 reveals that among different rapeseed mustard crops, toria was grown by the maximum farmers (96.80 %) followed by gobi sarson (20.00 %) and raya (6.00 %). These were those farmers who were growing more than one rapeseed mustard crops. The table further revealed that 72.34 per cent farmers were growing toria as a sole crop and rest were growing mixed rapeseed crop.

Table 2: Adoption of recommended practices of rapeseed mustard

Crop	Sowing time		Seed rate		Source of seed		Method of sowing		Seed treatment		Irrigation	
	recomm.	Other than recom	As per recomm.	Other than recom	Own	DoA/ pvt dealer	Broad casting	Line sowing	Yes	No	Irrigated	Un irrigated
Toria n= 91	69.24	30.76	25.28	74.72	100.00	0.00	100.00	0.00	0.00	100.00	5.49	94.51
Raya n = 6	16.66	83.34	33.33	66.67	33.33	66.67	100.00	0.00	0.00	100.00	100.00	0.00
Gobi Sarson n = 20	65.00	35.00	55.00	45.00	65.00	35.00	100.00	0.00	0.00	100.00	5.00	95.00

The analysis of table 2 reveals that 69.24 per cent of the farmers in the study area adopted the recommemnded sowing time for toria followed by gobhi sarson (65.00 %) and raya (16.66). As a seed rate is concerned, maximum farmers were using recommended seed rate in gobhi sarson (55.00 %) followed by raya (33.33 %) and toria (25.28 %) respectively. The study further revealed that all farmers were using their own seeds for sowing toria followed by gobhi sarson (65.00 %) and raya (33.33). Further, 100 per cent of the farmers were adopting broadcasting method of sowing for all the three main rapeseed crops *i.e* toria, raya and gobhi sarson. None of the farmers was using seed treatment. The study further revealed that 100 per cent of the farmers were growing raya under irrigated conditions and gobhi sarson and toria under un-irrigated conditions in the study area. The findings of this table is also supported by findings of Dutta (2014).

Table 3: Adoption of chemical fertilizers by the rapeseed mustard growers

Crop	Urea		DAP		MOP	
	Applied	Not applied	Applied	Not applied	Applied	Not applied
Toria	48.00	43.00	75.00	16.00	1.00	90.00
n = 91	(52.74)	(47.26)	(82.42)	(17.58)	(1.09)	(98.91)
Raya	3.00	3.00	6.00	0.00	0.00	6.00
n = 6	(50.00)	(50.00)	(100.00)	(0.00)	(0.00)	(100.00)
Gobi sarson	10.00	10.00	10.00	10.00	0.00	20.00
n = 20	(50.00)	(50.00)	(50.00)	(50.00)	(0.00)	(100.00)

The analysis of table 3 reveals that 52.74 per cent of the farmers in study area were using urea for growing toria followed by gobhi sarson & raya (50 %). As for DAP fertilizer is concerned, 100 per cent of the respondent farmers were using it for growing raya followed by toria (82.42 %) and gobhi sarson (50.00 %).The study further revealed that only 1.09 per cent of the farmers were using

MOP in toria and none of the farmer was using MOP for growing raya and gobhi sarson.

Table 4: Mean application of fertilizers by the respondents in rape seed mustard crop

Time of application	UREA (kg/ha)	DAP (kg/ha)	MOP (kg/ha)
Toria (n = 91)			
Basal dose	60.91 ± 39.00	93.16±40.58	-
After sowing	53.80 ± 15.70	-	-
Top dressing	55.43± 16.52	-	-
Raya (n = 6)			
Basal dose	65.00 ± 49.50	72.83 ± 21.73	-
After sowing	-	-	-
Top dressing	70.00 ± 42.43	-	-
Gobi sarson (n = 20)			
Basal dose	40.00 ± 8.16	89.33 ± 27.43	-
After sowing	44.50 ± 13.70	-	-
Top dressing	60.00 ± 28.28	-	-

Analysis of the table shows that farmers were using average 60.91, 65.00 and 40.00 kg/ha urea as basal dose in toria, raya and gobhi sarson, respectively while 53.80 and 44.50 kg/ha average urea after sowing in Toria and gobhi sarson and 55.43,70.00 7 60.00 kg/ha urea as top dressing in toria, raya and gobhi sarson, respectively. Regarding DAP, farmers in the study area are using average 93.16,72.83&89.33 kg/ha as basal dose in all the three main rapeseed mustard crops.

Table 4: Distribution of respondents on the basis of use of f y m

Crop	F Y M	
	Applied	Not applied
Toria (n = 91)	21.00 (23.08)	70.00 (76.92)
Raya (n = 6)	1.00 (16.67)	5.00 (83.33)
Gobi Sarson (n = 20)	4.00 (20.00)	16.00 (80.00)
Mean dose of F Y M 10.63 mt/ha S.D.± 1.89		

Analysis of the table 4 showed that only 23.08 per cent of the farmers were applying FYM for growing toria followed by gobhi sarson (20.00 %) &raya (16.67 %) in the study area. The study further revealed that mean dose of FYM was 10.63mt/ha.

Table 5: Adoption of plant protection chemicals by the rape seed mustard growers

Crop	Insect observed		Treatment		Name of pesticides known	
	f	%	*F*	%	*f*	%
Toria n =91	8.00	8.79	6.00	6.59	1.00	1.10
Raya n= 6	1.00	16.67	1.00	16.67	1.00	16.67
Gobi sarson n =20	6.00	30.00	5.00	25.00	2.00	10.00

Figures in the table 5 depicts that 30 per cent of the farmers observed insect in gobhi sarson followed by raya (16.67 %) &8.79 (percent) in toria crop in the study area. The study further revealed that only 25 per cent of the gobhi sarson growers applied pesticide for insect treatment followed by raya (16.67 %) and toria (6.59 %). Further only 16.67 per cent of the raya growers were knowing the name of the pesticide used followed by gobhisarson growers (10.00 %) and toria growers (1.10 %).

Table 6: Sources of information utilized by the rape seed mustard growers for purchase of inputs

Sourceof information	Seed		Fertilisers		Pesticides	
	f	%	*f*	%	*f*	%
Deptt.of Agriculture	42.00	44.68	8.00	8.51	1.00	1.06
Co farmer	32.00	34.04	19.00	20.21	1.00	1.06
Private dealers	6.00	6.38	10.00	10.64	4.00	4.25
Self experience	12.00	12.77	16.00	17.02	2.00	2.13
Mass media	2.00	2.13	1.00	1.06	0.00	0.00
Family members	2.00	2.13	1.00	1.06	0.00	0.00
Krishivigyankendra	0.00	0.00	1.00	1.06	1.00	1.06

Analysis of the table 6 shows that field functionaries of agriculture department were the main source of information of rapeseed growers regarding seed followed by co-farmers. Regarding the information about fertilizers, co-farmers and input dealers were the main sources. So a as pesticide is concerned, private dealers were the main source of information utilized by the farmers of the study area. These findings are also supported by Sharma *et.al* (2008).

CONCLUSION

It has been concluded from the study that toria is the main rapeseed mustard crop grown by the farmers of the study area and all the respondents were using their own seed and they were of the view that toria crop raised by using own seed attained early maturity which did not hamper the timely sowing of wheat crop. It has been observed that farmers of the study area are not adopting the recommended seed rate. Regarding chemical fertilizers, farmers are not using potassic fertilizer for growing rapeseed mustard crops. From the conclusions it has been suggested that: early maturing Toria varieties should be developed, farmers' traditional wisdom needs attention, literature in vernacular language should be developed, timely supply of inputs should be ensured, farmers training programmes on regular basis should be conducted in remote areas, and frequent mobility of extension functionaries should be ensured.

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REFERENCES

Akbar, M.A.2011.Adoption of Modern Rapeseed Mustard and Sesame Varieties with Production Technologyfor Yield Gap Reduction. Project code CE-PE-049,*KrishiGobeshonaFoundation-Technical Bulletin.*No-16

Bhardwaj, V. 2013.*Overview of Indian Oilseed Sector*. National Council of Applied Economic Research (NCAER) The Solvent Extractors' Association of India (SEA) Directorate of Rapeseed Mustard Research, 2012-13 A report.

Dutta, A. 2014. Impact of improvised production technology for rapeseed- mustard in West Bengal. *Journal of Crop and Weed, 10(2):272-276*.

Sharma, A.k., Jha, S.K., Kumar, V., Sachan, R.C., and Kumar, A.2008. Critical analysis of Information Sources and Channels preferred by Rapeseed mustard Farmers. *Indian .J.Ext.Edu.*8 (2&3), May-Sep, 2008.

Yadava, D.K.,Vasudev,S., Singh,N., Mohapatra ,T. andPrabhu, K. V. 2012. Breeding Major Oil Crops: Present Status and Future Research Needs.A book chapter in Technological Innovations in Major World Oil Crops, Volume 1: Breeding By Dr S.K. Gupta, DOI 10.1007/978-1-4614-0356-2_2

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Effectiveness of Backward and Forward Linkages in Fruit Cultivation: A study of NERAMAC (North Eastern Regional Agricultural Marketing Corporation Limited)

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ABSTRACT

NERAMAC, a public sector organisation was set up to support fruit producers of north eastern India in fruit cultivation, marketing, processing and employment generation. It thereby bridges the gap between the farmers and the market to enhance the agricultural procurement, processing, and marketing infrastructure. The effectiveness of NERAMAC in technology advisory service, input delivery services and marketing services in Dhubri and Karimganjdistrict of Assam were studied. An *ex-post facto* research design was used for the study and the data were collected from 120 respondents comprising of 80 beneficiary farmers and 40 non-beneficiary farmers of NERAMAC. The effectiveness was measured through effectiveness index developed for this purpose. The extension services in respect of backward and forward linkages rendered by NERAMAC were found to be medium in effectiveness by majority of the farmers in the region.

Keywords: NERAMAC, backward and forward linkages, effectiveness index.

INTRODUCTION

The Indian farmers are facing severe challenges of geographical isolation, low productivity, climate change, pest and diseases, quality and quantity of irrigation water, credit, lack of market support including large number of middleman in marketing of agricultural produce, improper farm advisory services, inadequate farm machinery services, lack of entrepreneurial opportunities and insufficient infrastructural support for small and marginal farmers. Small farmers also face new challenges on integration of value chains, liberalization and globalization effects, market volatility and other risks and vulnerability, adaptation of climate change *etc.* (Thapa and Gaiha, 2011). Over the years, the total cultivable land is shrinking steadily, the grain area per person in India has shrunk steadily for several decades. In 1950 it was 0.22 hectares and is now below 0.10 hectares. It is projected that by 2050 the figure will be as less as 0.06 hectares per person (Larsen, 2003). In this context, food security becomes a prime concern for all of us. Fruits can play a vital role in in attaining food and nutritional security of India, especially in the backward regions like Assam state of North eastern India which occupies an important position in terms of fruit production among the states of north eastern India. Among the fruits, oranges, pineapple, cashew nut, mango, banana, acid lime, are major fruits grown in this region (CMI SRC, 2005).

The major problem in the backward regions are lack of an efficient marketing system (Planning Commission, 2007). The middlemen intervention being a serious concern for farmers in general and specific in backward regions like north east as the real profit goes to them who buy up the farm products at farm gate at nominal price and sell at outrageous prices to the consumers. This behaviour of middle men have discouraged genuine stakeholders getting into agriculture because of the marginal profit associated with it as the middle men cart away the bulk of the profits,posing serious threat to food security (Oguoma, 2010).

In many countries, government extension services are criticized for being inefficient and out of touch with the needs of their clients and the wider society (Carney, 1998).There is a large gap between the farmers and the government agencies regarding proper information about what to grow, how to grow and when to grow. North Eastern Regional Agricultural Marketing Corporation Limited (NERAMAC), a central public sector undertaking promoted by North Eastern Council, is an institutional innovation in the form of procurement of the marketable surplus of fruits and vegetables, its processing and marketing along with input support to producers. NERAMAC is active in the region since 1982-83. In addition to undertaking processing and marketing activity, it also takes up activities to enhance entrepreneurial skills of the fruit crop growers. However, regular training of staffs in organizational coordination and management has been stressed for enhanced

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effectiveness (Das *et al*, 2014). As such the effectiveness of different extension agencies working at ground level needs to be viewed from the eyes of stakeholders. Keeping this in view, the study was conducted to assess the effectiveness of NERAMAC in providing backward and forward linkage services which is a public extension system operational in North eastern part of India.

METHODOLOGY

The study was conducted in two districts namely Dhubri and Karimganj of Assam state of India. Two blocks from each district namely Mankachar and South Salmara from Dhubri district and Badarpur and South Karimganj from Karimganj were selected purposively having highest activities of NERAMAC. Two villages from each selected block were selected randomly, making a total of 8 villages accordingly.Ten farmers from each selected village made the sample of beneficiary farmers and five from each village were selected as non-beneficiary respondents. An *ex-post facto* research design was used for the study. Farmers' perception about different forward and backward linkage services provided by the NERAMAC were focused for the study. For the purpose of measuring effectiveness, an index was adopted after necessary modification from Mukherjee (2012). The effectiveness of agricultural extension system was operationalized as comprising the - components - *viz.* forward and backward linkage services, extent of adoption, increase in yield, increase in profit/income and farmers satisfaction. The data collection was performed by personal interview method.

Forward and backward linkage services: Availability of services, accessibility, appropriateness, timeliness and qualitywere studied on three point continuum scale. The highest was scored 3 and lowest as one whereas timeliness of service was scaled on two point continuum *i.e.* Yes (2) and No (1).

Extent of adoption of technology: The extent of adoption was measured for the recommended cultivation and post harvest practices for fruits. The extent of adoption was measured as per cent of adoption of recommended practices as given bellow:

Extent of adoption = (Actual practice/ Recommended practices) x100

Increased yield of farmers: It was calculated by subtracting the earlier yield per acre of the crop before intervention of NERAMAC from present yield after intervention of NERAMAC. Following formula was used:

% increase in yield = (Increase in yield per acre /Earlier yield per acre per year) x 100

Increased income of farmers: Increased income was calculated by subtracting the earlier income per hectare of the crop before intervention of NERAMAC from present profit after intervention of NERAMAC. The following formula was used:

% income increase = (Increased in income per hectare/ Earlier income per hectare) x100

Satisfaction index: To measure farmer's satisfaction of extension service, the index prepared by Kumar, (2005) was used after necessary modification. There were seven statements scored on five point continuum *viz.* strongly agree (5), agree (4), undecided (3), disagree (2) and strongly disagree (1). The highest score one can obtain was 35 and lowest 7. The responses were added to get satisfaction score. The satisfaction index was calculated as:

Farmers' satisfaction index = (Individual score obtained/ Maximum score) x100

The respondents were classified into five categories from very low to very high level by dividing the score into five classes of equal interval.

Effectiveness index: The effectiveness index was prepared based on all the above mentioned parameters and was calculated by the following equation:

EI= (FBS *W1+ EA* W2 + IY * W3 + II * W4 + FS * W5) / (W1+W2+W3+W4+W5+W6)
Where,
EI: Effectiveness index
FBS: Mean score of forward and backward linkage services
EA : Score of Extent of Adoption
IY: Per cent increase in yield
II: Per cent increase in Income
FS: Farmer's satisfaction score
Wi are respective weight as per mean of experts rating to the above components

RESULTS AND DISCUSSION

The results and appropriate discussion has been presented in five sub heads *viz;* perceptions regarding forward and backward linkage services, timeliness of the services, extent of adoption, increase in production and income of the farmers and perceived satisfaction with

NERAMAC services.

Forward and backward linkage services: The forward and backward linkage services were categorized in sub heads like; availability of services, accessibility of inputs, quality, timeliness of services supply, and appropriateness of services. The responses of 80 NERAMAC beneficiary farmers described in table 1 shows that forward and backward linkage services of NERAMAC was found to be medium in availability by 62.5 per cent of farmers, high by 23.7 per cent and very high by 10 per cent. The services were found to be high in accessibility by 73.7 per cent of farmers, whereas, 16.2 per cent farmers found the services medium in accessibility. The services was found to be high in appropriate by 76.25 per cent farmers whereas, 17.5 per cent farmers found it medium. As per farmers' response about timeliness, the service was found to be medium in timeliness by 67.5 per cent farmers whereas, 7.5 per cent farmers found it high in timeliness and very high to 10 per cent of farmers. In case of quality of services it was found to be medium by 46.2 per cent and high by 23.7 per cent of farmers.

Table 2 shows appropriateness of the technologies provided by NERAMAC. It was operationally defined as suitability of the technology provided by the NERAMAC based on farming conditions and climate of the farmers in particular region. The perception of the farmers was obtained on degree of appropriateness of various services. About 66 per cent farmers perceived that the latest package of practice in the form of 'Raw material services with market updates' provided by NARAMAC was appropriate to their field situation and 30 per cent farmers perceived it highly appropriate for their location. Sixty per cent farmers perceived that the service provided by NARAMAC was appropriate to their field situation and 27.5 per cent farmers perceived it highly appropriate for their location in 'up to date support in allied sectors of agriculture'. About 'capacity building' services, 51.2 per cent farmers believed that it was appropriate in their situation while 35.0 per cent farmers believed that it was highly appropriate in their condition. It illustrated that 53.75 per cent farmers perceived appropriate 'market support' by the NERAMAC while 22.5 per cent farmers perceived it as moderately appropriate to their field situation. 63.75 per cent farmers experienced that the services for the 'post-harvest technology' were appropriate in their situation while 21.2 per cent farmers experienced it as somewhat appropriate in their condition. It also shows that 71.25 per cent farmers perceived that the 'processing services' provided by NARAMAC was appropriate to their field situation and 27.5 per cent farmers perceived it highly appropriate for their location.

Timeliness of the services: It referred to the availability of the technology and the services provided by the NERAMAC at the appropriate time to the farmers in terms of seasonality of the crops grown in particular area. The perceptions of the farmers were sought on the relativity of newness of technology. Table 3 represented the frequency and percentage of response of the farmers to the timeliness of the services of the NERAMAC. It showed that 68.75 per cent farmers perceived that information regarding the raw material services was provided in advance of the season while 6.25 percent framers perceived that it was provided far in advance of the cropping season. Seventy per cent farmers assumed that information regarding the practices of allied sectors was provided in advance while 13.75 per cent farmers felt that it was provided far in advance. In case of market support, 57.5 per cent farmers felt that it was provided far in advance. For the post-harvest technology, 30 per cent farmers perceived that the services were provided in advance and 50 per cent farmers responded that it was provided at the time of technology to be used.

Extent of adoption: The NERAMAC is promoting different fruit crops in this region. There were several recommendations in fruit cultivation and post harvest handling with proper market support prescribed by NERAMAC. Farmer's perception regarding the adoption of practices was sought and the results are presented in table 4. Majority of farmers (40 per cent) have highly adopted the recommended practices and 25 per cent of farmers adopted the recommended practices in medium. About 24 per cent had adopted the recommended practices very highly. The findings are similar with the findings of Kumar A. (2005) and Mukherjee (2011).

Increase in production and income of beneficiaries after NERAMAC intervention: The increase in production and income after intervention of NERAMAC were divided in five equal categories. Table 5 reveals that most of the farmers (30 %) had very high (80 % and above) had increase in their production after the intervention of NERAMAC. There was high (61-80 %) increase in the production of 23.8 per cent of the farmers whereas medium (41-60percent) increase in production of 20 per cent of the farmers. Only 15 per cent farmers had low (21-40 %) increase in their production and very low (0-20 %) increase in the production of 11.2 per cent farmers NERAMAC in their locality. Overall increase in production was 66.29 per cent. The findings are similar with the findings of Kumar A. and Vijayaragavan (2007). Table 5 further shows that there was very high (80 % and above) change in income for the 75 farmers, 12.5 per cent farmers have medium (40-60%) increase in income. Only 10 per cent farmers had high (60-80%) increase in income. The overall average change in income of the

farmers was 130.4 per cent after the intervention of NERAMAC.

Farmers' perceived satisfaction level from the services of NERAMAC: The farmer's satisfaction was operationally defined as the perceived need contentment by the utilization of services provided by NERAMAC. Table 6 depicted that 70 per cent of the total farmers had medium level of satisfaction with the services provided by the NERAMAC and 10 per cent farmers had high level of satisfaction. Five per cent farmers had very high satisfaction with the NERAMAC.

The findings are similar with the findings of Kumar (2005). The obtained score was divided into five equal groups ranging from low to high effectiveness of the NERAMAC services. Table 7 revealed that 62.5 per cent of the total farmers perceived that the NERAMAC effectiveness was medium.

Out of the total farmers, 16.2 per cent farmers perceived it very high effective in obtaining the services regarding their farming. There were 21.2 per cent farmers believed that it was highly effective to meet their needs. The findings are similar with the study of Chandrasekhar (2013) and Mukherjee (2011).

Table 1: Farmers' responses regarding forward and backward linkage of NERAAMC

(n=80)

Category		Availability	Accessibility	Appropriateness	Timeliness	Quality
Very low	(0-20)	-	-	-	-	-
Low	(21-40)	5(6.2%)	3 (3.75%)	1 (1.25%)	12(15%)	15(18.7)
Medium	(41-60)	50 (62.5%)	13(16.2%)	14 (17.5%)	54(67.5%)	37(46.2 %)
High	(61-80)	19 (23.7%)	59(73.7%)	61(76.25%)	6(7.5%)	19(23.7)
Very high	(81-100)	8(10%)	5(6.2%)	4(5%)	8(10%)	9(11.2%
Mean		64.55	67.34	65.56	68.43	73)12
S.D		6.18	5.56	5.87	4.36	7.78

Table 2: Distribution of farmers as per perceived appropriateness of the services provided by NERAMAC

n=80

Services	HA		AP		MA		SA		NA	
	f	%	*f*	%	*f*	%	*f*	%	*f*	%
Raw material services with market updates	24	30.00	53	66.25	1	1.2	2	2.50	0	0.00
Up to date support in allied sectors of agriculture	22	27.5	48	60.0	10	12.5	0	0.00	0	0.00
Market support	17	21.25	43	53.75	18	22.50	2	2.50	0	0.00
Entrepreneurial services	11	12.5	16	21.2	3	4.5	52	62.5	0	0.00
Procurement services	10	12.5	17	21.2	3	4.5	27	34.5	0	0.00
Processing services	22	27.5	57	71.25	1	1.2	0	0.00	0	0.00
Advisory services	0	0.00	11	13.75	52	62.5	17	21.2	1	1.2
Capacity building	28	35.0	41	51.2	11	13.8	0	0.00	0	0.00
Input services with protection technologies	23	28.8	10	12.5	20	25.0	52	62.5	0	0.00
Post-Harvest Technologies	2	2.50	51	63.75	8	10	17	21.2	2	2.50

HA=highly appropriate, AP=Appropriate, MA=moderately appropriate, SA=somewhat appropriate, NA=Not at all appropriate

Table 3: Distribution of farmers as per perceived timeliness of the services by NERAMAC

n=80

Services	FA		IA		UT		TL		TO	
	f	%	*f*	%	*f*	%	*f*	%	*f*	%
Raw material services with market updates	5	6.25	55	68.75	15	18.8	5	6.25	0	0.00
Up to date support in allied sectors of agriculture	11	13.75	56	70	9	12	0	00	0	0.00
Advisory service	3	3.75	26	37.8	51	63.75	0	0.00	0	0.00
Market support	7	8.75	46	57.5	10	12.5	17	21.25	0	0.00
Entrepreneurial services	5	6.2	45	56.5	50	62.5	4	5.0	0	0.00
Procurement services	25	31.25	40	50	15	18.8	29	36.2	0	0.00
Processing services	3	3.75	23	28.75	19	23.75	11	13.75	0	0.00
Capacity building	3	3.8	42	52.5	15	18.8	0	0.00	0	0.00
Input services with protection technologies	2	2.5	43	51.2	32	40	3	3.8	0	0.00
Post-harvest technologies	6	7.50	24	30	40	50	0	0.00	0	0.00

FA=Far in advance, IA=In advance, UT=at the time of usage of technology, TL= When technology loses its objective newness, TO=When technology becomes obsolete

Table 4: Extent of overall adoption of recommended practices

n=80

Category		Frequency (percentage)
Very low	(0-20)	1 (1.25%)
Low	(21-40)	8 (10%)
Medium	(41-60)	20 (25%)
High	(61-80)	32 (40%)
Very high	(81-100)	19 (23.75%)
Mean		65.00
S.D		4.4

Table 5: Distribution of farmers based on increase in production and income from fruit crop after NERAMAC services

n=80

Category	Class Score (%)	Production	Income
		Frequency(Percentage)	Frequency(Percentage)
Very Low	0-20	6 (7.5)	1 (1.25)
Low	20-40	9 (11.25)	10 (12.50)
Medium	40-60	32 (40.0)	36 (45.0)
High	60-80	20 (25.0)	20 (25.0)
Very High	80-Above	13 (16.25)	13(16.25)
Mean		61.69	85.50
Standard Deviation		5.45	7.69

Table 6: Satisfaction level of farmers based from NERAMAC services

n=80

Category of Satisfaction	Class Score	Frequency	Percentage
Very low	0-20	01	1.20
Low	20-40	9	11.2
Medium	40-60	56	70.0
High	60-80	10	10
Very high	80-100	4	5.0
Mean		24.17	
Standard Deviation		5.46	

Table 7: Distribution of farmers based on effectiveness index scores

n=80

Category of Effectiveness	Class Score	Frequency	Percentage
Very Low	0-20	0	0.00
Low	20-40	0	0.00
Medium	40-60	50	62.5
High	60-80	17	21.2
Very High	80-100	13	16.2
Mean		71.45	
Standard Deviation		5.34	

CONCLUSION

The study on effectiveness found that most of the farmers were moderately satisfied with the services from NERAMAC. Though, the adoption of recommended practices was still high, increase in production was medium resulting medium to high increase in income level of farmers. The services were found good in accessibility and appropriateness though the services were found medium in availability, timeliness, and quality. It can be concluded that proper technical backstopping by research institutes, forward and backward linkages for financial needs and learning-by-doing supported by inter-firm network collaboration may enhance the competitive potential of the fruit growers. There should be better coordination and convergence among different institutions like ATMAs, SAUs, and KVKs by forming linkage with this organizations and other governmental or non-governmental organizations for better grass-root level coordination. The input services with protection technologies, entrepreneurial services and procurement services were rated towards lower side as such services need to be more focused and the intensity need to be increased for wider coverage in number and subject matter areas. The market support and procurement services need to be more tailored to the need of the stakeholders.

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REFERENCES

Carney, D. 1998.Changing public and private roles in agricultural service provision. London: Overseas Development Institute. 37.Private Extensions in India.

Chandra Shekar S., Bahal R. and Padaria R. N. 2013 Effectiveness of Agri-Clinic in Promoting paid extension services among farmers. *Indian J. Ext. Edu 49 (3 &4) :28-33.*

CMI SRC 2005. Export potential of horticultural products from North eastern States. By CMI Social Research Center, sponsored by APEDA, New Delhi.Available at http://mdoner.gov.in.

Das L, Nain M.S., Singh R., and Burman R. R 2014.Constraints in Marketing of Fruits as Perceived by the Fruit Growers and NERAMAC in Assam.*Journal of Community Mobilization and Sustainable Development.*9(2):114-117

Kumar A. and Vijayaragavan, K. 2007. Effectiveness of Privatized Agricultural Extension Services - A case of Tata Kisan Sansar. *Indian Journal of Extension Education.*43 (3& 4): 68-73.

Kumar, A. 2005. Privatised extension in practice: effectiveness and management issues. M.Sc Thesis (Unpub.), Division of Agricultural Extension, IARI, New Delhi.

Larsen, J. 2003. Plan B updates, population growth leading to land hunger http://www.earth-policy.org/ plan b_updates/2003/update21

Mukherjee A., Bahal R., Burman R. R., Dubey S.K., and Jha G.K. 2012.Constraints in Privatized Agricultural Technology Delivery System of Tata Kisan Sansar.*Journal of Global Communication.*5 (2):155-159.

Oguoma, O.N., V. I. Nkwocha, and I. I.I Beawuchi 2010. Implications of middlemen in the supply chain of agricultural products.*Journal of Agriculture and Social Research (JASR*). 10(2):

Planning commission 2007. Rural marketing system in the North Eastern States: Problems, diagnosis and strategy perspective. Available at http://planning commission.gov.in/reports/sereport/ser/stdy_rulmak.pdf

Thapa, G. and R. Gaiha 2011, "Smallholder farming in Asia and the Pacific: Challenges and opportunities", paper presented at the conference on new directions for small holder agriculture, January 24-25,2011, Rome, IFAD.

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Socio- economic impact of *Krishi Mahotsav* on Beneficiary Farmers of Gujarat

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ABSTRACT

Transfer of scientific technologies from research station to farmers' fields plays the vital role for rural development and rural upliftment. The government of Gujarat organizes *Krishi Mahotsav* every year before monsoon. It is a unique approach of transfer of technology in the whole rural area. There are 18000 villages in Gujarat and *Krishi Rath* equipped with scientific technology information through posters, panels, TV moves in every village. The scientists of agricultural universities are appointed to deliver latest technical know-how. It was started in 2005 and designed for the benefits of farming community for one month duration. Eight *Krishi Mahotsav* have been completed till this study. The present study was conceived with a general objective of assessing the socio economic impact of *Krishi Mahotsav* on beneficiary farmers as a result of participating in *Krishi Mahotsav*. Four districts of Gujarat state Banaskantha, Mahesana, Sabarkantha and Kachchh were randomly selected for this study. The results revealed that majority of beneficiary farmers were found in medium category of socio-economic impact as a result of participation in *Krishi Mahotsav*. About aspect-wise socio-economic impact, majority of beneficiary farmers (43.33 %) have increased their cultivation land as a result of participating in *Krishi Mahotsav* and 95 per cent beneficial farmer have increased their annual income per hectare. According to the, opinion of the beneficiary farmers 57.08 per cent of them had increased their saving and investment, 67.92 per cent of them increased their social status and 72.50 per cent of the beneficiary farmers increased their social relationship through participation in *Krishi Mahotsav*.

Key words: Krishi Mahotsav, Transfer of technology, Socio economic impact

INTRODUCTION

The government of Gujarat organizes *Krishi Mahotsav* every year before monsoon. It is a unique approach of transfer of technology in the whole rural area. There are 18000 villages in Gujarat and *Krishi Rath* equipped with scientific technology information through posters, panels, TV moves in every village. The scientists of agricultural universities are appointed to deliver latest technical know-how. Started in 2005, it is a festival especially designed for the benefits of farming community and the duration of the festival is of one month. Eight *Krishi Mahotsav* have been completed till study.

METHODOLOGY

There was need of deeper probe into the effect of *Krishi Mahotsav*. The present study was conceived with a general objective of assessing Its socio economic impact on beneficiary farmers as a result of participating in *Krishi Mahotsav*. Four districts of Gujarat state Banaskantha, Mahesana, Sabarkantha and Kachchh were randomly selected for this study. From each selected district, two talukas and from each taluka three villages were selected randomly for the study. A list of villagers/farmers who had attended all the three *Krishi Mahotsav* (2006, 2007 and 2008) was made available from government authority. Later on ten farmers from each village were randomly selected which consisted a sample size of 240 respondents.

RESULTS AND DISCUSSION

Socio-economic impact on beneficiary farmers

Socio-economic impact is the impact that occurs as a result of knowledge gain or rejection of an innovation to individual or a social system. It was operationally defined as the resultant impacts in the form of socio-economic changes occurred among the beneficiary farmers. The difference of resultant impacts that occurred after execution of *Krishi Mahotsav viz.,* increase in land use, increase in annual income, impact in cropping pattern, increase in crop-production, impact in saving and investment, impact in social status and impact in social relationship were considered to be the components of socio-economic impact of beneficiary farmers. The information in this regard was collected and the beneficiary farmers were classified into three levels of socio-economic impacts *viz.,* low, medium and high. The data are presented in Table 1.

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Table 1: Distribution of the beneficiary farmers according to their level of socio-economic impact

n=240

Level of socio-economic impact	Frequency	Per cent
Low (Below 18.888 score)	69	28.75
Medium (18.888 to 27.046 score)	164	68.33
High (Above 27.046 score)	7	2.92
Total:-	240	100.00
Mean = 22.967	S.D. =	4.079

A perusal of data in Table 1 revealed that more than two third (68.33 %) of the beneficiary farmers were found in medium category of socio-economic impact. It is worth to note that 28.75 per cent of the beneficiary farmers were found in low category of socio-economic impact. Only 2.92 per cent beneficiary farmers found in high social-economic impact.

It can be concluded that a great majority (71.25 %) of the beneficiary farmers were in category of medium to high socio-economic impact. This might be due to the facts that beneficiary farmers got better contact with extension agencies, highly favourable attitude, medium level of knowledge and knowledge gain *etc.*

Aspect-wise socio-economic impact on beneficiary farmers

Change in land use

To assess the impact of *Krishi Mahotsav* regarding increase in cultivated land the change in land use pattern was categorized into utilized land under agricultural crop, land utilized under horticultural crops and barren and uncultivated land. Increase in cultivation land is depicted in Table 2.

Table 2: Distribution of beneficiary farmers according to their change in cultivated land as a result of participation in *Krishi Mahotsav*

n=240

Increase in area	Frequency	Per cent
No change	136	56.67
Upto 0.50 ha	39	16.25
0.50 to 1.00 ha.	31	12.92
1.00 to 1.50 ha.	16	6.67
1.50 to 2.00 ha.	08	3.33
More than 2.00 ha.	10	4.16

The data presented in Table 2 pointed out that 56.67 per cent of the beneficiary farmers of *Krishi Mahotsav* were unable to increase the area of cultivated land remaining 43.33 per cent beneficiary farmers of *Krishi Mahotsav* were able to use area of cultivated from 0.50 to 2.00 ha while, among the total beneficiary farmers 16.25 and 12.92 per cent farmers have increased their cultivation upto 0.50 ha and between 0.50 to 1.00 ha, respectively.

Whereas, 6.67 and 3.33 per cent beneficiary farmers have increased their cultivated land between 1.00 to 1.50 ha and 1.50 to 2.00 ha, respectively. Merely 4.60 per cent beneficiary farmers have increased their cultivated land more than 2.0 ha. Thus, it can be concluded that 43.33 per cent farmers have increased their cultivated land as a result of participation in *Krishi Mahotsav*.

Probable resason may be the guidance provided during *Krishi Mahotsav* about MIS, efficient use of irrigation water leds to increase cultivation land.

Change in cropping pattern

Districtwise changes in number of beneficiary farmers growing different crops before and after *Krishi Mahotsav* are shown in Table 3.

Table 3: Districtwise distribution of beneficiary farmers according to their change in crop grown as a result of participation in *Krishi Mahotsav*

n=240

Name of the crop	Banaskantha		Sabarkantha		Mahesana		Kachchh		Total	
	Before Krishi Mahotsav	After Krishi Mahotsav	Before Krishi Mahotsav	After Krishi Mahotsav	Before Krishi Mahotsav	After Krishi Mahotsav	Before Krishi Mahotsav	After Krishi Mahotsav	Before Krishi Mahotsav	After Krishi Mahotsav
Pulses	23	15	10	5	18	8	25	15	76	43
Pearlmillet	27	18	-	-	40	26	28	18	95	62
Sesamum	30	14	-	-	32	16	18	9	80	39
Cotton	10	28	20	43	10	34	20	43	60	148
Castor	14	30	30	33	12	28	23	33	79	124
Rice	-	-	42	30	-	-	-	-	42	30
Wheat	30	14	15	15	38	40	21	10	104	81
Cumin	-	-	-	-	24	10	16	21	50	31
Mustard	30	12	17	17	10	2	13	5	70	36
Potato	12	32							12	32
Vegetable	2	8	7	9	0	2	2	4	11	23
Other crops	2	4	1	2	8	12	3	6	14	24

The data presented in Table 3 revealed the impact of *Krishi Mahotsav* on beneficiary farmers in growing of two major crops before and after *Krishi Mahotsav*.

Table 4: Distribution of the number of beneficiary farmers according to their change in crop grown

n=240

Major crops grown by the beneficiary farmers	Number of beneficiary farmers		Per cent change
	Before *Krishi Mahotsav*	After *Krishi Mahotsav*	
Pulses	76 (31.67)	43 (17.92)	-13.75
Pearlmillet	95 (39.58)	62 (25.83)	-13.75
Sesamum	80 (33.33)	39 (16.25)	-17.08

Cotton	60 (25.00)	148 (61.67)	36.67
Castor	79 (32.92)	124 (51.67)	18.75
Rice	42 (17.50)	30 (12.50)	-5.00
Wheat	104 (43.33)	81 (33.75)	-9.58
Cumin	50 (20.83)	31 (12.92)	-7.91
Mustard	70 (29.17)	36 (15.00)	-14.17
Potato	12 (5.00)	32 (13.33)	8.33
Vegetable	11 (4.58)	23 (9.58)	5.00
Other crops	14 (5.83)	24 (10.00)	4.17

Figures in the parentheses indicate per cent beneficiary farmers.

The data indicated that there is an increase in number of beneficiary farmers in growing crops like cotton (36.67 %), castor (18.75 %), potato (8.33 %), vegetables (5.00 %) and other crops (4.17 %), while there is a decrease in number of beneficiary farmers in growing pulses, pearlmillet, sesamum, rice, wheat, cumin and mustard crops.

This may be due to the fact that farmers get more remunerative prices of cash crops as compared to traditional crop and other important probable results may be technical guidance provided by the Scientist / Experts at the time of *Krishi Mahotsav.* Similar resuls was found by Bhange *et.al* (2005).

Change in annual income

The data presented in Table 5 clearly indicated that 38.75 per cent of beneficiary farmers had increase in income in range of ₹ 10,000/- to ₹ 20,000/- per ha. and for 25.42 and 22.50 per cent of them had annual income increased between ₹ 20,000/- to ₹ 30,000/- and up to ₹ 10,000/- per ha, respectively. Merely 5.83 and 2.50 per cent beneficiary farmers had increased their annual income per ha between ₹ 30,000/- to ₹ 40,000/- and more than ₹ 40,000/-, respectively. Only 5.00 per cent beneficiary farmers had no change in their annual income.

Thus, it is indicated that 95 per cent of beneficiary farmers could increase their annual income per ha as a result of participating in *Krishi Mahotsav.*

Table 5: Distribution of the beneficiary farmers according to their change in annual income per ha

n = 240

Increase annual income per hectare	Frequency	Per cent
No change	12	5.00
Upto ₹ 10,000/-	54	22.50
₹ 10,000/- to ₹ 20,000/-	93	38.75
₹ 20,000/- to ₹30,000/-	61	25.42
₹ 30,000/- to ₹ 40,000/-	14	5.83
More than ₹ 40,000/-	06	2.50
Total :-	240	100.00

The probable reason might be due to the awareness of efficient use of irrigation, fertilizers and pesticides as a result of participating in *Krishi Mahotsav*. Similar result were found by Pandya and Pandya (2011)

Change in saving and investment, social status and social relationship

The data presented in Table 6 revealed that 57.08 per cent beneficiary farmers had increased their saving and investment, 67.92 per cent of them had increased their social status and 72.50 per cent beneficiary farmers had increased their social relationship through participation in *Krishi Mahotsav*.

Table 6: Distribution of the beneficiary farmers according to their aspect wise socio-economic impact

n = 240

Particular	Mean score frequency	Per cent
Change in saving and investment	137	57.08
Change in social status	163	67.92
Change in social relationship	184	72.50

It can be concluded that *Krishi Mahotsav* had incresed social impact regarding saving and investment, social status and social relationship of the beneficiary farmers because of knowledge gained through participation in *Krishi Mahotsav* and relationship build-up among farming community.

CONCLUSION

The results revealed that majority of beneficiary farmers were found in medium category of socio-economic impact as a result of participation in *Krishi Mahotsav*. About 43.33 per cent beneficiary farmers had increased their cultivation land while, 95 per cent of beneficiary farmers have increased their annual income as a result of participating in *Krishi Mahotsav*. According to the opinion of the beneficiary farmers, 57.08 per cent of them had increased their saving and investment, 67.92 per cent of them increased their social status and 72.50 per cent of the beneficiary farmers had increased their social relationship through participation in *Krishi Mahotsav*.

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REFERENCES

Bhange S.B, Lande S.B. and Sadaphai S. 2005 Impact of National watershed development progmamme. *Asian J. of Extn. Edn.*,XXIV, pp.62-65.

Pandya C.D. and Pandya R.D. 2011, Socio economic change as result of watershed development programme, *Guj. J. Extn. Edn.* :22 pp 51-52

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Impact of National Training on Sorghum Cultivation for Value-addition

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ABSTRACT

The study was conducted at Directorate of Sorghum Research, Hyderabad on 20 trainees comprising of agriculture officers from four state agricultural departments engaged in field extension to assess impact of the training programme conducted on sorghum value-added products and sweet sorghum. The data were collected through direct interactions with the participants and interview schedule . Results revealed that the learning index of the trainees was significantly correlated with their age, job experience, and level of satisfaction about training materials and atmosphere. Before training, majority of them (60%) belonged to medium knowledge level (between 16 and 30 knowledge score) who had more than double knowledge score (49-84) after the training. Knowledge gained was found to be highly significant at 0.001% level. The topics viz., improved package of practices for kharif and rabi sorghum cultivation followed by approaches for transfer of improved sorghum technologies, sweet sorghum as versatile bio-energy crop, major weeds of sorghum and their management and value-addition to sorghum with reference to its industrial uses and entrepreneurship development were perceived as more useful. The overall impact on the trainees was found to be highly significant and encouraging. This course will help them in their job to organize effective extension programmes and encourage small entrepreneurs at grass root level.

Key words: Impact of training; knowledge gain; sweet sorghum; technology transfer; usefulness of training; value addition

INTRODUCTION

Sorghum (*Sorghum bicolor* L. Moench) is a potential crop to grow well in harsh environments unlike fine cereals, wheat and paddy. It is an important staple food and fodder for livestock especially in semi-arid region. It is one of the principal sources of energy, protein, vitamins and minerals for millions of the poorest people in these regions. Recently, sorghum emerges as a source for bio-fuel and different value-added food products. However, the area under sorghum in India has declined significantly and the average productivity has increased (962 kg /ha in 2011-12) mainly due to adoption of improved production technologies by the farmers.

Adoption of technologies by the farmers is a key component in agricultural development. Several promising technologies are available in laboratories of the research institutes. However, low productivity, susceptibility to biotic, abiotic factors, timely use of inputs, crop management, marketing and its economics are the major concerns in sorghum promotion. To exploit the potential of the available promising technologies and overcome the clientele problems, technology transfer has to play a crucial role for well being of the small and marginal sorghum farmers. Transfer of technology is a complex but very essential process in agriculture development. There is challenge before extension agencies to develop competent human resources in the agriculture sector to serve large farming community under different agro-climatic situations (Chapke *et. al.*, 2013). The capacity building of the extension managers and field extension functionaries of the different sorghum growing states and agriculture as a whole, and to create self employment became important (Jha *et. al.,* 2002). Their competency can be enhanced by improving skills, updating latest technical knowledge and ultimately changing their attitude so that they can deliver their services effectively. Against this backdrop, the present study on impact assessment of the model training course on sorghum was undertaken to improve the professional competence, upgrade the knowledge and develop technical skills on improved sorghum cultivation, value addition and sweet sorghum.

METHODOLOGY

A national model training course (MTC) on "Sorghum cultivation for value-added diversified products and sweet sorghum perspectives" was organized by Directorate of Sorghum Research (DSR), Hyderabad during September 23-30, 2013. Besides the

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technological aspects of improved sorghum production technologies, preparation and marketing of value-added products, nutritional benefits, forage and sweet sorghum, and innovative extension approaches were covered. Twenty agriculture officers from agriculture departments of major sorghum growing states and ICAR, namely, Maharashtra (45%), Andhra Pradesh (35%) Karnataka (15%) and Madhya Pradesh (5%) participated in this course. The training methodology used was interactive lecturette using audio-visual aids, brainstorming, visit to field demonstrations and research facilities of concerned national and international organizations. The trainees were also provided with reading materials, a compilation of the subjects covered in the training, and also publications of DSR on the selected topics. The impact of the training in terms of gain in knowledge, skill and attitude including its usefulness was measured before and after the training with the help of semi-structured questionnaire. Training needs were also assessed at the beginning of the programme. The degree of learning acquired from this training was also measured by arriving at the changes between the post-training and pre-training scores with the formula; Learning Index (LI) = {Post-training score (%) - pre-training score (%)}/ {100 Pre-training score (%)}x 100. The standardized learning index obtained for each trainee was further studied in relation to pre-training reactions, biographical, organizational and psychological variables by using descriptive statistics, mean, frequencies, percentage, correlation and 't' test.

RESULTS AND DISCUSSION

Training needs related to sorghum development

The participants were asked about their training, needs on different aspects of improved sorghum cultivation. Responses were taken on a five-point continuum, very high, high, medium, low and no training need with assigning 4, 3, 2, 1 and zero score, respectively. It was converted into total score by multiplying with respective frequency of the respondents to each aspect. Total ten training needs related to sorghum were expressed by the participants at the beginning of the training (Table 1). Overall first preference was given by them to preparation of value-added food products and its marketing (72 total score), second to sorghum seed production technology (69 total score), third preference was for marketing of sorghum grains and fodder (68 total score) and the fourth was to effective transfer of technologies (67 total score) and fifth was to nutritional benefits of sorghum (64 total score). The sixth overall score assigned for crop management closely followed by crop protection, ethanol production from sweet sorghum, selection of location-specific crop production technologies, and intellectual property right (IPR) and farmer's right issues. It showed that value-addition and marketing, and seed production of improved cultivars were prime important training needs in the present commercial oriented farming than the subsistence one. Reddy and Ratnakar (2013) also reported similar kind of training needs for extension functionaries of state development departments of the country.

Table 1: Training needs related to sorghum expressed by the participants

n=200

Training areas	Extent of training needs					Weighted Score
	Very high	High	Medium	Low	No	
Preparation of value-added food products and its marketing	12	6	2	0	0	72
Sorghum seed production technology	10	9	1	0	0	69
Marketing of sorghum grains and fodder	12	5	2	1	0	68
Effective transfer of technologies	7	11	2	0	0	67
Nutritional benefits of sorghum	8	9	2	1	0	64
Crop management practices	7	9	4	0	0	63
Crop protection technologies	5	12	3	0	0	62
Ethanol production from sweet sorghum	9	7	2	0	2	61
Selection of location-specific crop production technologies	7	11	1	1	0	58
IPR issues and Farmers right	4	7	1	1	7	40

Relationship of learning with socio-personal traits of trainees

The participants of the training were diverse in their age group as fifty per cent were of middle age followed by young (30%) and old (20%). Most of the trainees were post-graduate (65%) while only 35 per cent were graduate, which showed that this group was learned group. Much variation was not found in their annual income as fifty five per cent were having income of more than ₹ 3.00 lakhs. It may due to getting good salaries as per their officer grades and seniority. All the trainees had more than 10 years of job experience and thereby they had better understanding about grass-root problems of the farmers which help them to learn better. Consequently, most of them had exposure of more than three training programmes related to agriculture. Their level of satisfaction regarding training material and method was found at moderate level which was expressed by 75 per cent of the participants. It was further felt relevant to study the relationship between these variables and learning index of the participants. Correlation among the above six variables with learning index was worked out and revealed that learning index of the trainees about course contents was inclined with increasing age, their job experience, and satisfactory training materials and atmosphere. It indicated that job experience with increasing age gave more insight into the subject. In other words, it can be stated that job experience with age was highly correlated with learning of the subject delivered in

the training. It is a fact that the effective learning could take place with satisfactory teaching materials and in favorable learning atmosphere. Chapke *et. al.*, (2006) also reported similar findings in their study. However, their education, annual income and training exposure were had correlation with the learning index (Table 2). The correlation indicated the relationship of one independent variable at a time with the dependent variable and did not indicate the intensity of the relationship. The data were therefore put to step-wise linear regression analysis considering six variables of learning as independent variables and learning index as a dependent variable. The result is presented in Table 3. The step-wise regression went up to two steps and finally, five variables of participants' profile: age, education, job experience, training exposure and their satisfaction level regarding the training were appeared in the optimum regression model (step II). These together explained 98.25 per cent of the total variation in learning from the training course with the 't' values being significant. It means that the one omitted variable contributed very meagerly to only 1.75% per cent of non-significant variation. Based on these findings it may be concluded that the five personal traits of the trainees contributed significantly in their learning of the course delived in the training. This finding also indicated that these attributes were very important to consider while delivering the course contents. Some supportive measures like recreation and reading facilities need to be arranged to keep their interest up.

Table 2: Personal profile of the participants of the MTC and its correlation with learning index

Variable	Classification	Frequency (%)	Coefficient of correlation (r)
Age	Young (below 30 years)	06 (30)	0.974***
	Middle (30-50 years)	10 (50)	
	Old (above 50 years)	04 (20)	
	Mean	37.5	
	Standard deviation (SD)	9.96	
Education	Graduate	07 (35)	-0.187
	Postgraduate	13 (65)	
	Mean	16.3	
	SD	0.98	0.376
Annual income	Below ₹ 2,00,000/-	02 (10)	
	₹ 2,00,001 to ₹ 3,00,000/-	07 (35)	
	Above ₹ 3,00,000/-	11 (55)	
	Mean	364000	
	SD	101186	
Job experience	Up to 10 years	14 (70)	0.864***
	11-20 years	02 (10)	
	More than 20 years	04 (20)	
	Mean	9.03	
	SD	10.38	
Trainings exposure	Up to 3 trainings	16 (80)	0.160
	4-6 trainings	03 (15)	
	More than 6 trainings	01 (05)	
	Mean	2.4	
	SD	4.42	
Satisfaction level	High	01 (05)	0.813***
	Medium	15 (75)	
	Low	04 (20)	
	Mean	83.9	
	SD	13.76	

Table 3: Results of regression analysis of personal profile of the participants of the MTC with learning index

Variables	'b' value	't' value	'P' value	R^2
Step I				
Age	1.55489	7.90	0.0000	0.9825
Education	-1.99968	-2.11	0.0551	
Job experience	0.33966	1.97	0.0699	
Trainings exposure	-0.11649	-0.55	0.5884	
Satisfaction level	0.35367	3.94	0.0017	
Annual income	0.18009	0.18	0.8615	
Step II				
Age	1.55327	8.18	0.0000	0.9825
Education	-1.95883	-2.20	0.0447	
Job experience	0.35065	2.26	0.0400	
Trainings exposure	-0.11402	-0.56	0.5816	
Satisfaction level	0.35281	4.08	0.0011	

Gain in knowledge

Knowledge of the participants on latest technologies included in the course was measured before start of the training and immediately after exposing the respondents to the complete course content. The knowledge was ascertained on three-point continuum i.e. full, partial and no with assigning two, one and zero score, respectively. The raw score was converted into the knowledge index (KI) by using the formula (KI= Obtained knowledge score/Obtainable knowledge score x 100). Differences in the mean knowledge gain score before and after exposure were compared by using paired 't' test and are presented in Table 4. It was revealed that majority of the trainees (60%) belonged to medium knowledge score range between 16 and 30 before training who had more than double score (49-84) after the training. Knowledge score range increased substantially after training in all the three categories, low (45-48 score range), medium (49-84 score range) and high (85-96 score range), over the pre-training categories *viz.*, low (9-15 score range), medium (16-30 score range) and high (31-34 score range), respectively. The calculated 't' value was found to be highly significant at 0.001 per cent level. It could, therefore, be inferred that the trainees had gained significantly higher knowledge about the subjects delivered in the training. The impact of the training in terms of knowledge was found to be highly significant. Ghosh and Pandey (2003) have reported in the similar line that training had significant impact on trainees in terms of knowledge gained, and suggested to extend such training opportunities to other field functionaries to augment their knowledge base.

Table 4: Distribution of the participants according to knowledge level

Knowledge level	Pre-training		Post-training	
	Score	Frequency	Score	Frequency
Low	9 -15	4 (20)	45 - 48	5 (25)
Medium	16 - 30	12 (60)	49 - 84	11 (55)
High	31 - 34	4 (20)	85 - 96	4 (20)
Range	9 - 34		45 - 96	
Mean	23.48		66.96	
SD	7.40		17.79	
t-value	11.1*** ($p < 0.001$)			

Satisfaction of the trainees regarding training

Teaching materials, atmosphere, subject matter, participants and experts were the major components in any learning process. To know the effectiveness of these components, the participants were asked to provide their perception as satisfaction regarding the training methodology, materials used and atmosphere on five point continuum namely, excellent, very good, good, satisfactory and poor with assigning 4, 3, 2, 1 and zero score, respectively in a post-training evaluation session.

More than fifty per cent of the participants expressed (Table 5) that atmosphere to exchange ideas freely with faculty members (65%), timely information of day to day activities (65%), medium of instructions (60%), training methods (60%) and use of audio-visual aids (60%) were excellent. However, duration of the training and practical orientation was rated as very good. It was further clarified by them that all the aspects of sorghum development could not be covered in details within eight days duration and practical aspects were much important than theory for them to solve the field problems of farmers. It will be viable inputs for future training programme for extension officers.

Table 5. Satisfaction of the trainees regarding training

Item	Excellent	Very Good	Good	Satisfactory	Poor
Atmosphere to exchange ideas freely with faculty members	13 (65)	6 (30)	1 (5)	0	0
Medium of instruction	11 (55)	6 (30)	3 (15)	0	0
Training methods	12 (60)	4	3 (15)	1 (5)	0
Use of audio-visual aids	12 (60)	5 (25)	3 (15)	0	0
Timely information of day to day activities	13 (65)	5 (25)	2 (10)	0	0
Duration of the training	2 (10)	13 (65)	3 (15)	2 (10)	0
Relevance of contents	9 (45)	7 (35)	2 (10)	2 (10)	0
Adequacy of contents	9 (45)	5 (25)	6 (30)	0	0
Sequencing of contents	7 (35)	7 (35)	5 (25)	1 (5)	0
Practical orientation	4 (20)	8 (40)	4 (20)	3 (15)	1 (5)

Figures in parentheses indicate percentage

Usefulness of the training programme

All the lectures delivered, including practicals conducted during the training were considered for this study. The deliberation of the course was made with taking care of training needs of the participants. The usefulness of the course content was assessed on the basis of rank-wise preference of the each topic by the trainees at end of the training. The data in Table 6 revealed that the foremost preferences as per usefulness of the topics was given to; improved package of practices for *kharif* and *rabi* sorghum cultivation followed by transfer of improved sorghum technologies, sweet sorghum as versatile bio-energy crop, sweet sorghum production technologies, major weeds of sorghum and their management, value-addition to sorghum with reference to its industrial uses and entrepreneurship development, grain storage including insect-pest and their management, and sorghum improvement for unexploited commercially important products. More or less needs of the trainees expressed as above (Table 1) were also depicted in the ranking of the usefulness order. Results indicated that besides, crop production technologies, new approaches transfer of technology, marketing, value-addition and new avenues like, sweet sorghum were found to be very useful which need to bring in sharp focus for sustainable development of the crop. The topics such as, prospects for sorghum bio-fortification, status of sorghum genetic resources management, legislations ensuring protection of plant varieties, sorghum cultivation in rice-fallows and farmers right issues related to sorghum were listed at the lowest rank. This may be due to their more research oriented in nature than direct application in the farmer's fields and less applicable in their working areas like, sorghum cultivation in rice-fallows. However, the participants felt that the training was highly useful for them in improving work productivity. These observations are in support of the findings reported by Vijayaragavan *et. al.,* (2002).

Table 6: Perceived usefulness of the course content of the training

Topic	Rank
Improved package of practices for *kharif* and *rabi* sorghum cultivation	I
Transfer of improved sorghum technologies	II
Sweet sorghum – A versatile bio-energy crop its juice quality and other diversified products syrup, jaggery production	III
Sweet Sorghum Production Technologies for Enhancing Crop Productivity and Bio-energy Production	IV
Major weeds of sorghum and their management	V
Value-addition to sorghum: Potential of sorghum for industrial uses in India and entrepreneurship development	VI
Sorghum storage Insect-pest and their management	VII
Sorghum improvement for unexploited commercially important products	VIII
Production and designing of sweet sorghum for bio-fuel and high biomass	IX
An overview of sorghum research, development and its potential under dryland conditions	X
Disease management in sorghum and sweet sorghum	XI
Know your Sorghum Pests and Their Management	XII
Improved genotypes and heterosis in *rabi* sorghum	XIII
Economics of sweet sorghum cultivation for bio-fuel production	XIV
Genetic improvement in *kharif* sorghum and latest *kharif* cultivars	XV
An effective extension approaches for transfer of dryland farm technologies – Experiences and implications	XVI
Principles of Quality Seed Production and Maintenance in Sorghum	XVII
Alternate uses of millets and scope for entrepreneurship	XVIII
Current status of sweet sorghum – industries experiences	XIX
Sorghum: An important forage crop	XX
Food contamination and its management	XXI
Nutritional benefits of sorghum with special emphasis on value addition	XXII
Value Chain Analysis of Dryland Agricultural Commodities	XXIII
Prospects for sorghum bio-fortification	XXIV
Status of Sorghum Genetic Resources Management in India	XXV
Legislations ensuring protection of plant varieties and seed quality in India	XXVI
Sorghum cultivation in rice-fallows: A new opportunity	XXVII
Farmers right issues related to sorghum cultivation	XXVIII

Suggestions of the participants

Just after completion of the training, the participants were asked to give suggestions for making the training more effective in future. It is observed that more than fifty percent of the participants favoured to have more field demonstrations and laboratory visits during the course (60%), other suggestions included process of preparation of sorghum food products need to be delivered in details (55%) and detailed discussion on process of ethanol production and its market opportunities (45%). Only thirty five and 15 per cent of the trainees suggested that emphasis may be given on crop and soil management aspects in details and training should be organized before starting the crop season, respectively (Table 7).

It is clear from these results that field and laboratory visits, and process of preparation of sorghum food products are more important for easy understanding and gaining knowledge. On perusal of the findings, it is indicative that the practical aspects of training should have been emphasized which give indication towards the principles of extension education as learning by doing and seeing is believing. The possible reasons behind such suggestion were the urge for more skill-oriented and need-based training programme.

Table 7: Suggestions offered by the participants for further improvements

Suggestion	Frequency	%
More field demonstration and laboratory visits are needed during the training	12	60
Process of preparation of sorghum food products need to be demonstrated in details	11	55
Emphasis needs to be given on process of ethanol production and its market opportunities	9	45
Crop and soil management aspects needs to be discussed in details	7	35
Such type of training needs to be organized before starting the crop season	3	15

Follow-up of the training programme

In the follow-up session of the programme, the feedback of the participants were collected through their interactions with all the resource persons. Most of them highlighted the importance of the training with a demand to deliver one aspect of sorghum development in eight-days period. They also said that the time schedule of the same was very much appropriate. They expressed their happiness about acquiring latest knowledge of different aspects of sorghum development. Most of the participants were already expressed that this course will help them to organize effective extension programmes like, *krishi mela*, Awareness camp, field day, field demonstrations and trainings for the farmers and small entrepreneurs at grass root level. This kind of motivation is very important to field extension functionaries in their job performance for greater accomplishment. This observation is also supported by Singh *et. al.*, (2002). However, the participants emphasized on increase in frequencies of field and lab visits, and demonstration in the curriculum. They also drew the attention to make available seeds of the high yielding varieties, and information on processing and marketing of sorghum food products. All these opinions and suggestions can be utilized as input to make any such type of training course more effective and successful in future.

CONCLUSION

It could be concluded that the participants had acquired latest knowledge on the improved sorghum production technologies, value-added food products, sweet sorghum and topics covered in the training. The training had a positive impact on them by increasing their understanding and practical aspects of the course content. The knowledge and skill acquired from this course will enable them to disseminate latest knowledge on sorghum cultivation and value-addition in their respective area and thus helps to improve their job performance. With this exposure, they had got confidence and motivation to educate the farmers in their area about importance of sorghum in resource-poor conditions for their livelihood. However, there is always scope for improvement. It was also suggested that practical aspect of the training programme may be strengthened by increasing the number of practical classes, demonstrations and field visits. It is stated that this type of training is much needed to improve competencies of extension functionaries of state development departments in the context of changing agricultural scenario.

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REFERENCES

Chapke, R.R., Bhagwat, V.R. and Patil, J.V. 2013. Sorghum cultivation for value-added diversified products and sweet sorghum perspectives. Directorate of Sorghum Research, ICAR, Hyderabad, India (ISBN: 81-89335-46-4): 175 pp.

Chapke, R.R., Pandit, N.C., Das, S.K., Biswas, C.R. and Jha, S.K. 2006. Impact of training on plant protection of jute. *Indian Journal of Extension Education, Vol. 42(1&2):* 133-135.

Ghosh, P.K. and Pandey, K.N. 2003. Impact of training on knowledge of farmers about improved rice cultivation technologies. *Indian J. of Ext. Edu.*, Vol. XXXIX (1&2): 108-110.

Jha, R.K., Sharma, G.R. and Pandey R.K. 2002. Appropriateness of training for rural youth. *Indian J. of Ext. Edu.*, Vol. XXXVIII (3&4): 214-216.

Reddy, V.G. and Ratnakar, R. 2013. Training needs of extension personnel in development departments. *Compendium*, National Seminar on "Futuristic Agricultural Extension for Livelihood Improvement and Sustainable Development", EEI, ANGRAU, Hyderabad, India: 330-336.

Singh, N., Vijayaragavan, K. and Sinha, B.P. 2002. Impact of training interventions on motivational levels of agricultural scientists. *Indian J. of Ext. Edu.*, Vol. XXXVIII (1&2): 24-30.

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Perception of Seed technology Training among Farm Women

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ABSTRACT

In the present stud, farmwomen's perception about the importance, need and adequacy of seed technology training conducted in two different KVKs of Rajasthan state was evaluated. A total of 120 farmwomen were randomly selected for the study. Data were collected through interview schedule. Results reveal that training on use of seed culture was found to be most important and training in new improved seed production technology was needed utmost in future to increase the production. Training on depth of sowing was found to be most adequate amomg majority of the respondents. Thus, farm women needed better training in some areas of seed technology and seed treatment. Therefore, there is a need to organize training programmes to stimulate higher participation of farmwomen in seed production so that women become more economically independent and improve financial status of the family.

Key words: Ttraining need, seed technology, farmwomen.

INTRODUCTION

"The tiny seed knew that in order to grow, it needed to be dropped in dirt, covered in darkness, struggle to reach the light", Sandra Kring.

Seed has been the lifeline and source of sustenance ever since organized agriculture and came into existence. In recent times, it has also drawn the attention of the world community as a means of technological intervention in agriculture for commercial interest on one hand, and on the other, the imminent need to conserve the diversity, which is on the threat of extinction. Seeds are critical in the food chain and women's role as seed savers, and breeders have been largely responsible for keeping the biodiversity alive. So, the need of the hour is to encourage women's inherent capabilities in seed multiplication and management and establish their dominance in the fast growing seed sector. Development of new models of seed production for women enabling their access to land, skill, technology and critical inputs will go a long way in making them potential seed producers for fulfilling the need of the seed of the villages. Combined with this, a systematic seed production plan, involving farmwomen for locally adoptable cultivars, will help in the conservation of these rich germplasm. This holds the key to food and livelihood security of the people especially in the wake of climatic changes. Knowledge on labeling, packing, testing and marketing techniques will empower them in quality seed production.

Quality of seed is maintained by including various practices, like proper winnowing, drying, bagging, and storage etc. The quality seed availability at proper time determines the agriculture growth. It is a well known fact that up to 85 per cent of the seeds used by the farmers is farm saved seeds i.e. the seed protected and conserved by the farmers from their own harvest for future use. This seed is not of proper quality and not kept in the proper storage condition. Due to these reasons, the germination of seed is adversely affected, which eventually reduces the production and productivity of the crop. It is, therefore, necessary to improve the quality stock of farm saved seeds for enhancing crop production and productivity.

Hence, seed production, seed distribution and other connected aspects have to be improved and strengthened at the farmers' level. To upgrade the quality of farmer-saved seed, it is proposed to provide financial assistance for distribution of foundation or certified seed at 50 per cent cost of the seed of crops for production of certified or quality seeds only, and to provide training on seed production technology to the farming community. Adopting modern agricultural technologies could improve productivity and reduce rural poverty, but there are little evidences on the constraints that limit the diffusion of better practices. In the present study, the researchers attempted to test as to how important, adequate and needed are the subject matter items on seed technology training.

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Trainings provide an opportunity to create awareness among the farmers about the improved agricultural technologies in order to get a shift in agricultural development approach through farming enterprises. Training of farmers and farmwomen at KVKs are scheduled at appropriate time so as to impart knowledge of suitable technology before the onset of the season. Efforts are concentrated to empower them by giving them training on scientific agricultural practices.

Over half of the world's agricultural producers are women; yet, men still tend to receive more and better training, and women's training is often inappropriate. The existing low level of consciousness about the roles women play in the development of a country; the deep-rooted cultural beliefs and traditional practices that prevent women from playing their full roles in the development process of the country; lack of appropriate technology to reduce the workload of women; shortage of properly qualified female development agents to understand, motivate and empower rural women by eliminating the major constraints hindering their progress motivated the researchers to conduct this study.

METHODOLOGY

KVK, Chomu and KVK, Ajmer were selected for the present study. Two Panchayat Samitis from the working area of each KVK were selected. Then two Gram Panchayats from each Panchayat Samiti were selected. Then two villages from each Gram Panchayat were selected randomly. This contributes to eight villages from one KVK. Thus, a total of 16 (8 x 2) villages from both KVKs were selected by random sampling process to form the sample for study.

Out of the total contact farmwomen in the selected villages, 15 farmwomen from each village were selected randomly. Hence, 120 farmwomen from one KVK formed the sample for the study. Thus, a total of 240 (16 x 15) farmwomen from both KVKs were selected for this study.

For determining the importance, adequacy and need of the training, a Scale developed and tested by Mr. Ishaq Mohammed Khan (1994) was used. The data so collected were transferred on work tables and tally sheets were prepared. The data were further processed, tabulated, classified and given statistical treatments.

The appropriate tables were prepared and the data were interpreted in light of the objectives of the study.

RESULTS AND DISCUSSION

Relative Importance of different subject matter items of training in seed technology

The importance of training on seed technology was identified on the basis of responses of the farmwomen under study. In the interview schedule there were items of training about seed management. Each of the major area heads a number of specific items was referred as area of training. The farm women were asked to rank these items of training keeping in view their importance on the three point continuum. *i.e.* most important, important & less important for them in their work. There were ten items of farm women training in this group as per details given in Table 1.

Table 1: Relative importance of subject matter items of training as perceived by farm women in seed technology

Item of training	Percentage of Farm women			Means Score	Rank
	MI	I	LI		
Selection of seed	54.44	36.37	9.19	2.45	5
Seed treatment	72.96	21.44	5.66	2.67	3
Seed multiplication	41.02	32.95	26.03	2.15	7
Improved seed Production	78.15	16.66	5.19	2.73	2
Seed storage	49.26	41.85	8.89	2.40	6
Seed certification & distribution	72.59	14.52	12.89	2.59	4
Use of seed culture	84.44	10.37	5.19	2.79	1
Depth of sowing	10.00	11.93	78.07	1.31	8
Overall	**57.86**	**23.26**	**18.88**	**2.39**	

Table 1 presents the 'Relative importance of different subject matter items of training as perceived by farm women in Seed Technology'. Eight items of training for 'Seed Technology' were selected and their relative importance was observed in terms of most important, important and least important. Ranks were assigned to the items of training as per the mean score values assigned by the farm women. It is revealed from the table 1 that 57.86 per cent farm women felt training for all the eight items as most important while 23.26 per cent farm women desired training as important and it was only 18.88 per cent farm women who reported the training as less important. Thus, it can be concluded from the above table that 'Use of Seed Culture' was seen most important by the maximum number of farm women *i.e.* 84.44 per cent.

The reason being due to the fact that the fertilizer cost is very high and the farm family is interested in deducting their fertilizer cost by using seed culture. It was 'Depth of Sowing' reported most important by the lowest percentage of farm women i.e. 10.00 per cent. 'Seed Storage' the item of training was preferred important by maximum percentage of farm women i.e. 41.85 per cent

and it was 'Use of seed culture' the item of training that was reported important by lowest number of farm women i.e. 10.37 per cent. The findings are in line with Gupta (2013) who revealed in his article that for gainful employment and economic activities, the rural women can be imparted suitable trainings on various farm technologies like selection and storing of seeds, techniques for preserving healthy seeds, seed treatment technique for nursery sowing, technique of transplanting for maintenance of space between plant to plant and row to row, importance of soil testing in fertilizers recommendations and methods of their application, safe application and storage of pesticides, use of biocides and cultural methods to check various diseases and insects, significance of organic farming to save the environment from being degraded.

The above said training requirements of farm women can be designed so that their contribution to agriculture production can be enhanced. This would also add to their skilful involvement in the farming operations which would ultimately increase their income.

Relative adequacy of different subject matter items of training in seed technology

Adequacy of training was operationalized in terms of exposure of farm women to different activities of KVK for gaining knowledge of improved technology. Farm women were asked as to how they thought in terms of adequacy of these activities to acquire required know how to carry their day to day farm operation.

The farm women were asked to rank these items in terms of adequacy keeping in mind their exposure on three point continuum i.e. most adequate, adequate and less adequate for farm women in their work. There were ten items of farm women training in this group as per details given in Table 2

Table 2: Relative adequacy of subject matter items of training as perceived by farm women in seed technology

Item of training	Percentage of Farm women			Means Score	Rank
	MA	A	LA		
Selection of seed	42.22	28.52	29.26	2.12	2
Seed treatment	5.93	58.93	35.15	1.71	4
Seed multiplication	10.53	7.69	31.78	1.29	7
Improved seed production	11.48	17.41	71.11	1.40	5
Seed storage	6.67	75.55	17.78	1.89	3
Seed certification & distribution	7.78	6.30	85.92	1.22	8
Use of seed culture	5.93	22.96	71.11	1.35	6
Depth of sowing	82.22	11.48	6.30	2.76	1
Overall	**21.59**	**28.60**	**49.81**	**1.72**	

The table 2 shows the 'Relative adequacy of different subject matter items of training as perceived by farm women in Seed Technology'. Eight items of training for 'Seed Technology' were chosen for observing their relative adequacy. All the items were awarded ranks as per their mean score values.

The table clearly shows that 21.59 per cent farm women felt training for all the eight items as most adequate while 28.60 per cent farm women desired training as adequate and it was 49.81 per cent farm women who reported the training as least adequate. It can be concluded from the above table that 'Depth of Sowing' the item of training was noticed most adequate by the maximum number of farm women i.e. 82.22 per cent. It was 'Seed Treatment' and 'Use of Seed Culture' the items of training grasped most adequate by the lowest percentage of farm women *i.e.* 5.93 per cent, respectively. 'Seed Treatment' the item of training was preferred adequate by maximum percentage of farm women *i.e.* 58.93 per cent and it was 'Seed Multiplication' and 'Seed Certification & Distribution' the items of training that was presented adequate by lowest number of farm women *i.e.* 7.69 and 6.30 per cent respectively. Highest number of farm women *i.e.* 85.92 per cent observed the 'Seed Certification & Distribution' the item of training as least adequate while 'Seed Storage' the item of training was observed least adequate by the lowest number of farm women *i.e.* 17.78 per cent.

It is clear from the table that ' Depth of Sowing' the item of training was provided the first rank. The items of training 'Selection of Seed' and 'Seed Storage' were provided ranks as second and third. The item of training *i.e.* 'Seed Certification & Distribution' was realized as least adequate by 85.92 per cent farmwomen and was provided the last *i.e.* eighth rank.

From the data in the table, 'Depth of Sowing' the item of training was ranked first and the 'Seed Certification & Distribution' was ranked last by the farm women among all eight items of training of seed technology. The item of training ranked first by the maximum number of the farm women was the 'Depth of Sowing'.

Future needs of different subject matter items of training in seed technology

Eight items of farm women training were checked in terms of their needs by the respondents which have been presented in Table 3.

Table 3: Future needs of subject matter items of training as perceived by farm women in seed technology.

Item of training	Percentage of Farm women			Means Score	Rank
	MN	N	LN		
Selection of seed	37.41	33.70	28.89	2.09	6
Seed treatment	48.89	44.81	6.30	2.43	4
Seed multiplication	32.42	48.29	19.29	2.13	5
Improved seed production	69.63	22.59	7.78	2.62	1
Seed storage	34.44	18.15	47.41	1.87	7
Seed certification & distribution	73.45	14.59	11.99	2.61	2
Use of seed culture	68.99	17.41	13.60	2.55	3
Depth of sowing	7.78	13.70	78.52	1.29	8
Overall	**46.62**	**26.66**	**26.72**	**2.20**	

The table 3 shows the 'Relative need for different subject matter items of training as perceived by farm women in Seed Technology'. Eight items of training for 'Seed Technology' were selected and their relative need was seen as most needed, needed and least needed. Mean score was calculated and ranks were assigned to the items of training as per their relative need.

It is clear from the table that 46.62 per cent farm women felt training for all the eight items as most needed, while 26.66 per cent farm women desired training as needed and it was 26.72 per cent farm women who reported the training as least needed.

It can be concluded that 'Seed Certification & Distribution', 'Improved Seed Production' and 'Use of Seed Culture' the items of training were noticed most needed by the maximum number of farm women i.e. 73.45, 69.63 and 68.99 per cent, respectively. It was 'Depth of Sowing' the item of training reported most needed by the lowest percentage of farm women i.e. 7.78 per cent. 'Seed Multiplication' the item of training was preferred needed by maximum percentage of farm women *i.e.* 48.29 per cent and it was 'Seed Certification & Distribution' and 'Depth of Sowing' the items of training that were perceived as needed by lowest number of farm women i.e. 14.59 and 13.70 per cent, respectively.

A study done by Sahu *et al* (2011) revealed that farm women possessed poor knowledge of improved varieties, disease and IPM, spacing , seed treatment, weed control and fair knowledge of sowing time, harvesting and seed rate. Hence these practices can be considered while formulating training courses in vegetable production technology. These information are of immense value and will help to disseminate the factual technology to the farmers' field which will subsequently help to enhance the production & productivity of vegetables in the state & nation as well.

Kumar *et al* (2007) also showed in his study that a majority of rice growers needed trainings for seed treatment and it was ranked highest training need area.

CONCLUSION

It can be concluded that out of eight items of training in 'Seed Technology', use of seed culture was the most important whereas improved seed production, seed treatment, seed certification and distribution, selection of seed, seed storage and seed multiplication were important and the depth of sowing was the least important item of training in decreasing order of their importance as perceived by farm women. In reference to the adequacy of the training it can be said that out of eight items of training in 'Seed Technology', training exposure in depth of sowing was perceived most adequate whereas in the selection of seed, seed storage, seed treatment, improved seed production, use of seed culture, seed multiplication it was found adequate and in seed certification and distribution it was found to be least adequate in decreasing order of their adequacy. Training in improved seed production was needed most by the farm women while seed certification and distribution, use of seed culture, seed treatment, seed multiplication, selection of seed, seed storage were needed while depth of sowing was least needed item of training as perceived by farm women.

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REFERENCES

Gupta, R.D. 2013, Farm Women and Future Strategies, Posted on 31/12/2013 by Dailyexcelsior. http://www.dailyexcelsior.com/farm-women-and-future-strategies/

Kumar, Yogesh; Singh Ummed; Bhagat, G.R. and Nain M.S. 2007, Training Needs of Rice Growers in Jammu District of J&K, *Indian Journal of Extension Education,* Vol.43, No. 1 & 2, pp.108-109.

Sahu, R.K.; Sachan, V.K.; Singh Ramanjeet and Singh Khilendra 2011,Training Needs of Farm Women in Vegetables Cultivation in Hilly Areas, *Indian Journal of Extension Education*, Vol.47, No. 1 & 2, 2011 (123-125).

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Socio-economic Impact of Self Help Group on Members in Banaskantha District of Gujarat

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ABSTRACT

The *ex-post-facto* study was undertaken in Banaskantha district of Gujarat state to evaluate the socio-economic impact of Self Help Groups on its members. The district comprises of 12 talukas, from which two talukas *viz.*, Palanpur and Deesa was selected purposively as these talukas have more number of SHGs. A list of women SHGs based on animal husbandry activities were obtained. Total twelve SHGs, six SHGs from each taluka were selected using simple random sampling. SHG members from each Self Help Group were selected proportionately for making sample size of 120 SHG members as respondents. Assessment of socio-economic impact was categorized into five aspects *viz.,* (i) Change in income, (ii) Change in spending pattern, (iii) Change in material possession, (iv) Change in thrift habit and (v) Change in employment of the respondents. Per cent change in income, spending pattern, material possession, thrift habit and employment was worked out and overall socio-economic impact of SHGs on its members was calculated by summing the score of all five dimensions of socio-economic impact and converting into per cent change. The study revealed that impact of SHG in terms of change in income (38.33 %), change in thrift habit (50.84 %), and change in employment (43.33 %) was found medium level of change. While impact of SHG in terms of change in spending pattern (57.50 %) and change in material possession (44.16 %) was found low change. It was recorded that 44.17 per cent of the respondent belonged to medium level of change of overall socio-economic impact of SHG on its members. Out of eleven variables, seven variables viz., education, social participation, occupation, annual income, attitude, innovativeness and media exposure had positive and significant association with overall socio-economic impact on members of SHG.

Key words: SHG, Socio-economic impact

INTRODUCTION

Failure of formal credit institutions in meeting the credit need for the poor stressed the need for an alternative arrangement for the delivery of credit to the poor. In recent years the SHGs emerged as an alternative mechanism to meet the urgent credit need of poor through thrift. SHG is the organization whose members have united on the basis of common interest to improve their economic and social condition in order to be better able to pursue their paramount long-term aim (Verhagen, 1987). SHGs are now-a-days gaining ground as important group approach for rural development, in general and income generating activities in particular. Most of the SHGs started to enhance the capacity and income of the rural women. Government is also giving more emphasis on development of SHGs. Rural women's contribution to family income by participating in SHGs may have some impact. Information on impact of Self Help Groups on its members gives a clear picture of the role of Self Help Group in socio-economic development of rural women. Hence, it was felt necessary to study the impact of women SHG on its members and so the present study was undertaken to study the socio-economic impact of Self Help Group on its members.

METHODOLOGY

The present study was undertaken in Banaskantha district of Gujarat state. The district comprises of 12 talukas, from which two talukas *viz.*, Palanpur and Deesa were selected purposively as these talukas are having more number of SHGs.

A list of women SHGs based on animal husbandry activities were obtained. Total twelve SHGs, six SHGs from each taluka was selected using simple random sampling. SHG members from each Self Help Group were selected proportionately for making sample size of 120 SHG members as respondents.

Assessment of socio-economic impact was categorized into five aspects *viz.,* (i) Change in income, (ii) Change in spending pattern, (iii) Change in material possession, (iv) Change in thrift habit and (v) Change in employment of the respondents. Per cent change in income, spending pattern, material possession, thrift habit and employment was worked out by using formula:

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$$\text{Per cent change in income} = \frac{\text{Difference in income in rupees}}{\text{Base income in rupees}} \times 100$$

$$\text{Per cent change in spending pattern} = \frac{\text{Difference in spending pattern in rupees}}{\text{Base spending pattern in rupees}} \times 100$$

$$\text{Per cent change in material possession} = \frac{\text{Difference in score of material possession}}{\text{Base score of material possession}} \times 100$$

$$\text{Per cent change in thrift habit} = \frac{\text{Difference in thrift in rupees}}{\text{Base thrift in rupees}} \times 100$$

$$\text{Per cent change in employment} = \frac{\text{Difference in employment in man- days}}{\text{Base employment in man-day}} \times 100$$

$$\text{Overall socio-economic impact in per cent change} = \frac{\text{Difference in score of all the five dimensions of economic impact}}{\text{Sum of base score of all five dimensions of economic impact}} \times 100$$

The resultant changes in per cent that occurred after participation in each aspect of impact of SHGs were assessed separately. The information in this regard was collected and classified into four levels *viz.,* (1) No change, (2) Low change (upto 33.00 per cent change), (3) Medium change (33.01 to 66.00 per cent change) and (4) High change (above 66.00 per cent change) as per the equal interval in per cent change. Then overall socio-economic impact of SHGs on its members was calculated by summing the score of all five dimensions of socio-economic impact and converting into per cent change.

RESULTS AND DISCUSSION

Table 1: Distribution of SHG members according to their change in income

n=120

Category	Per cent change in income	Frequency	Per cent
No change	00.00	13	10.83
Low	Up to 33.00	35	29.17
Medium	33.01 to 66.00	49	40.83
High	Above 66.00	23	19.17
Total		**120**	**100.00**

The result of the change in income of the respondents presented in Table 1 indicated that, nearly two-fifths (40.83%) respondents had a medium change in their income due to participation in SHGs to the extent of 33.01-66.00 per cent, followed by 29.17 per cent having low change in their income *i.e.* upto 33 per cent. While 19.17 per cent of the respondents had high change (above 66.00 per cent). There were only 10.83 per cent of the respondents who had no change in their income *even* though they participated in the SHGs.

Majority (60.00 %) of the respondents had generated above 33.00 per cent more income through participation in SHGs. It might be due to the reasons that their positive attitude towards SHGs contributed in well functioning of SHGs, which in turn helped them to procure loans from the linked banks for purchasing milch animals. Secondly, milk co-operatives in the study area also had given remunerative prices to their milk. Above findings were supported by the findings of Katole (2001).

Change in spending pattern

An attempt was made to study the various aspects of spending pattern on which the respondents incurred additional expenditure as a result of participation in SHGs. Change in spending pattern was measured against four aspects *viz.,*(i) food habit, (ii) clothing pattern, (iii) change in living condition and (iv) change in educational aspect. The frequency and per cent of respondents were calculated for each aspects of spending pattern. The data have been furnished in Table 2.

Table 2: Distribution of the SHG members according to their change in spending pattern

n =120

Aspect wise change in spending pattern	Frequency	Per cent
Food habit	85	70.83
Clothing pattern	74	61.66
Change in living condition	29	24.16
Change in educational aspect	63	52.50

The Table 2 revealed that, majority of the SHG members had increased spending on various aspects like food habit, clothing, living condition and educational aspect of children. Change in food habit was observed in majority (70.83 %) of the SHG members. It was found that SHG members had included vegetables, milk and fruits in their daily diet besides cereals and legumes.

With regards to change in clothing pattern 61.66 per cent of the SHG members changed their clothing pattern. After joining the SHGs, the income of the SHG members was increased hence, they were able to purchase more number of clothes for their family members. In case of change in living condition, nearly one-fourth (24.16 %) SHG members increased were expenditure to change or renovate their houses.

Change in educational aspect was observed in nearly half (52.50 %) of the respondents which might be due to

the reason that the increased income of SHG members might help them spending money for school fees, extra coaching, purchasing text book, uniform, *etc.*

Thus, it could be inferred that, a conspicuous change in spending pattern could be noticed among the members of SHGs as a socio-economic impact on them due to participation in SHGs.

After studying the aspect wise spending pattern, the per cent change in spending pattern of members of SHG was computed and the data obtained have been presented in Table 3.

Table 3: Distribution of the SHG members according to their change in spending pattern

Category	Per cent change in spending pattern	Frequency	Per cent
No change	00.00	00	00
Low	Upto 33.00	69	57.50
Medium	33.01 to 66.00	30	25.00
High	Above 66.00	21	17.50
Total		**120**	**100.00**

It was observed from Table 3 that, majority (57.50 %) of the respondents had a low change *i.e.* upto 33.00 per cent change, in their spending pattern due to participation in SHG, as a result they incurred additional expenditure on food items, clothes, living condition and educational aspects, whereas 25.00 per cent of them had medium change in their spending pattern *i.e.* 33.01 to 66.00 per cent change. Quite a few (17.50 %) respondents could have high change in their spending on the various items above 66.00 per cent.

Due to additional income from participation in SHGs, some respondents spent more money for purchasing different food items and clothes. While some spent money to improve their living condition and for better educational for their children.

Change in material possession

Material possession refers to the number of house hold and farm implements / equipments possessed by the SHG members. The data collected regarding change in material possession of the SHG members are given in Table 4.

Table 4: Distribution of the SHG members according to their change in material possession

Category	Per cent change in material possession	Frequency	Per cent
No change	00.00	20	16.67
Low	Upto 33.00	53	44.17
Medium	33.01 to 66.00	28	23.33
High	Above 66.00	19	15.83
Total		**120**	**100**

It is evident from Table 4 that, 44.17 per cent of the respondents appeared in low change (upto 33.00 per cent change) category, followed by 23.33 per cent of the respondents appeared in medium (33.01 to 66.00 per cent change) category of material possession. A few respondents *i.e.* 15.83 per cent appeared in high change (above 66.00 per cent change) category of material possession. Respondents' changes in their material possession may be due to additional income they could earn after participation in SHG. It was observed that among 16.67 per cent of respondents did not have any change in their material possession though they participate in SHGs.

It may thus be inferred that, a substantial economic impact of SHGs could be noticed on their members as far as the material possession is concerned, which facilitated them to earn additionally and buy the needy house hold and farm material. Above findings were supported by the findings of Katole (2001).

Change in thrift habit

The members of SHGs generally saved their additional income generated by participating in SHGs activities at home, by fixing deposit in bank, depositing in bank, saving in SHGs and by getting insurance policy. The information regarding change in thrift habit is depicted in Table 5.

Table 5: Distribution of the SHG members according to their change in thrift habit

n=120

Category	Per cent change in thrift habit	Frequency	Per cent
No change	00.00	00	00.00
Low	Upto 33.00	24	20.00
Medium	33.01 to 66.00	61	50.84
High	Above 66.00	35	29.16
Total		**120**	**100.00**

The data in Table 5 revealed that, the 100.00 per cent of the respondents had a change in their thrift habit because of regular saving in SHGs. It is further observed that half (50.84 %) of the respondents had medium change *i.e.* 33.01 to 66.00 per cent change, followed by 29.16 per cent of them had high change in their thrift habit *i.e.* above 66.00 per cent change. The findings of present study were in accordance with the findings reported by Katole (2001).

Change in employment

It refered to the difference between employment in days after participation in SHG and employment in days before participation in SHG. The SHG gave opportunities to its members for additional employment for whole year which contributes to earn additional income. The data collected regarding change in employment of the SHG

members were categorized in four categories are given in Table 6.

Table 6: Distribution of the SHG members according to their change in employment

n=120

Category	Per cent change in employment	Frequency	Per cent
No change	00.00	23	19.17
Low	Upto 33.00	31	25.83
Medium	33.01 to 66.00	52	43.33
High	Above 66.00	14	11.67
Total		**120**	**100.00**

The data presented in Table 6 indicated that 43.33 per cent of the respondents had medium change (33.01 to 66.00 per cent change) in their employment due to participation in SHGs followed by 25.83 per cent of the respondents who had low change (upto 33.00 per cent change) in their employment. While only 11.67 per cent of the respondents found having high change (above 66.00 per cent change) in their employment. It was interesting to note that 19.17 per cent respondents did not have any change in their employment even though they participated in SHG activities. It is thus inferred that, the SHGs had an impact on their members in generating employment opportunities which contributed to earn additional family income for the welfare of their families.

Overall socio-economic impact of Self Help Groups

The aim of SHG programme was to provide microfinance *i.e.,* credit plus related services and also focus on empowerment of members with special emphasis on women. The socio-economic impact of SHG on its members was assessed by consolidating the impacts of the five dimensions decided for the study *viz.,* change in income, change in spending pattern, change in material possession, change in thrift habit and change in employment. The data thus computed had been depicted in Table 7.

Table 7: Distribution of the SHG members according to the overall socio-economic impact of SHG as a whole

n=120

Category	Per cent change in employment	Frequency	Percentage
Low impact	Upto 33.00	45	37.50
Medium impact	33.01 to 66.00	53	44.17
High impact	Above 66.00	22	18.33
Total		**120**	**100.00**

A critical look at the data in Table 7 revealed that the medium level of socio-economic impact of SHGs could be noticed among 44.17 per cent of its members. This was followed by 37.50 per cent of the respondents who belonged to low level of socio-economic impact. The percentage of respondents appearing in high level category of socio-economic impact of SHGs was found 18.33 per cent.

It could thus be inferred that the SHGs had moderate socio-economic impact on its members in terms of change in income, change in spending pattern, change in material possession, change in thrift habit and change in employment. The findings were in accordance with the findings reported by Shambharkar (2012).

CONCLUSION

It was concluded from the aforesaid discussion that impact of SHG in terms of change in income (38.33 %), change in thrift habit (50.84 %), and change in employment (43.33 %) was found medium level of change. Change in spending pattern (57.50 %) and change in material possession (44.16 %) were found in low level. It was recorded that 44.17 per cent of the respondents belonged to medium level of change as overall socio-economic impact of SHG on its members.

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REFERENCES

Katole, A. 2001. Impact of Self Help Group in socio-economic development of its women members. M.Sc. (Agri.) thesis (Unpublished), Dr. P.D.K.V., Akola.

Shambharkar, Y.B. 2012. Impact of Self Help Groups on empowerment of women member. *Indian Research Journal of Extension Education*, 2: 188-192.

Verhagen, A.R. 1987. Self Help Groups and small village co-operatives for rural development: A critical perspective vision. *Indian Co-operative Review*. **38** (1): 30-37.

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Characterization of Livelihood Systems in Coral Ecosystem

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ABSTRACT

A livelihood comprises the capabilities, assets and activities required for a means of living. The present study has undertaken to characterize the livelihood systems in coral islands of India. Out of 11 inhabiting islands of Lakshadweep, two islands "Kalpeni" and "Androtт" were selected for the study. From the islands selected, two wards and from each ward 30 individuals were selected by simple random sampling technique. A total of 120 respondents comprised the sample. The results showed that three livelihood groups in the study area include the farming alone (group 1), non-farm activities alone (group 2) and both farm and non- farm activities (group 3). Activity ranking exercise was done based on different activities carried out by the islanders for means of living. It shows that group 3 is engaged in more diversified activities as their livelihood source.

Keywords: Characterization, livelihood system

INTRODUCTION

Rural livelihood is defined as the process by which households construct a diverse portfolio of activities and social support capabilities for survival and in order to improve their standard of living (Ellis, 1998). The livelihoods approach helps to organize the factors that constrain or enhance livelihood opportunities and shows how they relate to one another; it aims to builds on strengths; and it is more than an analytical framework. Livelihoods differ in different social, ecological and institutional settings. In this context, understanding the exact contribution each rural activity to the local and household's economy and identifying their respective potential effects on local populations, poverty level and wealth differentiation appears as one key element for the design of appropriate rural development policies. A livelihood analysis essentially envisages characterization of major livelihood groups with respect to their ownership of and access to resources, their strategic choices to use their assets in income-earning (or cost-saving) activities and their susceptibility to vulnerabilities. The coastal livelihood analysis provides a better understanding of coastal livelihood conditions at present and in future. This understanding has been instrumental in preparing a meaningful coastal zone policy, and would guide the formulation of a pragmatic coastal development strategy and a feasible investment program for enhancement of livelihoods of the coastal people, particularly the disadvantaged groups.

METHODOLOGY

The study was conducted in Kalpeni and Androtт islands of Lakshadweep. In each island two wards and from each ward thirty respondents were selected randomly. The Participatory Rural Appraisal (PRA) technique with semi-structured interview was used to collect information from islanders. The major element of the survey was an activity ranking exercise. The criteria used for the activity ranking was contribution of each activity to the households overall incomes.

RESULTS AND DISCUSSIONS

Share of agriculture in household income

Based on the share of agriculture in household income, sample was divided into three groups. First group representing people who were engaged in farming only and the second group involves those who were engaged in non-farm based activities only.

Third group was involved in both farm and non-farm activities as their livelihood source. Table 1 shows that 45 per cent of people depended upon non-farm based alternatives as their livelihood, while 44.17 per cent depended on both farmed based and non-farm based activities. Only 10.83 per cent of the total respondents were engaged in farming.

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Table 1: Distribution of respondents according to share of agriculture in household income

n=120

Category	Frequency	Per cent
From farming alone (Group 1)	13	10.83
Not at all from farming (Group 2)	54	45.00
Partially from farming (Group 3)	53	44.17

Distribution of respondents based on their average annual income

Distribution of respondents based on annual income showed that cent per cent of the first group were in very low income level (Table 2). In other two groups majority were coming under very high income level. In case of second group no one was below high level.

Table 2: Distribution of respondents based on their average annual income

n=120

Income class	Group 1 (n_1=13)	Group 1 (n_2=54)	Group 1 (n_3=53)
	Frequency (Per cent)		
Very low	13 (100.00)	0 (0.00)	0 (0.00)
Low	0 (0.00)	0 (0.00)	0 (0.00)
Middle	0 (0.00)	0 (0.00)	2 (3.77)
High	0 (0.00)	19 (35.19)	17 (32.08)
Very high	0 (0.00)	35 (64.81)	34 (64.15)

Comparison of average annual income between groups

Single factor ANOVA for average annual household income showed that difference between mean income of group 2 and 3 was less than critical difference. So, annual income of these two groups was on par. But the difference between first group from second and third group was more than its critical difference. Hence, it is significantly different (Table 3).

Table 3: Comparison of average annual income between groups

Category	Difference between mean values	CD
Between group 1 and group 2	1.769	0.187
Between group 1 and group 3	1.748	0.187
Between group 2 and group 3	0.021	0.117

Activity Ranking

Activity ranking for the study area showed that in farming group all were engaged in either farming or fishing while in other two groups majority were involved in service followed by business (Table 4). It has been found that people were depending upon mainland for everything. So, they are transporting from other parts of country especially from Kerala. Hence, business is emerging as an alternate non-farm based livelihood.

Table 4: Activity ranking of different groups

Group	Contribution to income
Group 1	Farming > Fishing
Group 2	Service >> Business
Group 3	Service> Business> Caste occupation> Wage earner = Farming > Fishing

(>> Ranks much higher than, > Ranks higher than, = Similar to)

Age

The data collected from respondents were analyzed and revealed that most of the respondents (84.62 %) in group 1 (Table 5) belonged to old age group and 15.38 per cent of them belonged to middle age group. In case of other two groups, majority were in middle age group with 70.37 per cent and 52.83 per cent in group 2 and group 3, respectively. In group 2, 16.67 per cent were young and 12.96 per cent were old while in group 3, 7.55 per cent were young and 39.62 per cent were old.

Table 5: Distribution of respondents based on their age

n=120

Category	Group 1 (n_1=13)	Group 1 (n_2=54)	Group 1 (n_3=53)
	Frequency (Per cent)		
Young (Below 35)	0 (0.00)	9 (16.67)	4 (7.55)
Middle aged (35-59)	2 (15.38)	38 (70.37)	28 (52.83)
Old (Above 59)	11 (84.62)	7 (12.96)	21 (39.62)

Education

In first group all the respondents were below high school level. Majority of this group (46.15 per cent) were illiterate. About 30.77 per cent of this group can read only and 15.38 per cent can read and write. Only 7.69 per cent of this group is educated up to primary level. Majority of the members in second group (81.48 per cent) are graduate and above and none of the member fall below primary level. In this, 16.67 per cent are educated up to high school level and only 1.85 per cent is educated up to primary level. In third group most of the members (39.19 per cent) are high school educated. 30.19 per cent of this group are graduate and above. 5.66 per cent are illiterate and 9.43 per cent can read only.

Table 6: Distribution of respondents based on their education

n=120

Category	Group 1 (n_1=13)	Group 1 (n_2=54)	Group 1 (n_3=53)
	Frequency (Per cent)		
Illiterate	6 (46.15)	0 (0.00)	3 (5.66)
Can read only	4 (30.77)	0 (0.00)	5 (9.43)
Can read and write	2 (15.38)	0 (0.00)	1 (1.89)
Primary school	1 (7.69)	1 (1.85)	7 (13.21)
High school	0 (0.00)	9 (16.67)	21 (39.62)
Graduate and above	0 (0.00)	44 (81.48)	16 (30.19)

Occupation

It is very clear from the Table 7 that members in the first group are engaged only in fishing and farming with 38.46 per cent and 61.54 per cent respectively. Majority of the members in second and third group (94.44 per cent and 52.83 per cent respectively) are involved in service sector job followed by business (5.56 per cent and 20.75 per cent respectively). In group 3, 3.77 per cent are involved in fishing and 11.32 per cent in caste occupation. People engaged in farming and wage occupation is 5.66 per cent each.

Table 7: Distribution of respondents based on their occupation
n=120

Category	Group 1 (n_1=13)	Group 1 (n_2=54)	Group 1 (n_3=53)
	Frequency (Per cent)		
Wage earner	0 (0.00)	0 (0.00)	3 (5.66)
Caste occupation	0 (0.00)	0 (0.00)	6 (11.32)
Farming	8 (61.54)	0 (0.00)	3 (5.66)
Business	0 (0.00)	3 (5.56)	11 (20.75)
Service	0 (0.00)	51 (94.44)	28 (52.83)
Fishing	5 (38.46)	0 (0.00)	2 (3.77)

Family type

Families were categorized based on the number of family members. It was observed that majority of the respondents in group 1 (76.92%) and group 3 (69.81%) belonged to joint family. About 23 per cent in group 1 and 30.19 per cent in group 3 belong to nuclear family. In case of group 2, majority of the respondents (77.78%) were belonging to nuclear family.

Table 8: Distribution of respondents based on type of family
n=120

Category	Group 1 (n_1=13)	Group 1 (n_2=54)	Group 1 (n_3=53)
	Frequency (Per cent)		
Nuclear family	3 (23.08)	42 (77.78)	16 (30.19)
Joint family	10 (76.92)	12 (22.22)	37 (69.81)

CONCLUSION

Characterization of livelihood system in Lakshadweep islands shows that a majority of people were involved in non-farm activities. A small proportion was involved in farming as their only source of livelihood and they belonged to old age category. Middle age people were mainly engaged in non-farm activities. Members in farming sector were educated maximum up to primary level only while in non-farm sector; no one was below primary level. Service sector was the emerging non-farm based livelihood alternative in islands followed by business. It indicated the deviation of education people from primay sector (Agriculture/ fishery to service sector. Type of family was not significantly different among the samples.

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REFERENCES

Ashley, C. 2001. Rethinking rural development. *Development Policy Review*, 19(4): 325-425.

Baby, S. 2005. Livelihood security of rural community: A critical analysis. *Ph. D. Thesis*, Division of Agricultural Extension, Indian Agricultural Research Institute, New Delhi, India.

Ellis, F. 1998. Survey Article: Household strategies and rural livelihood diversification. *Journal of Development Studies*. 35(9): 1-38.

Letha Devi, G. 2007. Changing livelihood pattern of rural women: An analysis in the context of urbanization. *Ph. D. Thesis*, Division of Agricultural Extension, Indian Agricultural Research Institute, New Delhi, India.

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Adoption of chilli Production Technology Among the chilli Growers in Sehore District of Madhya Pradesh

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ABSTRACT

This study was conducted in Sehore district of Madhya Pradesh in the year of 2013-14. The study revealed that majority of the chilli growers had high adoption behaviour (46.08%) followed by medium level of adoption(36.42%) and low adoption behavior (17.50%) regarding overall recommended chilli production technology respectively. The study also revealed that the socio-economic factors had positive and significant influence on the adoption of chilli production technology, among the chilli growers .

Key words: Chilli growers, adoption behaviour, production technology, constraints

INTRODUCTION

chilli (Capsicum) was introduced in India by the Portugese in Goa in the middle of 17th Century and since then it had rapidly spread throughout the country. As tropical and sub tropical crop, chilli is cultivated largely in India, Pakistan, Indonesia, South Korea, Bangladesh and Sri Lanka. In India, area under chilli crop is 918.00 thousand hectares with an annual production of 780 thousand tonnes in the year of 2009-10. The main chilli growing states are Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu and Madhya Pradesh. These states contributed 71 per cent of the total area and 79 per cent of the total production of chilli in India.

Madhya Pradesh is the sixth largest chilli producing state in India. In Madhya Pradesh the area under chilli crop is 59062 hectares with production of 59023.1 metric tonnes. chilli crop is mainly grown in the districts Sehore, Dhar, Indore, Badwani, Khandwa, Burhanpur, Betul and Chhindwara. Sehore district is the leading district in respect of area and production of chilli in Madhya Pradesh. Looking to the present situation of resource availability with farmers, particularly the size of land under cultivation of different crops, production pattern and prime need for enhancing the production of chilli to achieve the food security for future, there seems to be no other alternative to adopt the improved/ recommended chilli production technology. Studies show that the development of improved chilli production technology has subsequently contributed for increasing chilli production in India. But the improved chilli production technology is more capital and skill intensive. It requires more manure-fertilizer, irrigation and plant protection measures with improved and high yielding varieties of seed to adopt it. There is a tremendous opportunity for increasing the production of chilli by adopting the improved technology. To achieve the higher level of production and productivity, the low level of adoption of improved chilli production technology may be a big hindrance, which hampers the production potential of chilli on farmers' field. The gap always appears between the improved chilli production technology and their use in farmers' fields. In Madhya Pradesh, Sehore district is one of the important chilli growing tracts due to suitable agro-climatic condition and availability of production resources. It is fact that the majority of the farmers are still lagging behind the adoption of improved chilli production technology in the area. It becomes a serious concern to administration, agricultural scientists and extension workers. It thus, becomes necessary to assess the adoption behaviour of chilli growers, towards improved chilli production technology. There is also growing need to approach the farmers to convince and assist them in increasing their present chilli production with use of improved technology. To perform this task successfully, it is necessary to understand the adoption behaviour of chilli growers in the area considered for study. Taking the view of above statement, the present study " on adoption behaviour of chilli production technology among the chilli growers in Sehore district of Madhya Pradesh" was conducted.

METHODOLOGY

The present study was conducted in Sehore district of Madhya Pradesh. Kasarawad block in the district was

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selected purposively being a leading block in the area and production of chilli. A list of progressive chilli production villages was obtained from block office and out of them 10 villages were selected randomly. The list of chilli growers of the selected villages was prepared and 12 chilli growers from each village were selected by using simple random sampling method. Thus, the total 120 chilli growers were selected as respondents for the study spread over ten villages.The primary data were collected with the help of interview schedule, which was prepared on the basis of objectives of the study. The data were related with the socio-personal, economic and psychological characteristics of chilli growers and regarding level of adoption of improved chilli production technology. The data were collected and recorded in the interview schedule. Keeping in view the objectives of the study and to draw logical inferences, statistical tools like frequency, percentage, mean, standard deviation and correlation coefficient were used for analyzing and interpretation of the data.

RESULTS AND DISCUSSION

Table 1: Adoption behaviour of chilli growers towards improved chilli production technologies.

Practices	Adoption Behaviour		
	Low	Medium	High
Land preparation and ploughing of farm	20	50	50
	(16.66)	(41.67)	(41.67)
Improved varieties of chilli	16	44	60
	(13.33)	(36.67)	(50.00)
Sowing of seed	19	42	59
	(15.83)	(35.00)	(49.17)
Seed treatment	22	41	57
	(18.33)	(34.17)	(47.50)
Depth of seed and distance between row to row	21	43	56
	(17.50)	(35.83)	(46.67)
Use of rhizobium and PSB culture	24	46	50
	(20.00)	(38.33)	(41.67)
Recommended dose of fertilizer	18	42	60
	(15.00)	(35.00)	(50.00)
Use of bio-fertilizer	20	45	55
	(16.67)	(37.50)	(45.83)
Method of weed control and use of weedicide	23	43	54
	(19.17)	(35.83)	(45.00)
Plant protection measure	23	41	56
	(19.16)	(34.17)	(46.67)
Overall average adoption level	21	44	55
	(17.50)	(36.42)	(46.08)

Note: - (Figures in parentheses indicated percentages)

The study revealed that most of the chilli growers had high adoption behaviour followed by medium and low. The above findings were also reported by Rawat (2008), Hanumanaikar *et.al.* (2009) and Raghuwanshi (2011).

It is evident from the table that out of total chilli growers the most of the chilli growers had high (41.67%) and medium level (41.67%) of adoption behaviour about land preparation and ploughings of farm followed by (16.66 %) per cent chilli growers adopted low level of this practices.

The adoption of improved seed variety of chilli, the most of the chilli growers had high level (50.00%) of adoption behaviour followed by medium level (36.67%) and low level adoption (13.33%) .

Regarding sowing of seed, most of the chilli growers had high level of adoption behaviour (49.17%) followed by medium level (35.00%) and low level (15.83%).

Regarding seed treatment, most of the chilli growers had high level of adoption behaviour (47.50%) followed by medium level (34.17%) and low level (18.33%) of this practice. The most of the chilli growers adopted high level (46.67%) of depth of seed and distance between row to row practices followed by medium level (35.83 %) and low level (17.50%) of adoption behaviour.

About use of rhyzobium and PSB culture, the most of the chilli growers had high level (41.67%) of adoption behaviour followed by medium(38.33%) and low (20.00%) level.

Regarding recommended dose of fertilizer, most of the chilli growers had high level (50.00%) of adoption behaviour followed by medium (35.00%) and low level (15.00%) of adoption behaviour.

In case of use of bio-fertilizer, most of the chilli growers had high level (45.83%) of adoption behaviour followed by medium (37.57 %) and low (16.67%) level adoption behaviour of. this practice most of the chilli growers had high level (45.00%) of adoption behaviour followed by medium(35.83%) and low(19.17%) level of adoption behaviour with respect to method of weed control and use of weedicide .

Regarding plant protection measure, most of the chilli growers had high level (46.67%) of adoption behaviour followed by medium (34.17 %) and low level (19.16%) of adoption behaviour. of. this practice

Table 2: Distribution of chilli growers according to overall adoption behaviour towards production technology of chilli.

Adoption behaviour	Frequency	Percentage
Low	20	16.66
Medium	44	36.66
High	56	46.68
Total	**120**	**100.00**

The data revealed that most of the chilli growers had high adoption behaviour(46.08%) followed by medium level of adoption (36.42%) and low adoption behaviour (17.50 %) regarding overall recommended chilli production technology, respectively.

Table 3: Correlation between adoption behaviour of chilli growers of improved chilli production technology and selected independent variables.

Characteristics	'r' value
Age	0.166 N.S.
Education	0.268**
Farming experience of chilli	0.063 N.S.
Socio economic status	0.641**
Economic motivation	0.465**
Risk preference	0.251**
Innovativeness	0.293**
Information seeking behaviour	0.226*
Mass media exposure	0.128 N.S.
Extension participation	0.023 N.S.
Level of knowledge	0.534**

*= Significant at p= 0.05
**= Significant at p= 0.01

The results of correlation analysis in above table revealed that characteristics namely education, socio economic status, economic motivation, risk preference, innovativeness and level of knowledge were positively and significantly (0.01 % level) related to adoption behaviour of chilli growers,. On the other hand, characteristics namely information seeking behavior were positively and significantly (0.05 % level) related to adoption behaviour of chilli growers.

The socio-economic and psychological characteristics namely age, farming experience of chilli, mass media exposure and extension participation with adoption behaviour of chilli growers was found non-significantly related. The above findings were also in line with Joshi (2004), Kushwaha *et.al.* (2004), Chouhan (2007) and Jain (2007).

Table 4: Constraints faced by chilli growers in adoption of improved chilli production technology.

Constraints	Frequency (n=120)	Percentage	Rank
Lack of high yielding varieties of seed	25	20.83	XI
Unavailability of seed at time	45	37.50	VII
Lack of credit facilities at time	58	48.33	II
Lack of proper resources and capital	32	26.67	IX
Lack of proper information at time	46	38.33	VI
Lack of technical knowledge	75	62.50	I
Lack of training programme related with improved technology	48	40.00	V
Lack of irrigation facilities	35	29.17	VIII
Non performance of visits by agricultural personnel time to time	28	23.33	X
Costly agricultural inputs	57	47.50	III
Lack of proper market	49	40.83	IV

The constraints analysis was done based on the opinion survey of the sample of chilli growers. The above table revealed the major constraints as perceived by the chilli growers. Important constraints perceived by chilli growers 'lack of technical knowledge, followed by 'lack of credit facilities at time', 'costly agricultural inputs' , and lack of proper market.

CONCLUSION

On the basis of results of the in study, it may be concluded that higher number (46.08%)of chilli growers had high adoption behaviour. The study further revealed that the socio economic factor namely education,socio economic status, economic motivation, risk preference , innovativeness, information seeking behavior and level of knowledge were positively and significantly related to adoption behaviour of chilli growers, respectively. On the other hand, characteristics namely age ,farming experience of chilli, mass media exposure and extension participation were found to have non significant relation with adoption behaviour of chilli growers. The study also revealed that major constraints perceived by the chilli growers was lack of technical knowledge, lack of credit facilities at time, and costly agricultural inputs.

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REFERENCES

Chouhan,D.K. 2007. "A study of the technological knowledge possessed by the tribal cotton growers and its adoption in Manawar block of District Dhar (M.P.)". *M.Sc. (Ag.) Thesis (Unpublished), R.A.K. COA, JNKVV, Jabalpur*

Joshi,P.J. 2004. Extent of knowledge and adoption of farmers about modern practice of cotton in Bhal area of Gujarat. *M.Sc. (Agri.) thesis, G.A.U., Anand Campus, Anand.*

Kushwaha,R.; Singh,V.B. and O.P.Daipuria, 2004. Knowledge of solonacious vegetable growers towards plant protection measures-correlation and path analysis. 2nd National Extension Education Congress. *Society of Extension Education, Agra and MPUAT*, Udaipur.pp63-64.

Hanumanaika; R. H Jadhav; S.N.Ashalatha and K.V.Hind 2009. Extent of adoption of recommended technology by the chilli growers in Tunga Bhadra Project area of Bellary district of Karnataka . *Agri- Horticultural (Muzaffarnagar).*32(4): 367-370.

Raguwanshi,M. 2011. A study on adoption behaviour of vegetable growers in relation to their socio-economic and psycho attributes in Hoshangbad district of Madhya Pradesh. *M.Sc.(Ag.) Thesis, submitted to RAK College of Agriculture, Sehore (M.P.).*

Rawat Dhirandra, 2008. A study of the technology knowledge and its adoption by the chilli growers of Badwaha Block of Sehore district of M.P. *M.Sc.(Ag.) Thesis, submitted to RAK College of Agriculture, Sehore (M.P.).*

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Retrieval and Storage of Research Information by the Post Graduate Students of Kerala Agricultural University

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ABSTRACT

The retrieval and storage of research information is an important aspect when it comes to the post graduate students doing research. As far as agriculture students are considered, the research information retrieval is unavoidable for carrying out research works. Therefore, the study was conducted to find out the information retrieval behavior and storage of information by the research graduates in Kerala Agricultural University. A questionnaire was prepared and distributed among 30 post graduate students in various disciplines. The study revealed that more that more than 50 per cent of students retrieved information regularly. Seventy percentage of students accessed information to supplement their lecture notes. Fifty percentages of respondents utilized the library facilities more than once in a week. Internet was the source used to retrieve information by the respondents. Sixty percentage of respondents stored information occasionally and 76.6 per cent of respondents had the habit of taking prints for storing the information.

Key words: Research information, information retrieval

INTRODUCTION

The retrieval and storage of research information is an important aspect when it comes to the post graduate students doing research. As far as agriculture students are considered, information retrieval is unavoidable for carrying out research works. Our researchers take a lot of pain to gather information and hence it is also important to know from where the information is being retrieved as well as the how the retrieved information is being stored. Therefore, the study was undertaken to understand how the information was collected and was being stored so as to support the research work.

Herner and Mavitt (1954) found that one-fifth of the respondents visited the library very often to do their own literature searching. Osiobe (1988) found that browsing was the most important source of finding references for undergraduate students. Hartmann (2001) concluded that undergraduate students experienced difficulty in locating items from the library collection and did not understand the processes for retrieving journal articles. Majid and Ali (2002) studied the use of information resources by computer engineering students in Singapore and found that the top five information resources in order of preference were books (94%), lecturers (84%), the internet (86%), and friends (84%). They relied heavily on printed sources of information and their use of electronic journals and databases was very low

METHODOLOGY

Thirty postgraduate students were selected from various disciplines to study their information retrieval and storage behavior. The information was collected from the students using a structured questionnaire with three point continuum namely regularly, occasionally and never with scores 3,2,1 respectively and the score was calculated using the formula :

$$\text{Score} = \frac{\text{Total score obtained}}{\text{Maximum possible score}} \times 100$$

RESULTS AND DISCUSSION

A research is not that easy to be carried out without relevant information. Information being the base for conducting a research, an attempt was made in the present study to find out the information retrieval and storage by the post graduate students and the results are presented below.

1. Frequency of information retrieval

Table 1 reveals that majority of students (60%) regularly retrieved information. This shows that the students also feel that it is important to retrieve information for their academic purposes.

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Table 1: Frequency of information retrieval: how often do you retrieve information

n= 30

Regularly	Occasionally	Never
18(60%)	12 (40%)	0

2. Purpose of retrieval of research information

From Table 2 it is evident that majority of the scholars retrieved information for supplementing the lecture notes and this may be to excel in their academic with good marks. Seventy three percentage of student opined that information was retrieved for research related works. This may be because there is a need for a lot of references once you enter into research works

Table 2: Purpose of retrieval of research information

Purpose of retrieval	Retrieval index	
	Total score	Percentage
General awareness	60	66.60
To prepare class notes	60	66.60
Supplement lecture notes	69	76.60
Research work	66	73.30
Publishing papers	54	60.00
Reading	54	60.00
Recreational purpose	45	50.00

3. Frequency of visit to library

Table 3 reveals that majority of the students utilized the library more than once in a week which shows their need for retrieving information.

Table 3: Frequency of visit to library

Frequency of visit	No. of students	Percentage
Everyday	6	20
Once in a week	9	30
More than once in a week	15	50
Once in fortnight	0	0

4. Source used for information retrieving research information

From the above table we can see that 93.3 per cent of respondents use internet as a source for retrieving information and this may be because this is the medium that can be easily accessed any time. Only 56 per cent of respondents used books for retrieving information.

Table 4: Source used for information retrieving research information

Source	Score	Percentage
News paper	81	90.00
Journals	69	73.30
Periodicals	60	66.60
Seminar papers	54	60.00
Internet	84	93.30
Books	51	56.60
Television	60	66.60

5. Frequency of storing research information

From the Table 5 we can see that 60 per cent of research graduates occasionally stored the information whereas only 40 per cent of individuals stored the information regularly.

Table 5: Frequency of storing research information

	Regularly	Occasionally	Never
No	12	18	0
%	40	60	0

6. Sources used for storing research information

From the above table 6 we can see that 76 per cent of the respondents take print of the information they find and this may be to use them for the future research needs

Table 6. Sources used for storing research information

Sources	Score	Percentage
Pen drives	57	63.30%
CD rom	63	70.00%
Taking print	69	76.00%
Newspaper cuttings	48	53.30%
Store in computer	63	70.00%
Buy books	54	60.00%
By journals	57	63.30%

CONCLUSION

The study retrieval and storage of research information by the post graduate students in agriculture was helpful in understanding the information retrieval and storage behavior of post graduate students. The study revealed that more than 50 per cent of students retrieved information regularly. Most of the students retrieved information to supplement their lecture notes. Majority of students visited library more than once in a week. Among the various sources used to retrieve information, it was the internet that was mostly used by the respondents. Sixty percentage of the respondents stored information occasionally and about 76 per cent of the respondents took print as a method for storing the retrieved information. Therefore the study reveals that information is being retrieved and stored by the agricultural post graduates and is considered important by them for carrying out the research.

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REFERENCES

Hartmann, E. 2001. Understanding of Information literacy: the perception of first year undergraduate students at the university of Ballarat. Australian Academic and Research Libraries 32(2):35-43.

Herner, S. and Miyatt, D. 1954.Building a functional library.Chemical and Engineering News 32:49-50.

Majid, S. and Ali, T.T. 2002. Usage of information resources by computer engineering students: a case study of Nanyang Technology University, Singapore. Online Information Review, 26(5): 318-325.

Osiobe, Stephen A. 1988. Information-seeking behavior. International Library Review, 20(3):337-346

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Awareness and Attitude of Farmers towards Agro-forestry

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ABSTRACT

The study was conducted in Milkipur block of Faizabad District by concluding personal interview with 100 respondents selected through proportionate random sampling technique on the criteria of land holding size possessed, *viz.* Marginal, small, medium and large to find out the knowledge, attitude and adoption of agro-forestry systems. The majority of respondents (73 %) were found having medium level of attitude towards agro-forestry and attitude was measured on the scale developed by Shukla and Tyagi (2002). The respondents were categorized into three categories such as low, medium and high on the basis on the respondents e.g. low (up to 38), medium (39 to 44), high (45 and above) based on (i) mean-SD (ii) between mean ± SD (iii) mean +SD respectively. The correlation of attitude with like economic motivation and knowledge extent were found to be highly significant.

Key words: Awareness, attitude, farmers, agro forestry, agro forestry practices.

INTRODUCTION

The major policy initiatives, including the National Forest Policy 1988, the National Agriculture Policy 2000, Planning Commission Task Force on Greening India 2001, National Bamboo Mission 2002, National Policy on Farmers, 2007 and Green India Mission 2010, emphasized the role of agro-forestry for efficient nutrient cycling, organic matter addition for sustainable agriculture and for improving vegetation cover. However, agro-forestry has not gained the desired importance as a resource development tool due to various factors. Some of these factors include: restrictive legal provisions for harvesting & transportation of trees planted on farmlands and use of non-timber produce, near non-existent extension mechanisms, lack of institutional support mechanisms, lack of quality planting materials, inadequate research on agro-forestry models suitable across various ecological regions of the country, inadequate marketing infrastructure and price discovery mechanisms, lack of post- harvest processing technologies, *etc*. This is also due to the fact that the mandate of agro forestry falls through the cracks in various ministries, departments, agencies, state governments, *etc*. The value and position of agro-forestry is ambiguous and undervalued, and despite its numerous benefits, it is only sporadically mentioned at the national level, because of the lack of appropriate public policy support. Agro-forestry systems include both traditional and modern land-use systems where trees are managed together with crops and or/ animal production systems in agricultural settings. Agro-forestry is practiced in both irrigated and rainfed conditions where it produces food, fuel, fodder, timber, fertilizer and fiber, contributes to food, nutritional and ecological security, sustains livelihoods, alleviates poverty and promotes productive and resilient cropping and farming environments. Agro forestry also has the potential to enhance ecosystem services through carbon storage, prevention of deforestation, biodiversity conservation, and soil and water conservation. In addition, when strategically applied on a large scale, with appropriate mix of species, agro forestry enables agricultural land to withstand extreme weather events, such as floods and droughts, and climate change.

METHODOLOGY

The study was conducted during 2011-2012 to study the attitude towards agro-forestry farmers regarding improved agro forestry farming practices. The Milkipur block of Faizabad district was selected purposively for this study because presence of Agro-forestry area, from the selected block ten villages were selected namely, Sarurpur, Kaidhana khurd, Sahulara, Keenhupur, Sidhauna, Shivnathpur, Balarmaw, Kuchera, Tendha khurd and Sariyanwa through random sampling techniques.

A total number of 100 agro-forestry famers from 10 sample villages were selected through proportionate random sampling technique on the basis of size of land

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holding. An interview schedule was prepared in the light of decided objectives and variables undertaken. Attitude was measured using the scale developed by Shukla and Tyagi (2002) consisting of modified eleven statements on a five point continuum *viz.* Strongly agree, agree, undecided, disagree and strongly disagree by assigning weights of 5,4,3,2, and 1 respectively for each positive statements and reverse for negative statements.

The respondents were categorized in to three categories such as low, medium and high on the basis of total scores obtained by the respondents e.g. low (up to 38), medium (39 to 44), high (45 and above) based on (i) less than a mean-SD (ii) between mean ± SD (iii) greater than mean +SD respectively.

The questionnaire consisted of close questions, all of which were translated into the local language. Appropriate statistics are used to draw inferences, accordingly.

RESULTS AND DISCUSSION

Table 1: Distribution of respondents according to attitude about agro forestry system

n=100

Categories	Respondents	
	No.	Percentage
low (up to38)	13	13.00
Medium (39 to 44)	73	73.00
High (45 to above)	14	14.00
Total	100	100.00

Mean =41.50 S.D. =3.1511 Min.=33 Max. =48

From Table 1 it is observed that 73 per cent of the respondents were found having medium level of attitude towards agro-forestry followed by 14 and 13 per cent who had high and low levels of attitude towards agro-forestry system, respectively.

The mean score for attitude towards agro forestry system was observed to be 41.50 with a range of minimum 33 and maximum 48.

Hence, it can be inferred that most of the respondents 75 per cent were found having medium level of attitude towards agro-forestry system regarding different statements. In other words, it may be said that special attention was given to agro forestry by the farmers.

Table 2: Correlation coefficient (r) between different variable and attitude about agro forestry system

Variables	Correlation coefficient(r)
Age	0.0458
Education	0.1134
Family size	0.1416
Housing pattern	-0.0390
Land holding	0.0902
Annual income	0.0520
Social participation	0.0616
Occupation	0.0637
Farm power	0.1689
Farm implements	0.0159
Household material	0.1390
Transportation material	0.1559
Communication media	0.0529
Economic motivation	0.3269**
Scientific orientation	0.1033
Extension contact	-0.1220
Knowledge extent	0.2623**
Adoption extent	0.0340

* Significant at 0.05 probability level = 0.195
** Significant at 0.01 probability level = 0.254

It is revealed from Table 2 that the variables like economic motivation and knowledge extent were found to be highly significant. Age, education, family size, land holding, annual income, social participation, occupation, farm power farm implements, households material, transportation material, communication media, scientific orientation and adoption extent were significant by and positively correlated. Housing pattern and extension contact were found negatively insignificant with respect to attitude of respondents. It can be noted that the variables, namely age, education, caste, family type, family size, land holding, annual income, social participation, occupation, farm power, farm implements, house hold material, transportation material, communication media, scientific orientation and adoption extent had no influence on attitude of the respondents while those, which should be positive and significant relationship had direct influence over attitude. It meant that the value of these variables if increased, the extent of attitude will go towards favorableness.

CONCLUSION

Majority of respondents (73 %) were observed in the medium level of attitude followed by low 14 per cent and 13 per cent high and low levels of attitude, respectively. The mean scores of attitude was found to be 41.50. Among 18 variables studied, the two variables namely,

economic motivation and knowledge extent had highly significant and positive correlation with attitude of agro-forestry system.

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REFERENCE

Ajayi, O. C. 2007. User acceptability of sustainable soil fertility technologies: lessons from farmers' knowledge, attitude and practice in Southern Africa. *Journal Sustainable Agriculture*. 30 (3): 21-40.

Alam, M.; Furukawa, Y. and Mika, M. 2010. Perceptions, preferences, and attitude of Bangladesh farmers towards homegarden farming systems. *Small-scale Forestry*. 9 (2): 213-226.

Banyal, R.; Masoodi, N. A.; Masoodi, T. H.; Sharma, L. K. and Gangoo, S. A. 2011. Knowledge and attitude of farmers towards agroforestry practices in North Kashmir a case study. *Indian Forester Dehra Dun*. 137 (12): 1377-1381.

Khan, W. N.; Siddiqui, G. S.; M. T. Atif M. T. 2008. Farmers' attitude towards agroforestry in district Faisalabad. *Pakistan Journal Agricultural Sciences*. 45 (1): 60-64.

Manhas, J. S. and Singh, S. B. 2012. Attitude of trainees towards Basic Agriculture and Horticulture Training (BA & HT). *Progressive Agriculture*. 12 (1) 175-179.

Marseille, M. M.; Elands, B. H.; M. Brink, M. L. and Van, D. 2012. Experiencing polar bears in the zoo: feelings and cognitions in relation to a visitor's conservation attitude. (Special Issue: Human emotions toward wildlife.) *Human Dimensions Wildlife.* 17 (1): 29-43.

McGinty, M. M.; Swisher, M. E. and Alavalapati, J. 2008. Agroforestry adoption and maintenance: self-efficacy, attitude and socio-economic factors. *Agroforestry Systems*. 73 (2): 99-108.

Sanlier, N. and Konaklioglu, E. 2012. Food safety knowledge, attitude and food handling practices of students . *British Food Journal*. 114 (4): 469-480.

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Ergonomic Evaluation of Improved Grain Cleaning Technologies - Comparative Study of Traditional and Improved Tools

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ABSTRACT

This study was conducted to assess ergonomic efficiency of improved hanging type cleaner grader. Twenty farmwomen were selected to assess and compare the impact of improved technologies over traditional one. The physiological cost of work and energy expenditure in terms of heart rate, cardiac cost, time required, strokes, output were observed to be lower while performing selected activities with the improved technologies compared to the traditional one. The work output was also found higher with all of the improved technologies. The activity was performed with both the traditional method using as well as by using Supa, the improved tools. Results of the study showed that the average heart rate and energy expenditure of the women were reduced significantly while performing the grain cleaning activity with the use of improved tool manufactured by CIAE, Bhopal. The use of both the improved tools also led to reduction in the muscular stresses. Further it was observed that work productivity with the improved tool Hanging sieve had significantly improved. It was therefore recommended that women should be motivated to use the improved tools for grain cleaning to minimize health hazards.

Key words: Ergonomic evaluation, having sieve, health hazards.

INTRODUCTION

Farm women play a significant role in India's economy and their number, at present, is estimated at about 101 million. Though they play multifarious roles, farm women are employed mostly in drudgery-prone activities which includes transplanting, weeding, harvesting, threshing, grain cleaning etc. The tools/equipments available have been primarily developed for male workers and given for use to women workers which results in lower system efficiency and occupational health problems. Women have different ergonomical characteristics than men and therefore it is necessary to develop tools/equipments to suit their anthropometric and strength data. The tools/equipments once developed need to be demonstrated, and the users have to be given training for their proper use. The Central Institute of Agricultural Engineering, Bhopal in association with DRWA sub-centre and AICRPs located at SAUs has taken a lead in this direction and evaluated/refined/developed about 21 tools and equipment suitable for farm women. Efforts have also been made to provide training to women extension functionaries and farm women on these tools and equipments. Making these tools available in villages is also very important and needs to be given due consideration. This paper touches all these aspects and suggestions have been given for development and promotion of women friendly tools and equipments.

The role of women in agriculture is very significant especially the post harvest and agro processing activities like the cleaning, drying, grinding, decortications. Cleaning of wheat grains is the most common farm activities performed by the women in every rural home. Grain and chaff are separated using natural breeze or by creating artificial wind. While doing so, the women adopt many unnatural postures like bending, stretching of different body parts which lead to increase in cardio-vascular stresses. Elisjistom and Nachemson (1970) also found that unnatural postures led to several musculo-skeletal problems. The tools/equipments available have been primarily developed for male farmers and women farmers have to use the same if required resulting in low work efficiency and many occupational health problems. So, there is a need to develop or improve the existing grain cleaning equipment according to the anthropometric needs of the women farmers to reduce their drudgery. Keeping in mind these views, an improved tool for cleaning of grains i.e hanging sieve was tested in order to see the impact on the reduction of stresses of women and to measure its impact on the increase of work output (Oberoi *et. al*., 2005).

Studies have pointed out that farm activities that are time-and labour-intensive, monotonous, repetitive and more drudgery prone are generally performed by women.

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Since all the operations are done manually, they cause considerable physical and mental fatigue and other health problems. The root cause of their sufferings is ignorance about improved technologies, age-old methods of doing the work, inappropriateness of the technology and attitudinal constraints such as innate conservation and resistance to change. "Empowerment of Women in Agriculture" has been initiated with the objective to empower farm women technologically to reduce their drudgery (Badiger *et al.,* 2006). The present study was undertaken to measure the average heart rate during work and during rest of women performing the selected activity with traditional method and with the use of improved tools, measure the change in work output with the use of traditional and improved methods related to selected activity and compare the cardiac cost of work, time required for cleaning, number of strokes/batch for sieving saving with traditional and improved method.

METHODOLOGY

Twenty farm women of Narsinghpur District in the age group of 35 to 50 years with normal health without any major illness were selected for the study. The suitability of the women for the experiment was ascertained by measuring the body temperature, blood pressure, heart rate e*tc.* Cleaning and grading of grain with hanging sieve was compared with traditional practice Supa. During the experiment, value of various parameters *viz*. time profile, output, heart rate, work pulse, cardiac cost were recorded saving in cardiac cost. Stop watch was used to record the time.

Performance of the activity

The selected subjects were given enough rest and their resting heart rate was measured with the help of Heart Rate Monitor. Then the subject was asked to perform the selected activity by traditional method for approximately 30 minutes. and the heart rate of the subjects was measured for the entire activity. After the Hanging Sieve specifications completion of the task the recovery heart rate was again recorded till the subject came in the state of normal heart rate. The same procedure was repeated when the same women performed the activity with improved tools manufactured by CIAE, Bhopal.

Particulars	Hanging Type Cleaner	Sack Holder
Overall Dimensions (I x w x h), (mm)	1040 x620 x 205	530 x 450 x 810
Weight, (kg)	17.1	10.3
Size of jute bag, (mm)	-	1120 x 680
Cost, (₹)	4000	1500

Features

- Hanging sieve a batch type hand operated equipment to replace existing traditional practice of grain cleaning with natural wind or horizontal/vertical sieving to clean the grains.

- These separate impurities like stubbles, chaff, dirt and broken from wheat, bengal gram, soybean and other cereals and pulse crops.

- These improved tools consist of the mainframe, scalper/grading screen, draper rod, handle, shutter etc., and is operated by hanging it on any elevated point with 4 ropes.

- A batch of 5-10 kg of grains is fed into the cleaner and it swings to and fro to sieve the batch

- Single woman can operate this in standing posture and desired work can be done with minimum of efforts and body fatigue.

Working Principles of equipment

1) It is manually operated equipment for cleaning and grading of grain.

2) It consists of main frame, grading screen, draper rod, rubber grip over handle, shutter etc.

3) Four ropes are tied on the hooks provided on main frame of cleaner and hanged on any elevated points or hooks attached to the ceiling. It is operated in oscillating mode.

RESULTS AND DISCUSSION

Average heart rate, energy expenditure were calculated with the help of following indicators:

- Average heart rate during rest and work.

- ΔHR (beat/Min) = Average working heart rate-Average heart rate during rest.

- Output (Kg./hr.).

- Cardiac, cost of work per unit of output (beats/Kg)= ΔHR x duration of work/output.

Table 1: Comparative performance of the Supa and Hanging sieve

Particulars	(Traditional Practice with Supa)	(Double Screen grain cleaner Hanging Sieve)
No. of Trials	05	05
No. of Farm Women involved	20	20
Crop	Wheat	Wheat
Output Kg./Hour	15 kg hour	150 kg hour.
ΔHR	5 beat min.	5.94 beats min.
No. of women farmers adopted (%)	-	40

Assessment of selected ergonomic parameters

Table 2: Impact of improved tool over traditional tool for grain clearing activity

Particulars	Traditional Practice (with supa)	Hanging Sieve (Double Screen grain cleaner)
Number of workers required	01	02
Grain used for experiment	Wheat	Wheat
Quantity of seed fed per batch/Kg.	01 Kg.	10 Kg.
Time required for cleaning/batch/min	06 min.	04 min.
Number of strokes/batch for sieving.	32	13
Output Kg/hour	10/Kg.	150/Kg.
Average Heart Rate beats/min.	103.40 beats/min	93 beats/min.
ΔHR	5.94 beats/min	5 beats/min.
Cardiac cost of work per unit of output beats/Kg.	30 beats/Kg.	2.37 beats/Kg.

It was observed that with traditional method of grain cleaning heart rate was 103.43 beats/min but with the use of improved tool (Hanging sieve) heart rate was reduced to 93 beats/min (Table 2). The results had conformity with the findings of Sandhu *et al.(*2001) who advocated that by using improved tools/technologies, the physiological workload get reduced to a great extent.

The work efficiency measured in terms of output was significantly high (150 kg/h) in work output was observed while using improved technology compared to traditional method (10 kg/h) (Table 2). Results were in line with the study conducted by Gupta *et. al.* (2004).

Similar results are observed in case of energy expenditure and physiological cost of work. Thus, these technologies proved drudgery reducing, more efficient, advantageous in terms of increased output thus time taken. The time saving with the use of improved method was 04/batch/min against that of traditional method (06/batch/min). The energy expenditure was estimated by using the formula proposed by Varghese *et.al.* (1994) for Indian Women. The cardiac cost of work is the total number of heart beats spent about the resting level in order to perform the work. The cardiac cost of recovery is the total no. of heart beats above the resting level occurring at the end of work and return to the pre activity state (Saha, 1976).

Most of the agricultural activities particularly post harvest activities were commonly performed by farm women. Since all operations are performed manually they cause physical and mental fatigue and other health problems. Some of the schemes tried to introduce many technologies, which have not reached the women at gross root level. But this study has made concerned efforts through continuous training, demonstrations at field level and created awareness and skill in the use of these technologies. Use of improved technologies viz. tubular maize sheller, ground nut decorticator, ground nut stripper and hanging type cleaner grader showed decrease in physiological cost of work and increased work out put compared to traditional method. Hence, beneficiaries of this study changed their attitude, skill and knowledge which in tern helped to empower farm women technologically, socially and economically for improved quality of life.

Hanging sieve saved almost half the time and increase working efficiency (saving 19 strokes/batch for sieving) and reduced drudgery of farm women over traditional practice. Comparison with traditional practice (Supa) found that Hanging sieve was easy in operation, caused no muscle strain, saved cardiac cost of worker, and required less energy expenditure causing fatigue.

CONCLUSION

On the basis of the above-discussion, it may be concluded that improved tools decreased the health hazards and work-load and increased the efficiency of work. Besides, the quality of grain was also improved with the use of improved tool. Hence, there is need to promote such drudgery reducing technology for the overall health improvement of the farm women engaged in agriculture. This will lead to the empowerment of the farming community having a healthy mother and healthy family.

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REFERENCES

Badiger Chhaya, sumahasalkar and Kavitha 2006. "Ergonomic Evaluation of improved technologies for farm women in post harvest activities" *Karnakaka J. Agric. Sci.* 19(1):(80).

Elisjistom, C. and Nachemson, A 1970. *Applied. Ergon.,* 8: 87-88.

Gupta, P., Singh, S., Singhal, A., S., Mathour, P. and Choudhary, A., 2004. Drudgery reduction of farm women through technology intervention in rural areas of Rajastan. *In: Power Machinery Systems and Ergonomics, Safety and Health*, Anamaya Publishers, New Delhi, pp.331-337.

Gite L.P. 2008 "Tools and equipment for reducing drudgery of women in Agriculture in capacity building programme in OUAT Bhunabeswar P.P.1.

Sandhu, P. *et al.* 2001. In: International Congress on Humanizing Work and Work Environment-2001, lIT. Mumbai.

Saha, P.N. 1976. The practical use of some physiological research methods for assessment work stress. *Journal of Indian Association of Physiotherapists*, 4:9-13.

Oberoi Sharma Shivani and Kaur Kulvir, 2005 "A Comparative study of traditional and improved grain Cleaning tools Journal Dairying, Foods H.S. 24 (3/4) P.P. 197.

Varghese, M.A., Saha, P.N. and Athreya, N., 1994, A rapid appraisal of occupational workload from a modified scale of Perceived Exertion. *Ergonomics*, 37:485-491.

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Analyzing Constraints in Conflict Management in Wasteland Development Project

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ABSTRACT

The study was aimed to analyze the constraints encountered by Pragathi Bandu Self Help Group (SHG) members while implementing the Wasteland Development project. The present study was conducted in purposively selected Shimoga district of Karnataka state during 2013. Two taluks namely Shimoga and Bhadravathi were selected. From each taluk the villages having maximum number of Pragathi Bandu SHG members were selected. Total 36 Pragathi Bandu SHGs formed by SKDRDP were considered for the study. From each SHG, three members were randomly selected thus, making a total sample size of 108. The results revealed that all Pragathi Bandu SHG members expressed political influence, was major problem in resolving conflicts and majority (90.7%) of the respondents suggested to create general awareness about the essentiality of formation of SHGs for wasteland development activities.

Keywords: Problems, resolving conflicts, shgs (self help groups), suggestions, wasteland development project,

INTRODUCTION

Conflict has become inseparable part and parcel of our lives and we experience conflicts as we experience joy or sorrow in our day to day life. The concept of conflict resolution is a relational approach to solve conflicts. Many situations require the skill to resolve conflicts effectively and productively. Pragathi Bandu groups formed by Shree Kshetra Dharmastala Rural Development Project (SKDRDP) are unique male-member SHGs that implement Wasteland Development activities and are no exception to conflicts. Due to the presence of multiple stakeholders in Wasteland Development Project, the conflicts are bound to occur from opposing interests such as competition over scarce resources, differences in perceptions and attitudes.

The Pragathi Bandhu Self Help Groups (SHGs) are said to have great potential in accelerating the pace of the rural development, hence it was considered worthwhile to analyze the problems encountered by SHG members to resolve the conflicts and their suggestions to avoid or overcome the conflict to implement the Wasteland Development Project.

METHODOLOGY

The present study was conducted in purposively selected Shimoga district of Karnataka state during 2012-13. Out of seven taluks, two taluks namely Shimoga and Bhadravathi were selected purposively based on the maximum number of Pragathi Bandu SHGs formed by Shree Kshetra Dharmastala Rural Development Project (SKDRDP) to implement Wasteland Development activities. From each selected taluks namely Shimoga and Bhadravathi, the villages having maximum number of Pragathi Bandu SHGs were listed and three villages from each taluk were selected by using the same criteria. All the thirty six Pragathi Bandu SHGs formed by the SKDRDP in the selected villages were purposively considered for the study. From each SHG, three members were selected randomly thus, making a total sample size of 108 respondents for the investigation. *Ex-post facto* research design was adopted for the study. The required data was collected through personal interview method using structured, pre-tested interview schedule which was analyzed by using frequency and percentage.

RESULTS AND DISCUSSION

The Table 1 revealed that cent per cent of the Pragathi Bandu SHG members expressed political influence was major problem in resolving conflicts among while carrying out wasteland development activities. Majority (94.4%) of the respondents expressed caste system in the village followed by lack of motivation and initiation from village leaders (84.2%). Further, 78.7 per cent of respondents expressed non-availability of inputs followed by lack of co-operation and co-ordination from others (66.6%) and illiteracy (38.9%) were also cited as

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problems in resolving conflicts. Inadequate loans from the financial institutions and ineffective leadership (33.3%) were expressed as problems by about one third of the respondents.

The reason behind this was the political intervention and influence of politicians on certain conflicting issues. The caste system is the next most important problem which turned the disagreements into violent clashes between the two caste groups.

Few village as who had negative attitude towards the project were non co-operative with the SHG members while carrying wasteland development activities. Illiteracy, non-availability of inputs, inadequate loans from the financial institutions, luck of leadership, poor communication and lack of transparency among the members were other major problem faced by members.

Table 1: Problems faced by Pragathi Bandu SHG member in resolving the Conflicts while carrying out Wasteland Development activities.

n=108

Problems	Number	Per cent
Political influence	108	100.0
Illiteracy	42	38.9
Lack of motivation and initiation from village leaders	91	84.2
Caste system in village	102	94.4
Ineffective leadership	36	33.3
Lack of cooperation and coordination from others	72	66.6
Inadequate loans from financial institutions	36	33.3
Lack of technical knowledge	19	17.6
Non – availability of inputs	85	78.7

The data in Table.2 revealed the suggestions given by the respondents to resolve conflicts while carrying out wasteland development activities. Majority (90.7%) of the respondents suggested to create general awareness about the essentiality of formation of SHGs for wasteland development activities followed by communication of wasteland development activities to all the stakeholders to avoid speculations (83.3%), ownership and access rights to resources developed by group should be properly spelt out and given to only the group members with proper rules and regulations (77.7%), NGO should see that the programme incentives are sufficient and made available to all (76.8%), other SHG members should not be allowed to do the development works in wastelands (74.0%), equal per cent of respondents suggested that NGO should train the group members and others concerned in assessing conflicts (64.8%) and collaboration with local institutions and leaders to resolve conflicts (64.8%). Further, 62.9 per cent of the respondents expressed NGO has to monitor the Wasteland Development activities in the project area to avoid possible conflicts and 61.1 per cent expressed to identify the past conflicts and how it was manage them successfully. It was to interesting to note that 53.7 per cent of the SHG members had suggested that NGO should enable the participants to understand the whole concept of wasteland development during group formation phase. The possible reason for the first suggestion might be due to lack of awareness about the SHGs and its project activities to the villagers. The reason for the second most important suggestion might be the confusions about wasteland development activities due to poor communication with all the stakeholders of the project. Communication and capacity building are the possible areas which could be used to resolve the conflicts. The suggestion indicate that before implementing the project the NGOs should create general awareness about the essentiality of formation of Self Help Groups (SHG) for Wasteland Development Project in the villages. Thus, it facilitates to resolve conflicts and misunderstanding if any about the Pragathi Bandu SHGs at initial stage itself. Ownership and access rights to resources developed by group should be properly spelt out and given to only the group members with proper rules and regulations. The results were in line with the findings of Subba Rao (2001).

Table 2: Suggestions given by Pragathi Bandu SHG members to avoid or overcome conflicts while implementing wasteland development project.

n=108

Suggestions	Number	Per cent
Create general awareness about the essentiality of formation of SHGs for Wasteland Development activities.	98	90.7
NGO Should enable the participants to understand the whole concept of Wasteland Development during group formation phase.	58	53.7
Communication of Wasteland Development activities to all the stakeholders to avoid speculations.	90	83.3
Other SHG members should not be allowed to do the development works in wastelands	80	74.0
Ownership and access rights to resources developed by group should be properly spelt out and given to only the group members with proper rules and regulations.	84	77.7
NGO should see that the programme incentives are sufficient and made available to all.	83	76.8
Determine the past live conflicts and manage them successfully.	66	61.1
NGO has to monitor the Wasteland Development activities in the project area to avoid possible conflicts that could develop and resolve.	68	62.9
NGO should train the group members and others concerned in assessing conflicts for its easy resolution.	70	64.8
Collaboration with local institutions and leaders is essential to resolve conflicts.	70	64.8

CONCULSIONS

The problems identified and the suggestions given by Pragathi Bandu SHGs emphasize the need for taking necessary steps by NGOs, department of forestry, revenue department, rural development department, panchayat raj and village level institutions to avoid or resolve the conflicts in wasteland development projects. One important problem often neglected is messing with local politics and its influence on healthy functioning of SHGs. So, adequate strategies should be developed so that local politics will not hamper the functioning of SHGs. Further, implementing agencies or NGOs should provide appropriate information regarding the project activities to create general awareness about the need for formation of SHGs and enable the participants to understand the whole concept of Wasteland Development during group formation phase itself. Hence, the agencies involved must build positive relationship and confidence in the minds of villagers and consider their suggestions to solve the problems in a rational way.

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REFERENCES

Deutsch, M. 1973 Resolution of Conflict. New Haven; yale Uni. Press.

Fisher, U. A 1996, Third- Party Techniques for Conflict Resolution and Promoting Peaceful

NABARD, 1995. Status of micro finance in India 2008-09. NABARD, Mumbai, Settlement, *International organization*, 5(4) : 653-681.

Subba Rao , S. 2001 An analysis of local conflicts and their management in Melya tank watershed development project of Kolar district, *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci., Bangalore.

Warner, M and Jones, P 2000 Conflict management in community based natural resource project: Experiences from Fiji and Papua, New Guinea, *Natural Res. Persp. Rev.,* London: ODI.