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EDITORIAL

Information is the fifth need of man after air, water, food and shelter. It became more evident in the scenario in the era of climate change is pretending serious challenges to the agriculture sector in order to ensure nutritional and food security for growing population, changing consumer appreciations, decreasing land sizes, abiotic stresses, lower seed replacement ratio, demand for more food and processed products to ensure nutritional security poses and so on. Few of the challenges are being taken care through various technological solutions like water management, home science technologies, nutria garden establishment, conduction of front line demonstrations and their systematic analysis in agricultural growth, FDI in agriculture, stress on dairying and associate animal husbandry practices to support the crop production and so on. The present issue of Indian Journal of Extension Education is an amalgam of the extension issues and the solutions offered through its vast network of technology transfer and the topics of academic interest like organizational climate and academic performance of stakeholders in institutes of excellence. It is crucial for extension organizations to impart management skills to farmers and youth to effectively manage the resources including human resources, enterprises and technologies.

I extend my sincere thanks to all the authors to present the outcome of extension endeavors with empirical evidence and suitable research design and to all the expert members in the editorial board.

Special thanks are extended to the President, ISEE; Dr. US Gautam for providing insightful thoughts and guidance in bringing out this issue.

Dr. Bhanu Mishra, Dr. M. S. Nain, Dr. Shantnu Dubey, Dr. S.R.K. Singh, Dr. Alok Kumar, Dr. L. K. Tyagi and team deserve special thanks for making committed efforts in compiling and thorough editing of the papers.

(Rabindra Nath Padaria)

Message from President Indian Society of Extension Education

Dear Friends
Greetings

The ISEE is serving the professional need since 1964 through publishing 'Indian Journal of Extension Education', facilitating closer association promoting professional experience in teaching, research and extension, organizing National/ International symposia, Seminars, Workshops, Conferences, Training Programmes etc. for dissemination of scientific knowledge among scientists, extension personnel, policy makers, and administrators and policy advocacy at all levels. I extend my heartiest gratitude to the editorial board for their untiring effort in timely and qualitative publication of the journal and to the authors for their submissions. The National Seminar on SOCIO-DIGITAL APPROACHES FOR TRANSFORMING INDIAN AGRICULTURE, w. e. f. 20-22, November 2019, at CCSHAU, Hisar, Haryana was a grand success albeit having numerous hurdles. The participation and the quality of presentations made during three days deliberations set new standards. I extend my heartfelt congratulations and thankfulness to all those who supported the event in one or other way.

It is well known that after voluntary resignation of Dr. Baldeo Singh from ISEE and its acceptance on 06.12.2018 at Kolkata, undersigned was installed as President. Later on instead of smooth transition, hindrance in working and unauthorized declaration of ISEE elections forced for litigation and formation of ISEE Election Tribunal-2019. The Tribunal passed its Award/ Order dated 07.12.2019 *ex parte.* In the operating paragraphs, *undersigned was recognized as President of ISEE Society after voluntary resignation of Dr. Baldeo Singh, its approval by Executive Council on 06.12.2018 and General Body on 07.12.2018 and hence the Executive Council headed by undersigned as President was asked to continue to function as mandated to achieve objectives of the society as enumerated in Clause 2 and its sub clauses 2.1,2.2,2.3,2.4,2.5 of ISEE Society. Hence, as President of ISEE society Dr. U.S. Gautam decision shall and binding and all the consequential steps taken by Dr. Baldeo Singh after 06.12.2018 as the president of the ISEE are infructuous, null and void* ***ab initio****.*

In operating para VI of Tribunal's order it has been mentioned that '*The ISEE NATIONAL SEMINAR-2019 conducted w.e.f. 14-16 Nov. 2019 entitled "Holistic Approach for Enhancing Agricultural Growth In changing Rural Scenario" at SKNRAU, Bikaner.-334000, Rajasthan and also all kinds of Publishing of Official Journal (Indian Journal of Extension Education) after 06.12.2018 other than Dr. R N Padaria (Chief Editor), giving of Society Awards etc. in the name of Indian Society of Extension Education is declared unlawful and having no legal standing. Any financial incurring on the said activities is the sole responsibility of Dr. Baldeo Singh, and others in individual capacity and ISEE will not owe or bear any financial liability including the validity of illegal intellectual property as it is an alleged publication in the name of ISEE society which has got wide consequential impact on society and its constituents. ISEE bear no obligation towards any such activity by derecognizing declaring them illegal, of Dr Baldeo Singh, Dr Kartar Singh and others after 07.12.2018. However, during the seminar through misguidance of the society members the money in cash or any other form collected from members and participants of the seminar shall be part of ISEE revenue and any expenditure without sanction of executive council and president shall led to recovery of such equal amount along with* ***pande lite*** *interest against the individual concern along with other effective liabilities.'*

The detailed order stand shared with the respected members and is available at ISEE website http//www.iseeindia.org.in/ . It is to reiterate that the publication of IJEE w.e.f. January 2019 is nothing more than the compliance of the Tribunal order dated 07.12.2019. I assure dedication and hard work of executive council for ushering the objectives of ISEE and expect full cooperation and support from the hon'ble members of the society. In compliance of Tribunal order's operating para VII, the executive council of ISEE will soon decide upon the dates for conduct of free and fair elections for the new executive council and smooth transfer of executive powers.

The support extended by the executive council in day to day functioning in all odds deserves sincere thanks. Hope the continued support from all the members and the executive council members.

(Dr U S Gautam)
President, ISEE, New Delhi

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Entrepreneurial Behaviour of Commercial Floriculture Nursery Owners in Kadiyam of Andhra Pradesh

M. Uday Bhaskar*, M. Srinivasa Rao and P.V. Sathya Gopal

ABSTRACT

The study was conducted during the year 2018-19 in Kadiyam of Andhra Pradesh to measure the entrepreneurial behaviour of commercial floriculture nursery owners. Kadiyam mandal was purposefully selected since locale is nationally and internationally known for commercial floriculture nurseries. Three villages with highest number and area under commercial floriculture nurseries namely Kadiyam, Vemagiri and Veeravaram were purposively selected for the study and later 120 nursery owners were selected randomly from the three villages in proportion to the number of nurseries in each village. To quantify the entrepreneurial behaviour of commercial floriculture nursery owners, twelve components like innovativeness, decision making ability, leadership ability, achievement motivation, risk orientation, management orientation, scientific orientation, competition orientation, critical thinking, entrepreneurial self-efficacy, resiliency and locus of control were selected. It was found that more than three-fifth (67.50%) of the commercial floriculture nursery owners possessed medium entrepreneurial behaviour followed by 16.67 per cent of them with high level of entrepreneurial behaviour and only 15.83 per cent of them with low level of entrepreneurial behaviour.

Keywords: Component matrix, Entrepreneurial behaviour, Factor analysis, Nursery owners

INTRODUCTION

Kadiyam nurseries, the brand value of floriculture nursery industry in Andhra Pradesh had got its global attention and was prestigiously placed in the International market through valuable foreign exchange. Nurseries at Kadiaym Mandal were a combination of several small, medium and large nurseries covering an area of 1555 hectares of land and leading to an annual turnover of more than 200 crores. Kadiyam nurseries have occupied a special place in horticulture and this growth and development is not an individual effort, but it is an effort of all the stakeholders involved in its bloom, primarily the floriculture nursery owners at Kadiyam. The nursery owners at Kadiyam were striving hard to be on the platform of floriculture nursery business not only from the production point of view but also in exploring exemplary opportunities to market their plants. In this context, they are reaching to different states as well as different countries to introduce new varieties and are meeting the passion of the people all across the world. Literally, they are trying to become the source of new generation plants that are innovative and unique to the customers.

Entrepreneurial behaviour of nursery owners was found to be one of the important performance indicators for the success, which can influence the trademark of floriculture nurseries at Kadiyam. The entrepreneurial behaviour is purely a psychological parameter, which can be determined and assessed by using social science tools with appropriate analysis. Thus, considering the importance of entrepreneurship and role played by the nursery owners in the horticultural growth and

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development, it was felt necessary to conduct the study on entrepreneurial behaviour of nursery owners in order to study the components of entrepreneurial behaviour and to find out the components which have more impact and direct relation with entrepreneurial behaviour of nursery owners of nursery owners

METHODOLOGY

The study was conducted in the year 2018-19 and Ex-Post-Facto research design was followed in the present investigation. Kadiyam mandal of East Godavari district in Andhra Pradesh is purposively selected for the study as the locale is nationally and internationally known for commercial floriculture nurseries and was dominant with more area under floriculture. Three villages with the highest number and area under commercial floriculture nurseries namely Kadiyam, Vemagiri and Veeravaram were purposively selected for the study and later 120 nursery owners were selected randomly from the selected three villages in proportion to the number of nurseries in each village. An interview schedule was prepared for data collection. In the present study, entrepreneurial behaviour was operationally defined as cumulative outcome of twelve trait components namely innovativeness, leadership ability, achievement motivation, decision making ability, risk orientation, management orientation, scientific orientation, competition orientation, critical thinking, resiliency, entrepreneurial self-efficacy and locus of control. Factor analysis was carried out in the present study to extract the important and the most impacting trait components that have a direct relation with entrepreneurial behaviour.

The twelve components under entrepreneurial behaviour were measured with different scales of various continuum and were categorized into three groups keeping mean and standard deviation as the standard of the check.

In order to study the overall entrepreneurial behaviour of a nursery owner the twelve components were uniformed by converting obtained score of each component into percentage by using the formula given below:

$$\text{Percentage of } n^{th} \text{ component} = \frac{\text{Obtained score}}{\text{Max. obtainable score}} \times 100$$

Where, n= component of entrepreneurial behaviour

After arriving percentages of all the twelve components of entrepreneurial behaviour, the overall percentage of entrepreneurial behaviour was calculated by using the formula:

Overall percentage of entrepreneurial behaviour

$$\frac{(A+B+C+D+E+F+G+H+I+J+K+L)}{12}$$

Where, **A** is Innovativeness, **B** is Decision making ability, **C** is Leadership ability, **D** is Achievement motivation, **E** is Risk orientation, **F** is Management orientation, **G** is Scientific orientation, **H** is Competition orientation, **I** is Critical thinking, **J** is Entrepreneurial self-efficacy, **K** is Resiliency and **L** is Locus of control

Thus, the total percentage of each nursery owner in his overall entrepreneurial behaviour ranges from 0-100. Based on the percentages obtained the nursery owners were categorized into three groups keeping mean and standard deviation as the standard of the check.

RESULTS AND DISCUSSION

Entrepreneurial behaviour component wise distribution of nursery owners

It can be inferred from Table 1 that nearly two-third (65.00%) of the nursery owners had medium level of innovativeness and nearly two-third (60.83%) of the nursery owners had medium level of decision making ability. In the study area majority of the nursery owners were middle aged, educated upto high school, small farmers, with medium mass media exposure and low extension contact, which might had restricted them to go for new things in their land holding which finally contributed for medium level of innovativeness. This result are in line with findings of Gupta *et al.* (2013); Shewale (2017); Shreekant and Jahagirdar (2017); Swati *et al.* (2017); Gaikwad and Lalhriatpuii (2018) and Bindu *et al.* (2019). More than half (57.50%) of the nursery owners had medium level of leadership ability and majority (80.83%) had medium level of achievement motivation. Majority of the nursery owners might be so impressive in

Table 1: Distribution of nursery owners according to different components of entrepreneurial behaviour (n=120)

Components of Entrepreneurial Behaviour	Category			Mean	S.D.
	Low	Medium	High		
Innovativeness	23 (19.17)	78 (65.00)	19 (15.83)	29.35	4.31
Decision making ability	20 (16.67)	73 (60.83)	27 (22.50)	21.68	3.26
Leadership ability	32 (26.67)	69 (57.50)	19 (15.83)	12.86	1.81
Achievement motivation	18 (15.00)	97 (80.83)	05 (04.17)	15.28	1.72
Risk orientation	16 (13.33)	89 (74.17)	15 12.50)	24.94	3.32
Management orientation	18 (15.00)	83 (69.17)	19 (15.83)	65.93	6.10
Scientific orientation	16 (13.33)	78 (65.00)	26 (21.67)	22.76	3.01
Competition orientation	10 (08.33)	68 (56.67)	42 (35.00)	4.93	0.97
Critical thinking	16 (13.33)	88 (73.34)	16 (13.33)	71.08	7.63
Entrepreneurial self-efficacy	15 (12.50)	82 (68.33)	23 (19.17)	18.54	2.90
Resiliency	21 (17.50)	81 (67.50)	18 (19.17)	38.59	3.56
Locus of control	10 (08.33)	98 (81.67)	12 (10.00)	1.72	0.72

Note: Values indicated in parenthesis are the percentages

getting the attention of the customers towards their business through different strategies. In due course of time they might be utilizing their experiences and communication dynamism to lure the customers. On the other side, the nursery owners with low leadership ability might be taking up their business with a more mechanistic approach. Once a nursery owner is energized with lot of zeal and enthusiasm to do an activity, it will lead to strengthen the self-confidence and ultimately lead to success of the nursery business making owner economically sound. Similar results were reported by Thakare (2013); Wadekar (2016); Shreekant and Jahagirdar (2017); Shewale (2017) and Gaikwad and Lalhriatpuii (2018).

Nearly three-fourth (74.17%) of the nursery owners had medium level of risk orientation. The factors like experience, expert opinions, shifting trends in the society and the intuition might have played a major role in determining the extent of taking risk. The result obtained was in congruence with the findings of Raghunath (2014); Singh *et al.* (2014); Singh *et al.* (2016); Swati *et al*. (2017) and Bindu *et al.* (2019). More than two-third (69.17%) of the nursery owners had medium level of management orientation. As a good manager, the nursery owners might be properly applying the different principles of management so as to reach their destination. Nearly two-third (65.00%) of the nursery owners had medium level of scientific orientation. Cognitive approach for technological and managerial deeds is needed to have high success rate in a nursery business. As nursery owners, they might be more alert in updating the latest developments both in science and so as to take more appropriate decisions with high precision. Hence, the above trend was noticed. The result obtained was in agreement with findings of Shreekant and Jahagirdar (2017) and Bindu *et al.* (2019). More than half (56.67%) of the nursery owners had medium level of competition orientation. Being entrepreneurs, the nursery owners might be so alert in obtaining the information about the fellow nursery owners, in terms of their customer details, new plant varieties, advertisement strategies, pricing strategies and manpower utilization strategies to make their business to be in the competition. Majority of the nursery owners might be so keen in devising suitable competitive strategies to enhance their share in the market. The nursery owners with low technical competence might be routine in their daily business activities and leading it just for a livelihood. The result obtained was in accordance with findings of and Patel (2010).

Nearly three-fourth (73.34%) of the nursery owners had medium level of critical thinking. Critical thinking requires a profound logic which is acquired through sound knowledge. Being entrepreneurs, the nursery owners

might be so keen on analyzing the environment to design appropriate strategies to aggrandize the profit from the business. The nursery owners with low knowledge background might be poor in their critical thinking in running their business and deriving low profits. Similarly, more than two-third (68.33%) of the nursery owners had medium level of entrepreneurial self-efficacy. Since most of the nursery owners were having high school education (46.67%), medium mass media exposure (80.83%), medium level of management orientation (69.17%) and medium risk orientation (74.17%) they might have the ability to solve the problems in business and effectively handle financial resources whenever required for business and also can recognize opportunities in the business and perform efficiently under continuous stress, pressure, tough competitions and challenges. The result obtained was in contradictory with the findings of Gupta *et al*. (2013); Deepika (2014); Deepthi (2016) and Priyadarshini *et al*. (2016).

More than two-third (67.50%) of the nursery owners had medium level of resiliency. As an entrepreneur, majority of them might be having high resilience due to their strong economic status as well as perceived experiences. On the other side small size nursery owners might be facing the problem of undue stress which might be because of their low economic status as well as less exposure to such different situations. The result thus obtained was in contradictory with the findings of Deepika (2014). Majority (81.67%) of the nursery owners are with moderate internality/ externality. During the course of action, some of them might be so keen on analyzing the SWOT of the innovation and also prepare a contingency in case of failure of the technology. This requires a lot of cognition and telescopic faculty among the nursery owners. Some of the nursery owners might be so alert in bringing such interventions in their enterprise with due consideration for the alternative course of action. On the other side, the nursery owners with imitative type of culture might be neglecting the consequences for innovations brought out in the business. This result was in line with the findings of Deepika (2014).

Overall Entrepreneurial Behaviour of Nursery Owners

It can be revealed from the Table 2 that, more than three -fifth (67.50%) of the nursery owners had medium level of entrepreneurial behaviour followed by 16.67 per cent of them with high level of entrepreneurial behaviour and only 15.83 per cent of them with low level of entrepreneurial behaviour. This result was in confirmation with the findings of Thakare (2013); Wadekar (2016); Shewale (2017); Gaikwad and Lalhriatpuii (2018) and Bindu *et al*. (2019).

Table 2: Distribution of nursery owners based on their overall entrepreneurial behaviour (n=120)

Category	Frequency	Percentage
Low entrepreneurial behaviour	19	15.83
Medium entrepreneurial behaviour	81	67.50
High entrepreneurial behaviour	20	16.67
Total	**120**	**100.00**

Mean: 63.13; S.D: 6.14

Factor Analysis of Entrepreneurial Behavioural Components

Usually each major component under entrepreneurial behaviour acts as an important factor having an impact on other components of entrepreneurial behaviour. Hence, factor analysis was done to extract the important and the most impacting ones that have a direct relation with high intensity. Table 3 depicts the details of Eigen values and the percentage of variance explained by the components of entrepreneurial behaviour. The

Table 3: Factor analysis of entrepreneurial behaviour components

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1.	5.910	49.254	49.254
2.	1.135	9.458	58.712
3.	0.950	7.920	66.632
4.	0.717	5.974	72.606
5.	0.580	4.831	77.437
6.	0.541	4.511	81.949
7.	0.493	4.106	86.055
8.	0.448	3.736	89.792
9.	0.380	3.169	92.961
10.	0.375	3.128	96.089
11.	0.260	2.166	98.255
12.	0.209	1.745	100.00

Table 4: Component matrix of entrepreneurial behaviour of the nursery owners

Component matrix[a]		
	Component	
	1 (Innova-tiveness)	2 (Decision making ability)
Innovativeness	0.758	-0.064
Decision making ability	0.626	-0.427
Leadership ability	0.609	0.367
Achievement motivation	0.616	0.150
Risk orientation	0.803	-0.048
Management orientation	0.785	-0.285
Scientific orientation	0.722	0.039
Competition orientation	0.388	0.717
Critical thinking	0.846	-0.210
Entrepreneurial self-efficacy	0.780	-0.196
Resiliency	0.720	0.120
Locus of control	0.640	0.309

Extraction method: Principal component analysis- 2 components where extracted

components which are usually having Eigen value more than one are selected. Thus from the 12 major components under entrepreneurial behaviour, two major components having Eigen value greater than one i.e., innovativeness and decision making ability are extracted which were explaining a total variance of 58.72 per cent towards entrepreneurial behaviour of nursery owners. Further, an effort was made to find out the component factors of the above two extracted components of entrepreneurial behaviour under a component matrix by using principle component analysis method.

At a glance on Table 4 it can be revealed that, component 1 i.e., innovativeness had a greater impact on decision making ability, leadership ability, achievement motivation, risk orientation, management orientation, scientific orientation, critical thinking, entrepreneurial self-efficacy, resiliency and locus of control. Whereas component 2 i.e., decision making ability had a greater impact on competition orientation.

CONCLUSION

Research results revealed that majority of the nursery owners had medium entrepreneurial behaviour means it is a clear indication of their progressiveness. Therefore, sufficient incentives should be given to the small nursery owners by the government under National Horticulture Mission (NHM) to make them more successful entrepreneur. It was also found majority of the nursery owners had medium decision making ability, achievement motivation, management orientation, risk orientation and entrepreneurial self-efficacy. Hence utmost concern should be given to enhance these traits by educating the farmers with more training capacity building activities and exposure to mass media.

Results from factor analysis had shown that innovativeness and decision-making ability were the most impacting components on entrepreneurial behaviour on nursery owners; but yet most of the nursery owners had medium innovativeness and decision making ability and hence, there is a need to conduct intensive training programmes to expose the nursery owners on entrepreneurial opportunities, decision making, innovations, time and financial management etc.

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An Appraisal of Extension Service Delivery through Mobile Veterinary Units (MVUs) in Odisha

Anupama Jena[1]*, Mahesh Chander[2], Sushil Kumar Sinha[3], Pragya Joshi[4], Deepa Singh[5] and Devesh Thakur[6]

ABSTRACT

An ingenious way of livestock service delivery at farmers' doorstep through Mobile Veterinary Units (MVUs) under *Rastriya Krishi Vikas Yojana* (RKVY) is operational in all the 314 blocks of Odisha, with one of the objectives being to educate people on scientific livestock farming technologies. The study was conducted with a sample size of 90 farmers and 23 veterinary service providers *viz*., Veterinary Surgeons (VSs) and Livestock Inspectors (LIs) to analyze the efficacy of extension service delivery by MVUs and farmers' demand for livestock extension activities. The study concluded that, MVU professionals were very often associated with activities *viz*., awareness camp and home visit. Besides these, supply driven activities, input supply and training programmes for better animal husbandry were the most needed activities by the farmers. The service providers expressed that lack of time for extension activities and unawareness of farmers about importance of extension activities, were the major problems they faced while performing extension activities.

Keywords: Mobile veterinary unit, RKVY, Extension service delivery, Veterinary surgeon, Livestock inspector

INTRODUCTION

Information is the fifth need of man after air, water, food and shelter (Bachhav, 2012). Rural poor livestock owners are quiescent in information related on scientific livestock farming practices, diseases and prevention measures, credit facility and recent technological innovations which results in modest production. Balit *et al.* (1996) opinioned that adequate access to knowledge and information is the least expensive input to improve rural agricultural development. However, low productivity of animals owing to low knowledge level of the owners remains an unresolved challenge for the future (Singh *et al*., 2016). Due to non-availability of proper information and communication network system, need based information dissemination center and improved technological dissemination to the farmers, agriculture is becoming less remunerative (Meitei and Devi, 2009). The demand for information on livestock production is growing, both in the sense of demands expressed by the farmers themselves, and in the more general sense of a growing potential for increasing production through delivery of information (Morton and Mathewman, 1996) as lack of technical guidance and lack of knowledge about causes and treatment of diseases has always been constraint in dairy and poultry entrepreneurship (Gupta *et al*, 2013). The functioning of various livestock development agencies especially the State Departments of Animal Husbandry (SDAH) in relation to the extension education performed by them need to be analyzed so as to ascertain a paradigm for livestock extension service (Chander *et al.,* 2010). Limited technical manpower to disseminate information in rural and remote areas, lack of transport and communication facilities, inadequate

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financial support to technology transfer and less infrastructure facility create huge technology gap among rural farming communities (Meitei and Devi, 2009). The use of information by a user is defined by demand of information and disposition of the information channel (Lee, 1996). As information is the life blood for increasing productivity, information delayed is fruitless and in order to support farm level decisions and minimize the loses inclusion of farmers' communication network need to be focused (Ravi Kumar *et al*., 2015). So there should be some mechanism which makes intended information to reach the poor promptly. Considering this, Mobile Veterinary Unit (MVU), an initiative of Odisha Government (operational in all the 314 blocks of Odisha, since 10th July 2010) with many objectives includes better delivery of livestock services at farmers' doorstep in their preferred time. One of such objectives is to educate people on scientific livestock farming technologies. In MVU, a team of professionals comprising one Veterinary Surgeon (VS), one Livestock Inspector (LI) and one attendant, move to organize animal health camps in remote villages which are often neglected. Total working days for a MVU in a month are 20 days. Every working day, the team organizes one livestock health camp to benefit livestock owners of a minimum of two villages. The camps are organized on Monday to Friday in every week. The rest two days are for compiling monthly report and attending meeting. The specific objective of the study was to document extension services provided by the MVU, farmers' demand on extension services and problems faced by service providers while delivering the extension services. The study will directly help to improve the extension service delivery system of MVU.

METHODOLOGY

The study was carried out in Kandhamal district, one of the rural districts of Odisha, possessing less developed communication facility with maximum percentage of area covered with forests and hills. Due to inadequate transportation facility and distant location of veterinary institutions, this area has been considered suitable for study the functioning of Mobile Veterinary Units (MVUs). In the12 administrative blocks of Kandhamal district, 12 MVUs were functioning to deliver extension services. Three blocks were selected randomly for this study. From each block, 3 villages, where MVUs had already provided services, were selected purposively. In the next stage, from the 9 selected villages, 10 farmers from each village, who had availed the services of MVU, were selected randomly. As such, 90 farmers in total were selected for the study. Further, from 12 MVUs of Kandhamal district, 12 veterinarians and 11 livestock inspectors, who were working in the 12 MVUs, were selected for to study the service providers' view.

Primary data were collected from the farmers and the service providers through a pre-tested interview schedule and questionnaire respectively. A list of statements, describing need of extension services by farmers and eliciting constraints in delivering extension services through MVUs, was administered separately to the farmers and service providers, respectively. The pre-tested questionnaires were distributed to all the veterinarians and livestock inspectors during monthly meeting to document their response on functioning of MVUs. Farmers were requested to give score for each felt need of extension activities on a 4 point continuum as highly needed, moderately needed, less needed and 'not needed' with a respective score of three, two, one and zero. Further, for ascertaining the constraints faced by service providers in delivering the services, frequency and percentage of respondents for each constraint were collected.

The weighted mean score analysis, was found appropriate to derive the results from collected data. Total Weighted Score (TWS) was calculated by adding each respondent's score. The Total Weighted Mean Square (TWMS) was calculated using the following formula

$$TWMS = TWS / N$$

Where,

TWMS- Total Weighted Mean Score

TWS- Total Weighted Score

N= Sample Size

Based upon the values of TWMS, the farmers' need on extension activities, for sustainable animal husbandry was ranked.

RESULTS AND DISCUSSION

The result reveals that service providers of MVU, 'very often' conducted extension activities viz., awareness camp (72.2%) followed by farm and home visit, contrarily non focused on mass media exposure. Rarely training programme and campaign was organised.

Government should take necessary action to carry out all such activities by MVU personnel, as effective mixture of extension activities educate the farmers' about scientific animal husbandry practices. Similar finding, attaining the low level of mass media exposure could be due to lack of awareness of agricultural programmes and farm magazines were reported by Dympep and Dolli (2016). However, the findings contradicts the findings of Ravikumar (2005), who found in his study that 65.00 percent of respondents never did any farm and home visit, 72.50 per cent never associated with any group meeting type activities and 82.5 per cent never conducted any campaign under SDAH in India.

All the respondents confirmed that they received banners and 18.20, 8.70, 4.30 per cent received poster, folder/ leaflets and manuals, respectively from MVU for educating livestock farmers (Table 2). It could be inferred from the Table 2 that MVU was providing banners only to all the block level MVUs and other extension aids to educate farmers, was not adequately supplied. Since MVU is working to provide livestock advisory services to farmers, supply of adequate extension aids will supplement the service delivery more effectively. Ravikumar (2005) also reported that 50.00 percent of L.Is did not receive any extension aid from SDAH, while majority of L.Is and V.Ss had received folders, followed by posters.

Table 2: Distribution of service providers according to response on provision of extension aids

Type of extension aid	LI (n=11)	VS (n=12)	Total (N=23)
Poster	2(18.18)	3(25)	4(18.2)
Folder/leaflet	1(9.1)	1(8.3)	2(8.7)
Manual	1(9.1)	0(0)	1(4.3)
Banner	11(100)	12(100)	23(100)

Figures in the parentheses indicate percentage.

Input supply in terms of fodder seeds, fodder slips, medicines, pesticides and fertilizers were the top most demand among the farmers of Kandhamal district, as direct transient benefit is visible and will attract the farmers to avail the services. Training programmes on scientific animal husbandry practices was the 2nd preferred need of farmers, as MVU had very rarely imparted training. Information regarding livestock insurance was the next preferred need of farmers' since they aware of the importance of insurance, during unexpected loss or death or disability of animals. Information on credit facility in terms of source, term, interest rate and subsidy rate was ranked fourth by farmers. They are not able to avail the direct benefit from government and non-government initiatives due to their lack of knowledge on eligible credit facilities. Similarly, farmers expressed that direct monetary benefits from extension professionals, information need on market trend, prices of livestock product and value addition, seasonal animal diseases control and prevention measure, advanced technological knowledge for better

Table 1: Extension activities performed by MVU personnel

Name of activities	L.I. (n=11)				V.S. (n=12)			
	Very often	Often	Rarely	Never	Very often	Often	Rarely	Never
Awareness camp	8 (72.72)	3 (27.27)	0 (0)	0 (0)	9 (74.99)	3 (24.99)	0 (0)	0 (0)
Campaign	0 (0)	0 (0)	1 (9.09)	10 (90.90)	0 (0)	0 (0)	1 (8.33)	11 (91.66)
Group discussion	0 (0)	4 (36.36)	7 (63.64)	0 (0)	0 (0)	5 (41.66)	7(58.33)	0 (0)
Farm and home visit	7 (36.36)	4 (63.63)	0 (0)	0 (0)	8 (66.66)	4 (33.33)	0 (0)	0 (0)
Mass media exposure	0 (0)	0 (0)	0 (0)	11 (100)	0 (0)	0 (0)	0 (0)	12 (100)
Training programme	0 (0)	0 (0)	1 (9.09)	10 (90.90)	0 (0)	0 (0)	2 (16.66)	10 (83.34)

Figures in the parentheses indicate percentage.

Table 3: Ranking of Extension services needed by farmers (n=90)

S.No.	Farmers' need	TWS	TWMS	Rank
1.	Input supply (seeds, pesticides, fertilizers *etc.*	35	3.91	I
2.	Training programme on scientific animal husbandry practices	348	3.867	II
3.	Information regarding livestock insurance	347	3.856	III
4.	Credit facility in terms of source, term interest rate and subsidies	292	3.244	IV
5.	Direct monetary benefits	282	3.13	V
6.	Information on market trend, prices of livestock products and value addition	276	3.06	VI
7.	Seasonal diseases control and prevention	274	3.04	VII
8.	Advanced technological knowledge	266	2.89	VIII
9.	Demonstration at farmers' field	252	2.8	IX
10.	Work-shop at district veterinary dispensary	178	1.98	X

(TWS: Total Weighted Score, TWMS: Total Weighted Mean Score)

management, demonstration at farmers' field and work-shop at district level veterinary dispensary were also their preferred needs in the order of priority.

Table 4 revealed that lack of time followed by unawareness of farmers were the most felt constraints by VSs and LIs, respectively while performing extension activities. In Kandhamal district, most of the V.S posts in MVU were vacant. So the block level officers *i.e.* either Block Veterinary Officer (BVO) or Veterinary Surgeon (VSs) were additionally looking after MVU, besides their regular duties. It is practically very difficult and mostly they were devoting their time in disease preventive activities leaving less time for extension activities. Carrying out extension activities need prior preparation, consider farmers' felt and unfelt need, arrangement of extension aids in appropriate combination and motivate the farmers to attain the programme. Singh *et al*. (2014) also reported that, the SDAH, though considered being the major agency to cater to the needs of the livestock farmers, their role is limited to treatment, vaccinations and artificial insemination (AI) services.

Table 4: Distribution of service providers according to problems faced while performing extension activities

Reasons	LI (n=11)	VS (n=12)	Total (N=23)
Farmers did not cooperate	1(9.1)	1(8.3)	2(8.7)
Improper guidance	1(9.1)	1(8.3)	2(8.7)
Timely extension activities not feasible	3(27.3)	11(91.7)	14(60.9)
Less No. of attenders	4(36.4)	10(83.3)	14(60.9)
Less extension aid	8(72.7)	11(91.7)	19(82.6)
Poor physical facility	3(27.3)	1(8.3)	4(17.4)
Extension personnel are not trained properly	1(9.1)	0(0)	1(4.3)
Farmers' are not aware	9(81.8)	11(91.7)	20(87)
Lack of time	10(90.9)	10(83.3)	20(87)

Figures in the parentheses indicate percentage
(L.I- Livestock Inspector, V.S- Veterinary Surgeons)

Studies reveal that most of the states do not possess staff devoted specifically to livestock extension and in most cases it was restricted to one to two staffs who are relatively junior staff members looking after livestock extension work for whole state (Matthewman and Ashley, 1996; Kurup, 2003; Ahuja *et al.,* 2000). Infeasibility to conduct timely extension activities was also perceived as important constraints, as some extension activities are time specific like information on seasonal livestock diseases, control and prevention measures, management and feeding practices. Since, MVU has to cover all the distance villages; nearly two months are required to conduct the next training in any particular village. It questions the feasibility to deliver prompt extension services. Some other findings related to problems in performing extension activities well support these findings of problems in extension service delivery through MVU. The veterinary service personnel act more as veterinarians performing treatment, vaccination and AI to livestock than extension personnel to disseminate the needy technologies. This could be due to the reason that veterinary functionaries have to perform 25 multifarious activities in which extension is considered for rationalizing

their job chart (Venkatadri, 2002). Ravikumar (2005) found out that, the expenditure incurred over the years by various SDAH in India on livestock extension activities was found only around one to three percent of their total budget and the non-availability of attenders were the most severe constraints felt by both LIs and VSs of SDAH.

CONCLUSION

The Livestock Inspector revealed that farmers were not aware about the importance of the extension services delivered by MVU which necessitates the MVU personnel to spend more time in making them aware of such activities before performing the intended extension activities. Adequate extension aids in appropriate combination will enhance the service quality, and persuade the farmers to attain the programme. In MVU, it was also felt that less man power for performing extension activities, as both VSs and LIs were busy in delivering preventive and curative services. Hence exclusive extension personnel for performing extension work only can resolve the problem. All these discussions conclude that extension service delivery is an important part and parcel of livestock service delivery. For achieving a better animal husbandry production and productivity in Odisha, focus should be strengthened in extension service delivery activities on par with veterinary health care service delivery.

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Effectiveness of Cutting and Tailoring Trainings Organised by Krishi Vigyan Kendra for Scheduled Caste Women

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ABSTRACT

Cutting and tailoring is one of the avenues for self-employment which require less of basic and technical education, minimum infrastructure and moderate financial needs. Proficiency in the art of cutting and tailoring is an essential pre-requisite in clothing construction, it is very important to know the techniques of cutting and tailoring for producing attractive garments. The present study analyzed the effectiveness of trainings imparted by Krishi Vigyan Kendra, Sadalpur on cutting and tailoring. Among the training programme designing of garment was very useful with maximum training effectiveness index. The training on surface enrichment (83.61) and cutting of garments (82.78) was useful among the respondents with marginally TEI score. Respondents were found to be highly satisfied with raining programme. It indicated that respondents were highly satisfied about the subject matter taught/covered and quality of trainer made available to them during training programme.

Keywords: Cutting, Effectiveness, Krishi Vigyan Kendra, Satisfaction, Tailoring, Training

INTRODUCTION

Women in India constitute 50 per cent of the total population and contributing enormously toward the economic development of the nation. The participation of the women in most activities is encouraged. Thus, it is natural that women need special attention and focus in informal and unorganized sector. It has been realized in last few years that the wide spread poverty and stunt economic growth cannot be rectified unless gainful sustainable economic development. The Scheduled Castes comprise about 16.6 per cent of India's population (Census, 2011). Haryana stand at fifth position having large schedule caste population. The total population of Schedule caste in Haryana is 40.91 lakhs consisting 19.35 per cent of the state population about 78 per cent of the schedule caste population live in rural areas. Schedule caste constitutes the weakest and poorest section of society. For upliftment of schedule caste both central and state government have taken interest for capacity building of scheduled caste women in different areas in order to make self-reliant. Despite the fact, the programmes involving women are very rare, now the time has come to recognize the role for women in agriculture and allied fields. Accordingly, there is a need to plan and executive the programmes having equal opportunity of women if the social and economic development is to be achieved. Therefore, there is an urgent need to motivate and inspire rural women and specifically SC women bring them into the main stream to achieve the objectives of all round balanced development.

Cutting and tailoring is one of such avenues for self-employment which require less of basic and technical education, minimum infrastructure and moderate financial needs. Clothing construction is a technical accomplishment, which requires knowledge of fabrics, principle of clothing construction and skills involved in it.

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Proficiency in the art of cutting and tailoring is an essential pre-requisite in clothing construction, it is very important to know the techniques of cutting and tailoring for producing attractive garments. Cutting and tailoring is very common in almost every Indian household and girls learn this art from their elders.

The Krishi Vigyan Kendra (KVK) is an educational institution offers a very good opportunity to farmers and farm women by organizing trainings to work closely with trainees in developing a more skilled and educated workforce. The present study focused to analyze the effectiveness of the cutting and tailoring trainings imparted by KVK, Sadalpur.

METHODOLOGY

The study was conducted in Hisar district of Haryana state purposively. Hisar district was selected purposively as KVK Sadalpur is organizing training for scheduled caste women at regular intervals. Hisar, Adampur and Hansi blocks were selected purposively for the present study. Three trainings imparted by home scientist of Krishi Vigyan Kendra, Sadalpur were finally selected for the present study and comprising of 30 scheduled caste women each for the present study. Thus total sample of respondents was 90 trainees haled from different villages of Hisar district for the cutting and tailoring training. A well structured interview schedule was constructed for data collection.

The training effectiveness index (TEI) was computed in term of utility and coverage of training as perceived by the respondents (Mishra, 1990). Training utility was measured by getting the response of trainees for 14 items related to training on four point continuum i.e. very useful, useful, undecided and not useful with scores assigned were 4,3,2 and 1 respectively. Similarly training coverage was measured with the help of instrument developed for the study and response of trainees were taken on four point continuum i.e. well covered, moderately covered, poorly covered, not covered and were given score 4, 3, 2, and 1 respectively. Thus TEI was calculated in percentage with the help of following formula.

$$TEI = \frac{\text{Obtained utility score + obtained coverage score}}{\text{Total obtainable sore}} \times 100$$

Satisfaction level of training was measured in terms of subject matter covered in the specific training, physical facilities provided during the training and quality of trainer. Thus overall satisfaction level was calculated by total of all three aspects that is subject matter, physical facilities and qualities of trainer of each component.

RESULTS AND DISCUSSION

The percentage distribution of the respondents according to their socio-personal, economic, psychological and communication profile have been incorporated in Table 1. Most of the respondents (73.33%) were of younger age group, educated upto secondary/ser.sec. (38.89%) were married (64.44%) having low family education status (43.33%), small sized nuclear families (47.78%). Majority of the respondents (74.44%) had agricultural labourer as their main family occupation and monthly income upto Rs. 5,000 (55.56%) and had pucca house (43.33%). Majority of them (93.33%) had negligible social participation and landless (91.12%).

The results of economic, psychological and communication profile of the respondents presented in Table 2 indicate that Majority of respondents (58.89%) were falling in high category of change proneness, medium risk orientation (58.89%) and medium entrepreneurial motivation (66.67%). Less than half of the respondents (47.78%) took entrepreneurial decisions jointly. Most of the respondents (94.44%) were having low mass media exposure, medium localite sources of information utilization (58.89%) and medium cosmopolite sources of information utilization (44.44%).

Effectiveness of Training

Effectiveness of trainings was measured in terms of

1. Utility and coverage of training
2. Satisfaction level of respondents toward training.

The data presented in Table 3 indicate that the training programmes organized by KVK on cutting and tailoring were very useful to respondents. Training on designing of garments was very useful with maximum training effectiveness index (84.02%). Further, it was pointed out that cutting of garments (82.78%), surface enrichment

Table 1: Socio-personal profile of the respondents

S.No.	Variables and category	Hisar (n=30)		Hansi (n=30)		Sadalpur (n=30)		Total (n=90)	
		f	%	f	%	f	%	f	%
1.	**Age**								
	Young (16-27)	21	70.00	23	76.67	22	73.33	66	73.33
	Lower middle (28-39 years)	07	23.33	06	20.00	08	26.67	21	23.33
	Upper middle (40 years above)	02	06.67	01	03.33	-	-	03	03.34
2.	**Education**								
	Illiterate	02	6.67	01	03.33	01	03.33	04	04.44
	Primary	06	20.00	02	06.67	04	13.34	12	13.34
	Middle	07	23.33	13	43.33	07	23.33	27	30.00
	Secondary/Ser.Sec.	12	40.00	11	36.67	12	40.00	35	38.89
	Graduate	03	10.00	03	10.00	06	20.00	12	13.33
3.	**Marital status**								
	Married	20	66.67	19	63.33	19	63.33	58	64.44
	Unmarried	10	33.33	11	36.67	11	36.67	32	35.56
4.	**Family Type**								
	Nuclear	30	100.00	30	100.00	30	100.00	90	100.00
5.	**Family size**								
	Small (0-4 members)	08	26.67	18	60.00	17	56.67	43	47.78
	Medium (4-6 member)	15	50.00	12	40.00	12	40.00	39	43.33
	Large (above 6)	07	23.33	-	-	01	03.33	08	08.89
6.	**Family education status**								
	Low (0.71-2.31)	09	30.00	09	30.00	17	56.67	35	38.89
	Medium (2.32-3.91)	12	40.00	14	46.67	07	23.33	33	36.67
	High (3.92-5.00)	09	30.00	07	23.33	06	20.00	22	24.44
7.	**Family occupation**								
	Agricultural labourer	20	66.66	23	76.67	24	80.00	67	74.44
	Business	03	10.00	01	03.33	-	-	04	04.44
	Government service /Private service	07	23.34	06	20.00	06	20.00	19	21.11
8.	**Social participation**								
	No membership	27	90.00	29	96.67	28	93.33	84	93.33
	Member of a formal organization	03	10.00	01	3.33	02	6.67	6	6.67
9.	**House type**								
	Kaccha	07	23.33	05	16.67	09	30.00	21	23.34
	Pucca	15	50.00	12	40.00	12	40.00	39	43.33
	Mixed	08	26.67	13	43.33	09	30.00	30	33.33
10.	**Material possession**								
	Low	12	40.00	17	56.67	12	40.00	41	45.56
	Medium	11	36.67	10	33.33	12	40.00	33	36.66
	High	07	23.33	03	10.00	06	20.00	16	17.78

Table 2: Economic, psychological and communication profile of the respondents

S.No.	Variables and category	Hisar (n=30)		Hansi (n=30)		Sadalpur (n=30)		Total (n=90)	
		f	%	f	%	F	%	f	%
1.	**Monthly income**								
	Up to Rs. 5,000	22	73.33	20	66.67	22	73.33	50	55.56
	Rs. 5,001 to 10,000	08	26.67	10	33.33	08	26.67	40	44.44
2.	**Land holding**								
	Landless	25	83.34	30	100.00	27	90.00	82	91.12
	Marginal (up to 2.5 acre)	02	6.67	-	-	02	06.67	04	04.44
	Small (2.5-5 acre)	01	3.33	-	-	-	-	01	01.11
	Medium (5-7.5 acre)	01	3.33	-	-	-	-	01	01.11
	Large (above 7.5 acre)	01	3.33	-	-	01	03.33	02	02.22
3.	**Milch animals**								
	Nil	14	46.67	28	93.33	22	73.33	64	71.11
	1-2	16	53.33	02	06.67	08	26.67	26	28.89
4.	**Change proneness**								
	Low (0-8)	-	-	01	03.33	03	10.00	04	04.44
	Medium (8-16)	05	16.67	13	43.33	15	50.00	33	36.67
	High (16-24)	25	83.33	16	53.34	12	40.00	53	58.89
5.	**Risk orientation**								
	Low (0-6)	-	-	03	10.00	05	16.66	08	08.89
	Medium (6-12)	23	76.67	16	53.33	14	46.67	53	58.89
	High (12-18)	07	23.33	11	36.67	11	36.67	29	32.22
6.	**Entrepreneurial motivation**								
	Low (0-8)	-	-	01	03.33	03	10.00	04	04.44
	Medium (8-16)	25	83.33	21	70.00	14	46.67	60	66.67
	High (16-24)	05	16.67	08	26.67	13	43.33	26	28.89
7.	**Entrepreneurial decision making**								
	Self	01	3.33	02	06.67	-	-	03	3.33
	Husband	08	26.67	01	03.33	03	10.00	12	13.33
	Jointly	13	43.33	15	50.00	15	50.00	43	47.78
	Parents	08	26.67	12	40.00	12	40.00	32	35.56
8.	**Communication variables**								
(a)	**Mass media exposure**								
	Low	27	90.00	28	93.33	30	100.00	85	94.44
	Medium	03	10.00	02	06.67	-	-	05	05.56
9.	**Information source utilization**								
(a)	**Localite sources**								
	Low	-	-	01	03.33	25	83.33	26	28.89
	Medium	25	83.33	23	76.67	05	16.67	53	58.89
	High	05	16.67	06	20.00	-	—	11	12.22
(b)	**Cosmopolite sources**								
	Low	15	50.00	08	26.67	05	16.66	28	31.11
	Medium	12	40.00	14	46.67	14	46.67	40	44.44
	High	03	10.00	08	26.67	11	36.67	22	24.44

Table 3: Utility and coverage of subject matter related to various training by respondents

S. No.	Components	V.U4	U3	U.D2	N.U1	Overall Utility W.M.S.	Rank	W.C4	M.C3	P.C2	N.C1	Overall Coverage W.M.S.	Rank	TEI (%)
1.	**Designing of garments**													84.02
	Collar	42	29	13	6	3.19	IV	42	34	6	8	3.22	III	
	Neck line	40	34	10	6	3.20	III	39	36	9	6	3.20	IV	
	Yoke	45	32	10	3	3.32	I	41	37	7	5	3.27	II	
	Dart manipulation	43	35	7	5	3.29	II	45	33	9	3	3.33	I	
2.	**Cutting of garments**													
	Drafting	46	27	8	9	3.22	III	39	35	11	5	3.20	IV	82.78
	Doti salwar	37	35	11	7	3.13	IV	42	32	9	7	3.21	III	
	Pick bag	45	27	12	6	3.23	II	46	33	8	3	3.35	I	
	Children garments	41	35	10	4	3.25	I	44	32	9	5	3.28	II	
3.	**Surface enrichment**													
	Embellishing with fabric	47	33	6	4	3.37	I	43	32	8	7	3.23	III	83.61
	Aari work	42	32	9	7	3.27	II	42	35	5	8	3.24	II	
	Embroidery	39	32	11	8	3.05	IV	41	32	8	9	3.17	IV	
	Use of waste material for embellishment	42	34	9	5	3.25	III	44	32	9	5	3.28	I	
4.	**Machine care and operation**													81.94
	Operating the machine	41	32	10	7	3.19	II	42	31	9	8	3.19	I	
	Demonstration on repair of machine	46	30	9	5	3.30	I	43	30	9	8	3.20	II	

(83.61%) and machine care and operation (81.94%) was found equally useful among the participants with marginally less TEI score.

Regarding designing of garments, respondents perceived that yoke and dart manipulation had maximum utility and they were very well covered by the trainers. In cutting of garments pick bag and children garments were well covered. In surface enrichment embellishing with fabric and *aari* work were ranked I and II. Respondents perceived that subject matter related to use of waste material for embellishment was covered best. Regarding machine care and operation, demonstration on repair of machine and operating the machine were perceived to be covered well by trainers.

Satisfaction level of respondents toward training

It was measured in term of Subject matter, physical facilities and quality of trainer. With regard to perception of respondents about subject matter of training programme (Table 4) it is observed that respondents were highly satisfied about the subject matter during training programme. Almost similar scores were observed for Hisar, Hansi and Sadalpur separately indicating relevance of subject matter covered during training.

Respondents were highly satisfied about the physical facilities used during training programme (Table 5) with proper sitting arrangement of training (2.37 W.M.S. ranked I), availability of demonstration facility (2.26 W.M.S. ranked II), supply of training inputs (2.25 W.M.S. ranked III), convenient venue/location (2.20 W.M.S ranked IV) respectively.

It is observed in Table 6 that respondents were highly satisfied about quality of trainer in respect of interest of the trainer with (2.57 W.M.S. ranked I), experienced trainer (2.47 W.M.S. ranked II) and adequate knowledge of subject matter (2.36 W.M.S. ranked III) respectively.

Table 7 depicts that respondents were found to be highly satisfied with training programme. It also indicates that respondents were highly satisfied about the subject matter taught /covered and physical facilities made available to them during training programme. In case of

Table 4: Perception of women about subject matter of training

S.No.	Parameters	Hisar (n=30)	Hansi (n=30)	Sadalpur (n=30)	Total (n=90) W.M.S.	Rank
1.	Relevant to trainees need	2.70	2.33	2.53	2.53	I
2.	Training content comprehensive	2.20	2.33	2.56	2.36	II
3..	Practical utility	2.26	2.16	2.03	2.15	VI
4.	Timely	2.43	2.16	2.16	2.25	III
5.	Useful to trainees	2.33	2.13	2.20	2.22	IV
6.	Properly understood by trainees	2.50	2.23	2.20	2.20	V
7.	Appropriate subject matter	2.03	2.23	2.16	2.14	VII

Table 5: Perception of women about physical facilities used during training

S.No.	Parameters	Hisar (n=30)	Hansi (n=30)	Sadalpur (n=30)	Total (n=90) W.M.S.	Rank
1.	Proper Sitting arrangement	2.56	2.23	2.33	2.37	I
2.	Convenient venue/ location	2.10	2.20	2.30	2.20	IV
3.	Supply of training inputs	2.20	2.20	2.36	2.25	III
4.	Demonstration facilities	2.36	2.23	2.20	2.26	II
5.	Post training support facilities	2.03	2.13	2.16	2.12	VI
6.	Child care facilities at training	2.10	2.23	2.16	2.16	V

Table 6: Quality of trainer of the training

S.No.	Parameters	Hisar (n=30)	Hansi (n=30)	Sadalpur (n=30)	Total (n=90) W.M.S.	Rank
1.	Interest of the trainer	2.76	2.53	2.43	2.57	I
2.	Adequate knowledge of subject matter	2.22	2.46	2.40	2.36	III
3.	Clarity in expression	2.16	2.43	2.20	2.26	VI
4.	Cordial relation	2.20	2.30	2.10	2.20	IX
5.	Confidence	2.26	2.20	2.36	2.27	V
6.	Teach one idea at a time	2.13	2.30	2.33	2.25	VII
7.	Experienced trainer	2.73	2.26	2.40	2.47	II
8.	Oriented to field problem	2.30	2.26	2.33	2.30	IV
9.	Effective communication	2.13	2.23	2.30	2.21	VIII

Table 7: Overall satisfaction of women towards training

S.No.	Aspects	Hisar W.M.S. (n=30)	Hansi W.M.S. (n=30)	Sadalpur W.M.S. (n=30)
1.	Subject matter	2.35	2.24	2.26
2.	Quality of trainers	2.32	2.33	2.35
3.	Physical facilities	2.22	2.20	2.25

quality of trainer respondents were highly satisfied in all the three trainings also.

Among the training programme designing of garment was very useful with maximum training effectiveness index. This may be due to the fact that specialized and intensive practical training was imparted. The training on designing of garments was very useful with maximum

training effectiveness index (84.02%), surface enrichment (83.61) and cutting of garments (82.78) were useful among the respondents with marginally TEI score findings of Akansha (2006) and Rangi (2004) supported the study. It also indicates that respondents were highly satisfied about the subject matter taught/covered and quality of trainer made available to them during training programme.

CONCLUSION

Findings of the study showed that majority of respondents were of young age, educated up to secondary and sec.sec, were having small family size, mostly were landless had low mass media exposure, medium risk orientation, change proneness and entrepreneurial motivation. Respondents were highly satisfied about subject matter and quality of trainer. Training on designing of garments was very useful with maximum training effectiveness index, surface enrichment and cutting of garments were useful. Results of the present study further revealed that respondents were highly satisfied about the subject matter taught/covered and quality of trainer made available to them during training programme.

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Farmers' Perception and Adoption of Abiotic Stress Tolerant Rice Varieties in Rain-fed Lowlands of North Eastern Uttar Pradesh

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ABSTRACT

The farmers' practice of growing old but long tested improved and traditional rice varieties due to their experience and perception about varietal traits suitability to the local environment seem to be major determinants of technology choices in the region. The Varietal diversity index (VDI) was employed to know rice varietal diversity at farm level in the region. Likert scale was used to measure preferences and perceptions of rice varietal traits and constraints of improved and traditional rice varieties of the study area. Maximum number of sample farmers reported to have purchased seed every alternate year, while another one fifth of farmers purchased rice seed after every two years. Among the varietal attributes which farmers from the region demand in new rice variety, higher yield and tolerance to drought and submergence together scored the highest in terms of preference scale in both the districts of the region due to frequent occurrences of drought and flash floods.

Keywords: Abiotic Stress, Adoption, Farmer, Lowland, Perception, Rice Varieties, Tolerant

INTRODUCTION

Rice is one of the most important staple foods for more than half of the world's population and influences the livelihoods and economies of several billion people. Globally, the spectacular advancement in rice productivity started after the introduction of semi-dwarf high-yielding varieties during the mid-1960s, which enabled many rice-growing economies, including India, to attain self-sufficiency in rice production. Apart from breakthroughs in technology, the rapid expansion in rice area and production was also made possible by enhanced public investment in irrigation and infrastructure, fertilizer, and price policy support (Singh *et al.*, 2017). Subsequently, the thrust of rice breeding programs moved towards improving adaptability to relatively unfavourable production environments and improving quality traits like grain length and texture, aroma, nutritional content, cooking quality etc.Together, these technological, institutional, and policy initiatives enabled rice production not only geographically dispersed across different ecosystems (Irrigated, Rain- fed Upland, Rain- fed Lowland, and Flood Prone), but also made the country to attain all time high rice production of 110.15 million tons in 2016-17 (GoI, 2017).

The eastern states of India, contribute a substantial share in total rice production in the country, and mainly produce non-aromatic varieties. But agriculture in the region is more dependent on the monsoon rains, and droughts and floods frequently affect agricultural production. These flood-prone ecosystems have enormous potential for more food production to meet the ever increasing demands for rice supply because of the predominance of good soils and freshwater resources (Ismail *et al.*, 2013). Improved stress tolerant rice varieties like Swarna Sub-1 and Samba Masuri Sub-1 were recently introduced flood-tolerant version of the popular

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mega-variety Swarna (MTU-7029) and Samba Masuri (BPT-5204) popularly grown in Eastern India (Dar *et al.*, 2013). Since rice is one of the major crop in the region, productivity gains in rice is essential to bring the livelihood and food security to the region. With this objective, the Government of India launched a program called "Bringing Green Revolution to Eastern India (BGREI)" in 2009 to harness untapped potential of eastern states, taking into consideration the agro-climatic and socio-economic conditions of the region. Majority of funds under the programme were allocated for improving rice economy in the region through incentivizing adoption of improved technologies and enhancing input access to smallholders.

Since, agriculture in this region is dominated by a large number of marginal farmers and smallholders with varying levels of knowledge, skills, capital and resources, hence, understanding farmers' preferences for crop attributes and incentives to grow improved varieties are critical to the success of another green revolution in the region. Hence, the objective of the study is to analyze farmers' perceptions on varietal attributes of a range of improved and traditional rice varieties that are currently being grown in north eastern plain zone of Uttar Pradesh. The study would help understand the incentives that farmers need in making the choice of technology adoption, as well as the identification of interventions compatible with the resource endowments and farmers' needs.

METHODOLGY

The study is based on field level data collected from submergence-prone areas of rainfed lowlands of eastern Uttar Pradesh. Two districts *viz*. Gorakhpur and Siddharthnagar were selected purposively on basis area and production of rice.Two blocks namely Sardarnagar and Uruwa from Gorakhpur district and Birdpur and Naugarh blocks from Siddharthnagar district were also selected purposively based on higher intensity of rice cultivation. Further, three villages from each block were selected randomly making 12 villages in total. Finally, 10 farmers from each village were randomly selected making the total sample size of 120 farmer households. Qualitative and quantitative information on rice production practices for the kharif season of 2015-16 was collected using structured interview schedules. Farmers were asked to compare the relative performance of improved and traditional varieties being grown in the village. The Varietal diversity index (VDI) was employed to know rice varietal diversity at farm level in the region. The varietal diversity index (VDI) was estimated by using the following formula:

$$VDI_i = 1 - \sum_{j=1}^{n} (a_{ij} / A_i)^2$$

Where, a_{ij} = area planted to the jth variety by the ith farmer

A_i = total area planted under rice by the ith farmer

The index ranges from 0 to 1, zero indicated no rice varietal diversity and 1 indicated very high rice varietal diversity for a farmer. In order to identify the factors determining the level of diversity, linear regression model was employed to know factors influencing rice varietal diversity at farm level. Likert scale was used to measure preferences and perceptions of rice varietal traits and constraints of improved and traditional rice varieties of the study area.

RESULTS AND DISCUSSION

Rice varietal diversity and adoption of improved stress tolerant varieties

The region is characterized by predominance of small and marginal farmers and majority of the rural families are directly or indirectly engaged in agricultural activities. The annual rainfall ranges between 1000-1250 mm, but is quite erratic and confined to July-September. The majority of the farm families are illiterate and the average size of land holding is very small. Nearly 82 per cent of the farmers possess holding size less than 1 ha (0.52 ha) and only 12 per cent farmers have 1-2 ha (1.39 ha) land. Irrigation status of agricultural land indicates that about 40 per cent of net sown area is wholly dependent on rain and remaining (60%) is irrigated out of which only 18 per cent of the area is fully irrigated. The major area of the region is occupied by rice-wheat cropping system having the cropping intensity of 150 per cent. Sharecropping is the most popular form of land tenure. Altogether 11 improved as well as traditional rice varieties

were seen grown planted in the study area, and four of these varieties were of local land races. The majority of sample farmers in Gorakhpur district (45% of sample farmers) have grown Sarjoo-52 followed by Samba Masuri and Swarna varieties, while in Siddharthnagar district, 31 per cent sample farmers were found cultivating Samba Masuri during the study period. An improved version of Samba Masuri and Swarnawas released recently with submergence tolerance trait which is most suited in conditions when fields are submerged for 7 to 14 days with no yield penalty in without flooding conditions. Kalanamak variety of rice which is indigenous to the region and rated as very good in taste was grown by 73 per cent of sample farmers in Siddarthnagar. This variety is also rated as premium rice and commands higher market price (Table 1).

On an average, majority of farmers have cultivated more than one rice variety followed by two to three varieties. Farmers were cultivating more than one variety as part of risk minimization and income diversification strategy owing to frequent onset of drought and flash floods, diverse household needs and market demand. The estimated rice varietal diversity index in the region ranged from 0 to 0.70, and results indicate that 46 per cent of the farmers had no rice varietal diversity (grew only one variety) followed by medium rice varietal diversity (43%). Only 11 per cent of sample farmers have reported high rice varietal diversity. A comparison of two selected districts showed that in Gorakhpur district, 17 per cent of farmers had high rice varietal diversity index as against only 5 per cent in Siddharthnagar district. Hence results do not support the hypothesis that varietal diversity increases with an increase in environmental heterogeneity as the average number of varieties grown by farmers is less, reflecting socio-economic constraints in technology adoption. This was made explicitly clear when sample farmers were further examined regarding their seed purchasing behaviour. The frequency of paddy seed purchased as well as sources of seed purchase by the sample farmers' during 2015-16 revealed that only one third of farmers were purchasing paddy seed every year. Maximum number of sample farmers (40%) reported to have purchased seed every alternate year, while another one fifth of farmers purchased rice seed after every two

Table 1: Distribution of rice varieties grown on sample farms, 2015-16

Variety	Gorakhpur		Siddharthnagar	
	% share to farmers growing the variety	Area (ha)	% share to farmers growing the variety	Area (ha)
Samba Masuri sub1	11.67	7.09	6.67	1.62
Swarna Sub1	3.33	2.02	27.00	8.02
Kalanamak	3.33	1.21	73.33	18.32
Sarjoo-52	45.00	21.26	—	—
Swarna	16.67	9.05	3.56	1.39
Samba Masuri (BPT-5204)	28.33	13.77	31.23	8.62
Local varieties	20	11.34	6.67	1.62

Source: Field survey

Table 2: Distribution of farmers according to their rice varietal diversity index

Rice varietal diversity categories	% farmers		
	Gorakhpur	Siddharthnagar	Total
No rice varietal diversity (0)	40.33	45.33	45.83
Low rice varietal diversity (0.01-0.25)	0	0	0
Medium rice varietal diversity (0.26 - 0.50)	43.00	48.66	43.33
High rice varietal diversity (>0.5)	16.67	5.00	10.83
Total	**100**	**100**	**100**

Source: Field survey

years. It was also reported that majority of the sample farmers' (39%) used seed from own saved sources followed by seed from local market (32%), fellow farmers (18%) and seeds provided by the govt. scheme (11 %). Hence, results amply made clear that there still exists informal seed systems in the study area as most selected farmers preferred to use self-retained seeds for low cost of reasons.

A multivariate linear regression analysis is presented using diversity index as dependent variable to aid in understanding the determinant of farm crop diversity in rice. The results of the regression of the diversity index on the farmers' socio-economic characteristics, credit and market access etc., are presented in Table 3. The coefficient associated with the size of the operational holding was estimated positive and statistically significant. The coefficient associated with access to credit, number of visits made by extension personnel on farm also turned out to be positive and significant. The family size and caste did not have statistically significant effect on the varietal diversity. Thus, farm size, access to credit, education and age of the head of household were found to be the main factors determining the degree of varietal diversification in the study area.

Table 3: Determinants of rice varietal diversity on sample farms

Variables	Coefficients	Standard Error
Intercept	-0.44	0.14
Farm size	0.29	0.05
Non-farm income	2.02E-07	5.02E-07
Livestock units owned	-0.01	0.01
Age of head of household	0.006*	0.002
Distance from market	0.00067	0.005
Extension visits	0.07*	0.02
Level of education	0.03**	0.01
Access to institutional credit	0.11*	0.04
Family size	-0.003	0.004
Caste	0.07	0.04
R Square	0.60	-
Observations	120	-

Note: * and ** indicates significant at 1 and 5 per cent level, respectively.

Farmers' preference and perception on rice varietal traits

An analysis of farmers' preferences and perceptions showed (Table 4) that majority of sample farmers cultivating Sarjoo-52 (89%) and Kalanamak (100%) preferred these varieties for their good eating quality. However, Swarna Sub-1 and Samba Masuri Sub-1 were preferred by majority of farmers (84%) for higher yield performance during field submergence conditions. Out of all the major rice varieties grown, farmers' opined that no variety is resistant to drought. Kalanamak, a traditional variety of the area was perceived by the respondents somewhat resistant to the drought. It is important to note that all the farmers were fully aware of the fact that Swarna Sub-1 and Samba Masuri Sub-1 are performing better in submergence conditions as compared to other

Table 4: Farmers' perception of rice varietal traits in the study area

Traits	% farmers			
	Sarjoo-52	Swarna Sub 1/Samba Masuri Sub1	Samba/Samba Masuri (BPT-5204)	Kalanamak
Good eating quality	88.8	72.72	74.07	100
High yield performance	74.07	83.63	66.66	21.73
Higher price in the market	44.44	45.45	93.02	95.65
Early maturing	55.55	40.25	74.74	—
Resistance drought	—	—	—	47.82
Tolerance to lodging	81.48	81.81	92.52	91.30
Resistance to submergence	—	100	—	86.95
Resistance to pests/disease	40.74	54.54	81.48	—

Source: Field survey

Table 5: Farmers' perception on preferred varietal traits in improved rice cultivars

Attributes of varieties	Average Score	% farmers		Total
		Gorakhpur	Siddharthnagar	
High yield	7.86	90	100	95
Tolerance to submergence as well as drought resistance	7.81	100	83	92
Better taste	7.24	80	95	88
Stem borer resistance	7.20	93	86	90
Tolerance to lodging	7.19	100	90	95
Brown leaf spot resistance	7.07	96	100	98
Early maturity	7.04	83	93	88
Medium and slender grain	5.27	86	95	91

Source: Field survey

existing rice varieties. Similarly, 81 per cent sample farmers preferred these two varieties because of resistance to major diseases and pests. More than 90 per cent farmers' also opined that both the Sub-1 varieties and Kalanamak are also having resistance to the lodging.

Data in Table 5 clearly revealed that among the varietal attributes which farmers from the region demand in new rice variety, higher yield and tolerance to drought and submergence together scored the highest in terms of preference scale in both the districts of the region due to frequent occurrences of drought and flash floods. Next to this, better taste and cooking quality received high on preference scale (7.24) and preferred by 80 per cent and 95 per cent farmers of Gorakhpur and Siddharthnagar districts. Tolerance to lodging was also a trait which was preferred by 100 per cent and 90 per cent farmers of Gorakhpur and Siddharthnagar respectively because most of the varieties lodge at the time of harvest that makes mechanical harvesting more difficult. Resistant to stem borer and brown leaf spot were also preferred by sizeable number of farmers in the study area.

CONCLUSION

The farmers' practice of growing old but long tested improved and traditional rice varieties due to their experience and perception about varietal traits suitability to the local environment seem to be major determinants of technology choices in the region. Though, the adoption rate of improved rice varieties like Swarna-Sub1 and Samba Masuri 1 was 50 per cent among the sample households in the region, although all sample households in the region suffered from flash floods almost on recurrent basis. This indicates a range of socio-economic and institutional constraints limiting technology adoption by the farmers. Thus, scope does exist for encouraging the adoption of improved varieties through appropriate policy and institutional interventions. The findings also suggest that there is great scope for improving the production and productivity of rainfed lowland rice once key constraints such as drought as well as submergence tolerance may be addressed aggressively by rice breeding programmes. Besides this, timely availability of quality seeds, improved crop management, and remunerative prices with effective procurement also need to be addressed adequately. In terms of preference for new cultivars, farmers preferred cultivars having high grain yield with drought as well as submergence tolerance and insect resistant without compromising other preferred attributes. The study also revealed that a considerable proportion of the farmers had limited knowledge of improved varieties and access to seeds. This further calls for more research and adequate extension services for better farm management.

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Entrepreneurial Behaviour of Tribal Dairy Farmers in Balrampur District of Northern Hill Region of Chhattisgarh

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ABSTRACT

Entrepreneurs play an important role in the economic development of the society. The study was conducted during 2018-19 to know the entrepreneurial behaviour of tribal dairy farmers in Balrampur District of northern hill region of Chhattisgarh. The data were collected by pre-tested interview schedule from 120 interviewees. The results of the study found that majority of the respondents exhibited medium level (72.50%) entrepreneurial behaviour. The correlation of entrepreneurial behaviour among the eighteen independent variables; only seven variables (Land Holding, Mass Media, Income Status, Herd Size, Total Milk Production, Milk Sale and Attitude) showed the positive significant relationship. Regression analysis had shown all the 18 independent variables put together have influenced significant variation in entrepreneurial behaviour to the extent of 35.10 per cent. Path analysis approach depicted that total milk production had the highest total effect on entrepreneurial behaviour followed by Income Status and Landholding.

Keywords: Dairy farming, Entrepreneurial behaviour, Path analysis, Socio-economic status, Tribal dairy farmers

INTRODUCTION

In recent years the country has achieved a milestone in milk production because milking has been practiced in India as a rural farming undertaking at a tremendous level. Entrepreneurial is one of the possible ways to make rural people more competent in dairy farming. The total cattle population in rural and urban areas 514.11 million respectively with a percentage share of 95.78 per cent for rural and 4.22 per cent for urban area where female cattle (cow) population is 145.91 million, increased by 18.6 per cent over the previous census 2012 (Animal Census Report, 2019). The country's vast livestock resources play an important role in both the national economy and the socio-economic development of millions of rural and tribal households. Today's sustainable and financially viable dairy farming, that through entrepreneurship can efficiently generate income and self-employment, is required precisely (Patel *et al.,* 2014). India's milk production has risen gradually over the last two and a half decades and is second in the world to produce of milk (Chaudhary *et al.,* 2017). Entrepreneurs play an important role in the economic development of the society. They are considered as the valuable assets and the human resources which are having a lot of potential inside them and have to tap out carefully for having the fruitful results. Entrepreneurs are those people who exhibit common traits such as single-mindedness, drive, ambition, creative, problem solving, practical and goal-oriented. Personal qualities of an Agri-entrepreneur significantly affect the agribusiness. Self-criticism, effective leadership, market orientation and unique creativity are important for successful entrepreneurship development (Karthikeyen *et al.,* 2017). Dairy enterprise,

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next to crop production not merely provides continuous income and progressively improves dietary standards of family, but also supplements the income and reduces unemployment to a large number of the rural poor (Bhosale, 2014). It is now comprehended that enterprise contributes mightily in many ways to the development of a nation, i.e. the assembly and use of various materials, risks, innovation and imitation of cost-cutting and quantity-increasing production methods, widening market horizons and the planning and management of the production unit at different levels. A country's active economic growth depends essentially on the number of entrepreneurs' capabilities. In this proper regard, entrepreneurship is one of the key inputs for the production of the milk enterprise that can generously provide the phenomenal economic growth of the agriculture community (Chaurasiya *et al.*, 2016).

The state of Chhattisgarh has also performed an important role by efficiently generating self-employment through the dairy sector in the rural areas which in turn provides nutritious food to the rural folks. Total number of livestock in Chhattisgarh is 1.544 crore where the cattle and buffalo population is 1.1206 crore (NABARD, 2017). Considering the critical importance of dairy farming in the tribal region, it is a need for the development of entrepreneurship and this is one of the ways to make rural people more competent in dairy farming. The present study was conducted to assess the Entrepreneurial behaviour of tribal dairy farmers in the study area and to find out relation between the independent variables and entrepreneur behaviour of tribal dairy farmers in the study area.

METHODOLOGY

The study was conducted during the year 2018-19 in Balrampur District of northern hill Region, Chhattisgarh. The methodology suggested by Ray and Mondal (2011), Chaudhary *et al.* (2013) and Barua (2015) was followed with required modifications as per the context and objective of the present study to investigate. The present study followed ex –post facto research design

Chhattisgarh state consists of 27 districts, out of which Balrampur- Ramanujgang district was selected purposively. Out of total six blocks in Balrampur-Ramanujganj district namely, Balrampur, Ramchandrapur, Wadrafnagar, Raipur, Shankargarh and Kusmi (Samri) only two blocks namely Ramchanderpur and Balrampur were selected purposively. From Ramchanderpur block 2 villages and Balrampur block 2 villages were selected based on maximum availability of dairy farmer in the villages. In this way, the villages, Keoli, Gamhariya, from Ramchaderpur block and Manikpur, Kotarki from Balrampur block were selected for the study. A list of farm families who are engaged in Dairy farming was prepared. From the list of each selected village, 30 farm families were selected randomly. In this way, a total of 120 farm families (30* 4 = 120), were selected as respondents.

The collection of data was taken through a personal interview with the help of a pre-tested structured schedule. In the present study, eighteen independent variables viz. Age, Gender, Caste, Family Size, Family Type, Experience in Dairy Farming, Education, Social participation, Mass media Exposure, Social contact, landholding, Economic motivation, Income Status, livestock possession, Total milk production, milk consumption, milk sale and attitudes and one dependent variable entrepreneurial behaviour have been taken into consideration. The Entrepreneurial behaviour is the psychological dimension of an entrepreneur due to which he or she undertake enterprise and continuously attempt to perform better and better. (Akhouri *et al.*, 1999) stated that certain social motives are significantly related to entrepreneurial behaviour for the present study, thirty statement was included with three response categorized as 'always', 'sometimes', and 'never'. The score assigned were 3, 2 and 1 for given response respectively. The Entrepreneurial behaviour data was calculated and compared the relationship between the dependent and independent variables through the using of statistic tool viz. frequency, percentage, simple correlation, regression and path analysis with the help of SPSS version 16.0 software as well as the help of OPSTATE Website. The information was collected by directly asking the respondent and then categorized by used cumulative square root frequency for classification as the mean and standard deviation in the following categories:

RESULT AND DISCUSSION

Entrepreneur behaviour is the composite measure of thirty components. The data in Table 1 shows that majority (72.50%) of the respondents had a medium level of entrepreneurial behaviour, 15.00 per cent of the respondents scored low level of entrepreneurial behaviour and 12.50 per cent of the respondents had a high level of entrepreneurial behaviour. The mean score of the total distribution was 58.03 and standard deviation of the distribution was 8.23. From the results, it is clear that most of the dairy farmers had medium entrepreneurial behaviour. This might be due to the major components of the dairy farmers together reflected their medium entrepreneurial behaviour.

It was found from Table 2 that among eighteen independent variables (age, gender, caste, family size, family type, experience in dairy farming, education, social participation, mass media exposure, social contact, landholding, economic motivation, income status, livestock possession, total milk production, milk consumption, milk sale and attitudes) only five variables viz. landholding, annual income, total milk production, milk sale, and attitude of dairy farmer showed positive and significant relationship at one per cent level of probability, whereas mass media exposure, herd size showed positive and significant relationship at five per cent level of probability. Age, gender, caste, family size, family type, experience in dairy farming, education, social participation extension contact economic motivation and milk consumption did not establish any significant relationship with entrepreneurial behaviour.

Multiple regression analysis was carried out to know the importance of independent variables with their prediction ability in explaining the dependent variable of respondents. The regression coefficient (b) values and 't' values are revealed from the Table 3 and the analysis shows that all the 18 independent variables (age, gender, caste, family size, family type, experience in dairy farming,

Table 1: Entrepreneurial Behaviour of tribal dairy farmers

Mean	S. D.	Category	Frequency	Percentage
58.03	8.23	Low < 50	18	15.00
		Medium 50 – 66	87	72.50
		High > 66	15	12.50

Table 2: Correlation between Variables

S.N.	Variable	Mean	Std. Deviation	'r' Value
1.	Age (X_1)	41.4333	14.36893	0.169
2.	Gender (X_2)	1.1333	.34136	0.019
3.	Cast (X_3)	3.0583	1.10230	-0.032
4.	Family size (X_4)	7.2250	4.61722	0.079
5.	Family type (X_5)	1.4167	.49507	0.104
6.	Land holding (X_6)	1.3283	1.42009	0.388**
7.	Experience in dairying (X_7)	26.7083	14.82525	0.178
8.	Education (X_8)	1.6667	1.68699	0.108
9.	Social participation (X_9)	7.3833	2.26105	0.113
10.	Mass media exposure (X_{10})	3.9167	2.68072	0.230*
11.	Extension contact (X_1)	5.5583	1.70908	-0.078
12.	Economic motivation (X_{12})	22.0417	3.27043	0.055
13.	Income status (X_{13})	9.36503	7520.75727	0.455**
14.	Herd size (X_{14})	13.6583	15.13996	0.216*
15.	Total milk production (X_{15})	3.9167	3.67600	0.324**
16.	Milk consumption (X_{16})	.9500	.49323	0.167
17.	Milk sale (X_{17})	3.0042	3.49053	0.317**
18.	Attitude (X_{18})	34.6333	2.71916	0.286**

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

Table 3: Regression between Variables

S.N.	Variable	'b' Value	't' Value
1.	Age (X_1)	0.69	0.676
2.	Gender (X_2)	1.485	0.691
3.	Cast (X_3)	-0.19	-0.029
4.	Family size (X_4)	-0.028	-0.171
5.	Family type (X_5)	2.457	1.756
6.	Landholding (X_6)	1.121	1.557
7.	Experience in dairying (X_7)	-0.014	-0.134
8.	Education (X_8)	-0.648	-1.028
9.	Social participation (X_9)	0.219	0.663
10.	Mass media exposure (X_{10})	0.844	2.138*
11.	Extension contact (X_1)	-0.794	-1.865
12.	Economic motivation (X_{12})	-0.128	-0.522
13.	Income status (X_{13})	0.00	1.426
14.	Herd size (X_{14})	0.17	0.258
15.	Total milk production (X_{15})	4.388	1.495
16.	Milk consumption (X_{16})	-1.120	-1.391
17.	Milk sale (X_{17})	-1.344	-1.459
18.	Attitude (X_{18})	0.618	2.175*

*Significant at the 0.05 level (2-tailed).
$R^2 = 0.351$; F value = 3.035

education, social participation, mass media exposure, social contact, landholding, economic motivation, income status, livestock possession, total milk production, milk consumption, milk sale and attitudes) put together have influenced significant variation in entrepreneurial behaviour to the extent of 35.10 per cent and also shows that among eighteen independent variables only two variables mass media exposure and attitude of the dairy farmer was showing positively significant at 0.05% confidence level.

Path analysis is a technique that aims at determining the direct and indirect effects among the number of variables and thereby helps to a quantitative interpretation to the interrelationships within a known or an assumed casual system that exist in some specific population. The basic theorem of path analysis states that the zero-order correlation between any two variables is equals to the sum of the products of the paths and correlations between all the variables in the system. In this technique, the direct and indirect effects are measured by a quantity (standardized partial regression) called the path coefficient. A path coefficient is an absolute number without any physical unit, whatever the actual units of measurement for the variables. It indicates the extent to which the variance in a dependent variable is determined by the variance of the independent variable. Result extracted from path analysis shows that independent variable affected (direct and indirect effect) on entrepreneurial behaviour.

It has been found from Table 4 that the variable Income status (X13) 0.0522 has the highest total indirect effect on entrepreneurial behaviour (Y1) whereas landholding (X6) 0.0377 and attitude (X18) 0.0168 has been second and third position respectively. Total milk production (X15) 3.842 had the highest direct effect, milk sale (X17) 3.393 and mass media exposure (X10) 0.076 has been the second and third passion direct effect respectively. Total milk production (X15) 0.636 had the highest total effect on entrepreneurial behaviour where income status (X13) 0.105 and landholding (X6) 0.075 has been the second and third passion in total effect respectively.

The potential explanation for this assumption may be that respondents with greater holdings will be likely to seek specific scientific modifications. As a corporate behaviour of dairy farmer's results, farmers with a larger total of milk production are likely to have a strong desire to know about and be more open to a new practice, thus improving the know-how, income status and landholding which directly and indirectly imitate their entrepreneurial behaviour. Considering that dairy is a highly remunerative enterprise, entrepreneurs also expect exponential escalation of total milk production and are competing firmly to carry out efforts. Milking practice has a positive impact on entrepreneurial behaviour, as it provides the basis for the dynamic potential of an enterprise, the opportunity to learn and adapt to changing circumstances. The logical explanation might be that dairy farmers with total milk production may be more involved in and employ the latest innovation in their dairy enterprises. These findings are consistent with the observations provided (Porchezhiyan *et al.*, 2016).

Table 4: Path Analysis: Entrepreneurial behaviour of Tribal dairy farmers (Y1) Vs 18 Variable

S.No.	Variable	Total indirect effect	Direct effect	Total effect	Priority of total effect
1.	Age (X_1)	0.006	0.015	0.021	6
2.	Gender (X_2)	-0.003	0.004	0.001	11
3.	Cast (X_3)	0.000	0.000	0.000	12
4.	Family size (X_4)	-0.002	0.000	-0.001	13
5.	Family type (X_5)	-0.007	0.022	0.015	7
6.	Land holding (X_6)	0.0377 (second)	0.038	0.075	3
7.	Experience in dairying (X_7)	-0.005	0.001	-0.004	15
8.	Education (X_8)	-0.032	0.018	-0.014	16
9.	Social participation (X_9)	0.003	0.004	0.007	10
10.	Mass media exposure (X_{10})	-0.013	0.076 (third)	0.063	4
11.	Extension contact (X_{11})	-0.014	0.027	0.013	8
12.	Economic motivation (X_{12})	-0.005	0.003	-0.003	14
13.	Income status (X_{13})	0.0522 (first)	0.053	0.105	2
14.	Herd size (X_{14})	0.006	0.001	0.007	9
15.	Total milk production (X_{15})	-3.206	3.842(first)	0.636	1
16.	Milk consumption (X_{16})	-0.102	0.061	-0.041	17
17.	Milk sale (X_{17})	-3.977	3.393 (Second)	-0.585	18
18.	Attitude (X_{18})	0.0168 (third)	0.042	0.058	5

CONCLUSION

The study was concluded that majority of the respondents fall under the medium level of entrepreneurial behaviour followed by low and high level of entrepreneurial behaviour. Hence special consideration is required to develop the entrepreneurial abilities in dairy farmers. There is a possibility to enhance these traits among dairy farm. Among eighteen independent variables, only seven variables viz. Landholding, annual income, total milk production, milk sale, attitude of the dairy farmer, mass media exposure, herd size were having positive and highly significant relationship with their entrepreneurial behaviour. Regression analysis had shown all the 18 independent variables put together have influenced significant variation in entrepreneurial behaviour to the extent of 35.10 per cent, significant at 0.05 per cent confidence level. Path analysis shows that independent variable affected (direct and indirect effect) on entrepreneurial behaviour where total milk production had the highest total effect on entrepreneurial behaviour remaining Income status and Landholding has been the second and third passion in total effect respectively. It is, therefore, necessary to raise awareness among dairy farmers about the commercial viability and profitability of dairy farming and make them successful in the region. The medium level of entrepreneurial behaviour concerning selected components has focused on the need for farmers to expose recent developments and technologies in the field of dairy farming. The fact that most farmers have a medium level of entrepreneurial behaviour is a clear indication of the opportunity to push them towards a high level of entrepreneurship. Efforts for increased awareness and knowledge in dairy production techniques through various innovative extension methods exclusively designed for the target group is urgently needed.

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Correlates of Knowledge Regarding Utility of Soil Testing and Soil Health Card

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ABSTRACT

It is always important to find out the factor responsible for positive or negative disposition associated with farmer toward the usefulness and application of any innovation as change in knowledge preceded acceptance and application of an innovation. The present investigation was undertaken in Petlad taluka of Anand district in middle Gujarat region. The random sampling of one hundred farmers from Petlad taluka was done based on number of respondent who had soil health cards. The results revealed that 52 per cent respondent belonged to high to very high category with respect to knowledge of soil testing. These farmers adopted the technology of soil testing and use of SHC to balance the dose of fertilizers for sustaining soil health. The half of the respondents found the technology beneficial for sustaining soil health, lowering the input cost and improving the farm production.

Keywords: Awareness, Adoption, Knowledge, Soil health cards and soil testing

INTRODUCTION

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

Soil Testing is well recognized as a sound scientific tool to assess inherent power of soil to supply plant nutrients. The benefits of soil testing have been established through scientific research, extensive field demonstrations and on the basis of actual fertilizer use by the farmers on soil test based fertilizer use recommendations. Neufeld and Davison (2000) stated that soil testing is the only necessary and available tool for determining the amount of soil nutrients. Hence, to avoid deterioration of soil in long run and visualizing the importance of balance nutrient in crop production, government of Gujarat commenced soil health card programme. The soil health card is a simple document, which contains useful data on chemical analysis of the soil to describe soil health in term of its nutrient availability and its physical and chemical properties. Gujarat became the first state to launch soil health card programme for the farmers. Soil health card can be used to optimize the use of fertilizer in the integrated nutrient management (INM) system. The soil health card programme brings together the scientific

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community in the field of agriculture, the information repository of latest tool, techniques and cropping practices, the farmers and the Government for the economic upliftment of the people at large. Since, change in knowledge preceded acceptance and application of an innovation, it is therefore, always important to find out the factor responsible for positive or negative disposition associated with farmer toward the usefulness and application of soil health card programme. Hence, present study was undertaken to measure the knowledge of benefits of soil testing and utility of soil health card.

METHODOLOGY

The present study was undertaken in Petlad taluka of Anand district in Gujarat. The district is consisted of total number of eight talukas. Out of all eight talukas, Petlad taluka was purposively selected looking to the number of respondent had soil health card. One hundred farmers were randomly selected from ten different villages of Petlad taluka. A comprehensive list of all the respondents having SHC was obtained from *e-dhara* office of the respective villages. Thus, ten respondents from each village were selected at random for the study. The questionnaire was prepared in *Gujarati* language with a view to study and collect data through personal interview of the selected respondents. The data were tabulated and analyzed with the objectives to draw the meaningful conclusion.

RESULTS AND DISCUSSION

The demographic characteristics of respondent played an important role in the usefulness and application of soil testing and soil health card programme. Some of the profile variables were selected, analyzed and presented in Table 1. The result reveals that among the five characters of the family profile, size of family and occupation found to be the most influencing factors in utilizing the technology whereas age, land holding and annual income did not establish any relation with the adoption of the technology. **T**hese findings are consistent with the results found by Rajput and Chinchmalatpure (2016).

The study revealed that 50 per cent farmers had occupation in mixed form *i.e.* agriculture + livestock farming and rest of 41 per cent and 9 per cent involved in practicing agriculture and agriculture + Livestock + business, respectively. Among the group of respondents, around 56 per cent of the respondents belonged to the middle age group *i.e.* 36 to 50 years with having large family size (60 per cent). Around 45 per cent farmers had small land holding *i.e.* 1 to 2 hectare and nearly 70

Table 1: Demographic characteristics of the respondents according to family profile (n=100)

S.No.	Characteristic	Category	Number of Farmers	% Distribution
1.	Age	Young (Up to 35 year)	06	6.00
		Middle (36 to 50 year)	56	56.00
		Old (Above 50 year)	38	38.00
2.	Land holding	Landless	0	0.00
		Marginal (Up to 1 ha)	42	42.00
		Small (Above 1 to 2 ha)	45	45.00
		Large (Above 2 ha.)	13	13.00
3.	Annual income	Low (Up to Rs.50,000)	27	27.00
		Medium (Rs.50,001 to Rs.1,00,000)	70	70.00
		High (> Rs.1,00,000)	3	3.00
4.	Size of family	Small (Up to 5 member)	40	40.00
		Large (> 5 member)	60	60.00
5.	Occupation	Only Agriculture	41	41.00
		Agriculture with Live stock Farming	50	50.00
		Agriculture with Livestock farming and Business/Service	09	09.00

per cent farmers earn between Rs. 5,00,01 to 1,00,000/-. Factors such as age, farming experience, training received, socio-economic status, cropping intensity, aspiration, economic motivation, innovativeness, source of information and agent credibility have been found to have positive and significant association with adoption (Rao and Rao, 1996).

The demographic characteristics of the farmers personal profile is directly or indirectly related with the family profile and suggests the positive chances of adoption of the technology. The result revealed that among the five characters of the personal profile, education and resources of farmers found to be the most influencing factors in utilizing the technology whereas farming experience, social participation and source of finance had lower extent of influence on adoption (Table 2).

In personal characterization of all respondents, about 42 per cent farmers had secondary level of education *i.e.* 8th to 10th standard and only 18 per cent had higher secondary to graduate level education. Nearly 65 per cent farmers had experience for more than 21 years in the field of agriculture without any social participation (61 per cent). The majority of the farmers (53 per cent) considered Government sector or banks as a source to support their financial needs. In adoption of any technologies personal profile like education, farming experience, social participations, source of finance and resources of farmer play a major role (Rai and Saharia, 2004).

Adoption of technology is the decision to make full use of a new idea as the best course of action available and involves a change in the orientation and behaviour of the farmer from the time he/she becomes aware of the technology to its adoption (Akubuilo *et al.*, 1982). In the study knowledge about soil testing was analyzed with the help of some variables and presented in Table 3. The data revealed that 52 per cent of the respondent had high to very high level of knowledge and adoption of the technology. Knowledge regarding the benefit of soil testing was found most important for SHC programme. Agbamu's (1993) finding stated that farmers' knowledge

Table 2: Demographic characteristics of the respondents according to personal profile (n=100)

S.No	Characteristic	Category	Number of Farmers	% Distribution
1.	Education	Illiterate	06	6.00
		Primary (1 to 7th Std)	34	34.00
		Secondary (8th to 10th)	42	42.00
		Higher Secondary (11th to 12th)	04	4.00
		Graduate and above	14	14.00
2.	Farming Experience	Low (1 to 10 years)	07	07.00
		Medium (11 to 20 years)	28	28.00
		High (> 21 years)	65	65.00
3.	Social participations	No participation	61	61.00
		Participation in 1 organization	26	26.00
		Participation in 2 organization	12	12.00
		Participation in more than 2 organization	01	01.00
4.	Source of Finance	No Finance	09	09.00
		Private Sector	02	02.00
		Govt. Sector/ Bank	53	53.00
		Co- operative Sector	36	36.00
5.	Resources of Farmer	Low (0-25)	62	62.00
		Medium (26-50)	35	35.00
		High (above 50)	03	03.00

Table 3: Knowledge regarding benefits of soil testing and utility perception of soil health Card (SHC) (n=100)

S.No.	Characteristic	Category	Number of Farmers	% Distribution
1.	Knowledge regarding benefits of Soil Testing	Very Low (0-20)	14	14.00
		Low (21-40)	18	18.00
		Medium (41-60)	16	16.00
		High (61-80)	37	37.00
		Very High (Above 80)	15	15.00
2.	Knowledge regarding utility perception about Soil Health Card	Very Low (0-20)	14	14.00
		Low (21-40)	18	18.00
		Medium (41-60)	16	16.00
		High (61-80)	37	37.00
		Very High (Above 80)	15	15.00

of technology made contribution to its adoption. They found the technology satisfactory and important with respect to lower the input cost, benefit of soil testing and use of soil health card in their farming operation. Chowdary *et al*. (2016) also found that more than two-thirds (67 per cent) of the respondents had high level of satisfaction on SHC recommendations. These findings are consistent with the results founded by Srivastava and Pandey (1999), Yadav *et al*. (2005), Pagaria (2011) and Patel and Chauhan (2012). To ensure the importance of the technology state government has always given their advisement in time interval to enhance balance and efficient use of fertilizers based on soil testing and soil health cards.

It was found that around one third respondents reported very low to low adoption of the recommended technology. These respondents reported the hurdles while utilizing the technology which limited the extent of their adoption to this technology. The major constraints involved difficulty in understanding of soil testing, delay in getting the test reports, difficulty in following test based fertilizer recommendation, uncertainty in yield gain and lack of proper and scientific guidance.

CONCLUSION

It can be concluded that majority of respondent from Petlad taluka are of middle age and literate. Majority of the respondent (68 per cent) had medium to very high level knowledge about benefits of soil testing and use of soil health card (SHC). Educational awareness and resource laboratory to test soil samples in nearby location found to be the most influential factor in adoption of the technology. Therefore, as per problem faced and suggested by the farmers more scientific and educational trainings and facilities are required to disseminate the technology at large. Extension worker can take lead in this to overcome the barriers and promoting technology adoption of the technology at large.

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Implementation of Foreign Direct Investment (FDI) in Agricultural Retail Sector in India: An Economists' Opinion

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ABSTRACT

Agricultural retail sector is one of the most important pillars of Indian economy and it is growing at a phenomenal pace. FDI in agricultural sector plays an integral role in the country's economic growth. The aim of research paper is to explore the opinion of agricultural economists towards FDI in agricultural retail sector. The study was conducted in Haryana State. The study revealed that FDI will promote well – organized retail stores with minimum staff' was found highly prospective which got highest mean score of 2.67. Major advantages of FDI found were ; FDI may bring growth and prosperity in agricultural retail sector (mean score 2.65), FDI may improve infrastructure facilities (mean score 2.58), Inflow of foreign capital may increase after the implementation of FDI (mean score 2.58), FDI may provide high quality of farm inputs (mean score 2.53). Small and marginal farmers may suffer (mean score 2.47), Increases the real estate prices (mean score 2.33) and Discourage local retailers (mean score 2.32), No real benefit to famers and FDI may uproot the domestic retail stores with weight mean score 2.25 were major disadvantages of FDI.

Keywords: FDI, Agricultural retail sector and Economists' opinion

INTRODUCTION

India is an agrarian country traditionally, where farmers maintain food sufficiency by continuously engaging themselves in agriculture. Economically agricultural is one of the riskiest professions. Agricultural production is unstable because of its totally dependancy on the weather condition. In our country farmers are still kept on tenterhook, not knowing how to manage their economy, except to play it by years through a variety of changes like virtual collapse of rural credit in organized sector, especially for small and marginal farmers, continuous increase of input cost and stagnant crop price, profit potential of agricultural sector has declined substantially (Gupta, 2005). Today, an Indian farmer gets only one-third of what the end-consumer pays for his produce. In times of bumper harvests and distress selling, he gets just a sixth part only for his produce. If production is good then there is a surplus of agricultural produce and prices fall. When there is crop failure, farmers hardly get any compensation in terms of the higher price of crops. Present agriculture scenario is that farmer produces more produce according to the country population consumption need or surplus, but lacking the facilities like storage and warehousing, good quality hybrid seeds, better quality farm inputs for control of pests and diseases, post harvest technologies, food packaging, value addition and many more that lead to millions tone of food go wasted every year. Most of the industries also depend on the agricultural sector for their raw materials. Nevertheless, the agricultural market of India is highly fragmented and unorganized. This is proved empirically that 33 percent of fruit and vegetables in India are wasted and perished in the journey from the farm to the fridge. India has only

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5,300 cold storages, a figure that sits uneasy when placed against the 12 million small and medium retail outlets in the country. Indian food chain is defective one because of which after 65 years of independence farmers still live in the darkness of poverty, illiteracy, inequality and negligence. Agriculture sector can be taken, as complimentary and new formats in agricultural retailing will bring about the new horizon of growth and prosperity to farmers in India.

Global Foreign Direct Investment (FDI) has reached the all-time maximum level of US$ 1,833 billion in 2007. In developing countries, FDI inflows reached its highest level ever ($500 billion) – a 21 per cent increase over 2006 (Weissleder, 2009). FDI has been shown to play an important role in promoting economic growth, raising a country's technological level, and creating new employment in developing countries. FDI works as a mean of integrating developing countries into the global marketplace and increasing the capital available for investment, thus leading to increased economic growth needed to reduce poverty and raise living standards. FDI also opens up new frontiers to the farmers as today the present state of affairs regarding farmer in India is dissatisfactory, the endless and unnecessary chain of middleman takes away the fruits of the agriculture, from its deserving party i.e. farmers. Farmers suffer as the intermediaries add to the profit margin and provide the farmers with the price, which is sometimes, even below its cost of production. Due to low income, farmers are not able to pay their loans and suicidal cases among farmers are more. It is an alarming issue and needs to be urgently taken care of by the government. FDI will generate foreign capital and foreign players in India that will widen the sphere of agricultural retailing not only domestically but also globally. In 1991, reforms have mushroomed FDI purpose in various sectors in Indian economy like insurance, banking, outsourcing, IT, manufacturing, telecommunication, construction, and transportation, which has led to series of development in all these sectors and made them stand on the global platform. India is a second most sought destination for FDI after China. The UPA government in July 2011 has recommended 100 per cent in single brand and 51 per cent in a Multi-brand retail outlet that will transform retailing sector from unorganized to organize. Foreign retail giants like Wal-Mart, Carrefour, Tesco, Metro AG, etc. are eyeing on the ever promising Indian retailing through FDI. They will also try to eliminate the long supply chain in distribution process in India and they will purchase on large scale directly from farmers and offer good prices. FDI proponents also point to the employment potential of the food retail sector, specifically in aggregators and low-level processors. FDI would create new off-farm jobs for 50-60 million low-skilled workers, enough to absorb new entrants to the workforce as well as those potentially displaced by the market efficiencies introduced by FDI. After taking into consideration both pros & cons of FDI one can safely say that although there are certain apprehensions about FDI in India but all these fears are unfounded. There is hardly any truth in the fact that it would destroy the small entrepreneurs in India rather it will be beneficial for both the consumers & farmers of India. So, the future of India lies in FDI & the government must proceed in that direction if it wants to make the Indian economy a developed economy.

METHODOLOGY

The study was conducted two districts viz Hisar and Sonipat of Haryana state, purposively based on the criterion that one is in the proximity of NCR region and other district is far away from NCR region. Two blocks from each district were selected randomly. These were Hisar - 1 and Hansi - 1 blocks from Hisar district, Kharkhoda and Rai blocks from Sonipat district. Hence, there was a total number of 04 blocks selected for the present investigation. A list of economists was prepared with the help of some local key communicator of the respective district. A manageable sample size of 30 economists from each district was selected randomly for study to make a total sample size of 60 economists were interviewed.

RESULTS AND DISCUSSION

Table 1 shows that 45.00 per cent of the respondents had agreed, while 31.67 per cent of respondents were undecided and 23.33 per cent of the respondents had disagreed with the statement FDI is not suitable because most of the operational land holding are small and

Table 1: Economists' perception towards FDI in the agricultural retail sector (n = 60)

S.No.	Perception statements	Response			Total weighted score	Overall perception (%)	Weighted mean score	Rank order
		Agree	Undecided	Disagree				
1.	FDI is not suitable because most of the operational land holding are small and marginal	27(45.00)	19(31.67)	14(23.33)	125	49.33	3.70	IV
2.	FDI enhances overall benefits of farmers, retailer, and consumers	47(78.33)	10(16.67)	03(05.00)	127	52.22	3.92	I
3.	Subsistence nature of farming does not meet the requirement of FDI	44(73.33)	09(15.00)	07(11.67)	122	48.44	3.63	VI
4.	FDI may benefit to big farmers only	40(66.67)	07(11.67)	13(21.67)	114	45.78	3.43	XIII
5.	FDI may make efficient agricultural retail sector	47(78.33)	03(05.00)	10(16.67)	113	47.56	3.57	IX
6.	FDI jeopardize achieving eco-friendly and sustainable agriculture	36(60.00)	10(16.67)	14(23.33)	116	46.22	3.47	XII
7.	FDI may tend to more commercial orientation	33(55.00)	18(30.00)	09(15.00)	129	50.89	3.82	II
8.	FDI does not render services as per farmers needs	32(53.33)	10(16.67)	18(30.00)	112	43.78	3.28	XIV
9.	FDI is likely to increase the regional imbalances	48(80.00)	03(05.00)	09(15.00)	114	46.89	3.52	XI
10.	FDI may provide solution to farm problems	46(76.67)	07(11.67)	07(11.67)	120	48.00	3.60	VII
11.	FDI will regularly update the market knowledge	44(73.33)	10(16.67)	06(10.00)	124	48.67	3.65	V
12.	FDI may provide best quality agro-products at appropriate price	41(68.33)	10(16.67)	09(15.00)	121	47.33	3.55	X
13.	FDI may make agricultural profession risk-free	43(71.67)	11(18.33)	06(10.00)	125	50.00	3.75	III
14.	FDI may be helpful in providingthe best farm technologies	37(61.67)	11(18.33)	12(20.00)	119	47.78	3.58	VIII
15.	FDI may enable the availability of agro-products to consumers in all the season	27(45.00)	19(31.67)	14(23.33)	125	48.00	3.60	VII

Figures in parentheses in columns 3, 4and 5 indicates percentages, column 6 indicates total weighted score, columns 7indicate weighted mean scores, column 8 indicates overall perception and column 9 indicate rank order

marginal. Majority (78.33%) of the respondents had agreed and 16.67 per cent of respondents were undecided and only 05.00 per cent had disagree to FDI enhances overall benefits of farmers, retailers and consumers. It was observed from the data that more than two-third (73.33%) had agreed and 15.00 per cent of the respondents were undecided, whereas only 11.67 per cent had found disagreed to the statement Subsistence nature of farming does not meet the requirement of FDI. It was observed that 66.66 per cent of the respondents had agreed, 11.67 per cent were undecided and 21.66 per cent had disagreed to FDI may benefit to big farmers only. Table 1 shows that majority of the respondents (78.33%) had agreed and only 05.00 per cent were found undecided, while remaining 16.67 per cent had disagreed with FDI jeopardize achieving eco-friendly and sustainable agriculture. It was observed from the results that more than half (55.00%) had agreed, whereas 30.00 per cent of the respondents were undecided, and 15.00 percent had disagreed with the statement FDI may tend to more commercial orientation. The respondents more than half (53.33%) had agreed and 16.67 percent of the respondents were undecided, while remaining 30.00 percent had disagreed to FDI does not render service as per farmers needs. About the statement FDI is likely to increase the regional imbalances, huge majority (80.00%) of the respondents was found agreed whereas, 05.00 per cent of respondents were undecided and 15.00 percent had disagreed. It is also observed from table that more than two-third (76.67%) had agreed and 11.67 per cent of the respondents were undecided, while remaining 11.67 percent had disagreed towards the statement FDI may provide solution to farm problems. It was revealed from the table that 73.33 percent of the respondents had agreed whereas 16.67 per cent of the respondents were undecided and only 10.00 per cent of the respondents had disagreed with the statement FDI will regularly update the market knowledge. It was found that 68.33 per cent of the respondents had agreed and 16.67 per cent of the respondents were undecided, whereas 15.00 percent had disagreed about the statement FDI may provide best quality agro – products at appropriate price. The majority of the respondents (71.67%) had agreed and 18.33 per cent were undecided, whereas 10.00 per cent had disagreed to FDI may make agricultural profession risk – free. It was observed from the results that 61.67 per cent of the respondents had agreed, 18.33 percent were disagreed, while 20.00 percent of the respondents had disagreed to FDI may be helpful in providing the best farm technologies. In the table, it was found that 45.00 per cent of the respondent was agreed and 31.67 per cent of the respondents were undecided, whereas 23.33 per cent had disagreed to FDI may enable the availability of agro-products to consumers' in all the season'. FDI would also bring investment in post-harvest infrastructure that would increase the shelf life of produce and minimize food wastage now as high as 20-30 per cent, (The Economic Survey 2012-13). Moreover, new investment would result in other positive externalities such as better seeds and stricter standards that would increase quality and productivity while lowering costs and it directly benefited the end consumers. FDI in retail should also be crosscutting and modernize not only retail and agriculture but also manufacturing sector. Large number of FDI in the agricultural sector increases agricultural production which directly affects the export of the agricultural product. Most of the time the FDI involves in the export oriented products. Various studies such as Furtan and Holzman (2004) and Timothy Biller (2004) have been undertaken in an attempt to illustrate the impacts of FDI in agricultural export. Accordingly, in this section the researcher tries to analyze the impacts of FDI in agricultural sector.

It was found that there were a number of constraints in opinion of experts. A schedule was developed consisting of 15 statements explaining constraints of different related fields. These constraints were rated on three-point continuum rating scale ranging from 'very serious', 'serious' and 'not so serious' and a weightage of 3, 2 and 1, were assigned, respectively. Based on the responses obtained from the economists, a total score for each problem was worked out and this total score was converted into a weighted mean score and it was expressed in percentage (%) to measure the seriousness of the constraint. A cursory look at Table 2 revealed that Political interference is not allowing FDI in agricultural retail sector (Z = 1.85) was the predominant very serious constraint perceived by the economists. FDI can use farm resources for high-value cash crops' was the 2nd major

Table 2: Constraints Perceived in implementation of FDI in the agricultural retail sector (n = 60)

S. No.	Constraint statements	Response			Total weighted score	Weighted mean score	Z score	Nature of seriousness
		Very serious	Serious	Not so serious				
1.	Political interference is not allowing FDI in agricultural retail sector	19	33	19	131	2.18	1.85	VS
2.	Employment opportunities will be limited	4	30	32	98	1.63	-1.20	NSS
3.	Subsistence nature of farming	1	43	22	105	1.75	-0.56	S
4.	Over fragmented land holdings	1	45	27	107	1.78	-0.37	S
5.	FDI will lead to increased production of commercial crops only	11	23	25	105	1.75	-0.56	S
6.	Natural resources will be exhausted by FDI	8	25	29	101	1.68	-0.93	S
7.	FDI can use farm resources for high-value cash crops	14	39	11	127	2.12	1.48	VS
8.	Real estate issues	8	39	26	115	1.92	0.37	S
9.	Challenges with infrastructure and logistics	15	35	21	125	2.08	1.30	VS
10.	International quality standards of agro-products	9	44	16	122	2.03	1.02	VS
11.	Lack of retail space for storage of agro - products	9	33	26	111	1.85	0.00	S
12.	FDI facing high competition from conventional retail markets	7	35	28	109	1.82	-0.19	S
13.	Rigid government policies and regulations	6	23	29	95	1.58	-1.48	NSS
14.	Insufficient and inefficient power supply	7	34	31	108	1.80	-0.28	S
15.	Understanding consumers behaviour	8	28	30	104	1.73	-0.65	S

Figures in parentheses in column 3, 4and 5indicates percentages, column 6indicates total weighted score, column 7 weighted mean scores, column 8 indicates Z score value and column 9 nature of seriousness.

constraint (Z = 1.48) towards implementation of FDI. Challenges with infrastructure and logistics (Z = 1.30) and International quality standards of agroproducts (Z = 1.02) were reported as 3rd and 4th top most server constraints as per economists response towards implementation of FDI in agricultural retail sector. It would be noteworthy to mention that Real estate issues (Z = 0.37), Lack of retail space for storage of agro – products (Z = 00.00) FDI facing high competition from conventional retail markets (Z = -0.19), Insufficient and inefficient power supply (Z score= -0.28), Over fragmented land holding (Z score = -0.37) were found serious constraints in implementation of FDI in agricultural retail sector according to the economists opinion. The statements like Subsistence nature of farming and FDI will lead to increased production of commercial crops only were perceived serious kind of constraints with equal Z score = -0.56. Understanding consumers' behaviour and Natural resources will be exhausted by FDI were also identified as serious constraints with equal (Z score = -0.65) and (Z score = -0.93) respectively. Accordingly Employment opportunities will be limited (Z score =-1.20) and Rigid government policies and regulations with Z score (Z score = -1.48) respectively were perceived as not so serious constraints by the economists regarding implementations of FDI in agricultural retail sector.

Under this heading advantages of FDI in agricultural retail sector, some important advantages of FDI in agricultural retail sector as per economists opinion were perceived by the respondents (Producers, retailers and consumers). A schedule of selected alternative measure was developed and the economists were asked for the response. The economist's response was measured in three-point continuum, i.e. 'very adventitious', 'adventitious' and 'not so adventitious' and weightage of 3, 2 and 1 were assigned, respectively. Based on the responses obtained from the economists, a total score for each advantage was worked out and this total score was converted into a weighted mean score. The rank was also assigned depending upon the weighted mean score for showing the intensity of these advantages. With regards to advantages of FDI in agricultural retail sector, some major advantages were identified by the economists as experts. Among them, the advantages such as FDI may bring growth and prosperity in agricultural retail sector (mean score = 2.65), FDI may improve infrastructure facilities (mean score = 2.58), Inflow of foreign capital may increase after the implementation of FDI (mean score = 2.58), FDI may provide high quality of farm inputs (mean score = 2.53), FDI may help in decreasing the wastages of agro – products (mean score = 2.53) and FDI may help in reducing the price fluctuation of agro – products (mean score = 2.50) and FDI may reduce import of agro – products (mean score = 2.50) were expressed as major advantages of the FDI implementation in agricultural retail sector. It is also obvious from Table 3 that as per majority of the respondents expressed FDI advantages such as FDI decreases the risk in agricultural retail sector (mean score = 2.48), FDI may provide higher payments to the farmers for agricultural produce (mean score = 2.47), Farmers may get more benefits through FDI (mean score = 2.47), FDI may improve the supply chain system of agro – products distribution (mean score = 2.45), FDI may increase choice of agro – products to the consumers (mean score = 2.43), FDI may generate employment opportunities in agricultural retail sector (mean score = 2.40) and FDI may provide agro – products of international standards (mean score = 2.33). These might be possible advantages for the FDI in agricultural retail sector.

It is vivid from Table 4 that, after the implementation of FDI in agricultural retail sector experienced the following major disadvantages such as Small and marginal farmers may suffer got the top rank (mean score = 2.47) followed by More dependency on external technology and management occupied 2nd top rank with the weighted mean score 2.38. Increases the real estate prices (mean score = 2.33) and Discourages local retailers (mean score = 2.32) stood at 3rd and 4th rank. No real benefit to famers and FDI may uproot the domestic retail stores jointly placed at 5th rank with weight mean score 2.25. Deterioration of market balance (mean score = 2.22) placed at 6th rank. FDI may lead to adoption of inappropriate capital investment technology and Farmers may adopt unsustainable farm practices were jointly shared the 7th rank with weighted mean score 2.20. Over

Table 3: Advantages of FDI implementation in agricultural retail sector

S. No.	Adventitious Statements	Response			Total Weighted Score	Weighted Mean Score
		Very Adventitious	Some What Adventitious	Not So Adventitious		
1.	FDI decreases the risk in agricultural retail sector	33 (55.00)	23(38.33)	04(6.67)	149	2.48
2.	FDI may generate employment opportunities in agricultural retail sector	31(51.67)	22(36.67)	07(11.67)	144	2.40
3.	FDI may provide higher payment to farmers for agricultural produce	30(50.00)	28(46.67)	02(3.33)	148	2.47
4.	Inflow of foreign capital may increase after the implementation of FDI	40(66.67)	15(25.00)	05(8.33)	155	2.58
5.	FDI may improve infrastructure facilities	41(68.33)	13(21.67)	06(10.00)	155	2.58
6.	FDI may bring growth and prosperity in agricultural retail sector	44(73.33)	11(18.33)	05(8.33)	159	2.65
7.	FDI may provide high-quality farm inputs	37(61.67)	18(30.00)	05(8.33)	152	2.53
8.	FDI may help in decreasing the wastage of agro-products	38(63.33)	16(26.67)	06(10.00)	152	2.53
9.	Farmers may get more benefits through FDI	34(56.67)	20(33.33)	06(10.00)	148	2.47
10.	FDI may increase choices of agro-products to the consumers	34(56.67)	18(30.00)	08(13.33)	146	2.43
11.	FDI may help in reducing the price fluctuation of agro-products	37(61.67)	16(26.67)	07(11.67)	150	2.50
12.	FDI may reduce import of agro-products	35(58.33)	20(33.33)	05(8.33)	150	2.50
13.	FDI may provide varieties of agro-products at low prices	25(41.67)	26(43.33)	09(15.00)	136	2.27
14.	FDI may improve the supply chain systems of agro-products distribution	38(63.33)	11(18.33)	11(18.33)	147	2.45
15.	FDI may provide agro - products of standard	34(56.67)	12(20.00)	14(23.33)	140	2.33

Figures in parentheses in column 3, 4and 5indicates percentages.

exploitation of natural resources (mean score =2.18) and Inflation will be increased (mean score = 2.12) were placed at 8th and 9th respectively. Farmers become slave (mean score = 2.10) at 10th place and Monopoly in long term (mean score = 2.08) at 11th place respectively. Shrinking of jobs in agricultural sector and FDI may lead to income inequality between big and small farmers were jointly placed at 12th rank with weighted mean score 2.07.

Table 5 elaborates the specific areas to which the economists perceived more relevant in relation to prospects of FDI in agricultural retail sector. The mean score achieved by most of the technology and production related items was more than 2.63 i.e. more than 2 on a 3 point continuum, which represents a very encouraging scenario. The rank order of different items revealed that the consumers were of the opinion that FDI may generate franchisee opportunities for agricultural retailers and better consumer services with weighted score 2.63. It may promote direct retailing from farmers to consumers and FDI may lead to more urbanization and infrastructure development with the mean score 2.62. 'FDI provides agro-products at reasonable rates due to various discount and promotional schemes' (mean score 2.60) occupied 3rd rank. FDI may provide agro-products at international standards (mean score 2.58) and provide assurance of better shopping experiences (mean score 2.55) were placed at 4th and 5th position respectively. The 6th rank was jointly shared by the statements It may help in better

Table 4: Disadvantages of FDI in the agricultural retail sector

S. No.	Disadvantage statements	Response			Total weighted score	Weighted mean score
		Very serious	Serious	Not so serious		
1.	Small and marginal farmers may suffer	38(63.33)	12(20.00)	10(16.67)	148	2.47
2.	Over-exploitation of natural resources	26(43.33)	19(31.67)	15(25.00)	131	2.18
3.	Inflation may be increased	21(35.00)	25(41.67)	14(23.33)	127	2.12
4.	Farmers may become slave	17(28.33)	32(53.33)	11(18.33)	126	2.10
5.	Shrinking of jobs in agricultural sector	22(36.67)	20(33.33)	18(30.00)	124	2.07
6.	No real benefit to farmers	26(43.33)	23(38.33)	11(18.33)	135	2.25
7.	FDI may uproot the domestic retail stores	30(50.00)	15(25.00)	15(25.00)	135	2.25
8.	Increase the real estate prices	32(53.33)	16(26.67)	12(20.00)	140	2.33
9.	Monopoly in long-term	27(45.00)	11(18.33)	22(36.67)	125	2.08
10.	Deterioration of market balance	29(48.33)	15(25.00)	16(26.67)	133	2.22
11.	Discourages local retailers	32 (53.33)	15(25.00)	13(21.67)	139	2.32
12.	More dependency on external technology and management	36(60.00)	11(18.33)	13(21.67)	143	2.38
13.	May lead to income inequality between big and small farmers	23(38.33)	18(30.00)	19(31.67)	124	2.07
14.	FDI may lead to adoption of inappropriate capital-intensive technologies	29(48.33)	14(23.33)	17(28.33)	132	2.20
15.	FDI may adopt unsustainable farm practices	30(50.00)	12(20.00)	18(30.00)	132	2.20

Figures in parentheses in column 3, 4and 5indicates percentages.

farm resource management and investment in infrastructure like warehousing cold storage etc. with the mean score 2.53. FDI may provide high quality farm inputs and reduce the cost of production received the mean score 2.52. Farmers may avail benefits of contract farming program and may decrease the risk in agricultural retail sector received the mean score 2.48, while Inflow of foreign capital may be increased after the implementation of FDI received mean score 2.52. Further, the statements such as FDI may provide international standard farm technology to the farmers, FDI may provide a variety of choice and diversified bucket of agro-products, FDI may offer more employment even for semi-skilled and unskilled labors, FDI may reduce import of agro –products and FDI may improve the supply chain system were together occupied 2.45 mean score. FDI may provide financial credit to farmers (mean score 2.43) and FDI may be helpful in decreasing the price fluctuation of agro-products (mean score 2.42) got 11th and 12th ranks, respectively. FDI may provide products at reasonable prices due to various discounts and promotional scheme and FDI may lead to growth of the international agricultural retail trade jointly shared 13th rank with mean score 2.40. The four statements FDI may provide safer products, FDI may significantly enhance farmers income, FDI may lead to increase in productivity and efficiency and FDI may provide more choice of agro-products to the consumers were jointly placed at 14th rank with mean score 2.38, while FDI may provide varieties of agro – products at low prices (mean score 2.32), FDI may have access to advanced technology (mean score 2.27) and FDI may bring growth and prosperity in agricultural retail sector (mean score 2.22) were in lower order.

A look at the Table 6 makes it clear that age, education and family type were found positively and non-significantly correlated with all the dependent variables. There was positive and significant correlation of family background, marital status and family occupation with dependent variables perception, constraints,

Table 5: Economists' prospects of FDI in the agricultural retail sector

S. No.	Statements	Response			Total weighted score	Weighted mean score	Overall response (%)
		More bright	Somewhat bright	Not at all bright			
1.	FDI may provide international standard farm technology to the farmers	32(53.33)	23(38.33)	05(8.33)	147	2.45	14.41
2.	FDI may generate franchisee opportunities for agricultural retailers	44(73.33)	10(16.67)	06(10.00)	158	2.63	15.49
3.	FD1 may provide a variety of choice and diversified bucket of agro-products	33(55.00)	21(35.00)	06(10.00)	147	2.45	14.41
4.	FDI may provide agro-products at international standards	38(63.33)	19(31.67)	03(5.00)	155	2.58	15.20
5.	FDI may provide products at reasonable rates due to various discounts and promotional schemes	30(50.00)	24(40.00)	06(10.00)	144	2.40	14.12
6.	FD1 may promote direct retailing from farmers to customers	41(68.33)	15(25.00)	04(6.67)	157	2.62	15.39
7.	FDI may reduce profit of middlemen	36 (60.00)	24(40.00)	00(6.67)	156	2.60	15.29
8.	FDI may provide better customer services i.e. home delivery, easy return, etc.	42(70.00)	14(23.33)	04(6.67)	158	2.63	15.49
9.	FDI may provide assurance of better shopping experiences	38(63.33)	17(28.33)	05(8.33)	153	2.55	15.00
10.	FDI may provide safer products i.e. no adulteration in food products	30(50.00)	23(38.33)	07(11.67)	143	2.38	14.02
11.	FDI may significantly enhance farmer's income	33(55.00)	17(28.33)	10(16.67)	143	2.38	14.02
12.	FD1 may help in better farm resource management	37(61.67)	18(30.00)	05(8.33)	152	2.53	14.90
13.	FDI may invest in infrastructure like warehousing, cold storage	38(63.33)	16(26.67)	06(10.00)	152	2.53	14.90
14.	FDI may provide financial credit to farmers	29(48.33)	28(46.67)	03(5.00)	146	2.43	14.31
15.	Farmers may have access to advanced technology	26(43.33)	24(40.00)	10(16.67)	136	2.27	13.33
16.	Farmers may avail benefits of contract farming program	35(58.33)	19(31.67)	06(10.00)	149	2.48	14.61
17.	FDI may lead to more urbanization and infrastructure development	40(66.67)	17(28.33)	03(5.00)	157	2.62	15.39
18.	FDI may offer more employment even for semi-skilled and unskilled labourers	35(58.33)	17(28.33)	08(13.33)	147	2.45	14.41
19.	FDI may result in the increased land price	35(58.33)	19(31.67)	06(10.00)	149	2.48	14.61
20.	FDI may lead to increase in productivity and efficiency	34(56.67)	15(25.00)	11(18.33)	143	2.38	14.02

Table 5 contd...

S. No.	Statements	Response			Total weighted score	Weighted mean score	Overall response (%)
		More bright	Somewhat bright	Not at all bright			
21.	FDI decreases the risk in agricultural retail sector	29(48.33)	26(43.33)	05(8.33)	144	2.40	14.12
22.	FDI may generate employment opportunities in agricultural retail sector	25(41.67)	33(55.00)	02(3.33)	143	2.38	14.02
23.	FDI may lead to the growth of the international agricultural retail trade	28(46.67)	28(46.67)	04(6.67)	144	2.40	14.12
24.	Inflow of foreign capital may be increased after the implementation of FDI	36(60.00)	16(26.67)	08(13.33)	148	2.47	14.51
25.	FDI may improve infrastructure facilities	35(58.33)	21(35.00)	04(6.67)	151	2.52	14.80
26.	FDI may bring growth and prosperity in agricultural retail sector	22(36.67)	29(48.33)	09(15.00)	133	2.22	13.04
27.	FDI may reduce the cost of production	33(55.00)	21(35.00)	02(3.33)	151	2.52	14.80
28.	FDI may provide high-quality farm inputs	35(58.33)	21(35.00)	04(6.67)	151	2.52	14.80
29.	FDI may help to decrease the wastages of agro - products	38(63.33)	16(26.67)	06(10.00)	152	2.53	14.90
30.	FDI may provide more choice of agro-products to the consumers	29(48.33)	25(41.67)	06(10.00)	143	2.38	14.02
31.	FDI may be helpful in decreasing the price fluctuation of agro-products	31(51.67)	23(38.33)	06(10.00)	145	2.42	14.22
32.	FDI may reduce import of agro-products	34(56.67)	19(31.67)	07(11.67)	147	2.45	14.41
33.	FDI may provide varieties of agro-products at low prices	28(46.67)	23(38.33)	09(15.00)	139	2.32	13.63
34.	FDI may improve the supply chain systems of agro-products distribution	31(51.67)	25(41.67)	04(6.67)	147	2.45	14.41
35.	FDI may provide agro - products of standard	30(50.00)	23(38.33)	07 (11.67)	143	2.38	14.02

Figures in parentheses in column 3, 4and 5indicate percentages;

Table 6: Correlation between dependent and independent variables of economists for implementation of FDI in agricultural retail sector (n = 60)

S.No.	Independent variables	Correlation coefficient (r)				
		Perception for FDI	Constraints of FDI	Disadvantages of FDI	Advantages of FDI	Prospects of FDI
1.	Age	+0.098^{NS}	+0.223^{NS}	0.174^{NS}	0.027^{NS}	0.172^{NS}
2.	Education	+0.024^{NS}	+0.029^{NS}	+0.001^{NS}	+0.139^{NS}	+0.026^{NS}
3.	Family background	+0.043^{NS}	0.001^{NS}	0.220^{NS}	0.072^{NS}	0.064^{NS}
4.	Marital	0.152^{NS}	0.129^{NS}	0.199^{NS}	0.025^{NS}	0.103^{NS}
5.	Family Occupation	0.114^{NS}	+0.092^{NS}	0.069^{NS}	0.182^{NS}	0.113^{NS}
6.	Family type	0.186^{NS}	0.077^{NS}	+0.160^{NS}	0.022^{NS}	0.205^{NS}
7.	Experience	+0.134^{NS}	+0.088^{NS}	-0.100^{NS}	+0.015^{NS}	-0.128^{NS}

NS=Non Significance

disadvantages, advantages and prospects. With regard to experience of the respondents, it was found positively and significantly related with perception, constraints, disadvantages, advantages but were found positively and significantly correlated with all the dependent variables but disadvantages and prospects both the variables could establish negative and significant relationship with experience of the respondents.

CONCLUSION

The FDI flow in the agricultural Retail sector in India has shown a change in terms of size and capital investment. Although, the government prepared regulatory framework to increase the number of FDI, the benefits of the sector is not entirely satisfactory. The domino effect of lower implementation rate of investment is lower capital flow and employment opportunity in the economy. Further, the regional variation of FDI in the sector aggravates the regional inequality existed in the country. The government must work more on the infrastructural development beyond the provision of various incentive packages. In addition, in order to exploit the sector properly, the government must select the comparative advantage of the country and encourages FDI to involve just opening all sectors for FDI without a detail and thorough study may bring coordination failure in the subsectors.

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Perception of the Faculty about the Importance of the Dimensions of Organizational Climate of Selected State Agricultural Universities

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ABSTRACT

The study was conducted in four state agricultural universities of India viz. PAU Punjab (North); ANGRAU, Andhra Pradesh (South); AAU, Assam (East) and MPAU, Rajasthan (West) to study the variations in perceptions of the faculty and administrators regarding the importance of dimension of organizational climate along with their perception of prevailing and expected organizational climate. The data collected from the 216 faculty members using a scale developed on 13 dimensions viz. communication, management of rewards, interpersonal relationships, control and supervision, orientation, decision making, leadership, policies and rules, innovation, physical facilities, team work, monetary gains and accountability/ evaluation revealed that communication followed by leadership, team work and physical facilities were the most important dimensions according to the faculty who ranked monetary gains, accountability/ evaluation, management of rewards and control and supervision as least important.

Keywords: Perception, Importance, Organisational climate dimensions, Faculty and state agricultural university

INTRODUCTION

Numerous studies on organizational climate of both private and public sectors have shown that behaviour of the employees is governed by their perception of the organizational climate. In the last twenty years, organizational climate has been analyzed from many points of view. Likert (1967) proposed six dimensions of organizational climate whereas Litwin and Stringer (1968) proposed seven dimensions and Pareek *at al.* (1981) proposed twelve processes of organizational climate. Various studies using these dimensions have been conducted. Jhamtani and Singh (1987) used twelve and Iqbal (1999) used nine whereas Kaur (2004) analyzed the organizational climate on five dimensions. SAU's have a system of functioning which is unique due to radiations in role and responsibilities. The faculty moves beyond playing a singular role of a teacher, a scientist or an extension worker. This uniqueness calls for an in-depth analysis of the organizational climate of these institutions as perceived by the faculty and the administrators. Such analysis may enable SAU's which have been structured and other beside the ICAR system as a whole to identify the critical dimensions of organizational climate and bridge gap between the existing and expected organizational climate to improve working environment and productivity. In this context, the present study has been designed to analyze the organizational climate in totality, firstly by analyzing the importance of the dimensions in determining the organizational climate using thirteen identified dimensions and further by capturing the gap in the existing and expected organizational climate of four SAU's representing north, south , east and west zone of the country. Keeping the above in sharp focus, the present paper has been designed with the objective to study the perception of the faculty of selected SAU's regarding the importance of the identified dimensions of organizational climate.

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METHODOLOGY

The widely adaptable descriptive research survey design was used in the present study. The study was conducted in four State Agricultural Universities from Northern, Southern, Eastern, and Western zone of India viz. PAU Punjab (North); ANGRAU, Andhra Pradesh (South); AAU, Assam (East) and MPAU, Rajasthan (West). Sample of 54 faculty members representing variations in hierarchy and equal allocation to teaching, research and extension of each university were selected. Hence a total of 216 faculty members were selected as the total sample for the study. Perception of organizational climate was considered as dependent variable. Organizational climate scale was developed using Likert technique for measuring the prevailing and expected organizational climate. It comprised of 13 dimensions viz. communication, management of rewards, interpersonal relationships, control and supervision, orientation, decision making, leadership, policies and rules, innovation, physical facilities, teamwork, monetary gains and accountability/ evaluation. Socio-personal characteristics were selected as independent variable. An interview schedule consisting of two parts and a questionnaire consisting of two parts was developed for collection of data. Each respondent was contacted personally to explain the objectives of the study and record the profile and the ranking of the selected dimensions according to their importance in organizational climate. Responses were coded, tabulated and analyzed. Statistical techniques used for analyzed the data were frequency, percentage, mean score, Kendall's coefficient of concordance for ranks (W) and Kruskal-Wallis test. The findings emerged out of the data were suitably interpreted and conclusions were drawn.

RESULTS AND DISCUSSION

The data in Table 1 shows the ranking of different dimensions of the organizational climate. The ranking was based upon the importance given to selected dimensions of the organizational climate by the faculty of the four SAU's. To study the agreement in ranking by faculty of different SAU's, Kendall's coefficient of concordance for ranks (W) was worked out using the scores calculated based upon the ranks given. Data reveals that among the dimensions of organizational climate the faculty perceived communication as the most important dimension which affected the organizational climate. It was followed by

Table 1: Variation in the importance assigned to the dimensions of organizational climate by faculty of different SAU's

Dimensions of organizational	AAA		ANGRAU		PAU		MPAU		Total (N=216)	
climate	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank
Communication	3.67	**1**	2.59	**1**	4.39	**2**	3.85	**1**	3.63	**1**
Management of rewards	9.89	**13**	7.54	**11**	7.56	**11**	7.06	**8**	8.01	**11**
Interpersonal relationship	7.57	**9**	5.57	**7**	6.50	**8**	7.43	**11**	6.77	**9**
Control and supervision	8.83	**12**	7.24	**10**	7.11	**10**	7.41	**10**	7.65	**10**
Orientation	3.69	**2**	4.83	**4**	7.04	**9**	7.31	**9**	5.72	**6**
Decision making	4.85	**3**	5.20	**6**	5.13	**4**	5.43	**3**	5.15	**5**
Leadership	5.24	**5**	4.70	**3**	3.81	**1**	4.63	**2**	4.60	**2**
Policies and rules	6.67	**7**	6.56	**9**	6.11	**7**	5.96	**7**	6.32	**8**
Innovation	6.68	**8**	5.63	**8**	5.96	**5**	5.91	**6**	6.04	**7**
Physical facilities	5.50	**6**	4.91	**5**	6.02	**6**	5.56	**4**	5.50	**4**
Teamwork	4.91	**4**	4.69	**2**	5.04	**3**	5.89	**5**	5.13	**3**
Monetary gains	7.72	**10**	7.72	**13**	10.98	**13**	9.70	**13**	9.03	**13**
Accountability/ Evaluation	8.54	**11**	7.56	**12**	9.63	**12**	8.76	**12**	8.62	**12**
Kendall's coefficient of concordance (W)	0.860									
chi-square	**30.95****									

**Significant at 1% level of significance.

leadership, teamwork and physical facilities. The lowest ranked dimensions were monetary gains, accountability/ evaluation, management of rewards and control and supervision. The university wise data shows that communication was the most important dimension except in case of PAU faculty who ranked leadership as the most important followed by communication. However statistically, agreement existed between the ranking given to all the dimensions. The faculty of AAU assigned lesser importance to leadership (Rank 5) as compared to the other universities. Teamwork, which was ranked third in overall organizational climate, was perceived as less important (Rank 5) by faculty of MPAU. The exception in case of decision making was also observed. Faculty of AAU, MPAU and PAU perceived it to be more important than faculty of ANGRAU (Ranked 6). Jhamtani and Singh (1987) also reported the importance of team as a determinant of desirable organizational climate. Faculty assigned least importance to the dimension of accountability/ evaluation and monetary gains (Rank 13). Views were similar in all universities except AAU (Rank 11), where faculty found management of rewards as least important. In overall organizational climate, management of rewards occupied 11th rank and same was in case of ANGRAU and PAU whereas faculty of AAU found it to be least important. Faculty of MPAU found it to be more important (Rank 8). Rewards were also given importance in determining the organizational climate by Richard *et al.* (2004).

Faculty of ANGRAU, PAU and MPAU were in agreement in ranking the dimension of control and supervision (Rank 10) but AAU faculty perceived it as less important (Rank 12). Similar was the case of interpersonal relationship as lesser importance to this dimension was given by the faculty members of MPAU. Variation in importance assigned to dimension of 'orientation' was also observed. PAU and MPAU (Rank 9) were in agreement whereas AAU (Rank 2) and ANGRAU (Rank 4) assigned much higher importance to it. Similarly leadership was most important to the faculty of PAU (Rank 1) followed by that of MPAU (Rank 2) but AAU faculty ranked it as 5th most important determinant of organizational climate. ANGRAU faculty assigned lesser importance to policies and rules (Rank 9) as compared to all the other three universities (Rank 7) in which faculty was in complete agreement. Innovation was also perceived as more important dimension by faculty of PAU (Rank 5) than AAU and ANGRAU (Rank 8). However, variation was less between PAU and MPAU faculty (Rank 6). Teamwork was ranked second most important dimension by ANGRAU but was ranked 5 by MPAU. PAU faculty placed it at rank 3 and AAU at rank 4. Degree of trust and morale were also found to be important to organizational climate by Richard (2004). Teamwork has become an important part of the working culture and many organizations now look at teamwork skills when evaluating a person for employment. Most organization realizes that teamwork is important because complex work requires a team with multiple skills for provide better results.

The data therefore reveals that disagreement and agreement existed in perception of the faculty across SAU's regarding the importance of these dimensions. Further, the Kendall coefficient (w) revealed that statistically the faculty across the four selected universities were in agreement in ranking of dimensions. It may be due to the fact that similar people likely to have similar ways of viewing their surroundings, which leads to greater consensus regarding perceptions on importance of dimensions in organizational climate. Hence, it can be concluded that with minor variations, agreement existed among the faculty pointing towards the importance of communication and leadership and least importance of monetary gains. It may be due to the fact that organizational climate is based on employee's perceptions and when these perceptions are shared by members of a specific unit or department it results in employees behaving in similar ways (Schalt *et al.*, 2006). The data shows that dimension of 'communication' was perceived as the most important to organizational climate. Information flow from administration to the faculty, vice versa and in between faculty at all levels is especially important for a conductive organizational climate and achievement of results as proved by many past studies. Open communication is necessary to facilitate goal accomplishment. Jones and James (1977) also ranked communication as the number one dimension of

organizational climate. According to Reddy (2002) informal and friendly communication among peer groups widen the communicative openness among the university scientists. Leadership was perceived as important dimension (Rank 2) in an organizational climate. It may be due the understanding the faculty that the success of an organization depends upon the leadership capabilities of the authority and leader. Leaders also have a powerful influence on the expectations and behaviours of employees in the organization. Richard *et al.* (2004) pointed out that the success of an organization is also determined by the credibility of the leader. Woodman and King (1978) also identified leadership as a vital dimension of organizational climate.

CONCLUSION

From the data it can be concluded that among the dimensions of organizational climate the faculty perceived communication as the most important dimension which affected the organizational climate. It was followed by leadership, teamwork and physical facilities. The lowest ranked dimensions were monetary gains, accountability/ evaluation, management of rewards and control and supervision. There was university wise variation in assigned importance to different dimensions of organisational climate, such as the faculty of AAU assigned lesser importance to leadership as compared to the other universities. The university wise data shows that communication was the most important dimension except in case of PAU faculty who ranked leadership as the most important followed by communication. However statistically, agreement existed between the ranking given to all the dimensions of organisational climate.

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Influence of Profile Characteristics on Knowledge Level about Drip Irrigation System

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ABSTRACT

This paper tries to find out the knowledge level of sugarcane farmers about drip irrigation system and also the profile characteristics influencing knowledge level of sugarcane drip farmers. The investigation was carried out in three districts of Telangana state with 240 sugarcane drip farmers. The three districts were selected purposively as they had highest area under sugarcane cultivation. The results revealed that most of the sugarcane drip farmers had medium level of knowledge about drip irrigation system. Finally correlation and step-down regression analysis was used to find out the most influencing profile characteristics on level of knowledge of sugarcane drip farmers.

Keywords: Correlation, Drip irrigation system, Education, Knowledge, Profile characteristics, Regression, Sugarcane, Training

INTRODUCTION

Water is a precious natural resource in the world. Of the available water, major chunk is utilized for agriculture. The estimated global withdrawal of water for agriculture is 69 per cent followed by 21 and 10 per cent by industries and municipalities respectively (Palanisami and Paramasivam, 2003). Various studies reported that by 2025, one-third of the developing countries in the world will face severe water crisis. Present alarming situation demands scientific management of available water. Drip irrigation is a pragmatic advancement in irrigation science. In India, drip irrigation is adopted in 4 lakh ha (Karpagam *et al.*, 2010). Maharashtra is the leading state where 1.42 lakh ha area is under drip irrigation system followed by Karnataka (64,000 ha). However, total drip irrigated area is less than one percent of the total irrigated area in India. There are several factors which have influenced the adoption and maintenance of drip irrigation; among them knowledge on drip irrigation system is very important one. The study not only explored the knowledge level of sugarcane drip farmers but also brings out the personal characteristics which influence the knowledge level of the sugarcane drip farmers.

METHODOLOGY

The study was conducted using descriptive type of research design applying ex-post facto research. The state of Telangana was chosen purposively for the study, three zones of the state (Southern Telangana, Northern Telangana and Central Telangana) were selected purposively, One district was selected purposively from each agro climatic zone based on highest area under sugarcane crop, thus the study area constitute three districts, accordingly Nizamabad from Northern Telangana, Medak from Central Telangana and Mahabubnagar from Southern Telangana districts were selected. Two mandals were selected randomly from each district, thus constitute six mandals, four villages were

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selected randomly from each mandal thus constitute 24 villages for the study. The respondent for the study was operationally defined as the farmers who adopted drip irrigation system in sugarcane crop. Ten respondents were selected from each village constituting 240 farmers.

A knowledge test was developed through item analysis. Out of 60 items 25 items were selected for the final knowledge test by calculating the item difficulty index, item discrimination and point biserial correlation. All the 25 items in the knowledge test read out to the sugarcane drip farmers after establishing rapport with them and were asked to answer the items by themselves. A score of one and zero was assigned for correct and wrong answer for each item respectively and the total number of correct responses given by sugarcane drip farmers out of the 25 items was the knowledge score obtained by him or her.

To study the influence of profile characteristics on knowledge level of sugarcane drip farmers correlation and step-down regression analysis were used.

RESULTS AND DISCUSSION

The knowledge level of sugarcane farmers about drip irrigation system is presented in Table 1. The results in the Table 1 indicates that, 42.50 per cent of the sugarcane drip farmers were under the category of medium knowledge followed by low level of knowledge (30.00%) and high level of knowledge (27.50%). These results are in conformity with the findings of Timbadia *et al*. (1993); Joshi (2004); Jitarwal and Sharam (2007); Modi *et al*. (2008) and Ghanghas *et al.* (2015).

The medium to low level of knowledge of respondents on drip irrigation system in sugarcane crop can be attributed to the fact that to complete targets, MI (micro irrigation) companies and subsidy given by government agency, MI companies supply the drip materials to farmers without considering farmers knowledge about drip irrigation system.

Table 1: Distribution of the sugarcane drip farmers according to their level of knowledge (n=240)

Category	Frequency	Percentage
Low	72	30.00
Medium	102	42.50
High	66	27.50

Influence of profile characteristics on level of knowledge of sugarcane drip farmers was studied by using correlation and step down regression analysis of profile characteristics with level of knowledge are furnished in Table 2 and Table 3.

Among all the selected thirteen variables there was a positive and significant relationship between level of knowledge of sugarcane farmers on drip irrigation system and the education, trainings undergone, extension contact, sociopolitical participation, information management behaviour, risk taking ability, level of aspiration and there was a negative and significant relationship between level of knowledge of sugarcane farmers on drip irrigation system and age.

The value of the coefficient of multiple determination (R^2) as given in table. indicates that the ten independent variables *viz.*, education, farm size, farming experience, area of sugarcane under drip, annual income, trainings undergone, socio-political participation, information

Table 2: Relationship of profile characteristics with the level of knowledge drip irrigation system by sugarcane farmers

Independent variables	Level of knowledge
Age	-0.228389*
Education	0.349145**
Farm size	0.038801^{NS}
Farming experience	-0.01565^{NS}
Area of sugarcane under drip	0.035687^{NS}
Annual income	0.013868^{NS}
Trainings undergone	0.439389**
Extension contact	0.227724*
Socio political participation	0.257926*
Information management behaviour	0.3275599*
Risk taking ability	0.245625 *
Innovativeness	0.041021^{NS}
Level of aspiration	0.235482*

*Significant at 5% level of significance; **Significant at 1% level of significance.
NS=Non Significance

Table 3: Contribution of profile characteristics towards level of knowledge of sugarcane drip farmers

No.	Profile characteristics	Sugarcane drip farmers (n=240)			
		'b' value	SE	't' value	Sig.
X_2	Education	0.250	0.065	2.826	0.020**
X_3	Farm size	0.051	0.090	1.571	0.050**
X_4	Farming experience	0.129	0.058	1.242	0.026**
X_5	Area of sugarcane under drip	0.089	0.130	1.686	0.042**
X_6	Annual income	0.180	0.133	0.350	0.178
X_7	Trainings undergone	0.095	0.066	2.9953	0.005*
X_9	Socio political participation	0.145	0.061	0.2436	0.019**
X_{10}	Information management behaviour	0.158	0.059	2.6907	0.008*
X_{12}	Innovativeness	0.069	0.055	1.0476	0.036**
X_{13}	Level of aspiration	0.181	0.063	4.3963	0.004*

management behaviour, innovativeness and level of aspiration put together could explain 79.90 per cent of variation in the dependent variable of the level of knowledge of sugarcane farmers on drip irrigation system.

Education equips individuals with the necessary knowledge to respond to unforeseen events. Literate individuals are very keen to get information and use it. Education promotes awareness about the possible advantages of modern agriculture and the use of modern technologies. This might be due to the fact that extension personnel are the best and reliable sources of information; contact with extension personnel gives more knowledge about drip irrigation system in sugarcane crop. Training is an investment to upgrade the human resource. It brings changes in knowledge and skills related to one's profession. It is a common feature that farmers who actively participate in social activities through social & political organizations come across different types of people, exchange one's views and experiences, seek solutions for their problems and thereby gain more and more new knowledge. This might be due to the fact that an individual having medium to high innovativeness desires to seek changes in farming and introduces in his own operation and try to have more knowledge of those techniques to decide the pros and cons of them before actually implementing them. The probable reason might be that a farmer who wants to take risk during operation and maintenance of drip irrigation system in sugarcane crop will try to develop his knowledge with regard to the crop and its operation. The result supports the general view that medium information management behaviour enhances the knowledge of the farmers on several aspects of farm technology. Farmers who keep in touch with Personal-cosmopolite channels and localite channels are likely to have better knowledge on the current advances in agriculture. Higher aspiration leads to a desire to acquire higher knowledge in order to keep themselves abreast with recent improved agricultural practices.

CONCLUSION

In the present scenario, adoption and extent of use of agricultural technologies is a very crucial factor. The medium to low level of knowledge of sugarcane farmers will lead to medium extent of use and maintenance of drip irrigation system, so there is need to offer more training programmes about maintenance of drip irrigation system in sugarcane crop.

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Physiological Workload and Postural Discomfort Among the Farm Women During Vegetable Transplanting

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ABSTRACT

Manual transplanting of vegetable saplings are labour intensive and time consuming operation. During the manual transplanting of saplings of vegetables, farm workers are highly affected by excessive physiological workload and postural discomfort which are the major cause of human drudgery. Pace of work, time spent in various activities, static body position and physiological and mental strain etc. are also the important factors which affect the work capacity of the farm workers. The study was undertaken to assess the physiological workload and postural discomfort among farm workers during conventional method and mechanized method of vegetable sapling transplanting. Physiological parameters i.e. HR, energy expenditure, TCCW and PCW etc. were measured during transplanting operations. The center of gravity method was used to assess the postural discomfort among farm workers. Total 30 farm women were selected for the study. The results revealed that working heart rate (HR work) of the subjects when the vegetable seedling transplanting was performed with conventional method ranged from 122.25 to 154.65 beats/min with a mean value of 135.65 ± 9.54 beats/min. OCR was found to be 1.06 ± 0.38 and 0.54 ± 0.43 l/min, respectively for manual and mechanized method of vegetable transplanting.

Keywords: Discomfort, Physiological, Postural, Transplanting, Vegetable, Workload

INTRODUCTION

The health benefits of vegetables are well recognized by nutritional and medical communities. Vegetables occupy an important place in Indian diets as they increase their nutritive value and palatability (Kaur, 2016). In worldwide, India ranks second in producing the vegetables. Vegetable production is labour intensive and can generate 3 - 10 times the employment and income per hectare of land compared to that of cereals. Vegetables also create a number of job opportunities in complementary businesses that arises such as marketing, processing and transportation. The demand for horticultural products is projected to grow significantly in the coming decades, due to an increase in the awareness of their nutritional importance and the resultant increase in their consumption. This offers an opportunity to absorb an ever-increasing unemployed labour force. Agriculture ranks among the most hazardous industries. Farmers are at very high risk for fatal and non-fatal injuries; and farming is one of the few industries in which family members (who often share the work and live on the premises) are also at risk for fatal and non-fatal injuries (NIOSH, 2013).

The farm workers perform these multiple tasks in a traditional manner due to limited knowledge and skill, which consumes most of their time and energy. There is no doubt that some of the traditional implements have low risk but at the same time they also have high level of

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occupational health hazards. The risk factors includes awkward body postures, repetitive movements and long working hours which ultimately leads to occupational health hazards like drudgery, musculoskeletal disorders, postural discomfort and body pain etc.

A large number of studies have revealed that different component of vegetable production produces postural discomforts in body of farm workers. This is why the productivity of crop and working efficiency of farm workers both are declined. Keeping the above mentioned fact in mind, this study was planned to assess the physiological workload and postural discomfort among the farm workers during vegetable transplanting.

METHODOLOGY

The ergonomical evaluation of vegetable seedling transplanting was conducted with female agricultural workers at Krishi Vigyan Kendra, Banda in the month of October 2018. Thirty female subjects in the age group of 20- 55 years were selected because they usually attain their highest strength level between 20-45 years (Mc Ardle *et al.*, 2001). The vegetable seedling transplanting operation was done for 7:00 A.M.12:30 P.M. and 2:00 P.M. to 5:30 P.M. for the comparison of drudgery in mechanized and conventional method. Farm women performed the vegetable seedling transplantation activity with manual transplanting in squatting posture and with Hand operaterated vegetable transplanter in standing posture. Farm women performed the continuous transplanting operations for 50 minutes and taking 10 minutes break. For the assessment of physical and physiological parameters of female workers heart rate, blood pressure, VO2 max, body mass index (BMI), age, weight, energy expenditure, total cardiac cost of work (TCCW) and physiological cost of work (PCW) were taken into consideration. Before going to field HR rest, blood pressure, and oxygen consumption rate of the subjects were measured. After 50 minutes of continuous operation HR work, VO2, energy expenditure, total cardiac cost of work, physiological cost of work, rate of perceived exertion and overall discomfort rating were measured. Segmental method of Center of gravity was used to assess the deviation of center of gravity of body from normal body posture.

The subjects were calibrated with the Harvard step stool test to determine their physical fitness index by using following formula:

Physical fitness index = Duration of stepping × 100 / Sum of 1^{st}, 2^{nd} and 3^{rd} minute recovery heart rate

The physical fitness of the respondents was calculated and interpreted by using physical fitness index (PFI) score given by Verghese *et al.* (1994) and the respondents were ranked from poor to excellent. The resting heart rate (HR rest), oxygen consumption rate at rest (VO2 rest) and the blood pressure were measured at rest and 15 minute prior to any experiment. The blood pressure of the samples was measured by digital blood pressure monitor and the heart rate was measured by Polar heart rate monitor and recorded as HR=beat/min.

The oxygen consumption rate was calculated by following formula:

VO2= 0.023 × Body weight (kg) - 0.034 × Age (years) + 1.65

The body mass index of subjects was calculated by dividing square of height (m^2) to weight (kg).

Following formula was used to calculate the total cardiac cost of work (TCCW) and physiological cost of work (PCW).

Total cardiac cost of work = cardiac cost of work + cardiac cost of recovery.

TCCW = CCW + CCR; where

CCW = AHR × Duration of activity; where

AHR = Avg. working HR- Average resting HR

CCR = (Avg. recovery HR- Average resting HR) × Duration.

Physiological cost of work = Duration of work/TCCW

Energy Expenditure was calculated using the formula:

EE (Kj/min) = 0.159 × HR (beats/min) –8.72

The whole body center of gravity (CG) of the workers were determined by segmental method in normal erect posture, which was taken as reference posture and

in other postures adopted by farm workers during traditional and mechanized method of transplanting. The location of CG was compared by the following equations:

Percentage of location of CG = Length of CG from ground/Total length of the body x 100

Two-sample t-test assuming unequal variances was performed among the female farm workers to find out whether there is any significant difference in ergonomical parameters of workers for the chosen level of significance (P<0.0001). Statistical analysis was performed using the statistical package IBM SPSS statistics (Version =20).

RESULTS AND DISCUSSION

Heart rate: The working heart rate (HR work) of the subjects when the vegetable seedling transplanting was performed with conventional method ranged from 122.25 to 154.65 beats/min with a mean value of 135.65 ± 9.54 beats/min. The corresponding values with hand operated vegetable transplanter were 103.78 to 126.45 and 118.32 ± 7.67 beats/ min, respectively. The mean work pulse (HR) with manual transplanting was observed to be 63.99 ± 6.21 beats/min but reduced to 39.7 ± 10.9 beats/min with mechanized method; a reduction of HR by 11.68 per cent. Work pulse of 40 beats/ min is the allowable limit for sustained working (Kroemer *et al.*, 1997).

Oxygen consumption rate (OCR): OCR was found to be 1.06 ± 0.38 and 0.54 ± 0.43 l/min, respectively for manual and mechanized method of vegetable transplanting. T-test showed a significant decrease (17.54%) in OCR with mechanized method (P<0.0001). An OCR of 0.63 l/min and HR of 105 beats/ min for women were considered acceptable for sustained work of 8 hours with intermittent rests (Mohanty *et al.*, 2008).

Energy expenditure rate (EER): EER with manual transplanting was observed to be 18.43 ± 2.02 kJ/ min whereas with hand row vegetable transplanter it decreased to 9.40 ± 0.95 kJ/min (14.25%). The total cardiac cost of work (TCCW) was found to be 1956.3 and 765.4 in case of manual and mechanical method respectively. With vegetable tranplanter, the TCCW reduced by 47.46 per cent. The corresponding physiological cost of work (PCW) was 218.54 and 22.17 in manual and mechanical transplanting, respectively.

Table 1: Comparative ergonomic evaluation of manual vegetable transplanting with hand operated vegetable transplanter

Physiological parameters	Manual Transplanting			Transplanting with vegetable transplanter			% Decrease	t cal
	Range	Mean	SD	Range	Mean	SD		
HR work (beats/min)	122.25-154.65	135.65	9.54	103.78-126.45	118.32	7.67	21.97	0.975
Work pulse (beats/min)	54.32-75.21	63.99	6.21	39.8 –50.8	39.7	10.9	11.68	1.219
VO2 work (l/min)	0.54-1.75	1.06	0.38	0.49-1.17	0.54	0.43	17.54	0.623
EER (kJ/min)	14.36-21.35	18.43	2.02	9.54-13.54	9.40	0.95	14.25	0.060
TCCW	-	1956.3	61.23	-	765.4	63.66	47.46	0.461
PCW	-	218.54	25.17	-	117.98	22.17	4.32	1.653

Table 2: Percent deviation of center of gravity in various working posture during manual and mechanical vegetable transplanting

Different body postures adopted by respondents	Manual method		Mechanical method		t value
	CG of women	Percent deviation from normal	CG of women	Percent deviation from normal	
Normal Standing Posture	59.2±3.92		59.2±3.92		
Transplanting					
Standing	49.87±10.69	9.89	55.49±7.13	3.26	4.87**
Bending	35.64±6.87	22.90	52.69±5.41	17.75	7.95**
Squatting	38.22±1.23	35.43	-	-	-

During the operation of manual transplanting, female farm workers adopt standing and bending postures for longer duration of time and perform the activity in repetitive motion. In standing body posture during manual method of transplanting the deviation of CG of female farm workers it was shifted to 9.89 per cent (49.87±10.69) whereas in mechanical method it was assessed as 3.26 per cent (55.49±7.13). During the bending position the location of CG of female farm workers during manual transplanting was 22.90 (35.64±6.87) and in mechanical method it was found 17.75 (52.69±5.41) respectively. Agrawal *et al.* (2004) studied the effect of linkage of ergonomic performance of agricultural workers. In posture extremes, muscles may not be able to produce the forces requires by the task, may place extreme stress on tendons and may put pressure on nerve tissue and blood vessels (Jumah and Nyame, 2004).

CONCLUSION

From this investigation it has been concluded that in manual method of uprooting and transplanting, agricultural workers adopt traditional sitting, bending and squatting body postures with folded legs. This is directly associated to high postural stress and work performance of the farmers. As body joint angles and the location of center of gravity had lesser degree of deviation from the reference position during vegetable transplanting operations, a lesser degree of postural stress was imposed in reference postures. Hence, the agricultural workers involved in vegetable seedling transplanting operation may be suggested to work with improved and mechanized method to lessen work related postural stress.

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Risk Factors for Academic Backwardness: An Intervention Study

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ABSTRACT

Academic backwardness in school is not simply an intellectual matter, but that it is a condition where normal school achievement has been prevented by a variety of interacting influences. Therefore, the present study examined the risk factors which are associated with academic backwardness among school children. The sample consisted of 76 academically backward children of both the gender studying in 8th and 9th standards from two villages of Dharwad taluk. A structured checklist developed by AICRP – CD scientists on reasons for academic backwardness was used to assess the causal factors for academic underachievement. Results revealed that majority of children expressed hard to study some subjects, slow in writing and inability to give answers to all the questions in the exams quoted as academic reasons. In familial factors children perceived that their home environment is not conducive for the study, family income and parent's occupation disturbing their studies, parents and family members did not contributing much to their studies and lack of expected cooperation from family members. With respect to health problems worry, tension and stress during study, Tiredness due to the long distance of school from home, lack of concentration, headache and restlessness making the child to underachieve in the school. The intervention was found to be effective in modifying the environment of school, home and also the behavior of students, parents and teachers. Hence reducing the risk factors related to academic, familial and health aspects.

Keywords: Academically backward, Familial reasons, Health reasons, Intervention, Mass academic reasons

INTRODUCTION

It is a universal truth that all children are basically same but are different up to a limit from each other physically, mentally, educationally and socially. It is therefore, not unusual to find in classroom, many students who do not benefit much from the usual classroom teaching mostly designed for the normal or averages students. Among such children, there may be two groups of children, the first one who possess a superior intellectual potential and a unique creative ability to deal with their environment, known as "gifted" children and the second one who do not progress from grade to grade according to the normal rate of the school system and who constantly require special assistance in the classes in which they are enrolled and are called "backward" (Karande and Kulkarni, 2005). It has already been shown by various researches that backwardness in school is not simply an intellectual matter, but that it is a condition where normal school achievement has been prevented by a variety of interacting influences.

A significant number of children fail to perform adequately in academics without any apparent limitation. In a considerable number of these incidences, there is a discrepancy between the children's potential and their actual performance. It is a known fact that each student of the class brings a unique set of characteristics to the classroom: different background knowledge, intelligence, and a unique learning style, a variety of interests and

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varied parental support and expectations. Every student possesses different intelligence, interests, learning styles and educational problems which may influence his academic achievement. It is an important fact that these variables definitely affect the educational backwardness. A low general intelligence-the inborn general capacity, is found to be the commonest and most serious in all the causes of educational sub-normality (Cyril Burt, 1937). But it is not necessary that all backward children have less than average IQ or ability. It may possible that a child may be backward in spite of having high intelligence. Quite a number of children with high intelligence show a great deal of 'scatter' in their scholastic achievement because of the impact of emotional and social maladjustment.

It is considered that students generally face various educational problems. Because of these problems, the students may not concentrate on their studies and become educationally backward. Hence, many problems related to teachers and teaching, social atmosphere, organizational or administration and cultural causes may be responsible for low academic achievement. Under these circumstances, the students are surrounded by many problems which may be related to poor self-concept, lack of parent's involvement and encouragement, damaging peer pressure, cultural deprivation, emotional problems and physical illness. Therefore, it is necessary that not only the teachers but also the parents of the backward students must root out the causes of the backwardness and create such type of environment where such students take interest in educational activities and make their academic achievement high. With this background the proposed study is to identify the risk factors and to study the impact of intervention on reasons of academic backwardness among school going children.

METHODOLOGY

The sample comprised of 76 academically backward children out of 139 normal population including both the gender studying in 8^{th} and 9^{th} standards from two villages namely Kotur (n=40) and Mummigatti (n=36) of Dharwad taluk. Academically backward children were identified based on two criteria i.e. academic performance of the children in the previous year (those who secure 'C' grade & attending remedial classes) & opinion of respective class teachers about children. Further the selected children were administered with a structured checklist developed (AICRP – CD) on reasons for academic backwardness. The tool consisted 42 statements with respect to academic, familial and health aspects of children with two alternative responses namely 'yes' and 'no'. The scores obtained by the children were taken as pre test scores, later the same group were intervened through lectures, videos and demonstration by subject experts through different sessions for about 8 hours. Intervention includes the topics like method for accurate reading, how to develop concentration, when to study, what to study, how much to study for better retention, methods for memorizing, organization of reading material etc. The same children were followed up for post test with one week gap, the children were again administered with same checklist on reasons for academic background and scores were considered as post test scores. During post test, due the reason of irregular attendance 8 children were dropped.

RESULTS AND DISCUSSION

It is evident from the Table 1 that majority of children felt very hard to study some subjects (67%) followed by slow writing (63.2%) and inability to give answers to all the questions in the exams (55.3%) in pre test. It is interesting to note that there was drastic reduction in with problems related to academic reasons from post test scores. After the intervention, the students were improved with understanding the subjects taught in the class, making themselves able to prepare hard prior to the exams, motivating themselves to study the difficult part of the subject, able to sit for the long lasting class and lastly adjust with teachers, peers and with school environment. This result is in support with study of Chaturvedi (2009) reported that effect of school environment on academic achievement of young adolescents. He reported that facing difficulty in understanding the subjects, long duration of teaching, partiality in the class were the major contributing factors for the academic backwardness in children.

It is observed from the Table 2 from pre test score, boys quoted many academic reasons compared to their

Table 1: Academic problems of academically backward children at pre and post test

Academic Reasons	Pre test (n=76)		Post test (n=68)	
	Yes	No	Yes	No
I don't understand what teachers teach in the class.	36(47.4)	40 52.6)	6(8.8)	62(91.2)
I don't like few subjects that's why I am lagging behind.	35 (46.1)	41 (53.9)	32(47.1)	36(52.9)
I feel that some subjects are hard.	51 (67.1)	25(32.9)	48(70.6)	20(29.4)
Studies seem to be beyond to my capacities.	31 (40.8)	45(59.2)	11(16.2)	57(83.8)
I postpone studies for examination time.	34 (44.7)	42 (55.3)	5(7.4)	63(92.6)
I feel that studies is burden.	18(23.7)	58 (76.3)	4(5.9)	64(94.1)
I am unable in continuing the tasks related to study.	22(28.9)	54 (71.1)	5(7.4)	63(92.6)
I am unable to give answers to all questions in the exams.	42(55.3)	34(44.7)	22(32.4)	46(67.6)
I write slowly.	48 (63.2)	28(36.8)	19(27.9)	49(72.1)
I am afraid of studies.	19(25.0)	57(75.0)	2(2.9)	66(97.1)
I find teaching methods in class room are boring.	18 (23.7)	58(76.3)	2(2.9)	66(97.1)
School hours seem long to me.	19 (25.0)	57(75.0)	2(2.9)	66(97.1)
My written and oral language is not good.	26 (34.2)	50 (65.8)	8(11.8)	60(88.2)
I feel difficulty to understand my teacher's language.	24(31.6)	52(68.4)	10(14.7)	58(85.3)
My teacher's behavior seems to be bias.	21(27.6)	55 (72.4)	8(11.8)	60(88.2)
Behavior of my classmates is not good with me.	20(26.3)	56(73.7)	5(7.4)	63(92.6)

Table 2: Percentage distribution of academic problems by gender at pre and post test

Academic Reasons	Pre test (n=76)				Post test (n=68)			
	Yes		No		Yes		No	
	Boys (45)	Girls (31)	Boys (45)	Girls (31)	Boys (37)	Girls (1)	Boys (37)	Girls (31)
I don't understand what teachers teach in the class.	17(37.8)	19(61.3)	28(62.2)	12(8.7)	5(13.5)	1(3.2)	32(86.5)	30(96.8)
I don't like few subjects that are why I am lagging behind.	22(48.9)	13(40.9)	23(51.1)	18(58.1)	18(48.6)	14(45.2)	19(51.4)	17(54.4)
I feel that some subjects are hard.	31(68.9)	20(64.5)	14(31.1)	11(35.5)	31 (83.8)	17 (54.8)	6(16.2)	14(45.2)
Studies seem to be beyond to my capacities.	18(40.0)	13(41.9)	27(60.0)	18(58.1)	5 (13.5)	1 (3.2)	32(86.5)	30(96.8)
I postpone studies for examination time.	22(48.9)	12(38.7)	23(51.1)	19(61.3)	3 (8.1)	2 (6.5)	34(91.9)	29(9.5)
I feel that studies are burden.	14(31.1)	4(12.9)	31(68.9)	27(87.1)	4 (10.8)	-	33(89.2)	31(100.0)
I am unable in continuing the tasks related to study.	15(33.3)	7(22.6)	30(66.7)	24(77.4)	3(8.1)	2(6.5)	34(91.9)	29(93.5)
I am unable to give answers to all questions in the exams.	23(51.1)	19(61.3)	22(48.9)	12(15.8)	12(32.4)	10(2.3)	25(67.6)	21(97.7)
I write slowly.	29(64.4)	19(61.3)	16(35.6)	12(15.8)	13(35.1)	6(19.4)	24(64.9)	25(64.9)
I am afraid of studies.	11(24.4)	8(25.8)	34(75.6)	23(74.2)	2 (5.4)	-	35(94.6)	31(100.0)
I find teaching methods in class room are boring.	13(28.9)	5(16.1)	32(71.1)	26(83.9)	2 (5.4)	-	35(94.6)	31(100.0)
School hours seem long to me.	14(1.1)	5(16.1)	31(68.9)	26(83.9)	1 (2.7)	1 (3.2)	36(97.3)	30(96.8)
My written and oral language is not good.	17(37.8)	9(29.0)	28(62.2)	22(71.0)	8(21.6)	-	29(78.4)	31(100.0)
I feel difficulty to understand my teacher's language.	16(35.6)	8(25.8)	29(64.4)	23(74.2)	10(27.0)	-	27(73.0)	31(100.0)
My teacher's behavior seems to be bias.	11(24.4)	10(32.3)	34(75.6)	21(67.7)	4(10.8)	4(12.9)	33(89.2)	27(87.1)
Behavior of my classmates is not good with me.	12(26.7)	8(25.8)	33(73.3)	23(74.2)	4(10.8)	1(3.2)	33(89.2)	30(96.8)

Figures in the parenthesis indicate percentage

counter parts. For boys it was very hard to study some subjects (68.9%), about 65 per cent write very slowly, postponing studies for examination time (48.9%), dislike some subjects (48.9%) and not having good language to communicate (37.8%). Majority of girls facing the problems like inability to understand what teachers teach in the class, unable to give answers to all questions in the exam and feeling that sometimes teachers behavior is bias when treating with other student. At post test, particularly among boys there was a drastic reduction in academic problems except the problem like some subjects are hard (83.8%). For understanding the subject, putting continuous effort by means of hard work, long hours of studying, extra classes, discussion with teachers, peers and in addition, interest and inner motivation to study from the student side is very much necessary to succeed. Similar results were found in the studies conducted by Umunadi (2009) and Garikai (2010) empirically examined the perception of both boys and girls on quoting reasons for poor academic performance of the school students. The findings indicated that there was a difference in academic performance of male and female students with male students quoted many reasons for their backwardness like disliking of difficult subjects, teacher's favoritism; long hours of class, peer relation and extra tuition work were the most important factors hindering their study.

Regarding the familial reasons (Table 3), about 20-30 per cent of children at pre test perceived that, their home environment is not conducive for the study, family income and parents occupation disturbing their studies, parents and family members did not contributing much to their studies and lack of expected cooperation from family members together interfering in the academic achievement of the children. At post test, the children were showed lot of decrement in these problems. The intervention was found to be effective in reducing the familial problems which are hampering the child's academic achievement. Results were in line with study of Muola (2010) reported the positive relationship between parent's education and academic achievement of the students and concluding that educated parents can make study arrangements for their children to avoid academic backwardness in them. Nayak *et al.* (2017) reported that 88 per cent didn't receive any academic help from their parents. Lower education status of the father and unhappy family were found to predict poor scholastic performance in adolescents.

Table 3: Familial problems of academically backward children at pre and post test

Familial Reasons	Pre test (n=76)		Post test (n=68)	
	Yes	No	Yes	No
My home environment is not conducive for studies.	14(18.4)	62(81.6)	7 (10.3)	61(89.7)
My siblings disturb me in my studies.	7(9.2)	69(90.8)	8 (11.8)	60(88.2)
My family members engage me more in activities other than studies.	11(14.5)	65(85.5)	2(2.9)	66(97.1)
I have to do other work due to financial constraints.	20(26.3)	56(73.7)	11(16.2)	57(83.8)
Actually my parents don't want that I should continue my studies.	13(17.1)	63(82.9)	2(2.9)	66(97.1)
My family occupation interrupts me in my studies.	15(19.7)	61(80.3)	8 (11.8)	60(88.2)
Due to some family reasons I can't spare time for studies.	22(28.9)	54(71.1)	21(30.9)	47(69.1)
There is no contribution of my family members in my studies.	21(27.6)	55(72.4)	10(14.7)	58(85.3)
Due to lack of education, the expected cooperation from family members is lacking.	25(32.9)	51(67.1)	17(25)	51(75)
My studies are affected due to family disputes.	20(26.3)	56(73.7)	12(17.6)	56(82.4)
I can't study because of ill health of family members.	18(23.7)	58(76.3)	8(11.8)	60(88.2)
Proper facilities for studies are not available in my home.	20(26.3)	56(73.7)	7(10.3)	61(89.7)
There is no inspiration and guidance in my home for studies.	13(17.1)	63(82.9)	5(7.4)	63(92.6)

Figures in the parenthesis indicate percentage.

Table 4 revealed the percentage distribution of familial problems by gender at pre and post test. In pre test more number of boys facing many problems in their family than girls. About 20-40 per cent of boys perceived their family environment as not conducive for learning, engaging them in income generating activities due to lack of money, lack of cooperation and encouragement from parents and family members, lack of facilities for study, lack of education and family disputes were the major contributing factors for their academic backwardness. At post test, to some extent the family problems were solved through intervention. Presence of parents during the intervention makes them more cooperative in their children studies. This result is line with studies conducted by Singh and Praveen (2010) studied the relationship of social maturity with academic achievement of high school students. Results revealed that girls were found to be more socially mature than boys. Therefore instead of feeling uncomfortable due to their family problems girls cope up themselves to activate themselves in all the areas and this might be the reason for not reasoning more familial factors as risk factors for their academic backwardness by girls.

Health problems of academically backward children at pre and post test is given under the Table 5. At pre test, around 30-40 per cent of children showed very few health problems such as worry, tension and stress during study, tiredness due to the long distance of school from home, lack of concentration, headache and restlessness

Table 4: Percentage distribution of familial problems by gender at pre and post test

Familial Reasons	Pre test (n=76)				Post test (n=68)			
	Yes		No		Yes		No	
	Boys (45)	Girls (31)	Boys (45)	Girls (31)	Boys (37)	Girls (1)	Boys (37)	Girls (31)
My home environment is not conducive for studies.	11(24.4)	3(9.7)	34(75.6)	28(90.3)	7(18.9)	1 (2.7)	30(81.1)	30(97.3)
My siblings disturb me in my studies.	4(8.9)	3(9.7)	41(91.1)	28(90.3)	6 (16.2)	4 (10.8)	31(83.8)	27(89.2)
My family members engage me more in activities other than studies.	6(7.9)	5(16.1)	9(86.7)	26(83.9)	2 (5.4)	5(13.5)	35(94.6)	26(86.5)
I have to do other work due to financial constraints.	13(28.9	7(22.6)	2(71.1)	24(77.4)	7(18.9)	4(10.8)	30(81.1)	27(89.2)
Actually my parents don't want that I should continue my studies.	6(13.3)	7(22.6)	39(86.7)	24(77.4)	-	3(8.1)	37(100.0)	28(91.9)
My family occupation interrupts me in my studies.	9(20.0)	6(19.4)	36(80.0)	25(80.6)	3(8.1)	5(13.5)	34(91.9)	26(86.5)
Due to some family reasons I can't spare time for studies.	15(33.3)	7(22.6)	30(62.7)	24(77.4)	15(40.5)	6(16.2)	22(59.5)	25(83.8)
There is no contribution of my family members in my studies.	10(22.2)	11(35.5)	35(77.8)	20(64.5)	10(27)	1(2.7)	27(73.0)	30(97.3)
Due to lack of education, the expected cooperation from family members is lacking.	18(40.0)	7(22.6)	27(60.0)	24(77.4)	14(37.8)	8(21.6)	23(62.2)	23(78.4)
My studies are affected due to family disputes.	11(24.4)	9(29.0)	34(75.6)	22(71.0)	8(21.6)	4(10.8)	29(78.4)	27(89.2)
I can't study because of ill health of family members.	9(20.0)	9(29.0)	36(80.0)	22(71.0)	5(13.5)	4(10.8)	32(86.5)	27(89.2)
Proper facilities for studies are not available in my home.	11(24.4)	9(29.0)	34(75.6)	22(71.0)	5(13.5)	2(5.4)	32(86.5)	29(94.6)
There is no inspiration and guidance in my home for studies.	8(17.8)	5(16.1)	37(82.2)	26(83.9)	2(5.4)	4(10.8)	35(94.6)	27(89.2)

Figures in the parenthesis indicate percentage.

Table 5: Health problems of academically backward children at pre and post test

Health Reasons	Pre test (n=76)		Post test (n=68)	
	Yes	No	Yes	No
My frequent illness hinders my studies.	21(27.6)	55(72.4)	13 (19.1)	55(80.9)
Sufficient food is not available for me.	10(13.2)	66(86.6)	1 (1.5)	67(98.5)
Due to depression I am unable to study properly.	23(30.3)	53(69.7)	8(11.8)	60(88.2)
As my school is far from my home so I get tired.	31(40.8)	45(59.2)	29 42.6)	39(57.4)
Often I feel tired so I am unable to concentrate on my studies.	22(28.9)	54(71.1)	13 19.1)	55(80.9)
My frequent absentia in school because of illness affects my studies.	19(25.0)	57(75.0)	19 27.9)	49(72.1)
I frequently suffer from headache.	25(32.9)	51(67.1)	12(17.6)	56(82.4)
I frequently suffer from stomach ache.	13(17.1)	63(82.9)	2 (2.9)	66(97.1)
I am unable to study properly because of vision problems.	12(15.8)	64(84.2)	5 (7.4)	63(92.4)
I feel physically weak which affects my studies.	10(13.2)	66(86.2)	2 (2.9)	66(97.1)
My studies are affected due to lack of concentration.	9(11.8)	67(88.2)	16 23.5)	52(76.5)
My studies are affected because of my worries and restlessness.	25(32.9)	51(67.1)	15(22.1)	53(77.9)
I am unable to hear properly in the class room.	13(17.1)	63(82.9)	8 (11.8)	60(88.2)

Figures in the parenthesis indicate percentage.

Table 6: Percentage distribution of health problems by gender at pre and post test

Health Reasons	Pre test (n=76)				Post test (n=68)			
	Yes		No		Yes		No	
	Boys (45)	Girls (31)	Boys (45)	Girls (31)	Boys (37)	Girls (1)	Boys (37)	Girls (31)
My frequent illness hinders my studies.	11(24.4)	10(32.3)	34(75.6)	21(67.7)	11 29.7)	2 (5.4)	26(70.3)	29(94.6)
Sufficient food is not available for me.	6(13.3)	4(12.9	9(86.7)	27(87.1)	1 (2.7)	1(2.7)	36(97.3)	30(97.3)
Due to depression I am unable to study properly.	13(28.9)	10(32.3)	32(71.1)	21(67.7)	4(10.8)	4(10.8)	33(89.2)	27(89.2)
As my school is far from my home so I get tired.	19(42.2)	12(38.7)	26(57.8)	19(61.3)	13(35.1)	4(45.9)	24(64.9)	27(54.1)
Often I feel tired so I am unable to concentrate on my studies.	16(35.6)	6(19.4)	29(64.4)	25(80.6)	8 (21.6)	5(13.5)	29(78.4)	26(86.5)
My frequent absentia in school because of illness affects my studies.	11(24.4)	8(25.8)	34(75.6)	23(74.2)	18(48.6)	2 (5.4)	19(51.4)	29(94.6)
I frequently suffer from headache.	11(24.4)	6(19.4)	34(75.6)	25(80.6)	7(18.9)	6(16.2)	30(81.1)	25(83.8)
I frequently suffer from stomach ache.	19(42.2)	5(16.1)	26(57.8)	26(83.9)	2 (5.4)	1 (2.7)	35(94.6)	30(97.3)
I am unable to study properly because of vision problems.	8(17.8)	3(9.7)	37(82.2)	28(90.3)	2 (5.4)	6 (16.2)	35(94.6)	25(83.8)
I feel physically weak which affects my studies.	9(20.0)	3(9.7)	36(80.0)	28(90.3)	2 (5.4)	2 (5.4)	35(94.6)	29(94.6)
My studies are affected due to lack of concentration.	6(13.3)	13(41.9)	39(86.7)	18(58.1)	13(35.1)	3 (8.1)	24(64.9)	28(91.9)
My studies are affected because of my worries and restlessness.	23(51.1)	7(22.6)	22(48.9)	24(77.4)	7 (18.9)	9 (24.3)	30(81.1)	22(75.7)
I am unable to hear properly in the class room.	10(22.9)	24(77.4)	35(77.8)	7(22.6)	6(16.2)	2 (5.4)	31(83.8)	29(94.6)

Figures in the parenthesis indicate percentage.

making the child to underachieve in the school. At post test, more number of the children made arrangements for their daily school attendance like coming to the school by bus or by riding bicycle, so it was help them to save the time, energy and make them more lively during the classes. Therefore, it was possible for them to attend the classes with more eagerness and make them able to concentrate on the studies. Chronic medical illnesses were found to be more in children with scholastic backwardness. It is well established that children with chronic illnesses have poor academic functioning compared to healthy children. Nayak *et. al* reported that the students who suffered from acute disease within fifteen days before examination and who had had fever showed poor performance in the school examination. Low achievement is not simply a result of school absenteeism due to the illness, but due to the inherent aspects of the illness. Children with chronic illnesses and the added disadvantage of low socioeconomic status are at particular risk for poor school achievement. It emphasizes the importance of providing educational support to children with health problems.

Table 6 discussing the gender difference with respect to health problems. Both boys and girls were suffering from very few health problems like tension, headache, poor concentration and acute worry have major role in disturbing the academic achievement of the children. From the table it was concluded that both the groups are on par with each other at pre and post test.

CONCLUSION

Academic backwardness is one of the common problem in the present scenario but it calls for the professionals help to overcome. It is the result of mixture of various reasons including school, familial and health aspects. These risk factors exploit child's innate capacities and does not register or show up educational success. This builds up stress and tension in the child so his potentials may be burned up merely handling the stress. Result of the present study also reported the same trend that, combinations of above mentioned factors hinders the academic achievement of school going children and leads to backwardness in every facets of academics. Study results encouraging the early recognition and proper intervention at right age at right time. Hence there is need to educate the parents and teachers to work out on the child's academic achievement.

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Strategy of Improving Wheat (*Triticum aestivum* L.) Productivity under New Alluvial Zone through Demonstration Programme

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ABSTRACT

The front line demonstrations of wheat were conducted during the *rabi* season of 2014-17 in seventeen farmers fields to demonstrate production potential and economic benefit of improved technologies consisting suitable variety (*viz.* HD 2967), improved nutrient (150:60:40 kg/ha NPK) and weed control measures under new alluvial zone of West Bengal, in irrigated conditions. The productivity of wheat ranged from 32.95 to 38.43 q/ha with mean grain yield of 36.13 q/ha under improved practice on farmers field as against a grain yield under farmers practice which ranged from 21.98 to 24.65 q/ha with a mean of 23.36 q/ha. It is evident from the results that the yield of improved wheat variety was found better than the local check under same environmental conditions. Farmers were motivated by results of demonstrated technologies applied in the FLDs and it is anticipated that they would adopt these technologies. Yield of the front line demonstration and potential yield of the crop was compared to estimate the yield gaps which were further categorized into technology index. Cultivation of wheat under improved practices fetch higher net return of Rs. 19,519 to Rs. 23,247/ha compared to farmer practice of Rs. 7,847 to Rs.12,100/ha. The average B: C ratio of improved technology was 1.77 in comparison of farmer practice mean B: C ratio was 1.43.

Keywords*:* FLD, Improved practice, Variety, Wheat, Yield

INTRODUCTION

Wheat is the important winter season food crop of India and improvement in its productivity has played a key role in making the country self-sufficient in food grain. West Bengal is not a traditional wheat growing state in India. However, at present, wheat has become a staple food crop next to rice and its consumption is gradually increasing because of change in food habit and economic prosperity. In spite of a wide range of adoptability, little attention has been paid towards wheat production and maximization of yield potential of this crop in West Bengal and its share to national production is less than one per cent. Productivity of 2.8 t/ha is also far below the national average of 3.14 t/ha (Mukherjee, 2017). Since wheat is a major cereal crop and population is gradually increasing, increase in its production and acreage should be given top priority in order to achieve food and nutritional security in the state. However, success of any crop production depends on use of appropriate genotype/variety of high yield potential and improved nutrient and weed control measures.

Among the agronomic practices suitable cultivars plays a significant role in maximizing the crop yield and productivity. Weed control measures is very important for proper distribution of plants over cultivated area and for better utilization of available soil and natural resources. Most of the farmers in the new alluvial zone of West Bengal, avoid growing wheat due to improper knowledge of suitable cultivar and poor nutrient and weeding control measures. Hence, an effort made through AICRP on

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Wheat and Barley Improvement, by introducing the recommended technologies of wheat production with suitable cultivar through front line demonstration on farmers field during *rabi* season of 2014-17.

METHODOLOGY

Present study was conducted under the aegis of Bidhan Chandra Kristi Viswavidyalaya during winter season of 2014-15, 2015-16 and 2016-17 in the Nadia district of West Bengal. Participatory rural appraisal (PRA), group discussion and transect walk were followed to explore the detail information of study area. For easy understanding of the farming community of the region, training, field day and farmer awareness programme were conducted to excel the farmers understanding and skill about the demonstrated technology on wheat. Field demonstrations were conducted under close supervision of staff and scientist working under AICRP on Wheat and Barley. Total 17 front line demonstrations under real farming situations were conducted during *rabi* season of 2014-15, 2015-16 and 2016-17 at four different villages namely; Charjadubati, Majherchar, Golahat and Majhergram (Kachrapara), respectively. All the participating farmers were trained on various aspects of wheat production technologies. The area under each demonstration was kept 0.50 ha. A one fifth area was also devoted to grow local standard check (farmer's practices). Soil sample were analyzed for NPK as per standard laboratory procedures (Jackson, 1973). The soil was sandy clay loam in texture (sand 47.54 ± 0.6, silt 29.59 ± 0.4 and clay 22.87 ± 0.3), with moderate water holding capacity with low in organic carbon (0.28-0.47%) contents, slightly alkaline (7.1 ± 0.05), tested low in available N ($KMnO_4$-N, 291.3 ±5.1 kg/ha), medium in available P (Olsen's-P, 19.1 ± 0.9 kg/ha) and high in available K (NH_4OAC-K, 276.3 ± 8.1 kg/ha). The treatment comprised of recommended practice as established by AICRP on Wheat and Barley Improvement. Improved variety seed (HD 2967), with seed rate of 100 kg/ha along with recommended dose of fertilizer 150:60:40 kg of NPK/ha and weed control measures were used. Crop was sown between18th to 21st November in the demonstration field, with 20 cm row spacing. The crop received full dose of P_2O_5 and K_2O and half dose of nitrogen as basal dose and remaining nitrogen in 2 equal splits i.e. at tillering and at boot stage. The source of fertilizer was urea, single super phosphate and muriate of potash for N, P and K, respectively. Weed control measures mainly include, post emergence application of 2, 4 DEE @750 ml/ha was given at 23 DAS (days after sowing) followed by one hand weeding at 40 DAS for complete check of weed during critical period of crop-weed competition. Fields were irrigated at the critical stages of crop and the crop was harvested between 29th March to 9th April during all the years of demonstration. Farmer's practice constituted seed of age old variety of Sonalika. Crop was sown on the same time as demonstration, broadcasting method of sowing, higher seed rate (125 kg/ha), imbalance dose of fertilizers applied (100:40:0 kg NPK/ha), no seed treatment, no plant protection measures and one hoeing at 22 DAS were adopted. Crop was harvested on the same time of harvesting of demonstration plots. Harvesting and threshing operations done manually and thresher, respectively; 5m × 4m plot harvested in five different locations in each demonstration and average grain weight taken. Similar procedure adopted on FP plots under each demonstration then grain weight converted into quintal per hectare (q/ha). Before conduct the demonstration training to farmers of respective villages was imparted with respect to envisaged technological interventions. All other steps like site selection, farmer's selection, layout of demonstration, farmers participation *etc*. were followed as suggested by Choudhary (1999). Visits of

Table 1: Mean weather data during the crop season

Year	Meteorological month	Rainfall (mm)	Rainy days	Temperature (°C)		Humidity (%)		Sunshine (hrs/day)
				Minimum	Maximum	Minimum	Maximum	
2014-15	October-March	4.56	3	15.31	35.80	44.56	82.05	5.16
2015-16	October-March	13.81	9	11.40	29.36	53.26	92.46	6.02
2016-17	October-March	0.21	1	12.42	33.65	47.98	84.65	7.54

farmers and extension functionaries were organized at demonstration plots to disseminate the technology at large scale. Yield data was collected from farmers practice and demonstration plots. The grass returns, cost of cultivation, net returns and benefit cost ratio (B:C ratio) were calculated by using prevailing prices of inputs and outputs and finally the extension gap, technology gap and technology index were worked out. Technology gap, extension gap and technology index were measured as per procedure given by Samui *et al.* (2000).

RESULT AND DISCUSSION

The weather data during the crop season are given in Table 1. There was scanty rainfall during the period of study. The minimum and maximum temperature ranged from 11.40 to 15.31 and 29.36 to 35.80, respectively during the years of demonstration. The relative humidity ranged from 44.56 to 53.26 for minimum and 82.05 to 92.46 per cent for maximum. The sunshine hrs/day varies from 5.16 to 7.54 during the FLD period.

The yields attributing parameters like ear head (no./m^2) and number of tillers/m^2 obtained over the years under recommended practice as well as farmers practice are presented in Table 2. Observation revealed that, ear head numbers were registered high with FLD plots compare to farmer's practice. Ear head (no./m^2) ranged from 236.63-311.23 with mean of 268.92 with improved practices on farmer's field as against a ranged from 156.33-201.29 with mean of 181.91 in farmer's practice. The number of tillers/ m2 of wheat ranged from 305.66 to 341.33 with mean of 322.77 under improved technology as against a ranged from 234.33-256.66 with a mean value of 252.16 recorded under farmers practice. This corroborate with the finding of Mukherjee (2016).

The grain yields of wheat obtained over the years under recommended practice as well as farmers practice are presented in Table 2. Grain yield is a function of various yield attributing factor and grain yield ranged from 32.95 to 38.43 q/ha with mean grain yield of 36.13 q/ha under improved practice on farmers field as against a grain yield ranged from 21.98 to 24.65 q/ha with a mean of 23.36 q/ha recorded under farmers practice. With comparisons to farmers practice there was an increase

Table 2: Impact of FLD programme on wheat productivity, yield attributes, yield and other variable

Year	Area (ha)	No. of farmers	Earhead (No. /m^2)		Tiller (No./m^2)		Grain yield (q/ha)			GY % increase over FP	Biological yield (q/ha)		BY % increase over FP	Harvest index (%)		Technology gap (q/ha)	Extension gap (q/ha)	Technology index (%)
			IP*	FP**	IP	FP	Potential	IP	FP		IP	FP		IP	FP			
2014-15	4	26	236.63	156.33	305.66	265.66	45	32.95	23.45	40.51	79.65	50.32	58.28	41.36	46.60	12.05	9.50	26.77
2015-16	10	61	311.23	201.29	341.33	234.33	45	38.43	21.98	74.84	87.32	52.36	66.76	44.01	41.97	6.57	16.45	14.60
2016-17	10	53	258.92	188.12	321.33	256.66	45	37.01	24.65	50.14	71.91	56.39	27.52	51.46	43.71	7.99	12.36	17.75
Total/ Mean	24	140	268.92	181.91	322.77	252.16	45	36.13	23.36	55.16	79.62	53.02	50.85	45.61	44.09	8.87	12.77	19.70

*Improved practice; ** Farmer's practice.

of 40.51, 74.84 and 50.14 per cent higher yield, respectively during 2014-15, 2015-16 and 2016-17 following improved practices. The higher grain yield of wheat under improved practices was due to the use of latest high yielding variety, enhance rate of fertilizer application with proper weed control measures. Further analysis of Table 2 revealed that, biological yield also varies to the tune of 71.95 to 87.32 q/ha compared to farmer practice with range of 50.32 to 56.39 q/ha. Improved technology in the farmer's field, increase biological yield to the tune of 27.52 to 66.76 per cent over the age old farmers practice. The more grain yield and biomass production recorded with improved practices owing to better utilization of available resources, mainly because of more dry matter accumulation and yield attributing characters.

Similarly, higher harvest index was recorded under improved technology (41.36 to 51.46% mean value of 45.61%) as compared to farmers practice (ranged between 41.97 to 46.60%, mean of 44.90). The higher values of yield attributing character, yield and harvest index following improved practice was due to the use of right kind of crop genotype with suitable technology interventions during the study years of demonstration. Similarly, Nain *et al.* (2012) reported spike length, number of grains/spike, grain yield, and total dry matter produced as significantly higher in the tested technologies as compared to farmers' practices.

The extension gap ranging between 9.50-16.45 q/ha during the period of study emphasized the need to educate the farmers through various means for the adoption of improved agricultural production to reverse the trend of wide extension gap (Table 2). The technology gap is the difference or gap between the demonstration yield and potential yield and it was varies during the year of observation. The trend of technology gap ranging between 6.57-12.05 q/ha reflected the farmer's cooperation in carrying out such demonstration with encouraging results during the period of study. This gap existed due to variation in the soil fertility and climatic or weather conditions (Table 1). Hence location specific recommendations are necessary to bridge the gap. These findings are similar to the findings of Patel *et al.* (2013) and Mukherjee (2016a). The technology index showed the feasibility of the evolved technology at the farmer's field. The lower the value of technology index, the more is the feasibility of the technology. As such, the reduction in technology index from 26.67, 14.60 and 17.75 per cent, respectively during 2014-15, 2015-16 and 2016-17 exhibited the feasibility of the demonstrated technology in this region. The results of the present study are in recurrence with the findings of Bar and Das (2015).

The inputs and outputs price of commodities prevailed during the FLD period were taken for calculating cost of cultivation, net returns and B:C ratio. (Table 3). The investment on production by adopting improved technology ranged from Rs. 26,893 to Rs. 28,695 with a mean value of Rs. 27,859/ha against farmers' practice where the variation in cost of production ranges was Rs. 22,654 to Rs. 23,965 with mean value of Rs. 23,480/ha. Cultivation of wheat under improved practices fetched

Table 3: Economics of FLD of wheat as affected by recommended practices as well as farmer's practices under irrigated conditions

Year	No. of demons-tration	Yield (q/ha)		Economics								
				Gross expenditure (Rs./ha)		Gross returns (Rs./ha)		Net return (Rs./ha)		Additional net return (Rs./ha)	B:C ratio	
		IP*	FP**	IP	FP	IP	FP	IP	FP		IP	FP
2014-15	4	32.95	23.45	26,893	22,654	46,412	33,636	19,519	10,982	8,537	1.72	1.48
2015-16	7	38.43	21.98	27,989	23,821	51,236	31,668	23,247	7,847	15,400	1.83	1.32
2016-17	6	37.01	24.65	28,695	23,965	50,365	36,065	21,670	12,100	9,570	1.75	1.50
Total/Mean	17	36.13	23.36	27,859	23,480	49,337	33,789	21,479	10,310	11,169	1.77	1.43

*Improved practice; ** Farmer's practice

higher net return of Rs. 19,519 to Rs. 23,247 with mean value of Rs. 21,479 compared to farmer practice to Rs. 7847 to Rs. 12,100 with mean amount of Rs. 10,310/ha. The additional net return of Rs. 8,537 to Rs. 15,400/ha with a mean value of Rs. 11,169/ha over farmer practice was received. The average B: C ratio of improved technology was 1.77, varying from 1.72 to 1.83, whereas, in farmers' practice means B: C ratio was 1.43 with range of 1.32 to 1.50. This figure may be due to higher yields obtained under improved practices compared to age old farmer practice.

CONCLUSION

The result of front line demonstration convincingly brought out that the yield of wheat could be increased with the intervention on varietal replacement *i.e.* HD 2967 with improved cultivation practices for new alluvial zone of West Bengal. To safeguard and sustain the food security in India, it is quite important to increase the productivity of wheat under limited resources. Favorable benefit cost ratio is self explanatory of economic viability of the demonstrated technology and convinced the farmers for adoption of improved technology of wheat production. The technology suitable for enhancing the productivity of wheat and calls for conduct of such demonstration under the transfer of technology programme.

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Performance of Blackgram and their Improved Variety in Chhatarpur Districts under Bundelkhand Region of Madhya Pradesh

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ABSTRACT

Consistent efforts to popularize the improved variety PU 35 of blackgram along with recommended production since *kharif* 2011 are being taken up in District Chhatarpur by KVK for enhancing the yield and income of farmers. Since most of the farmers lack knowledge and adoption of high yielding diseases resistant varieties and thereby harnessing lower yields culminating in limited net returns. The performance of blackgram production through varietal replacement under central portion on the plateau of Bundelkhand region in Madhya Pradesh, showed that by the end of 2018, 65.1 and 16.8 per cent area has been occupied with blackgram and their improved variety 'PU 35 with an increase in yield by 489 kg per ha and net returns by 46.5 per cent over locally cultivated varieties. Maximum yield (10.29 q/ha) was obtained during 2018-19. During 2013-14 and 2015 (rainfall 1300 and 1161.4 mm) the improved variety of blackgram (PU 35) produced lower yields (907 & 925 q/ha) which showed that this variety can also perform better under average rainfall regime. The returns per rupee investment varied between 2.7 to 2.9 whereas it was 1.3 to 1.4 in locally cultivated varieties with traditional farmers practice during 2011 to 2018.

Keywords: Economic impact, Improved varieties, Impact and Spread of technology

INTRODUCTION

Blackgram (*Vigna mungo*) is an important economic pulse crop and considered as a good source of protein for human being. Blackgram has been a predominant crop in Madhya Pradesh especially in Chhatarpur district which accounts for 65.1 per cent (2, 61,450 ha) area under Blackgram cultivation. The district Chhatarpur falls under central portion on the plateau of Bundelkhand region in M.P. and lies between north latitudes 240 06' and 250 20' and longitude 790 59' and 800 26 East. Current average productivity of the crop in the district is 540 kg per ha as against the state and national productivity of 730 and 585 kg per ha respectively (Anonymous, 2018). However, the productivity of blackgram is quite low as compared to yield potential in the experimental station (Singh *et al*., 2017). Though there are several factors for low production and productivity of blackgram crop in the district, however, lower seed replacement with improved varieties is crucial one. The lower seed replacement rate with improved varieties is due to their inadequate availability in spite of development of numerous location specific varieties with 20-25 per cent yield superiority over the local cultivars with additional trait of resistance against insect-pests and diseases (Singh *et al*., 2019). Moreover, the farmers did not follow the recommended production technology. In view of these, KVK Chhatarpur introduced the improved variety PU 35 during *kharif* 2011 along with improved production technology in and continued till 2018.

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METHODOLOGY

The module demonstrated (5.0 ha) at farmer's field during *kharif* 2011 included use of improved variety PU 35, balanced dose of fertilizers (20:60:20 NP_2O_5K kg/ha) based on soil test values and seed treatment with fungicide (Carbendazim + Thiram @ 1+2 g/kg seed) followed by seed inoculation with *Rhizobium leguminosorum* and phosphorus solubilizing bacteria (PSB) @ 5 g per kg seeds each and one spray of imazethapyer @ 1 litre per ha at 15 days after sowing for weed management. The performance of the crop was compared with the farmer's practice on the same location, which included use of only 50 kg DAP per ha, higher seed rate (25 kg/ha) and sowing of seeds without seed treatment with fungicides and biofertilizers. The soil of demonstrations site was sandyloam. The crop was sown between first week of July and harvested during second week of September. The seed rate of improved variety of Blackgram (PU 35) was used @ 20 kg per ha. Soil test based tailored NPK fertilization was applied as basal dose. The crop was protected from insect-pests and diseases as per recommendation. The yield data from demonstration field and farmer's crop was collected after harvesting the crop during 2011. In subsequent year (2011-2018), the horizontal spread of the improved variety (PU 35 and LBG 20) in the farmers' field of district was made through frequent farmers contact, interface with farmers, training of farmers and Rural Agricultural Extension Officer (RAEO), Krishak Sangoshthi and field days on blackgram. In addition, the progressive farmers of the district also disseminated the information about improved variety among the farming community through personal contact in subsequent years of study. For economic evaluation in term of gross and net return and cost benefit ratio, the prevailing rates for input, labour and produce was utilized. Rainfall data were also recorded during the study period to analyze the performance of the variety (PU 35). For getting feedback about the introduced variety from blackgram growers a comprehensive schedule was developed. The information's were mainly collected with due cooperation of RAEO in the District. The personal interviews with the RAEO and farmers were also conducted for getting the feedback in the study area.

RESULTS AND DISCUSSION

Change in area

Reduced fallow area and soybean cultivated area from 21350 to 19752 ha and 31900 to 19400 ha respectively during 2011-2018 (Table 1) was observed. Blackgram crop has covered 261450 ha area out of 401390 ha area of *kharif* crops in Chhatarpur districts. 65.1 per cent area under blackgram was observed during 2018-19 against 35.8 per cent during 2011 and it reduced area under soybean cultivation by 56.1 percent due to adoption of improved production technique of blackgram as soybean crop has been susceptible to biotic and abiotic stress due to dominancy of monotony cropping system in this region. The production and productivity of soyabean was stagnant or declining against to potential/average

Table 1: Changes in area of *Kharif* crops in Chhatarpur District

Year	Area under improved var.	Area under black gram (000ha)	*Kharif* area (000ha)	Fallow area (000ha)	Reduce fallow area (%)	Varietal spread of black gram (%)	Area spread under black gram (%)	Soybean area (000ha)	Replacement of soybean Crop by black gram (%)
2011-12	5	50700	141500	21350		0.01	35.8	31900	-
2012-13	30	80500	193500	21000	1.6	0.04	41.6	31000	2.8
2013-14	1400	150000	253400	20600	3.6	0.93	59.2	28200	11.9
2014-15	2800	180000	312430	20200	5.6	1.56	57.6	26500	19.1
2015-16	6500	200000	354620	19900	7.2	3.25	56.4	24300	28.7
2017-18	16500	240000	382300	19700	8.3	6.88	62.8	22300	39.5
2018-19	42300	261450	401390	19752	8.1	16.18	65.1	19400	56.1

productivity due to heavy infestation of yellow mosaic virus, stem fly, and Rhizoctonia aerial blight. Apart from these, premature shedding of flowers, pods and leaves also caused reduction in yield under stress conditions as reported by Singh *et al*. (2016). As such introduction of improved variety "PU 35" of blackgram and promotion of cultivation of blackgram in the place of old variety of blackgram and soybean crop the shift in area could be achieved. Besides this reduction in fallow area by 8.1 per cent was occupied by blackgram crop in *kharif* season to fulfill requirement of pulses and farmers income. Blackgram crop was found suitable in Bundelkhand region due to their suitability (resistant and tolerant to biotic and a biotic stress and short duration), similar results were found in soybean and chickpea crop by varietal performance and suitable technological intervention by Singh *et al*. (2017) and Singh *et al.* (2019).

Yield performance

Adoption of improved variety 'PU 35" of blackgram increased the seed yield by 123 per cent over existing varieties (Berkha/T9) in a span of seven years of study (Table 2). Irrespective of variety and seasonal variations, the average yield achieved from improved variety was 1029 kg per ha as compared to that of 540 kg per ha under farmers' practice during seven years. It is evident from the results that the improved variety of blackgram (PU 35) performed better under average rainfall situation (Table 3). Maximum yield (10.29 q/ha) was obtained during 2018-19 when annual rainfall in Chhatarpur district was recorded as 668.2 mm during crop period. During 2013-14 and 2015-16 when higher rainfall was 1300 and 1161.4 mm respectively during crop period, the improved variety of blackgram (PU 35) produced lower yield 907 and 925 kg/ha which showed that this variety can also perform better under average rainfall regime. The yield increase with the improved variety under the farming situation of demonstration area is likely to be effective in area with similar microclimate. The year-to-year fluctuations in yield can be explained on the basis of variations in microclimatic condition of that particular place. Singh *et al.* (2013) also opined that depending on identification and use of farming situation, specific interventions may have greater implications in enhancing systems productivity. Yield enhancement in different crops in front line demonstration has amply been documented by Kumbhare *et al.* (2014); Nain *et al.* (2014) and Nain *et al.* (2015).

Horizontal spread of the variety

Improved blackgram variety PU 35 was sown only in 5 ha area during *kharif* 2011-12 in village Chowkhada and in the second year this variety occupied 30 ha area in other farmer's fields by fellow farmers. During 2018-19, the horizontal spread of the variety PU 35 increased by 16.8 per cent (42300 ha) out of total area of blackgram

Table 2: Horizontal Spread of Improved Variety (PU 35) of Blackgram and its productivity in District Chhatarpur

Year	Horizontal Spread (ha)		Horizontal Spread of improved variety and black gram crop (%)		Average yield (kg/ha)	
	PU 35	Horizontal spread of Blackgram	PU 35	Horizontal spread of Blackgram	Improved variety along with package and practices	Locally cultivated varieties
2011-12	5	50700	0.01	35.8	880	405
2012-13	30	80500	0.04	41.6	891	410
2013-14	1400	150000	0.93	59.2	907	405
2014-15	2800	180000	1.56	57.6	950	429
2015-16	6500	200000	3.25	56.4	925	415
2017-18	16500	240000	6.88	62.8	983	502
2018-19	42300	261450	16.18	65.1	1029	540

Table 3: Effect of Rainfall on the production of blackgram in District Chhatarpur

Year	Rainfall (mm) in *Kharif* season (June-Sept.)	No. of rainy days	Average yield (kg/ha)	
	Chhatarpur District		PU 35	Locally cultivated varieties
2011-12	796	**29**	880	405
2012-13	**895**	35	891	410
2013-14	1300	57	907	405
2014-15	**547.5**	21	950	429
2015-16	1161.4	52	925	415
2017-18	525.2	18	983	450
2018-19	**668.3**	29	1029	540

261450 ha of Chhatarpur district (Table 3). Before adoption of this variety the farmer used to harvest an average maximum production of blackgram of 540 kg per ha, and now the same farmer is producing 1029 kg per ha of blackgram. The better performance of blackgram variety over others grown at the location appears on account of its trait of doing well under either higher or lower rainfall conditions, better germinability, inbuilt resistance to YMV and moderately resistance to *Rhizoctonia* aerial blight disease and tolerance to insect-pests. This makes it possible to optimize productivity of blackgram by adoption of improved variety ‘‘PU 35" in light and heavy black soils of high rainfall regions. Similar report was found in soybean and chickpea crops by Singh *et al.* (2016) and Singh *et al.* (2019).

Economic evaluation

The cost of cultivation in improved cultivar was comparatively higher (Rs. 13500-16200) as compared to farmer’s practice (Rs. 13,000-15,700) on account of additional input provided in the demonstration. Higher gross returns (Rs. 39292–45945) and net returns (Rs 25792-29745) were obtained from improved variety (PU 35) as compared to local cultivar (Rs. 18083-20539) and (Rs. 5083-4839) respectively. The average net return obtained from improved variety was 46.4 per cent higher over locally cultivated varieties (Table 4). The returns per rupee investment were accordingly reflected in improved variety (2.8 to 2.9) as compared to locally cultivated varieties (1.3 to 1:4). The variation in cost of cultivation during study period is attributed to variation in cost of inputs and that of produce. The result suggests economic viability and agronomic feasibility of adopted module in soybean cultivation. The results are in conformity of findings reported by Dudhade *et al.* (2009); Jain and Trivedi (2006).

Impact of technology

The achievements and outcome of improved variety (PU 35) are outstanding. Blackgram has registered significant increase in productivity and returns per rupee investment. The average yield of improved variety (PU 35) of Blackgram has exhibited 43.9 per cent increase in yield against to farmers locally cultivated varieties. This is primarily due to introduction of high yielding disease resistant variety along with improved technology against farmer practices as cited by Singh *et al*. (2019) who reported similar report in chickpea crop. It could be possible mainly due to effective dissemination of improved variety and production technique (PU 35) of blackgram crop by bringing awareness among farmers and farm women along with RAEO of the village through various field oriented activities, training programme and availability of literature related to package and practices of blackgram crop in accordance with Singh *et al*. (2017) and Singh *et al*. (2018).

Feedback of blackgram growers

Adoption of a given variety (PU 35) is usually a process, which passes through awareness about the variety, assessment of the expected returns from the variety, the farmer may then decide to grow. Good performance of the variety was observed during

Table 4: Economic Evaluation of Horizontal Spread of Improved Variety of Blackgram (PU 35) in Chhatarpur District

Year	Average cost of cultivation (Rs./ha)		Gross returns (Rs./ha)		Net returns (Rs./ha)		Returns/Rupee investment	
	Improved practices	Local practices	Improved practices	Local practices	Improved practices	Local practices	Improved practices	Local practices
2011-12	13500	13000	39292	18083	25792	5083	2.9	1.4
2012-13	14200	13700	39783	18307	25583	4607	2.8	1.3
2013-14	14900	14300	40498	18798	25598	4498	2.7	1.3
2014-15	15200	14900	42418	19155	27218	4255	2.8	1.3
2015-16	15800	15100	43087	19423	27287	4323	2.7	1.3
2017-18	16000	15400	43891	19646	27891	4246	2.7	1.3
2018-19	16200	15700	45945	20539	29745	4839	2.8	1.3

evaluation with the farmers. For getting feedback about the variety, approximately 35 rural extension officer and 225 farmers were interviewed through comprehensive questionnaire in the study area. Since this variety has tolerance to excessive soil moisture or long dry spell during crop period, resistant to YMV and Rhizocotonia aerial blight and tolerant to insect and pests therefore, it was found suitable in terms of increased profitability and reduced risk. The farmers decided to switch off the other variety and adoption of this improved variety. Scientist gain insights about the level of adoption and the underlying factors that constraint or facilitate the adoption process, it is useful to examine the factors that determine technology uptake similar result was found in pigeonpea and chickpea crop under front line demonstration by Singh *et al.* (2017) and Singh *et al.* (2019). This information is important to both researchers and policy makers. The researcher would gain useful feedback on the level of uptake of the variety/technology by the blackgram growers and the attributes of the technology that conditioned the level of adoption. This can be useful in decision to develop well-suited variety that meets the needs of the target of increasing population in future. Policy makers can use such information to reform the policies that slower down the technology uptake or formulate and implement new instruments that hasten and support the adoption process.

CONCLUSION

The farmers of Chhatarpur district have been sowing the improved variety (PU 35) of blackgram crop consistently since last seven years which brought out significant increase in yield of blackgram crop that leads positive socio-economic changes in farmers life. The study also suggests that similar kind of approach can effectively convince the other farmers in other villages to adopt improved variety (PU 35) with recommended package of production to optimize their productivity which may effectively contribute to increase the national production of blackgram.

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Evaluation of Front Line Demonstration of Pulses in Raebareli District

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ABSTRACT

India is the major pulse producer country. Pulses fix atmospheric nitrogen through symbiotic action. Low productivity of traditional varieties of pulses are a cause of concern for farmer's at large. To overcome the problem of low yield, Krishi Vigyan Kendra, Raebareli has conducted Front line demonstrations in the different localities of Raebareli district. Cultivation of high yielding varieties of pulses viz. i.e. Blackgram variety Shekhar-1, 60.41 per cent, PU-31, 18.25 per cent, Greengram variety Meha (IPM-9925), 75.60 per cent, Shweta-46.00 per cent, Lentil variety KL-320, 69.70 and 38.84 per cent, KLS-218, 39.21 per cent, Gram variety KWR-108, 63.23 per cent and 71.37 per cent and Field pea variety KPMR- 400, 54.92 per cent more yield of pulse crops as compared to local check. The productivity gain under FLD over farmers practice created awareness and motivated the other farmer's to adopt scientific crops production and management.

Keywords: Extension gap, Front line demonstration, Pulses, Technology gap, Technology index

INTRODUCTION

Globally India is the major pulses producer followed by the Canada, China, Myanmar and Brazil. The world's major pulse producing countries, which together account for half the global production India, Canada, China, Myanmar and Brazil. India is the largest producer of pulses, accounting for 25 per cent of global pulses production. In a country like India, pulses are the cheapest and concentrated source of dietary amino acids, where protein demand of vegetarian population is fulfilled through pulses, so it is also considered as "A poor man's meat". Pulses occupy unique position in the world of agriculture by virtue of its high protein content, which is almost double than that of cereals. They have a special role in meeting the protein requirement of predominantly vegetarian population. In addition to protein, pulses are also containing good quality lysine, tryptophan, ascorbic acid and riboflavin. Pulses are suitable for people with diabetes also for coronary heart disease and anemia as they regulate the cholesterol. The presence of bioactive compounds i.e. Photochemical and antioxidants, build up anti-cancer properties in pulses. Other than the suitability for human health, pulses are also good for environment. Pulse crops are considered as the wonderful gift of nature as they have an ability to fix the atmospheric nitrogen (N_2) there by helps in N cycling within the ecosystem. Besides N_2 fixation, incorporation of crop residue increases the microbial activity restores soil properties, carbon sequestration and thus provides suitability in crop production system.

With the above objective in view Krishi Vigyan Kendra, Raebareli conducted front line demonstrations (FLDs) on the improved package of practices in pulses production. Pulses are cultivated in the entire district and most of the area comes under semi arid condition. Its productivity is far below the potential yield due to lack of knowledge and adoption about new technologies.

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METHODOLOGY

The present study was carried out by Krishi Vigyan Kendra, Raebareli during *Kharif* season from 2015-16 to 2017-18 (3 years) in the farmers field of 26 villages of 11 blocks in Raebareli district. In total 722 FLDs in 155.4 ha area in different locations were conducted. The soil type of demonstration field was alluvial with pH ranging from 7.5 to 8.5 and average rainfall 923 mm with mean maximum and minimum temperature 44.2°C and 2.3°C, respectively. About 90 per cent of rainfall is distributed during June to September. The component of demonstration under front line demonstrations comprised high yielding varieties viz. Black gram-Shekhar-1, PU-31, Lentil- KL-320, KLS-218, Greengram- Meha (I PM-9925), Shweta, Gram- KWR-108, Fieldpea-KPMR-400 and farmers' practice are given in Table 1.

In case of farmer's practices, existing practices being used by farmers were followed. Before conducting the demonstration, training to the farmer's of respective villages was imparted with respect to envisaged technology interventions, site selection, farmer's selection, layout of demonstration, farmer's participation etc. as suggested by Choudhary (1999). The farmer's were selected on the criteria that they were involved in pulse cultivation since last 5 years. In the present study the data on output of pulse crop were collected from FLD plots besides the data on local practices commonly adopted by the farmers of this region were also collected. The collected data were tabulated and analyzed by using statistical tools like frequency and percentage. To estimate the technology index, extension gap and technology gap the formulae were considered as suggested by Samui *et al.* (2000); Kadian *et al.* (2004); Sagar and Chandra (2004).

RESULT AND DISCUSSION

Result of front line demonstrations indicated that the cultivation practices considered under FLD viz., use of improved varieties, proper seed rate, seed inoculation by rhizobium and PSB culture balance application of fertilizer, integrated pest management, irrigation and spraying of weedicides along with two hand weeding produced on an average of higher yield i.e. blackgram variety Shekhar-1, 60.41 per cent, PU- 31, 18.25 per cent, Green Gram variety Meha (IPM-9925, 75.60 per cent, Shweta-46.00

Table 1: Description of technological intervention under FLD on pulses

Particulars	Technological intervention (T)	Farmers Practice (T)	Gap
Variety	Blackgram – Shekhar-1, P.U.-31	Loca l & Old	Full Gap
	Greengram- Meha (IPM-9925), Shweta	Local & Old	Full Gap
	Lentil-KL-320, KLS-218	Local & Old	Full Gap
	Chickpea-KWR-108	Local & Old	Full Gap
	Fieldpea- KPMR-400	Local & Old	Full Gap
Seed Rate	Blackgram/Green Gram- 15 kg/ha	20-25 kg/ha	Partial Gap
	Lentil-35-40 kg/ha	40-50 kg/ha	Partial Gap
	Chickpea/Fieldpea-75-80 kg/ha	100-125 kg/ha	Partial Gap
Integrated Nutrient Management	N:P:K (20:60:20 kg/ha) +Rizhobium @ 5g /kg seed + PSB @ 5 g /kg + Gypsum @ 200 kg/ha at the time of field preparation	No use of fertilizer	Full Gap
Integrated Pest Management	Seed treatment with Trichoderma Viridae @ 5 g/kg seed + One spray of Proparicphos @1.5 lit/ha at the ETL	One-two spray of insecticide	Partial Gap
Irrigation	First irrigation at the time of branching and Second irrigation during pod formation	No Irrigation	Full Gap
Weed Management	Spray of Emizathyper @ 1000 ml/ha with Two hand weeding first at 20-25 days after sowing and second at 40 days after sowing	No spraying	Full Gap

per cent, Lentil variety KL-320, 69.70 and 38.84 per cent, KLS-218, 39.21 per cent, Gram variety KWR-108, 71.37 per cent and 63.23 per cent and Field pea variety KPMR 400-54.92 per cent more yield of pulse crops as compared to farmers practices. The result of FLD led to motivation to adopt the improved agricultural technologies applied in the FLD plots. Yield of pulse crops however varied in different years which might be due to the other factors like soil moisture availability, climate conditions, disease and pest attack as well as the change in the location of trials. The high yielding varieties of pulse crops yielded higher as compare to local check.

The technology gap, the gap in demonstration yield over potential yield were found i.e. blackgram Variety Shekher -1, 7.3 q/ha, PU-31, 10.2 q/ha, Lentil variety KL-320, 3.4 q/ha and 2.45 q/ha, KLS-218, 5.8 q/ha, Green gram variety Meha 7.8 q/ha and Shweta 4.7 q/ha. Gram variety KWR-108, 0.8 and 1.75 q/ha and Field pea variety KPMR-400, 11.55 q/ha. Hence location specific recommendation appears to be necessary to bridge the gap between the yields of different varieties. The highest extension gap of 8.85 &8.6 q/ha was recorded in gram variety KWR-108 fallowed by field pea variety KPMR-400,7.25 q/ha & lowest 2.3 q/ha for greengram variety Shweta.

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

Year	Crop	Variety	Grain yield (q/ha)			% increase over FP	Technology gap (q/ha)	Extension gap (q/ha)	Technology index (%)
			Potential	FLD	FP				
2015-16	Blackgram	Shekhar-1	12-15	7.70	4.80	60.41	7.3	2.9	48.66
2017-18	Blackgram	PU-31	15-16	8.70	5.80	18.25	10.2	2.9	45.62
2015-16	Lentil	KL-320	15-18	14.60	8.60	69.70	3.4	6.0	18.88
2016-17	Lentil	KL-320	15-18	15.55	11.20	38.84	2.45	4.35	13.61
2017-18	Lentil	KLS-218	18-20	14.20	10.20	39.21	5.8	4.0	29.00
2016-17	Greengram	Meha (IPM-9925)	12-15	7.20	4.10	75.60	7.8	3.1	52.00
2017-18	Greengram	SHWETA(K M 2241)	10-12	7.30	5.00	46.00	4.7	2.3	39.16
2016-17	Gram	KWR-108	20-23	22.20	13.60	63.23	0.8	8.6	3.47
2017-18	Gram	KWR-108	20-23	21.25	12.40	71.37	1.75	8.85	7.60
2017-18	Fieldpea	KPMR-400	30-32	20.45	13.20	54.92	11.55	7.25	36.09

Table 3: Gross expenditure, gross return, net return and b:c ratio of pulse crops production under FLDs

Year	Crop	Variety	Gross Expenditure (Rs/ha)		Gross Return (Rs/ha)		Net Return (Rs/ha)		B:C Ratio	
			FLD	FP	FLD	FP	FLD	FP	FLD	FP
2015-16	Blackgram	Shekhar-1	12800	11100	61600	38400	48800	27300	4.81	3.46
2017-18	Blackgram	PU-31	13340	10000	35000	21500	27160	10220	2.63	2.15
2015-16	Lentil	KL-320	16850	14680	51100	30100	34250	15420	2.03	1.05
2016-17	Lentil	KL-320	12800	11100	69975	50400	57175	39300	4.46	3.54
2017-18	Lentil	KLS-218	24500	24000	63900	45900	39400	21900	2.60	1.91
2016-17	Greengram	Meha (IPM-9925)	12600	10400	50400	28700	37800	18300	4.0	2.75
2017-18	Greengram	SHWETA	13340	11280	36500	25000	23160	13270	2.74	2.22
2016-17	Gram	KWR-108	24500	24000	156800	92200	132300	71200	5.40	2.96
2017-18	Gram	KWR-108	54500	48800	151500	87600	97000	39600	2.77	1.79
2017-18	Fieldpea	KPMR 400	30500	29000	112250	66000	81750	37000	3.68	2.27

This emphasized the need to educate the farmers through various means for adoption of improved varieties and recommended practices. The technology index shows the feasibility of the evolved technology at the farmer's field. The lower the value of technology more is the feasibility of the technology. The technology index for gram variety KWR-108 was found lowest (3.47%), indicating the performance of this variety in Raebareli district

The data presented in Table 3 indicated that adoption of improved technology of pulses not only gave higher yield, but also provided higher benefit cost ratio as compared to the farmers practice. This may be due to higher yield obtained under the recommended practice compared to the farmers practice. Similarly result has earlier reported on pulse crops by Tomar (2010); Mokidue *et al.* (2011); Kumbhare *et al.* (2014) and Singh *et al.* (2014).

It was also observed from the data of front line demonstration recorded higher grass return and net return as compared to local check during different year in different pulse crops. The additional cost /ha in FLD yielded additional net return per hectare suggesting higher profitability and economic viability of the demonstration.

CONCLUSION

The front line demonstration conducted on pulse crops at farmer's field, resulted that the farmers may got increased yield by following the recommended package of practice. The productivity gain under FLD over farmer's practice created awareness and motivated the other farmers to adopt scientific crops production and management. This study suggests to strengthen extension approach to educate the farmers for higher production and to increase net return on sustainable basis.

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Consumer Awareness Towards Ayurveda Products and the Factors Influencing Choice of Ayurveda Products

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ABSTRACT

Ayurveda is basically a natural way to preserve health of an individual through conserving the folks mind, body and spirit practiced equability with nature. The goal of the current paper was to study the reasons of preferring Ayurveda products and to determine the factors affecting ayurvedic products. Convenience sampling was used. Data has been collected from 100 customers who used ayurvedic products and purchased either from local shops, retail shops and online as well were selected for the study during January to March 2019 from the Hisar city of Haryana District. Factor analysis and average has been used to identify factors influencing selection of ayurvedic products while using SPSS 13. The survey data from the questionnaire was analyzed using factor analysis in order to summarize the 10 statements related to relevance of ayurvedic medicines into smaller sets. These 10 statements are reduced to four principal components through varimax rotation. The percentage of variance explained by factor 1 to 4 was 18.412, 18.004, 16.579 and 13.042. Study revealed that effects of ayurvedic medicine and use of ayurvedic medicine has high Cronbach alpha value i.e. .562 and .550 respectively. Hence it can be concluded that ayurvedic medicine along with allopathic, homeopathic medicine is good for common diseases. Moreover, ayurvedic medicines should be taken under doctor's prescription as everyone is concerned about their health and moving towards the ayurvedic or nature based products. Even though, ayurvedic medicines too have side effects on our health if taken without supplements.

Keywords: Allopathic, Ayurveda, Equability, Homeopathic, Impact, Medicine

INTRODUCTION

Ayurveda stands for (Sanskrit) a historical clinical treatise summarizing the Hindu artwork of recuperation and prolonging life, sometimes viewed as a fifth Veda. Ayurveda is a system, which avails the critical fundamentals of nature to keep health in an individual via retaining the individual's mind, body and spirit in adept equanimity with nature. The Ayurveda approach of holistic healthcare emphasizes balancing the body, mind, and spirit to deal with and forestall disease. The knowledge of this recovery technique used to be exceeded down through ancient Indian religious texts known as the "Vedas". Fast globalization and changing life-style lead to fitness changes and deterioration in everyday life, passing unfavorable effect on health. Intensive industrialization and long working hours deliver drastic harm to fitness in particular in metros and NCR Region, only medicine which can help human beings is nature mother "Ayurveda". In the existing scenario, consumers are getting greater concerned about their health as nicely as keeping work lifestyles balance with the aid of giving choice to only those merchandise which continues fitness and gratification. Consumer appreciation is described as the way that buyers normally view or experience about positive merchandise and services. It can also be related

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to customer pleasure which is the expectation of consumers towards the product Ayurveda has been identified by using WHO as whole machine of natural medicine.

The Indian natural market is flooded with several familiar and recognized herbal brands. In pursuit of a wholesome life-style Indian has grown to be greater inclined to Ayurvedic or Herbal remedy as choice healthcare for herbal cure. The preference and usage of a specific company by using the patron over the time is affected with the aid of the excellent benefits provided through the manufacturer in particular when it comes to manufacturer of eatable and cosmetics. Consumer pride is derived when he compares the true performance of the product with the performance he anticipated out of the usage. India is already an eye-catching destination for manufacturers to set in due to favorable advertising conditions. India has regarded to be a hub of Herbal brands as well seeing that the herbal products are deeply associated with the spirituality sentiments of the people. WHO find out about estimates that about eighty percentage of world populace relies upon on natural products for their health care as a substitute of modern drugs especially due to the fact of side effects and high cost of present day remedy (Sharma *et al.,* 2008). Many studies in line include the subjects like market potential (Sharma *et al.,* 2008), attitude towards organic farming (Jaganathan *et al.,* 2009), attitudes and beliefs of consumers (Suleiman, 2014), purchase intention (Kalaivani *et al*., 2019) and consumption pattern (Krishnan *et al,* 2019). Present study aimed to know about the reasons of preferring Ayurveda products and to determine the factors affecting choice of ayurvedic products.

METHODOLOGY

Exploratory research design was used for attaining objectives. Primary data was collected from Hisar city, 100 respondents who were using ayurvedic products were selected. To select respondents, judgmental and convenience sampling was used and data was collected during January to March 2019 from respondents at city Cafeterias, hotels and eating points. Sociological model (included demographic profile of the respondents were taken) was used to understand theoretical models underlying the respondents and their awareness of ayurvedic products.

The data was analyzed using SPSS13 software. Factor analysis in order to summarize the 10 statements related to relevance of ayurvedic medicines into smaller sets was performed and 10 statements were reduced to four principal components through varimax rotation. Only those factors were considered as significant, whose Eigen-values were more than one. The reliability coefficients for four factors ranged from 0.477 to 0.562 indicating a fair to good internal consistency among the items of each dimensions.

RESULTS AND DISCUSSION

Majority (60%) of the respondents were female, followed by their male (40%) counterpart. Age group comprised of 18-25 years was 39 per cent, followed by age group 26-40 years were 28 per cent. Majority (58%) of the respondents were married. Most of the respondents (37%) were graduate and post graduate (35%) followed by undergraduate (25%). Mainly (36%) of respondents considered Ayurvedic product as of good quality, followed by minimum side effects (33%) easily available (16%) and reasonable price. Majority of the respondents (83%) considered Ayurveda product for assurance of their health. Regarding the motivation towards Ayurveda products, respondents considered that social media and doctors play vital role for its recommendations i.e. 32 & 30 per cent respectively, followed by friends (23%) and celebrity (14%). Regarding the side effects of ayurvedic, 63 per cent respondents believed that low side effects, 32 per cent respondents believed as medium side effects and 5% respondents believed as high. Majority of the respondents were using Patanjali (40%) followed by Himalaya (25%), Dabur (22%) and Vicco (12%). Respondents said that ayurvedic products comprised of chemicals (62%), no adulteration (17%) and pesticides (13%). Regarding gaining advantageous position in the market, respondents said that Ayurveda products belong to rich heritage (45%) followed by spiritual elements (29%) and biodiversity (20%) makes it more popular.

Kaiser-Meyer-Olkin (KMO) test and Bartlett's Test

Table 1: Demographic profile of the respondents

Variables	Demographic Profile	Freq. & Percentage
Sex	Male	40
	Female	60
Age	18-25 year	39
	26-40 year	28
	41-55 year	26
	56 & above	07
Marital Status	Married	58
	Unmarried	42
Education Level	Under graduate	25
	Graduate	37
	Post graduate	35
	Doctorate	3
Why do you prefer Ayurvedic products?	Good quality	36
	Reasonable price	15
	Easily available	16
	Minimum Side effects	33
Ayurvedic products give assurance of health?	Yes	83
	No	17
How do you get motivation towards Ayurvedic products?	Social media	32
	Doctor	30
	Celebrity	14
	friend circle	23
	Others	1
Level of side effects of Ayurvedic products	Low	63
	Medium	32
	High	5
Which brand of Ayurvedic product you prefer the most?	Patanjali	40
	Dabur	22
	Himalaya	25
	Vicco	12
	Other	1
Factors influencing the reason for preferring ayurvedic products?	Chemical	62
	Pesticide free	13
	No adulteration	17
	Others	8
Why Ayurveda have advantageous position in market?	Spiritual elements	29
	Biodiversity	20
	Rich heritage	45
	Others	6

Table 2: Kaiser-Meyer-Olkin (KMO) test and Bartlett's Test of Sphericity

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.519
Bartlett's Test of Sphericity	Approx. Chi-square	118.087
	df	36
	Sig.	.000

of Sphericity as pre analysis verification for judging the suitability of the entire sample which is a prerequisite of factor analysis was applied. Table 2, shows the value of Kaiser-Meyer-Olkin (KMO) test and Bartlett's Test of Sphericity is .519 and 118.087 respectively, which are statistically significant at 1% level of significance. Thus, it shows that the sample is suitable for factor analysis. Table 3, shows four factors in the rotated component matrix.

Four factors were: Use of Ayurvedic medicine, Impact of Ayurvedic medicine, Effects of Ayurvedic medicine and Ailment. Each of these factors is discussed below:

Use of Ayurvedic medicine: The first factor explained highest variance of 18.412 per cent. Three statements related to use of ayurvedic medicine are loaded to this factor. Thus, the loaded statement to this factor directs us to conclude that the sample respondent's orientation was towards better health with minimum side effects on health.

Impact of Ayurvedic medicine: The second factor explained variance of 18.004 per cent. Three statements related to impact of ayurvedic medicine were loaded to this factor. Respondents considered ayurvedic medicines as reliable as they are made up of plants roots and shrubs and environment friendly as well. They also considered that advertisements played an important role in attracting and retaining customers. Moreover advertisements created awareness and publicity among the respondents.

Effects of Ayurvedic Medicine: This factor explained variance of 16.579. Respondents mentioned that, no doubt ayurvedic medicines have some side effects so consuming health supplements will neutralize the effect. Hence it can be concluded that ayurvedic medicines will not harm as allopathy medicines and considered to be safe for health (Table 4).

Table 3: Rotated Component Matrix

S.No.	Statements	1	2	3	4
1.	You consume ayurvedic medicine along with allopathic, homeopathic medicines for treatment of common diseases	**.812**	.033	.141	.121
2.	You consume ayurvedic medicine on doctor's prescription	**.669**	-.049	-.003	-.406
3.	You use some herbal cosmetic products	**.612**	.410	-.119	.260
4.	Ayurvedic medicine reliable to your pocket	.164	**.701**	.145	-.343
5.	Advertisement of ayurvedic products have some impact on you	.305	**.651**	-.271	.021
6.	You use ayurvedic medicine for treatment of major disease like diabetes, asthma	-.219	**.650**	.244	.136
7.	Ayurvedic medicines have some side effects on your health	.031	-.128	**.879**	-.049
8.	You consume some ayurvedic health food supplements	.055	.304	**.722**	.175
9.	You use ayurvedic medicine for common disease like cold, cough, allergy etc.	.067	-.048	.095	**.870**
10.	You consume ayurvedic medicine along with allopathic, homeopathic medicines for treatment of common diseases	**.812**	.033	.141	.121

Extraction Method: Principal Component Analysis, Rotation Method: Varimax with Kaiser Normalization.

Table 4: Total Variance Explained

Name of Factor	Statements	Factor loading	Cronbach alpha value	Total variance	Cumulative variance
Use of Ayurvedic	You consume ayurvedic medicine along with allopathic, homeopathic medicines for treatment of common diseases	.812	.550	18.412	18.412
medicine	You consume ayurvedic medicine on doctor's prescription	.669			
	You use some herbal cosmetic products	.612			
Impact of Ayurvedic	Ayurvedic medicine reliable to your pocket	.701	.477	18.004	36.416
medicine	Advertisement of ayurvedic products have some impact on you	.651			
	You use ayurvedic medicine for treatment of major disease like diabetes, asthma etc.	.650			
Effects of Ayurvedic	Ayurvedic medicines have some side effects on your health	.879	.562	16.579	52.995
medicine	You consume some ayurvedic health food supplements	.722			
Ailment	You use ayurvedic medicine for common disease like cold, cough, allergy etc.	.870		13.042	66.037

Ailment: The fourth factor explained variance of 13.042. Respondents considered that ayurvedic medicine were used for the common diseases not for serious diseases. Hence it can be concluded that ayurvedic medicines can cure common diseases easily without any side effects.

CONCLUSION

The study reflects that the reasons behind choosing Ayurveda products disclosed that 36 per cent respondents considered it as of good quality, followed by minimum side effects (33%), easily available (16%) and reasonable price. It can be concluded that customers preferred ayurvedic products as they were of good quality, minimum side effects and easily available on stores. Four important factors which influenced decision for choosing Ayurveda products, included use of ayurvedic medicine, impact of ayurvedic medicine, effects of ayurvedic medicine and ailment. Out of these four factors effects of ayurvedic medicine was of utmost importance. Hence it can be concluded that respondents were aware about the quality,

availability, reasonable price and minimal side effects of using Ayurveda products.

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Knowledge level of Rural Women Regarding Home Science Technologies

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ABSTRACT

Women play a key role in food production and form a large proportion of the agricultural work force globally. Knowledge empowerment is crucial in women development. Rural women can create wonders in their society with knowledge gain about different Home Science Technologies. A study was conducted in three randomly selected districts of Andhra Pradesh with sample size of 270 Krishi Vigyan Kendra trained respondents with an objective to measure the knowledge level of rural women regarding Home Science Technologies. Knowledge level was measured in seven different areas – Value addition to millets, nutrition garden, fruit and vegetable preservation, tailoring and embroidery, seed bag technology, vermicompost technology and backyard poultry. The study revealed that average knowledge scores obtained by respondents were medium. The knowledge scores in the areas of fruit and vegetable preservation, value addition to millets. nutrition garden, tailoring and embroidery, vermicompost technology and backyard poultry were in an ascending order. Knowledge scores were significantly related with age, social capital, information source utilisation, innovativeness, value orientation, perception about dissemination method, input availability, market facility and institutional support. The degree of contribution and influence exerted by the different precursor variables than studied variables was observed. Further studies to explore other correlated factors are needed.

Keywords: Home science technologies, Knowledge level, Krishi Vigyan Kendra, Rural women

INTRODUCTION

Rural women are key agents for development. They play a catalytic role towards achievement of transformational economic, environmental and social changes required for sustainable development. But limited access to credit, health care and education are among the many challenges they face. The net productivity of the women is definitely much more than the men, as they manage both the home and outside work in a well-balanced way. Krishi Vigyan Kendra's (Farm Science Centers), an innovative science based institutions were thus established mainly to impart vocational training to the farmers and farm women. Imparting knowledge for rural women about home science technologies and conducting vocational trainings on those technologies will help them in their overall empowerment. Such vocational trainings help them to sustain themselves through self-employment and to make them self-reliant economically and thus discourages them to migrate to the urban areas. Knowledge acquirement certainly leads to adopt the technologies along with the support of various profile characteristics of rural women. Therefore, a systematic study was conducted in the Andhra Pradesh state to measure the knowledge level of the rural women about home science technologies.

METHODOLOGY

The study was conducted in three districts purposively selected from each of the three regions of undivided Andhra Pradesh i.e. Nizamabad District from Telangana

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Region, YSR Kadapa District from Rayalaseema Region and West Godavari District from Coastal Region where the selected technologies were present. Three KVK's were selected for the study purposively because these KVK's were in operation in the selected districts under the authority of ANGRAU i.e. Rudrur, Utukur and Undi. One village was selected randomly where the KVK conducted activities from each of the selected mandals for the study, i.e. Rudrur village from Varni Mandal, Thimmapur village from Birkur Mandal, Hegdoli village from Kotagir Mandal of Nizamabad district, Bina Palli village from Chinta Komma Dinne Mandal, Kotur from Vallure Mandal and Uppar Pally from Chennur Mandal of YSR. Kadapa District, Adavi Kolanu village from Nidamarru Mandal, Undi village from Undi Mandal and Aakuveedu village from Aakuveedu Mandal of West Godavari District thus making a total of nine villages for the study. From each village, 30 rural women drawn randomly from trained women and thus, a total of 90 rural women from Coastal region, 90 rural women from Rayalaseema region and 90 rural women from Telangana region thus, a total of two hundred seventy (270) respondents constitute the sample size.

Schedule was developed for study to measure respondents knowledge level regarding selected home science technologies along with profile characteristics as the universe of content. Knowledge was measured in seven different areas – value addition to millets, Nutrition Garden, Fruit and Vegetable preservation, tailoring and embroidery, seed bag technology, vermicompost technology and backyard poultry. 27 items were included in questionnaire comprised of 3 types of the question viz. fill in the blanks, multiple choice, true or false and dichotomous questions to measure the knowledge on seven selected Home Science Technologies. The correct response to each item was given a score of 'one' and incorrect response a score of 'zero', that the knowledge score of a respondent is the summation of scores of correctly answered items out of total test items. The possible knowledge score ranged from 0 to 27.

RESULTS AND DISCUSSION

The average knowledge scores of respondents 36.44 indicated that the overall knowledge level was on medium level (Table 1). The standard deviation of the total knowledge scores was 3.96 indicating significant variations in the knowledge level. For further analysis, the respondents were classified in three categories on the basis of knowledge scores. It was found that from the data, that majority (57.41%) of the respondents belongs to medium level of knowledge category on selected Home science technologies (Table 1). It was followed by 26.30 per cent and 16.30 per cent of the respondents under high and low knowledge level categories.

Table 1: Distribution of respondents based on their overall knowledge level (N=270)

Category	Frequency	Percentage
Low	44	16.30
Medium	155	57.41
High	71	26.30
Total	**270**	**100.00**

The findings of Table 2 inferred that majority (84.44%) of the respondents had high level of knowledge on value addition to millets. It might be due that the university KVKs conducted much trainings on this area and in Rayalaseema and Telangana regions it is mostly in use in different forms. It was observed that majority (67.78%) of the respondents possessed high level of knowledge about nutrition garden, this might be due to the reason of that most of the rural women belonged to agriculture as main occupation and horticulture as subsidiary occupation. 84.81 per cent of the respondents

Table 2: Technology–wise knowledge level of respondents

Home Science technology	Category		
	Low	Medium	High
Value addition to millets	7(2.59)	34(12.96)	228(84.44)
Nutrition Garden	58(21.48)	29(10.74)	183(67.78)
Fruit and Vegetable preservation	15(5.56)	26(9.63)	229(84.81)
Tailoring and embroidery	60(22.22)	48(17.78)	162(60.00)
Seed bag	31(11.48)	239(88.52)	0(0.00)
Vermi compost	98 (36.30)	14(5.19)	158(58.52)
Backyard Poultry	59(21.85)	198(73.33)	14(5.19)

The figures in parenthesis indicate percentage

had high level of knowledge about fruit and vegetable preservation. This might be due to the reason of that university KVKs conducted much trainings on this area to promote local and seasonal fruits and vegetable preservation. It was noted that majority (60%) of the respondents had high level of knowledge about tailoring and embroidery. 88.52 per cent of the respondents had medium level of knowledge about seed bag technology. Majority (58.52%) of the respondents had high level of knowledge about vermicompost technology. Majority (73.33%) of the respondents had medium level of knowledge about backyard poultry technology. It might be due to that it is difficult to the rural women to remember vaccination schedule and medicines names which must be given to the poultry birds. These findings were in contrary to the findings of Veenita (2015) who reported that majority *i.e.* 65.78 per cent of respondents had medium knowledge about Homestead technologies of RAU. Technology-wise knowledge analysis revealed that knowledge level of majority of the respondents in case of stitching and embroidery, mushroom production vermicompost technology and apiculture were medium to low. Whereas knowledge level were low to medium among majority of the respondents on technologies such as Fruit and vegetable preservation, Art and Craft making and value added products from mushroom.

The observations of Table 3 reveals that variables such as social capital, information source utilization, value orientation, market facility and institutional support were positively and significantly related with the knowledge level of the respondents at 1 per cent level of significance and innovativeness, perception about dissemination method, input availability of the respondents was significantly related to knowledge level at 5 per cent level of significance., but age had negative association at 1 per cent level of significance with knowledge level of rural women. Remaining of the independent variables *viz.* education, family income, socio economic status, media usage, economic motivation and management orientation were non-significantly correlated with knowledge level of the respondents.

It can be inferred that knowledge level of the respondents decreased with increase in age. It meant

Table 3: Relationship of independents variables with the Knowledge

S.No.	Independent Variables	Coefficient of correlation (r) Knowledge (Y_1)
X_1	Age	-0.12815 *
X_2	Education	0.00003 NS
X_3	Family income	0.06300 NS
X_4	Socio economic status	-0.05714 NS
X_5	Socio-capital	0.18688 **
X_6	Information source utilization	0.25266 **
X_7	Media usage	-0.02453 NS
X_8	Economic motivation	-0.04566 NS
X_9	Management orientation	0.07166 NS
X_{10}	Innovativeness	0.15009 *
X_{11}	Value orientation	0.24723 **
X_{12}	Perception about dissemination method	0.15205 *
X_{13}	Input availability	0.14611 *
X_{14}	Market facility	0.17912 **
X_{15}	Institutional support	0.18635 **

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

that younger to middle aged respondents had higher level of knowledge about Home science technologies than respondents who were older in age. This might be due to that the young people were always more enthusiastic and interested to learn new information and skills which were reinforce them to support their family. Poonam *et al.* (2016) revealed results of their study that age significantly influenced the gain in knowledge and also that there is negative correlation between age and gain in knowledge, meaning that as age increases gain in knowledge decreases. Young people are more open to new ideas than the old ones. A look at the computed coefficient of correlation (r) between social capital and information source utilization knowledge level of the respondents were positively and significantly correlated at 1 per cent level of significance. Social - capital can help the knowledge improvement process in many ways, *i.e.* the network of relationships possessed by a rural woman in a social network and the set of resources embedded within it strongly influence the extent to which interpersonal

knowledge sharing. High information source utilisation of rural women *i.e.* frequently approached to KVK experts might enforced the rural women to gain more knowledge on selected home science technologies.

Innovativeness, perception about dissemination method and input availability of the respondents was positively and significantly related to their knowledge level at 5 per cent level of significance. This may be due to that most of the respondents belonged to young age and this age group were more exciting and challenging to learn new knowledge and skills for self evaluation while majority of the respondents expressed that television was the most useful method to get credible information, and regularly they follow knowledge based programmes like Annada, Sakhi Raithe Raju, like farm and home based programmes in different television channels. It was observed that value orientation, market facility and institutional support of the respondents were positive and significantly correlated with their knowledge level at 1 per cent level of significance. This might be due to that most of the rural women poses the value orientation, who had this quality definitely accept any new information or skill which ultimately benefits their family assets while most of the respondents had poor market facilities, due to that they might be prone to acquire more knowledge and exposure to better their market facilities. Whereas continuous mutual follow-up of both respondents and KVK staff for technical support developed a positive relation. Young and more innovative women are more prone towards knowledge acquisition than other women and availability of inputs and more institutional support also supports them to acquire more knowledge and it definitely improves their adoption levels.

The independent variables information source utilization and value orientation were found to be statistically significant at 1 per cent level of significance and were positively contributing to the knowledge level of the respondents. Economic motivation and innovativeness were found to be positively significant at 5 per cent level of significance. But Socio economic status, market facility and Institutional support were found to be statistically significant at 1 per cent level of significance and were negatively contributing to the knowledge level of the respondents All the variables collectively explained 28.13 per cent variability towards knowledge level of the respondents. It can be inferred from these results (Table 4) that out of the fifteen selected independent variables, only seven of them were significantly contributing to the knowledge level of the respondents. It means that there are some other irrelevant variables that are contributing to the knowledge level of rural women and these variables should be consider in future research studies and while developing strategies or programs relating to the knowledge of rural women.

Step down regression analysis was done to identify the independent variables that accounted for variation in knowledge levels of the respondents. Table 5 indicates that among all eight variables explained 26.62 per cent variation in knowledge level of the rural women. The variance ratio (11.833) test was found to be significant at 1 per cent level of probability. The variables information source utilization, value orientation and institutional support were positive and significant at 1 per cent level of probability whereas economic motivation and innovativeness were positive and significant at 5 per cent level. The variable market facility was negative and

Table 4: Relative contribution of independent variables towards knowledge level of the respondents

S. No.	Independent variables	b Values	Standard error	t-value
X_1	Age	0.0881	0.0551	1.599NS
X_2	Education	0.0918	0.0595	1.543NS
X_3	Family income	0.0256	0.0582	0.440NS
X_4	Socio economic status	-0.1091	0.0552	1.976*
X_5	Social capital	0.0548	0.0578	0.948NS
X_6	Information source utilization	0.3215	0.581	5.531**
X_7	Media usage	-0.1267	0.0662	1.912NS
X_8	Economic motivation	0.1264	0.0549	2.302*
X_9	Management orientation	0.0017	0.0610	0.027NS
X_{10}	Innovativeness	0.1131	0.0548	2.063*
X_{11}	Value orientation	0.3188	0.0576	5.532**
X_{12}	Perception about dissemination method	0.0456	0.0595	0.767NS
X_{13}	Input availability	0.0216	0.0617	0.349NS
X_{14}	Market facility	-0.1350	0.0566	2.386*
X_{15}	Institutional support	0.2132	0.0621	3.435**

R^2= 0.2813; F calculated value= 8.38

Table 5: Step down multiple regression analysis for analysis of the influence of selected profile characteristics with knowledge of rural women

S. No.	Independent variables	b Values	Standard error	t-value
X_5	Socio economic status	-0.1038	0.0540	1.923NS
X_6	Information source utilization	0.3358	0.566	5.934**
X_7	Media usage	-0.0924	0.0593	1.558NS
X_8	Economic motivation	0.1148	0.0545	2.108*
X_{10}	Innovativeness	0.1165	0.0548	2.125*
X_{11}	Value orientation	0.3268	0.0556	5.878**
X_{14}	Market facility	-0.1432	0.0561	2.551*
X_{15}	Institutional support	0.2359	0.0590	4.001**

R^2= 0.2662; F calculated value= 11.833

significant at 5 per cent level. The variables socio economic status and media usage contributed non-significantly to the variation in knowledge. Thus the above seven variables were crucial in explaining the variation in knowledge levels of rural women.

CONCLUSION

Medium knowledge level in overall is a positive result, while the technologies seed bag and backyard poultry were in medium knowledge level of respondents when it was analyzed individually. Rest of five technologies majority of the rural women were in high knowledge level. The KVK staff was in a mutual understanding flow with rural women b conducting need based trainings. Majority of the profile characteristics of the rural women had positive and significant relation. It shows that mostly knowledge acquisition levels depended on profile characteristics. The degree of contribution and influence exerted by the dependent variables on the knowledge scores. Further studies to explore other correlated factors are suggested. Also, studies to explore the knowledge acquisition as an active process on the part of the rural women can help improve the knowledge level and leads to increase of adoption levels for the family betterment.

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Agro-Economic Impact of Climate Resilient Practices on Farmers in Anantapur District of Andhra Pradesh

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ABSTRACT

Climate change is one of the serious challenges to the agriculture sector in order to ensure nutritional and food security for growing population. National Innovations on Climate Resilient Agriculture (NICRA) project aims to improve resilience of Indian agriculture to climate change and climate vulnerability. The present study was conducted to know the impact of the climate resilient technologies upon the NICRA beneficiaries in Anantapur district of Andhra Pradesh. The study was conducted with a sample of 60 respondents from three NICRA project implementing villages. Before-after comparison of NICRA beneficiaries was employed to identify the project impact and the difference was tested using paired t-test and found that it was statistically significant. The results of the study reveals that area under irrigation, crop yield, cropping intensity and annual income of NICRA beneficiaries after the project interventions was significantly higher than that of before the implementation of the interventions. More than fifty percent respondents had medium level of impact of the climate resilient technologies. This study helps the implementing institutions in redesigning the interventions for wide adaption of climate resilient practices.

Keywords: NICRA, Impact, Climate resilient practices

INTRODUCTION

Agriculture in India with more than half is rainfed area, is mostly dependent on monsoon besides the interplay of other biotic and abiotic factors. Agriculture is subjected to various stress and potential yield are seldom attained with stress. Climate change can affect the yield positively as well as negatively. Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia (IPCC, 2013). Climate change projections for Indian sub-continent indicate an increase in temperature by at least 3.3°C by 2080s relative to pre-industrial times (IPCC, 2007a,b). There are evidences of negative effects on yields of wheat and paddy in some parts of India due to raised temperature, moisture stress and lessening of rainy days. Under medium-term (2020–2039) climate change scenario, crop yield is projected to reduce by 4.5 to 9 per cent, depending on the magnitude and distribution of warming (NICRA, 2013). As agriculture sector has to face the hostile effects of climate change and climate variability, hence adaptation strategies are indispensable for farmers to deal with them (Chunera and Amardeep, 2018). Adaptation is context and location specific. There is no single best approach for reducing hazards across all settings (Rakshit *et al*., 2016). To overcome the drought, farmers have to be ready to adopt climate resilient agriculture technologies. Various improved agricultural practices evolved for diverse agro-ecological regions in India which have potential to enhance climate change adaptation, if deployed prudently. The Indian government has accorded high priority to Research and Development for coping with climate change in agriculture sector. The Prime Minister's National Action Plan on

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Climate Change has recognised agriculture as one of the eight National Missions. Indian Council of Agricultural Research (ICAR) launched a major network project entitled, National Initiative on Climate Resilient Agriculture (NICRA) during 2010-11, focusing on the process of developing district level contingency plans for all the rural districts of country with Central Research Institute for Dryland Agriculture (CRIDA), Hyderabad as the nodal agency with an outlay of Rs.350 crores for the XI Plan. The project is being implemented at large number of research institutes of ICAR, State Agricultural Universities and KVKs. NICRA has four intervention modules, the four intervention modules are Natural resource management, Crop production, Livestock and fisheries and Institutional interventions. These interventions includes climate resilient practices like micro irrigation systems, crop diversification, introduction of improved varieties, provision of farm machineries through custom hiring centres and increasing climate literacy of farmers. This study was to evaluate the usefulness of Climate Resilient practices in farmer's field. Keeping this in view, an effort has been made to assess the impact of NICRA project on beneficiary farmers in Anantapur district of Andhra Pradesh.

METHODOLOGY

This study was conducted in Anantapur district of Andhra Pradesh during 2017-18 and 2018-19. The study sample comprised of 60 farmers selected randomly from three purposively selected villages i.e. Chamaluru, Peravalli and Chakrayapeta. The selection of districts, blocks and villages were based on the assessed vulnerability of these localities to climate change as determined by National Innovations on Climate Resilient Agriculture (NICRA) of Indian Council of Agriculture Research (ICAR), Government of India in 2011. Before and after comparison was used to outline the impact of the climate resilient practices upon the NICRA beneficiaries. This comparison was done with help of baseline data and recall memory of respondents. The data was collected using a pre-tested structured interview schedule and collected data was analysed in light of pre-determined objective for the present study. As the data obtained were quantitative in nature, paired t-test was employed to find the significance of differences.

The impact of NICRA project was calculated by combining all the four indicators viz., Percentage change in area under irrigation [A], Percentage change in crop yield [B], Percentage change in cropping intensity [C], Percentage change in annual income [D]. The final score of impact of NICRA project expressed in Percentage was arrived by using the formula:

$$\text{Impact of NICRA project on beneficiary farmers} = \frac{A+B+C+D}{4}$$

The respondents were grouped into three categories of low, medium and high based on the mean and standard deviation. The results were expressed in the form of frequencies and percentages.

RESULTS AND DISCUSSION

Impact of NICRA project on beneficiary farmers

Percentage change in area under irrigation [A]

It was observed from Table 1 that, 59.04 percentage increase in area under irrigation was observed among the NICRA beneficiaries due to the adoption of climate resilient technologies. The results of the 't' value (11.56) revealed that there was significant difference in area under irrigation between before and after the adoption of climate resilient technologies. The results from Table 2 reveals that nearly two-third of the beneficiaries (65.00%) were under medium level followed by high level (23.33%) and low level (11.67%) of percentage change in area under irrigation. The probable reason might be due to fact that conservation of rain water through farm ponds and sustainable use of irrigation water through micro irrigation brought the additional land under irrigation. Babu *et al.* (2016) reported that 97.98 percentage increase in area under irrigation was observed among the Andhra Pradesh Micro Irrigation Project (APMIP) beneficiaries due to adoption of Micro irrigation system in Chittoor district.

Percentage change in crop yield [B]

It was concluded from Table 1 that, 30.06 per cent increase in crop yield was observed among the NICRA beneficiaries after the adoption of climate resilient technologies. The results of the 't' value (29.77) revealed that there was significant difference in crop yield between

Table 1: Percentage change in indicators due to adoption of climate resilient technologies

Indicators	Before adoption	After adoption	Difference	Percentage change	t - value
Area under irrigation	1.05 hectares	1.67 hectares	0.62 hectares	59.04	11.56**
Crop yield	1.926 tonnes/ha	2.505 tonnes/ha	0.579 tonnes/ha	30.06	29.77**
Cropping intensity	98.43	139.37	40.94	41.59	14.398**
Annual income	57,733.33 rupees	90520.08 rupees	32786.75 rupees	56.78	25.37**

**Significant at P < 0.01

before and after the adoption of climate resilient technologies. The results from the Table 2 stated that majority of the beneficiaries (63.33%) were under medium level followed by high level (20.00%) and low level (16.67%) of percentage change in crop yield. The possible reason might be adoption of climate resilient practices increased the availability the irrigation water, usage of improved varieties and input use efficiency which improves the quality and quantity of produce. There was an increase in average yield for rice, maize, ragi, redgram and groundnut with yield 41.51, 35.64, 26.53, 6.28 and 7.33 q/ha respectively in comparison to previous yields of NICRA farms (Jasna *et al.,* 2017).

Percentage change in cropping intensity [C]

It was revealed from Table 1 that, 41.59 per cent increase in cropping intensity among the NICRA beneficiaries after adoption of climate resilient technologies. The results of the 't' value (14.39) revealed that there was significant difference in area under irrigation between before and after the adoption of climate resilient technologies. The results from Table 2 shows that more than half of the beneficiaries (56.67%) were under medium level followed by high level (30.00%) and low level (13.33%) of percentage change in cropping intensity. Mono cropping was observed before the implementation of NICRA. After the implementation of NICRA, as the water was saved through climate resilient technologies, the beneficiaries had shifted to intercropping and multi cropping. Hence there is increase in cropping intensity. Babu *et al.* (2016) stated that 126.94 percentage increase in Cropping Intensity observed as a result of Micro irrigation system for APMIP beneficiaries in Chittoor district.

Percentage change in annual income [D]

It was concluded from Table 1 that, 56.78 per cent increase in income was observed among the NICRA beneficiaries after the adoption of climate resilient technologies. The results of the 't' value (25.37) revealed that there was significant difference in area under irrigation between before and after the adoption of climate resilient technologies. The findings from Table 2 indicates that more than half of the beneficiaries (58.34%) were under medium level followed by high level (23.33%) and low level (18.33%) of percentage change in annual income. The reason for increased income levels may be due to increase in irrigated area and yield levels of NICRA beneficiaries due to implementation of climate resilient technologies. There was a change in income by 2.56 fold in ginger and 2.67 folds in turmeric through mulching of beds in Kyrdem village (Medhi *et al.,* 2018).

Impact of NICRA project on beneficiary farmers

$$\text{Impact of NICRA project} = \frac{A+B+C+D}{4}$$

$$= \frac{59.04+30.06+41.59+56.78}{4}$$

$$= 46.86$$

It is clear from the results showed in Table 1 that, there was 46.86 per cent of impact of NICRA project observed among the beneficiaries.

Findings of Table 2 indicated that more than half of the beneficiaries (51.67%) were under medium level of impact of NICRA Project followed by high level (30.00%) and low level (18.33%) of impact of NICRA Project.

Table 2: Distribution of respondents according to the Percentage change in Indicators due to adoption of climate resilient technologies

S.No.	Indicators	Category	Respondent Farmers (n=60)	
			Frequency	Percentage
1.	Change in area under irrigation (ha)	Low	7	11.67
		Medium	39	65.00
		High	14	23.33
2.	Change in crop yield (tonnes/ha)	Low	10	16.67
		Medium	38	63.33
		High	12	20.00
3.	Change in cropping intensity	Low	8	13.33
		Medium	34	56.67
		High	18	30.00
4.	Change in annual income (Rupees)	Low	11	18.33
		Medium	35	58.34
		High	14	23.33
5.	Overall impact of NICRA project	Low	11	18.33
		Medium	31	51.67
		High	18	30.00

The visible favourable impact of NICRA on its beneficiaries might be due the need based components of NICRA project.

The NICRA project tackles all the aspects of development of dry areas in a holistic approach coming with ridgeline. In the first instance, soil and water conservation works taken up on free of cost by the agency where, farm ponds and percolation ponds, were constructed in the NICRA village. This has maximized the rain water storage and conservation which made the beneficiaries to attain higher yield and increased cropping intensity by intercropping systems, availability of water throughout the season through rain water structures have made them to achieve diversified farming. The establishment of the custom hiring centre has made the beneficiaries to take up timely operations related to production. These climate resilient technologies along with convincing of the beneficiaries through series of extension educational activities have made them to increase their income over the years, resulted in better infrastructure facilities and resources, which might have resulted in higher social status as well. There was 68.63 percent impact of APMIP observed among the beneficiaries. Majority of the respondents had medium level (45.83%) of impact in Chittoor district (Babu *et al.,* 2016). Pise *et al.* (2018) reported that, 57.50 per cent of beneficiaries of NICRA had medium level of overall impact of NICRA followed by (22.50%) low and (20.00%) high level of overall impact of NICRA on the beneficiaries of NICRA project in Shekta village.

CONCLUSION

National innovations on climate resilient agriculture (NICRA) is a great initiative taken by ICAR, with the objective to improve the resilience of Indian agriculture covering crops, livestock and fisheries to climatic variability and climate change. The current research stressed impact of climate resilient practices demonstrated at NICRA villages due to its increased adoption. With a network of institutions functioning in every locality, the practices gained speed in their adoption and effectiveness. The study exposes that, there is significant increase in area under irrigation, crop yield, annual income and cropping intensity of beneficiaries had been observed after the adoption of climate resilient technologies of NICRA

project. This is likely due to effect climate resilient practices like drip irrigation, crop diversification, farm ponds construction, usage of early maturing varieties and healthy soil management practices. Findings revealed an encouraging influence of the demonstrated technologies in various areas of farmer's life of NICRA village. It might be helpful to accelerate the mind set of non-adopters from the awareness stage to adoption stage for climate resilient technologies of NICRA project. The findings will offer the feedback to the implementing institutions engaged in dissemination of climate resilient practices for further reshaping the interventions, in order to improve its outcome and output.

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Influence of Bypass Fat Supplementation on Productive Performance and Economics of Lactating Cows

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ABSTRACT

The present experiment was conducted on 20 healthy lactating cows of nearly similar age and stage of lactation to study Bypass fat supplementation on Productive Performance and Economics in lactating cattle in Unnao district. Cows were divided into 2 groups (10 cows in each group), which T_1 was fed through farmers practices (control) (Use of concentrate, wheat straw and fodder) and T_2 group in addition to farmers practices was supplemented with Bypass fat (20 g/day milk yield for 60 days and Fenbendazole 3 gm tablet used orally as dewormer at once). The results revealed that the milk yield and fat percent was significantly higher ($P<0.05$) in T_2 group as compared to T_1. However, the Protein and SNF percent was non-significantly but numerically higher in T_2 group as compared to T_1. The economics status of supplementation of bypass fat was 24 Rs/day /animal with 77.41 per cent more return over the farmer's practices (T_1). Based on the observations the bypass fat supplementation to lactating cows is beneficial in terms of increasing milk production, fat percent and higher over return.

Keywords: Bypass fat, Economics, Lactating cows, Nutrient compositions, Productive performance

INTRODUCTION

Nutrition plays an important role for optimum expression of genetic potential of livestock (Tiwary *et al.,* 2010). Milk production in the small holder dairy sector is mostly constrained by shortage of affordable appropriate nutritional regimes and overall management (Ngongoni *et al.,* 2009). Economic output of milk production and hence of dairy farming can be maximized by acquiring calve from each cow per year, pre-requisite of acceptable reproductive efficiency. One of the several reasons, the poor nutrition is one of the major attributes that led to the low productivity of dairy cows of the India. Lack of good-quality fodder, fodder availability around the year and inadequate feed resources were the main constraints for poor nutrition of dairy cows in the country (Perera and Jayasuriya, 2008).

The technology of bypass fat protects the nutrient from degradation and bio-hydrogenation in rumen with increase in the energy density of the diet enabling the animals to meet their energy and essential fatty acid requirements expressing their milk production potential to the fullest extent (Krishna and Reddy, 2009). Additional fat fed as bypass fat does not interfere with rumen fermentation process, but supplies more energy (2.25 times of protein and carbohydrate) to the animal for more milk synthesis after being digested in abomasum's and small intestine with absorption from the small intestine (Bobe *et al.,* 2007; Garg *et al.,* 2008).

During lactation, the amount of energy required for maintenance of body tissues and milk production often exceeds the amount of energy available from the ration

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(Voigt *et al.*, 2006), thus forcing mobilization of body fat reserves to satisfy energy requirement.

Feeding bypass fat to lactating animals is another alternative as it provides a dense source of non-fermentable energy. In this way, animal can get more energy at low dry matter intake. However, fat feeding presents certain problems. Unsaturated fatty acids strongly inhibit activity of carbohydrate-splitting microorganisms which can interfere rumen function. Fats, as salts of long chain fatty acids improve rumen fermentation and have increased digestibility (Sirohi *et al.*, 2010). Responses to supplementation of dairy cow diets with rumen-bypass fat have been variable. Therefore, the objective of this study was to determine the effect on milk yield, milk compositions, Economics of feeding bypass fat to lactating cows in farmers' field condition.

METHODOLOGY

The lactating cows (n=20) of varying calving intervals, milk production (3-7 liter per day), similar body weight (310-380 kg) and age ranging from 34 to 66 months were selected for this study, in year 2019, at the village Arerkala (26.753'N and 80.432'E) in Miyaganj block of Unnao district, Uttar Pradesh. All the animals were identified by different farmers of the village level. For the study, animals were divided into two groups: T_1 (n=10) was Farmers practices (Mustard cake, wheat grain, wheat straw and seasonal green fodder) kept as a control group, T_2 (n=10) 20 g/ltr milk yield/day bypass fat supplement (commercial product) for 60 days with Fendendazole 3g tablet use orally as a dewormer before starting experiment.

During the trial period, the cows were allowed to green fodder (Berseem) on *ad libitum* basis in the morning and evening, along with wheat straw as roughage. Mustard cake and wheat grain as a concentrate was also offered to animals according to their productivity while water was available on *ad libitum* basis. Cows were fed individually to meet the requirements on respective diets as advocated by Kearl (1982). Experimental animals were housed with stanchions in covered area and kept free in open paddock at farmer's field.

The chemical composition of samples (Dry Matter, Organic Matter, Crude Protein, Neutral detergent fibre, Acid detergent fibre, Ether Extract and Total Ash) was determined by the methods described by Association of Official Analytical Chemists (AOAC, 2000) manual. Daily milk production of each cow was recorded and weighed by digital weighing balance. Milk samples, consisted of proportional volumes of morning and evening milk, were taken after cleaning and disinfection of teats and discarding the first streams of foremilk. Milk samples were collected in 50 ml sterile plastic vials at 0, 15, 30, 45 and 60 days of experiment during the lactation period. The fat percent was determined in milk samples by using Gerber's fat test according to BIS (1977). Total solids was done by Badcock's formula and Solid not fat was done according to Prasad *et al.* (1999) and milk yield of cows was recorded daily in morning and evening.

The experimental results were presented as Mean ± SEM (standard error mean). The data on dry matter intake, average daily gain and milk parameters were analyzed statistically using one way ANOVA technique as per Snedecor and Cochran (1994) and means were separated for significance by using Tukey Kramer range tests.

RESULT AND DISCUSSION

The nutrient compositions of feeds used in the experiment are shown in Table 1. The average dry matter intake of animals was 8.87 kg/day/animal and the average of roughage to concentrate ratio was maintained to be 62:38. The ether extract content of bypass fat was 89.46 per cent, indicating that the supplement was quite rich in energy content. Dry matter intake (DMI) was higher for group T_2 as compared to T_1 (control) (Table 2), however, the data were non-significant. The higher DMI may be due to additional bypass fat supplementation, which resulted in slight enhancement of concentrate intake and also changed the roughage concentrate ratio slightly, varying from 60.56:39.44 in the T_1 group to 64.11:35.89 in T_2 group. Kumar and Thakur (2007) and Garg *et al.*, (2008) had also observed similar level of nutrient after addition of bypass fat to the experimental animals when compared with the control.

Table 1: Chemical composition of feeds and fodders (% DM basis) used in the experimental ration

Particulars	Concentrate		Wheat straw	Green Fodder (Berseem)	Bypass Fat
	Mustard cake	Wheat grain			
OM (%)	91.7	97.1	89.25	87.66	89.00
CP (%)	34.9	12.3	3.52	18.68	0
EE (%)	9.4	1.9	0.52	2.92	89.46
NDF (%)	7.9	13.9	80.60	45.79	0
ADF (%)	4.7	3.7	49.00	28.62	0
Hemicellulose (%)	3.2	1.5	31.60	17.17	0
Ash content (%)	8.3	2.9	10.75	12.34	10.54

Table 2: Voluntary feed intakes of lactating cows

Particulars	T2 (Farmer practice with bypass fat supplement)	T1 (Farmer practice)	Significance
Initial Body Weight (kg)	345.14±17.25	340.24±15.21	NS
Final Body weight (kg)	369.29±13.76	362.65±14.25	NS
Average Body weight (kg)	357.22±16.06	351.45±15.45	NS
Dry Matter Intake (kg/day/animal)			
Berseem fodder	14.78± 0.73	16.60± 0.81	NS
Wheat straw	2.74± 0.12	2.95±0.13	NS
Concentrate	3.61± 0.09	3.90± 0.15	S
Bypass fat	0.086± 0.01	-	-
Total DMI	8.95± 0.58	8.80± 0.49	NS
DMI %	2.51	2.50	NS
Roughage: Concentrate ratio	64.11:35.89	60.56:39.44	-

Feeding of bypass fat resulted in significant ($P<0.05$) increase in milk yield. Milk yield was increased by 13.15 per cent in T_2 group over the T_1 group. Similarly, Naik *et al.* (2007) and Garg *et al.* (2008) also reported significant improvement of milk yield in ruminants. Milk fat percentage differed significantly higher ($P<0.05$), whereas milk protein and SNF were numerally higher in T_2 group as compared to T_1 group during experimental (Table 3). Milk fat per cent showed a clear cut rise with the bypass fat supplementation (Mishra *et al.*, 2004; Garg *et al.*, 2008). However, milk protein level decreased in some experiments (Polidori *et al.*, 1997). But, like this study milk protein level was similar in all other experiments. The study has made it clear that our lactating cows do need the bypass fat supplement in their diet incorporated, in order to meet their energy requirements fully to express their milk production potential. This was demonstrated by the highly significant increase in milk yield, fat percentage and TS (Total solids) percentage in milk as a result of feeding the bypass fat supplement (Table 3).

The daily feed cost was higher in T_2 group as compared to T_1 group. Higher feed cost was on account of feeding bypass fat 117 Rs/animal/day. The data on daily realizable receipt (Table 4) from sale of milk (Rs/animal) and ROFC was higher in T_2 as compared to T_1 group. This is the reflection of higher milk yield in T_2 as compared to T_1 group. When the economics of milk production on feeding bypass fat 20 g/kg milk yield it was observed that increase in daily income by 24 Rs/day /animal as compared to T_1 group and 77.41 per cent more return over the T_1 (Control).

Table 3: Milk production and composition of milk in lactating cows

Particulars	T2 (Farmer practice with bypass fat supplement)	T1 (Farmer practice)	Result
Milk yield (kg/day)	4.30± 0.17	3.80± 0.16	S
Fat %	3.74± 0.12	2.92± 0.10	S
Protein %	3.10± 0.14	3.14± 0.14	NS
SNF %	8.40± 0.53	8.35± 0.51	NS
Total Solids % (TS)	12.14± 0.51	11.27± 0.48	NS
Percent increase in milk yield	13.16	-	-

Table 4: economic of return over feed cost (ROFC)

Particulars	T2 (Farmer practice with bypass fat supplement)	T1 (Farmer practice)
Daily cost of feeding (Rs/animal)	117	113
Daily realizable receipt (Rs/animal)	172	144
Daily return over feed cost (Rs/animal)	55	31
Net difference in ROFC over Farmer practice (Rs/animal/day)	24	-
% more return over Farmer practice	77.41	-

CONCLUSION

It can be concluded that bypass fat supplementation to lactating cows is beneficial in terms of milk production, fat percent and more return over the farmer's practices. However, dry matter intake was not significantly affected. Therefore, livestock holders need to be aware about the impact of bypass fat supplementation in lactating cows. So that they include bypass fat in animal feed to raise their income as well as health of livestock.

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Research Note

Effect of Nutrition Education Intervention to Diabetic Subjects on use of Millet Recipes in the Management of Diabetes

Krishna Mishra[1], Nirmala B. Yenagi[2] and Uma Hiremath[3]

ABSTRACT

Diabetes mellitus is the most common metabolic disorder affecting humankind and creating health hazard. The inclusion of millets in the diabetic diet has been reported from ancient days in India as they exhibit hypoglycaemic effect due to presence of higher proportion of complex carbohydrate, resistant starch, slow rising sugars and water-soluble gum β-glucans. With this context the study was conducted in which the knowledge, attitude and practice of millets of the diabetic subjects were seen and further the intervention programme on consumption of millet recipes for 30 days was conducted on 12 diabetic volunteers. The nutrition education enhanced the level of adoption of millets by12.9 per cent. Significant reduction in Fasting and Post Prandial Blood sugar level and reduction in diabetic symptoms were also observed. Millet recipes along with the recommendation for diabetics can also be introduced in the regular diet of normal healthy people which in return may help to increase the food value chain of millets.

Keywords: Adoption, Attitude, Intervention, Knowledge, Millets, Nutritional awareness, Practice

INTRODUCTION

Diabetes poses a major health problem globally and is one of the top five leading causes of death in most developed countries. The prevalence of diabetes in India is showing a sharp upswing as is evident from secular trends from different parts of the subcontinent and studies of migrant Indians (Mohan, 2004). India is called the capital of diabetes. Recent studies in India have established strong positive associations between refined grain intake and Type 2 diabetes. Moreover, improved standard of living has modified the lifestyle of people leading to health and nutritional transitions thus inviting the spectrum of lifestyle disorders**.** Healthy traditional recipes having coarse grains and conventional cooking methods are replaced by recipes of refined grains predominantly wheat and rice (Nambiar and Patwardhan, 2014**)**. Diet, exercise and drugs management are very much essential for a diabetic patient. But diabetes management is sometimes very costly for the poor man as they cannot afford to the drugs and also regular check up. Hence, especially for them diabetes management through diet is very much essential. Emphasis need to be given more on carbohydrates in all the three meals and also the intake of dietary fibre content.

Millet is a general category for several species of small grained cereal crops and is a food staple in parts of India, Africa, China and elsewhere. Millet contains an average of 10–12 per cent protein and is superior to that of wheat or corn in terms of content of essential amino acids, it nonetheless contain less than half the amount of the essential amino acid lysine that is found in high quality protein sources such as meat (Ronzio, 2004). Moreover, millets are rich in the phytochemicals like polyphenols and antioxidants which are helpful in delaying the onset

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of secondary complications of diabetes. But still most of the people are unaware about the nutritional and therapeutic properties of millets. People are only consuming rice and wheat in their staple diet. In this context an awareness programme was conducted for giving proper nutrition education to the diabetic subjects on the role of millets in the management of diabetes An intervention programme on millets was also conducted and also the adoption of millets in regular diet was studied.

METHODOLOGY

The subjects were selected through simple purposive random sampling method. Different institutes of Dharwad - Hubli area were visited for selection of subjects for giving nutritional awareness. Interested centres were selected for nutritional awareness programme. The centres included 2 hospitals- Dr. S.R. Ramanagoudar hospital and Chetana Diabetic Centre, one factory- Valtek Corporation, Navanagar, Hubli and UAS, Dharwad campus. From each institute 5 to 15 diabetic subjects were selected. Information regarding age, sex, onset of diabetes of the selected respondents was collected. Keeping in view the objective of the study the questionnaire was developed and pretested to assess the nutritional knowledge, attitude and practice of millets by the diabetic subjects. It included 3 sections in which 20 knowledge related, 13 attitude related and 7 practices related questions were included. 50 diabetic volunteers were selected from 82 diabetic subjects and data was collected through pre structured interview schedule. Collected data was analysed using mean and standard deviation.

Nutrition education was given in four different sessions for 1 hour each to 82 subjects of different institutions. Lecture was given regarding the nutritional and therapeutic properties of millets especially with respect to diabetes. Education materials in the form of handouts containing information on diabetic foods, dietary fibre, diabetic complications and their management through millets were also provided to the diabetic subjects. The patients were provided folders containing information on the recipes along with the procedure to cook the recipes in detail. The diabetic patients were given 10-20 grams of each recipe in cups and there were 10 breakfast/ lunch items and 4 snacks items so that their acceptability could be seen. The sheets were provided which included 5 point hedonic scale containing excellent, very good, good, fair and poor.

Out of 82 diabetic subjects, 12 diabetic volunteers were selected who were ready for consumption of different millet recipes for 1 month. Easy to cook and traditional recipes were provided to the diabetic subjects. Eight packets containing 100g of millet raw ingredients for different recipes like little millet upma, foxtail millet upma, ragi vermicelli, foxtail millet bisibelebhat, foxtail millet khichdi, ragi dosa, ragi thalipattu, little millet rice were provided once in a week continuously in cyclic menu. The secondary data of the initial blood parameters like Fasting blood sugar and Post Prandial Blood Sugar of the diabetic subjects were collected before the study and after the intervention to see the changes in their blood sugar profile. The changes in number of initial and final diabetic symptoms were also observed. For the follow up of the level of adoption a channel of supply was created for the diabetic subjects. Raw millets and also ready to use millet recipes mixes were supplied in UAS campus and also in the hospitals on payment basis. A stall was put in UAS campus once in a week for three months and also made available in College of Rural Home Science, Dharwad. Addresses of shops where millets were available locally were also facilitated. Regular update was kept regarding their consumption of millets over phone and level of adoption was studied.

The knowledge, attitude, practice level, change in symptoms and the level of adoption were expressed in frequency and percentage. Paired t-test was used for the comparison of initial and final blood sugar level.

RESULTS AND DISCUSSION

The nutritional knowledge level of fifty diabetic subjects about millets showed that about 38 per cent of the subjects had high knowledge about the therapeutic qualities of millets. Majority of the respondents had moderate knowledge (40%) (Figure 1). Very few people, about 22 per cent of the subjects were unaware about the millets. This data shows high nutritional knowledge of people about millets. Similar results were reported by

Malagi *et al*. (2007) in which equal number of diabetics belonged to good and poor knowledge categories, showing the need for education programme to improve the knowledge about diabetes. Majority of the population had moderate knowledge scores (36.70%) followed by low (32.10%) and high knowledge scores (31.20%). This may be due to the wide growing area of millets in the local region. Similar results reported by Beranje *et al*. (2010). They were aware of it as millets are consumed as festival foods in North Karnataka. Also they knew about millets in general by getting the idea from their ancestors. But the knowledge was limited to the general benefits of millets only. But they were unaware about the nutritional and therapeutic qualities of millets. As per the survey, about 32 per cent of the people had highly favourable attitude (Figure 2), thirty per cent of the subjects had favourable attitude towards millets, but more diabetic subjects had 'less favourable' attitude (38%) towards millets despite their good knowledge and were not ready to accept millets. This may be because some people thought that millets were not easily digestible, content of anti-nutrients in them, hence they may cause harmful effects on health like diarrhoea and other ailments. The main reasons was that millets are considered as poor man's food, people thought that if they consume millets then it would hamper their status. About 24 per cent people had good practice of millets in their regular diet either in breakfast, lunch or dinner about 3 to 4 times in a week or daily. About 50 per cent of the people had satisfactory practice of millets. About 26 per cent of the subjects did not consume millets at all (Figure 3). Majority of diabetic subjects (66%) had satisfactory practices. Malagi *et al*. (2007) and Beranje *et al*. (2010) reported that 41.30 per cent of diabetic subjects had satisfactory practice scores regarding consumption of whole grains in the management of diabetes. Practice was only limited

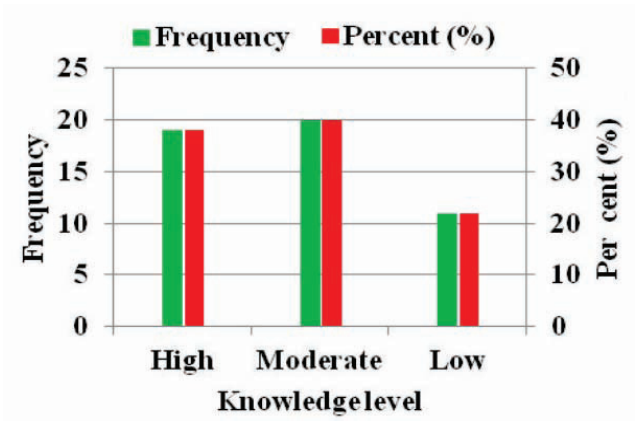

Figure 1: Nutritional knowledge of diabetic subjects about millets

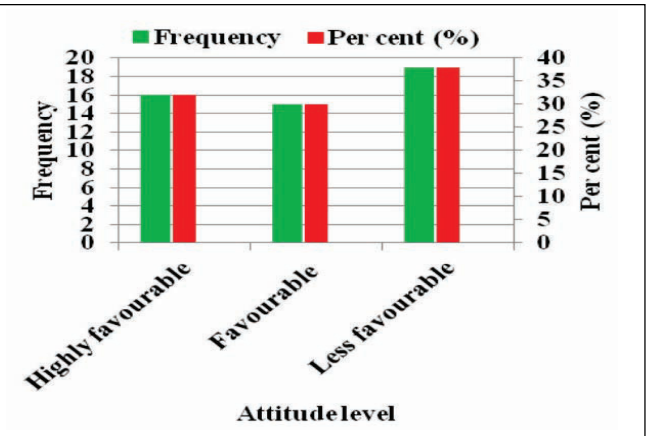

Figure 2: Attitude level of diabetic subjects towards millets

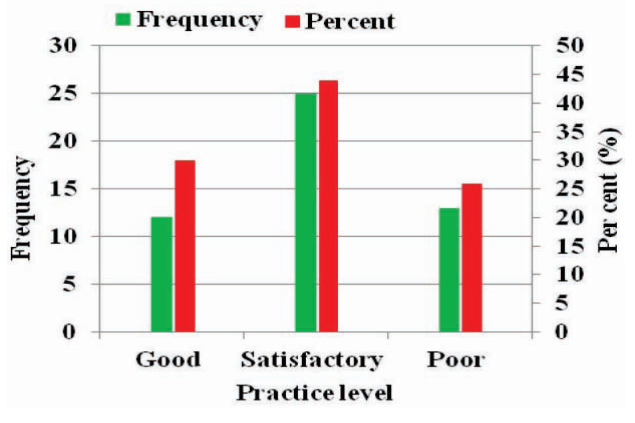

Figure 3: Overall food practice of diabetes subjects

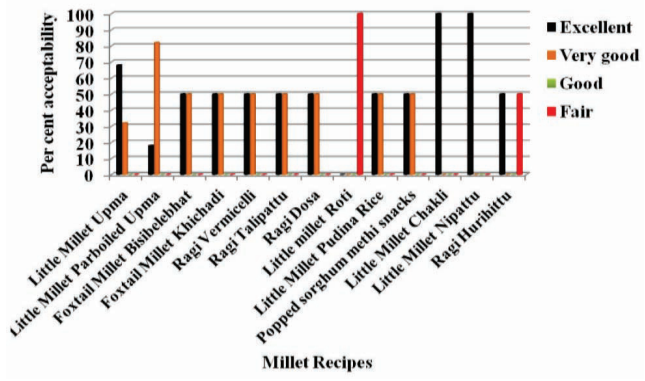

Figure 4: Per cent acceptability of millet recipes by diabetic subjects

to functions and festivals. Despite good knowledge about millets also they were not ready to consume millets as there was lack of availability and also they were unaware about different types of millet recipes. So they couldn't cook and eat. Another reason may be, through various schemes and programmes, government is supplying refined cereals to people at very cheaper price and the Below Poverty Line (BPL) people were also entertained with so many facilities to get proper nutrition. They were being provided with cereals and pulses at a reasonable price. So, they were not opting for millets.

All the recipes were highly acceptable and were categorized as 'excellent' and 'very good', mainly little millet upma. Only little millet *roti* was scored as 'fair' (Figure 4). Among the snacks items little millet *chakli* and little millet *nipattu* were highly acceptable (100%). Popped sorghum *methi* snacks and *ragi hurihittu* were 50 per cent acceptable as 'excellent' (Figure 4). Evaluation of dhokla, uppuma and laddu for preference using a nine-point hedonic scale showed all the three food products to be acceptable, Similar results reported by Pathak *et al*. (2000). In a study by Yenagi *et al*. (2011), foxtail millet steamed *methi kadabu* was highly accepted, followed by little millet steamed *kotte kadabu* and little millet vegetable pulav. The most acceptable among the breakfast items were little millet *upma* followed by little millet parboiled *upma*. It may be attributed to their good taste or mineral content. Among the snacks items, little millet chakli and nipattu were highly acceptable. It may be due to their appearance, taste, crispiness and familiarity. The breakfast cereal developed by Kumari *et al*. (2019) with pearl millet was also found nutritionally superior.

The initial range of the Fasting Blood Sugar (FBS) was 95 to 188 mg/dl and in Post Prandial Blood Sugar (PPBS) was 131 to 306.1 mg/dl. After intervention of millet based recipes there was significant ($p<0.05$) reduction of the Fasting Blood sugar as well as Post prandial blood sugar by 18.26 and 11.28 per cent respectively (Table 1). This can be attributed to the polyphenol content, antioxidant activity, anti-diabetic effect and also dietary fibre content of the millet recipes as compared to rice (Mishra, 2016). Similar results were also obtained after consumption of millet based recipes in several studies (Itagi *et al*., 2013; Jali *et al*., 2012; Yenagi *et al*., 2016). In some subjects there was rise in blood sugar after intervention either in Fasting or Post Prandial blood sugar level or even both. This may be because of consumption of other high glycaemic foods by them along with the millet recipes as the intervention

Table 1: Impact of regular consumption (30 days) of different types of millet foods on blood sugar level of diabetic subjects

S.No.	Age (yrs)	Sex	Onset (yrs)	Fasting Blood Sugar				Post prandial Blood Sugar			
				Initial (mg/dl)	Final (mg/dl)	Percent change (%)		Initial (mg/dl)	Final (mg/dl)	Percent change (%)	
1	53	M	3	140	97	30.71		170	156	8.23	
2	68	F	5	140	148	-5.71		200	248	-24	
3	57	F	8	170	161	5.29		190	172	9.47	
4	51	M	10	180	168	6.66		306.1	263.4	13.94	
5	3	F	4	165	135	18.18	**t = 3.198***	210	229	-9.04	**t = 1.467***
6	48	M	3	145.3	146.7	-0.96		260.8	220.9	15.30	
7	58	M	7	95	103	-8.42		210	195	7.14	
8	46	M	1.5	142	103	27.46		183	159	13.11	
9	49	M	3	188	158	15.95		221	212	4.07	
10	68	M	2-3 m	149.4	90.7	39.02		202	176.4	12.67	
11	43	F	3-4m	180	162	10.00		210	173	17.61	
12	45	F	1	99	88	11.11		131	150	-14.50	

was self motivated. Other reasons may be immediately after the intervention they didn't check the blood sugar. The symptoms like excess thirst, excess hunger, frequent urination, tingling, itching, blurred vision, weakness, nerve disorder, constipation, giddiness, numbness and irritability were found in the diabetic subjects before the millet interventions. Most of the subjects were having excess hunger (66.66%) followed by excess thirst (58.33%) and weakness (25%). After intervention of millet there was significant reduction in all the symptoms especially excess thirst (8.33%) and excess hunger (0%). This may be due to reduction in FBS and PPBS. The reduction could be due to the good nutrient composition, presence of phenolics, % DPPH radical scavenging activity, anti-diabetic effect and also dietary fibre content of these millet recipes (Mishra, 2016). Highly significant difference was present in the pattern of consumption of millets in regular diet. The subjects not consuming millets were significantly higher (63.41%) than people consuming millets. About 24.39 per cent of the people were consuming millets once in a week followed by regular consumption in one meal (10.98%). But only 1.22 per cent of the people were consuming millets regularly in all the meals. So, the total consumption of millets was found to be 36.9 per cent. Hence, the consumption of millets increased by about 12.9 per cent. A similar study revealed that nutritional knowledge among school children significantly increased (t value - 8.39**) at the end of awareness programme (Yenagi *et al*., 2012). This could be attributed to proper nutrition education and also likeness of the millets recipes which were not less than rice and wheat recipes in any of the sensory attributes. The reduction in blood sugar and also the reduction in the diabetic symptoms during the intervention programme may also have tempted them to consume millets in their regular diet. The reasons for non-consumption of millets by some of the diabetic subjects as depicted by them were because of the high cost, non availability, not possible for daily consumption and no time to cook separately.

CONCLUSION

The nutrition awareness programme on millets to diabetic subjects increased the level of adoption of millets in the regular diet by 12.9 per cent. Consumption of millet recipes for a period of 30 days significantly reduced the blood sugar level and also the diabetic symptoms. Hence, there is a need to promote consumption of millets and also to increase the availability through Public Distribution System. This information may be used in planning of diets by dieticians and nutrition graduates. Millet recipes may be introduced in the regular diet of families which will help to increase the food value chain of millets.

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Research Note

Nutri-garden for Sustainable Food Security and Nutritional Diversity in Hamirpur District of Bundelkhand Region (U.P.)

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ABSTRACT

Nutri-garden is one of the easiest ways of ensuring access to a healthy diet that contains adequate macro and micronutrients. Thus the study were planned keeping in view improved food security, increased availability of vegetables, better nutrition and food diversity by provisioning bio-fortified vegetable varieties seeds and saplings. The purposive experimental study was planned. The study was conducted in 12 villages under FLDs programme in Hamirpur District. Total 120 farm families were selected for the study having area around 150 m^2 near the house. Total 33 varieties were provided throughout the year in every *Nutri-garden*. Brocalli, Pusa Chaulai, Sarson Saag, and Kasuri Menthi etc. (rich source of nutrients) were first time introduced in selected Nutri-Garden. It was found that area available for kitchen garden in most of farm families was cultivated area near the house (29.17%) and unused land near the house (35.83%). It was observed that maximum production was in Rabi season followed by Kharif and Zaid season respectively, may be due to scarcity of water in Bundelkhand region during summer. Availability of Macro and micro nutrients through consumption of vegetables in daily routine diet was found satisfactory.

Keywords*:* Food security, Nutritional diversity, Malnutrition, Mitigation, Nutri-garden

INTRODUCTION

The global population is growing at a rapid rate and is expected to reach over 9 billion by 2050. The need to feed the continually growing population is crucial. It has been projected that average daily energy need could reach 3050 kcal per person by 2050 requiring global food production to increase by 70 per cent. Among all people, those of developing countries are suffering from chronic food insecurity at a higher rate than others (FAO, 2014). Now a days India is suffering from triple burden of widespread poverty, food insecurity and under-nutrition. India is likely to be the most populous country by 2030 with 1.6 billion people with a vast majority of hungry and malnourished people. Over half of the population suffers from chronic food insecurity. It has been projected that global food production will need to increase by 70 per cent in order to meet the average daily calorie requirement of the world's population in 2050s. The household level data on calorie intake indicates that the average calorie consumption among population in India is falling over the last twenty years. Common nutritional problems of human beings are protein energy malnutrition (PEM), micro nutrient deficiencies like vitamin A deficiency (VAD), Iron deficiency anaemia (IDA), Iodine deficiency disorder (IDD) and Vitamin B complex deficiencies**.** The expert committee of Indian Council of Medical Research (ICMR-2012) recommends that every individual should consume at least 300 g vegetables and 100 g fresh fruits /day (green leafy vegetables – 50 g, other vegetables 200 g, roots and tubers -50 g) and pregnant women should consume 100 g leaf vegetables/day.

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In India per capita availability is around 135 g against the minimum requirement of about 300g for a balance diet. Even this low level of average supply does not fully reflect the consumption pattern of the rural household and those below the poverty line where per capita vegetable consumption is very low, even lower than 40g per day. It is now well conceived that by simply adding greens and other vegetables to the available food grains the diet of the average Indians can substantially be upgraded. To make this recommendation realistic promotion of Nutri-garden is the best option which can supply required vegetables in daily diet to the rural families. Bundelkhand region many semi-arid and arid areas particularly exposed to the impacts of climate change and projected to suffer a decrease of water resources. Very less farmers were growing vegetables in all season for household consumption. So that lots of population suffering from malnutrition problems. In rural areas surroundings of house some unused land are vacant which can be utilize for installing "Kitchen Garden" which will produce fresh vegetables for supplementing the vitamin deficiencies of the human population. In addition, extra produce will add to additional income by sale of the vegetables in the market, thus they can increase the earnings of the family. Hence, Nutri-garden is a realistic solution to solve the nutritional insecurity in this region. The intervention based study was planned in rural areas of Hamirpur district in Bundelkhand to enhance nutrition knowledge of rural women, ensure fresh and nutri-rich vegetables in daily routine diet by providing Bio-fortified variety's seed and saplings of vegetables so that consumption as per RDA of ICMR for healthy life may be ensured.

METHODOLOGY

The study was conducted purposely in 12 villages of different blocks (Kurara, Sumerpur, Rath, Sarila, Gohand, Muskara) under FLD Programme by Krishi Vigyan Kendra, Hamirpur. Ten farm families were selected from each village making a total of 120 farm families having 150 m^2 area near around the house for interventions. Data was collected through a well-developed interview schedule to elicit information from selected households. A plan for model of nutri-garden of 150 m^2 was drawn up (Figure 1), keeping in view the maximum output and a continuous supply of vegetable for the table throughout the year as per recommended by ICMR (Indian Council of Medical Research) 2010.

To fulfil the daily requirement of vegetables in diet as per recommended by ICMR 2010, provided Kitchen garden kit of Bio-fortified variety of vegetables seeds and saplings in Kharif, Rabi and Zaid season. Kitchen garden kit was purchased from IARI, New Delhi and

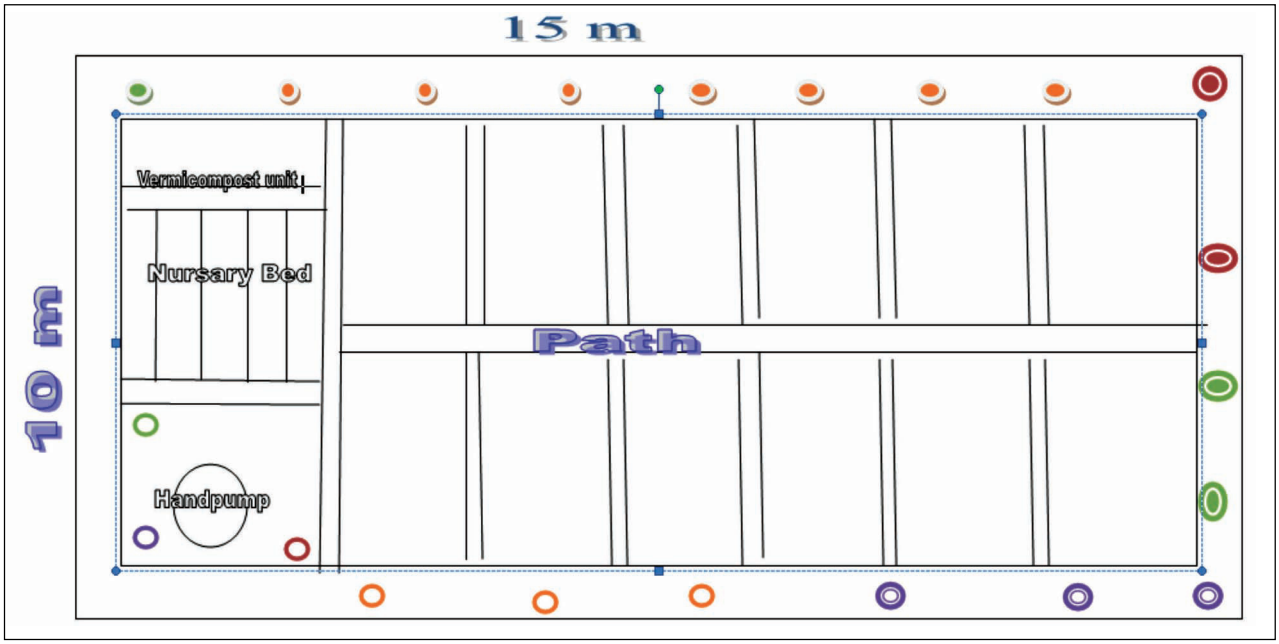

Figure 1: Layout of Model Nutri garden

IIVR, Varanasi (U.P.). The data regarding area available for nutri-garden, vegetable grown in different season, yield and consumption pattern were collected on weekly basis from selected households. Simple descriptive statistics was employed in order to have a summary description of the data collected.

RESULTS AND DISCUSSION

The area that got cultivated for kitchen gardening, the choice of vegetable crop grown was entirely depends on food preference of the respective family. Pal and Kaur (2019) reported that non-availability of quality planting material of fruits and seeds of HYVs of vegetable, lack of knowledge about improved varieties, seed rate and sowing time, lack of knowledge about seed treatment and lack of knowledge were reported major bottlenecks in successful adoption of kitchen gardening.

Table 1 depicts that area available for kitchen garden in most of farm families was unused land near the house (35.83%) followed by in cultivated area near the house (29.17%) and cultivated area near the tube well (20.00%). Only 15 percent farm family's court yard for Nutri-garden was available in Hamirpur district. It was also found that most of the respondents has not grown all types of vegetables throughout the year before intervention of this programme due to lack of awareness, laziness and lack of seed. Kaur *et al.* (2017) also found that 47 per cent respondents cultivated vegetables, pulses and fruits for their nutritional garden. However, Pal and Kaur (2019) reported that non - availability of quality planting material of fruits and seeds of HYVs of vegetable, lack of knowledge about improved varieties, seed rate and sowing time, lack of knowledge about seed treatment and lack of knowledge were reported major bottlenecks in successful adoption of kitchen gardening.

A seasonal calendar of locally available all types vegetables viz. Green leafy vegetables, root and tuber, fruits and other vegetables was prepared. The Kitchen garden kits were prepared by purchasing of Bio fortified variety of vegetables seeds**.** The saplings of naturally fortified fruits like - Moringa, Curry leaf were also made available to selected households.

Table 2 depicts that around 33 nutrient-rich varieties of vegetables were grown throughout the year in every nuri-garden. Data reveals that maximum production (337.98 kg) was found for fruits and other vegetables, followed by green leafy vegetables (144.61 kg), and root and tuber crops (108.18 kg). Total production was 590.77 kg in the year. Brocalli, Pusa Chaulai, Sarson Saag and Kasuri Menthi etc. were first time introduced in selected kitchen garden of Hamirpur. Promotion of all types of vegetables was emphasized for their nutritional importance and diversification.

The results indicated that according to season, the quantity of vegetables produced per household was highest in Rabi season whereas lowest in Zaid season due to scarcity of water during summer in Bundelkhand region. Study also get supported from Aliza *et al*. (2018). It was found that 150 m^2 area of kitchen garden fulfilled more than the requirement of vegetable in daily routine diet for family (Up to 6 Members) in Rabi season followed by 76.30 per cent in *Kharif* season and 67.64 per cent in *Zaid* season. The average net income saved by the

Table 1: Distribution of respondents on the basis of availability of area and vegetables grown before intervention (N= 120)

Area Available	No. of respon-dents / %	No. of respondents grown before intervention		No. of respondents grown vegetables in different season before intervention								
				Kharif			*Rabi*			*Zaid*		
		Yes	No	GLVs	F/R	All	GLVs	F/R	All	GLVs	F/R	All
Backyard/ Court yard of house	18 (15.00)	13	05	-	13	-	03	09	01	01	04	-
Unused land near the house	43 (35.83)	27	16	01	24	02	04	20	03	03	09	-
Cultivated areas near the house	35(29.17)	29	06	01	27	01	06	21	02	06	10	-
Cultivated area near the tube well	24(20.00)	19	05	03	15	01	03	12	04	05	07	01

Table 2: Promotion of Bio-fortified Vegetables for Nutritional Diversity

Type of vegetables	Name of Vegetables/Variety	Production in different seasons			Total
		Kharif	*Rabi*	*Zaid*	
Green Leafy Vegetable	Palak (All Green)	10.11	16.47	11.78	38.36
	Chaolai (Pusa lal chaulai)	10.90	10.57	10.85	32.32
	Coriander (Vardaan)	1.14	6.51	1.73	9.38
	Methi (Pusa Kasuri)	0	12.82	0	12.82
	Sarson Saag (Pusa Sarson Saag1)	0	12.82	0	12.82
	Chenopodium album (Bathua)	0	5.28	0	5.28
	Cabbage (Pusa Mukta)	0	18.07	0	18.07
	Brocalli (KTS-1)	0	15.56	0	15.56
Fruit vegetables	Tomato (Kashi Aman)	0	24.95	0	24.95
	Cauliflower (Pusa Shrad)	0	18.98	0	18.98
	Brinjal (Kashi Sandesh)	0	21.18	0	21.18
	Bottle gourd (Kashi Ganga)	24.88	0	16.83	41.71
	Chilli (Kashi Anmol)	0	5.12	0	5.12
	Pumpkin (Kashi Harit)	27.37	0	15.59	42.96
	Sponge gourd (Kashi Dibya)	18.60	0	12.30	30.9
	Nasdaar tori (Kashi Shivani)	21.56	0	0	21.56
	Sarputiya (Kashi Khushi)	6.93	0	0	6.93
	Bitter gourd (Pusa do Mausami)	5.42	0	8.79	14.21
	Cucumber (Pusa Sanyog)	6.58	0	8.94	15.52
	Snake Guard	9.90	0	0	9.9
	Lady's Finger (Kashi Pragati)	13.14	0	12.35	25.49
	Cucumis Melo (Kakdi)	0	0	7.74	7.74
Beans	Red kidney bean (Rajama)	0	5.28	0	5.28
	Pea (Kashi Udai)	0	14.80	0	14.8
	Sem (Kashi Haritima)	0	0	16.83	16.83
	Cow pea (Kashi Kanchan)	0	0	13.89	13.89
Root and Tuber	Knol khal	0	12.82	0	12.83
	Radish (Pusa Shweta)	10.56	17.59	8.50	36.65
	Carrot (Pusa Rudhira)	0	15.48	0	15.48
	Garlic (Yamuna Sefed)	0	7.38	0	7.38
	Onion (Agrifound Dark Red)	0	8.84	0	8.84
	Turnip (Pusa Shweti)	0	16.56	0	16.56
	Beetroot (Detroit Dark Red)	0	10.44	0	10.44
	Total Production	167.10	277.56	146.11	590.77

Table 3: Evaluation of availability of vegetables round the year through Kitchen Garden (area 150 m^2)

Season	Average No. of family member	Reqt. of Vegetables Throughout the year (kg)	Availability of vegetable (kg)	Gap/ Difference (kg)	Reqt. Fulfilled (%)	Cost of cultivation (Rs.)	Gross Income (Rs.)	Net Income (Rs.)	B:C Ratio
Kharif (122 Days)	06	219.60	167.10	-43.50	76.30	680.0	3625.88	2945.88	1:5.3
Rabi (123 Days)	06	221.40	277.56	+56.16	125.36	880.00	5787.40	4907.40	1:6.6
Zaid (120 Days)	06	216.00	146.11	-69.89	67.64	980.00	3883.20	2903.20	1:3.9
Throughout the year	06	657.00	590.77	66.23	89.92	2540.00	13296.48	10756.48	1:5.3

Source: ICMR 2012-Guidelines for Indian, Requirement of Vegetables/day/person 300 g

farmer was Rs. 10756.48 per year from the kitchen garden. Similarly, Kumari *et al.* (2018) reported that from 150 m^2 (for Small Family 5 Members) of kitchen garden 100 per cent requirement of vegetable in daily routine diet was fulfilled and saved the money for buying other vegetables.

Nutritional value index for all 33 varieties of vegetables grown in nutrition gardens across the three seasons were calculated with the help of ICMR 2012 methodology. Table 4. depicts that the availability of green leafy vegetables was found more i.e. (66.03 g/person/ day) and vegetables was found less (154.32 g/person/ day) as compared to recommendations of ICMR 2010. The availability of macro and micro nutrients was also found sufficient in diet as per National Institute of Nutrition, Indian Council of Medical Research (ICMR 2018) recommended minimum requirements of Protein (20.0 g) from cereals, 21.0 g from pulses,10 gm from milk, 4.0 g from vegetables, 1.0 g fruits and 4.0 gm from nuts & seeds per person /day for healthy life.

Consumption pattern of vegetables before and after introducing Kitchen garden was calculated. It can inferred from Figure 2 that average vegetable consumption of a person was less than RDA before introducing kitchen garden and also consumption of green leafy vegetables, root and tuber was very less as compare to other vegetables may be due to awareness.

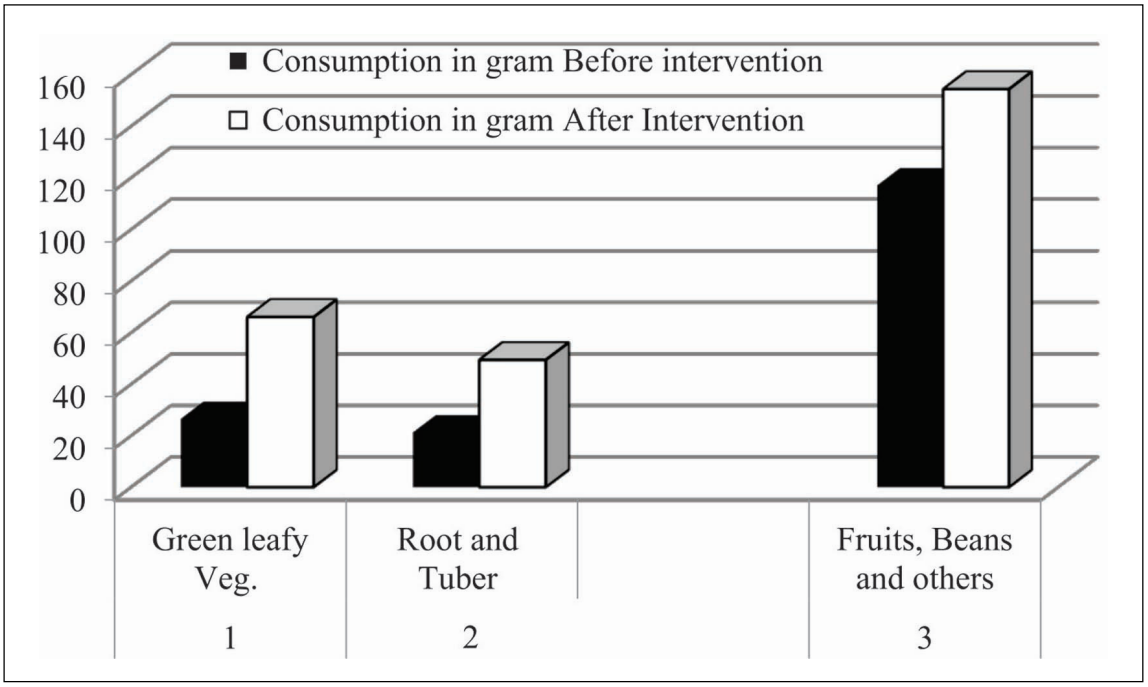

Figure 2: Consumption pattern of vegetables

Table 4: Nutritional Requirement fulfilled of Vegetable through Kitchen Garden in Selected Farm Families

Model of Kitchen Garden	Average No. of family member	Requirement /Availability of types of vegetables /day/ person (g)	Requirement / availability of types of vegetable throughout the year (kg)	Nutritional Requirement fulfilled / Person/ day									
				Energy (Kcal)	Protein (g)	Fat (g)	CHO (g)	Fiber (g)	Vit. A (µg)	Vit C (mg)	Thimin (mg)	Raibo-flavin (mg)	Iron (mg)
(150 m^2)	06	Green leafy Veg. 50 g / 66.03	109.50/144.61	42	2.7	0.3	2.7	0.9	978	9.8	0.02	0.16	2.79
		Root and Tuber 50g / 49.40	109.50/108.18	28	0.9	0.1	5.2	0.7	543	8.0	0.03	0.03	0.81
		Fruits and Beans 200g / 154.32	438.00/337.98	76	1.8	0.4	12.4	3.2	126	18.7	0.12	0.12	1.7
Throughout the year		300g/269.75	657.00/590.77	146	4.4	0.8	34.6	3.8	1547	36.5	0.17	0.31	5.3

Source: Gopalan *et al.* ICMR 2012- Nutritive value of Indian Foods. pp-42.

As an impact of kitchen gardening on rural communities the consumption of all types of vegetables increased in daily diet. It was acknowledged that after intervention of kitchen garden all the participants were taking more interest and people saved money. Consumption of fresh and organic vegetables in daily routine diet also increased. Consumption of vegetables increase from 53 to 87 per cent, similar increase after the kitchen gardening training was reported by Galhena *et al.* (2013.)

CONCLUSION

It may be concluded that before intervention of technology of nutri-garden the farmers/farm women were not aware and also used inadequate quantity of vegetables in daily routine diet whereas after interventions of refined technology the production of vegetables increased as well as consumption of vegetables in daily. There are lots of social benefits that have emerged from kitchen gardening practices; better health and nutrition, increased income, employment, food security within the household and enhance in community social life. Increased consumption of fruits and vegetables is one of the easiest and cheapest ways of enhancing health. As such backyard nutrition gardening as a low cost sustainable approach for mitigating malnutrition especially in rural households need to be promoted at large scale.

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