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EDITORIAL

Agrarian Issues and Response of Agricultural Extension System

Indian agriculture faces a number of critical issues and challenges which need to be addressed urgently. No doubt, we have made laudable achievements in agricultural development through Green Revolution during the period 1965 to 1985. During Sixth Plan Period (1980-85) the agricultural growth rate exceeded overall growth rate. However, since 1997-98, the agricultural growth is only about two per cent per annum, while the over all economy has been growing at eight per cent per annum. If the current trend continues we may soon face a severe shortage of food grains to feed burgeoning population and other problems related to growth & development. "No wonder our farmers, who keep others alive, are now forced to take their own lives and 40 per cent of them want to quit farming, if there are alterative options". Today we face problems such as stagnation of yields of crops, declining fertility of soil, depletion of water resources, environmental pollution, climate change, and ineffective and inadequate extension services, non-availability of quality inputs and degradation of natural resources.

What are the reasons for the decline in agricultural growth? How can the growth in agriculture can be revived? One of the reasons attributing to poor growth in agriculture is the neglect of and low investment in agricultural research and extension and ineffective Agricultural Extension System (AES) in several states of India. The performance of AES suffered due to ineffective policies and lack of development and promotion of sustainable farming technologies. The growth in agriculture mainly depends upon revival of AES. Therefore we have to address various issues while answering the question 'what should be the responses and responsibilities of AES to tide over the present problems encountered by agriculture sector'? We have to focus on the following components of technology development and transfer: i) development of appropriate extension policies to address current issues of Indian agriculture; ii) re-envisioning and strengthening of Agricultural Extension System to meet the challenges of agrarian issues; iii) micro level institutional arrangements for strengthening market-led extension services for small and marginal farmers; iv) strategies related to relating to diffusion of farming technologies including IPM practices, organic farming, precision farming etc; v) innovative extension strategies for efficient supply of quality inputs (such as seeds, fertilizers, etc.) at community level; and vi) innovative extension strategies such as contract farming, participation of farmers organizations, co-operatives, other public-private partnership to minimize technological, environmental, and market risks.

It is crystal clear from above discussion that extension in the coming years has to go beyond the narrow focus of transfer of technology and will include a much broader role. Implementation of a wider role by extension requires a climate of willingness and motivation for change including creativity, flexibility and readiness to learn from success and failures. "Will extension system which is controlled by a bureaucratic Government set-up respond to the changes and challenges and re-establish itself into a vibrant organization ?" is the question in the mind of most of the extension scientists and practitioners. I am sure that the extension system will respond to the different issues in a positive manner and bring about a radical change in the paradigm and practice of extension.

I am glad to place before you the present volume of the journal which has several research papers and notes which are notable for their scholarship and usefulness .You will find that several papers in this volume deals with issues like entrepreneurship development, assessment of Bt. cotton, training needs of extension managers and adoption of zero tillage technology. I hope that you will find time read these papers and enrich your knowledge and practices.

I sincerely extend my thanks to Dr.Premlata Singh, Dr.Rashami Singh, and Sh.Lenin , Sh. A.Chandru and Sh.Jeganathan for their untiring help in bring out this issue.

K.Vijayaragavan
Chief Editor

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CONTENTS

Research Papers

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Entrepreneurial Needs of Students in Agricultural Universities

Daniel Temesgen[1] and Baldeo Singh[2]

ABSTRACT

The study was undertaken to investigate the career preferences and entrepreneurial training needs of agricultural students. A total sample of 150 students were randomly selected. It was found that most of the students preferred career in non-agriculture sector. More than half of the respondents identified security of employment in the work and high starting salary and long-term salary prospect as important factors in choosing a career. It was noticed that greater percentage of the respondents had only some knowledge in important aspects of managing business operations required by potential entrepreneurs and nearly two-thirds of the students were moderately achievement-motivated, indicating gap of knowledge, skill and motivation which could hinder the growth of entrepreneurship among the students.

Understanding entrepreneurial needs of students with a multi-dimensional view is important for strategic planning of entrepreneurship development. It is increasingly recognized that entrepreneurship development is the only way to overcome the present unemployment situation among the young graduates and create appropriate extension strategies in the light of privatization and commercialisation. It helps in providing information that helps in designing strategies of identifying, stimulating and reinforcing entrepreneurial behaviour among the students. It also highlights the importance of introducing entrepreneurial education and training among the students and the role of agricultural colleges and universities in addition to the opportunities and support available. However, it has been indicated in various studies that adequate entrepreneurial training and support required to work in competitive environment are lacking among the young graduates. Hence, it is important to know the preferences, aspiration and entrepreneurial needs of the young agricultural students. Therefore, this study was designed to investigate the entrepreneurial needs of young agricultural students so as to suggest appropriate measures and policy direction for entrepreneurship development in agricultural students. The specific objectives of the investigation were to study the career preferences and aspirations of agricultural students, and to determine their entrepreneurial training needs of agricultural students.

METHODOLOGY

This research was conducted in three selected agricultural institutes namely Indian Agricultural Research Institute, New Delhi, Punjab Agricultural University, Ludhiana and Haryana Agricultural University, Hissar. The sample of the study comprised of the final year B.Sc. (Agriculture) students from Punjab Agricultural University, Ludhiana, Haryana Agricultural University, Hissar and M.Sc. students from Indian Agricultural Research Institute, New Delhi. A total sample of 150 students, that is 50 from Punjab Agricultural University, 50 from Haryana Agricultural University and 50 from Indian Agricultural Research Institute were randomly selected from the list of students. The data were collected from the students by using questionnaire. Scales and test were used to measure variables such as aspiration, preference, needs and achievement motivation of students.

Training need refers to the gap between what is and what should be in terms of knowledge and skill of the students in establishing and running agri-business

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enterprises in the future. The training needs were measured by a scale used by Colombo Staff College for Technical Education (1998) but slightly modified for the study purpose.

Preference of career refers to the choice of student's future career or occupation. Preference of the respondents with respect to the future career was measured with the help of the scale developed by Supe (1969). The preferences of student's future career or occupation were recorded with the help of a four-point continuum scale ranging from most preferred, least preferred, and not preferred.

Factors which may be relevant in choosing a career were studied and rated on a five point continuum scale ranging from very important, fairly important, undecided, not very important, and not at all important. Respondents were provided with a list of factors, which may be relevant in choosing a career. The various factors were adapted from scale developed by Society of America and modified for the study purpose. A rating of '5' indicates that a factor is considered to be 'very important' while a rating of 'I' indicates that a factor is considered to be 'not at all important' in terms of choosing a career. This enables an average rating to be computed for each of the items presented to respondents.

RESULTS AND DISCUSSION

Profile of the respondents

To draw a profile of agricultural students, a set of socio-personal characteristics were studied. The frequency distribution of agricultural students indicate that the average age of the respondents was 22 years with minimum age 20 and maximum 25 years and standard deviation of 0.874 indicating that all were young. Among the respondents 80.00 per cent were males whereas 20.00 per cent of the respondents were females. Majority of the female respondents were from PAU (24.00%) and followed by HAU (20%).

Majority of the students of IARI (58%), PAU (66%) and HAU (76%) belonged to nuclear families. Family occupation of majority of the respondents was service sector (44.66%) and only 36.49 per cent had agriculture as family occupation. The majority of the respondent from HAU (58.00 %) had rural background followed by PAU students (56.00) and 46.00 per cent of IARI students. Majority of the business owned by the relatives of the respondents were non-agriculture and the majority of the respondents in PAU and HAU had relatives owing business. A majority of PAU (58 %), IARI (54.00 %) and HAU (52.00%) of sample students belonged to an income range of Rs. 150,000-300,000, whereas 26 per cent of IARI, 22 per cent of H.A.U. and 18 per cent of PAU sample students belonged to an income range up to Rs. 150,000 per annum.

Career preferences of agricultural students

The frequency distribution of the respondents based on the career preference is given in Table 1. It was found that most preferred career by the respondents was employment in non-agriculture government organisation such as administrative services, policy and army officers, which received the highest mean score (2.24) of preference. This was followed by employment in agri based government organizations (1.79), employment in large companies (1.44), own agri-business (1.18), employment in medium and small companies (0.820). The least score was recorded that, only few students would prefer to take own agri business as occupation. This may be due to the risk and insecurity attached to the self-employment. Thus, the focus on rural economic development through agri-entrepreneurship may not be consistent with student desires. It is suggested that students receiving entrepreneurial training have a significantly higher motivation. These findings therefore, suggest that by improving a student's need for achievement they are more likely to establish and grow business. Similarly, Government sector employment is seen to have higher social status while low social status is accorded to the self-employment. Self-employment in general is not considered as prestigious or valuable. There

Table 1. Institute wise distribution of respondents based on their career preferences (mean score and rank)

S. No.	Preferred career	Mean scores of preferences				
		IARI	PAU	HAU	Total	Rank
1.	Government organisation (agricultural)	1.91	1.71	1.75	1.79	2
2.	Government organisation (non agricultural)	2.24	2.22	2.25	2.24	1
3.	Large agribusines Company	1.41	1.48	1.46	1.44	3
4.	Small/medium business company	0.740	0.820	0.91	0.820	5
5.	Own business (non agricultural)	0.480	0.90	0.750	0.710	6
6.	Your own agri-business	0.750	1.41	1.35	1.18	4

are only a few effective interventions either from the state or private institutions to facilitate self-employment activities and to change the status or image of self-employment. The media can be used to change social perception of people who are employed in the private sector or who are self-employed.

Factors responsible for career preferences

From the table 2, it is evident that over 59 per cent of respondents identified security of employment in the work as very important factor in choosing career followed by high starting salary (42%) and long-term salary prospect (55%). Whereas majority of the respondents identified status attached to the work (51.33%) intrinsic interest (37 %), impact of the work on social life (41.70%) and value of the work for the community (40.30%) as fairly important factors. Further, the factors were analysed and rank ordered based on the mean score of each factors. Accordingly the highest mean score was obtained by long term salary prospect, closely followed by security of employment, status attached to the job, high starting salary, impact of the work on social life, value of the work for the community, and intrinsic interest.

From this it can be noted that entrepreneurship does not carry a significant social premium, because of its associated higher risk and the social opportunity cost which is higher than those called 'white collar jobs' in public sector.

Entrepreneurial training needs of agricultural students

The knowledge and skill of the respondents required to establish and run agri-business enterprises was studied and measured by four-continuum scale (low knowledge, high knowledge, low experience, high experience). The distribution of the respondents in terms of score of their knowledge and experience of different aspects of business is given in table 3. The aspects covered include marketing, competing with other, pricing of the product/services, promotion of business, managing finance, managing business operation, managing employee, project management, communication and policy issues.

Marketing

The data reported in Table 3 reveal that majority of the respondents had high knowledge in terms of choosing location of the business (44.67%), assessing market size (38.66%), determining type of customers (37.33%), and identifying potential customers (34.67%). Whereas 22, 21.33, 18.67 and 14.67 per cent of the respondents had low knowledge in terms of market size assessment, potential customer identification, choosing business location, and determining the type of potential customers, respectively.

Competition with others

The results in this aspect revealed that about 42.00 and 26.67 per cent of respondents had high knowledge in finding out how competitors are working and how their firm is different, whereas 21.33 and 23.33 per cent of respondents had low level of knowledge and 28.67 and 32.67 per cent had low experience with regard to finding out how the competitors are working and determining how their firms would be different from the competitors.

Table 2. Level of importance of factors responsible for career choice (n=150)

Factors for choosing career	Very important		Fairly important		Mixed view		Not very important		Not at all important	
	f	%	f	%	f	%	f	%	f	%
Intrinsic interest in the work	3	2.00	55	36.67	36	24.00	56	37.33	0	0.00
Security of employment	88	59.25	33	22.75	15	10.00	8	5.33	4	2.67
Long term salary prospect	81	54.69	57	37.81	7	4.67	2	1.50	2	1.33
Comparatively high starting salary	63	42.00	51	34.23	28	18.50	7	4.67	1	0.60
Status attached to the job	37	24.70	77	51.33	28	18.50	7	4.67	1	0.60
Impact of the work on social life	37	24.60	62	41.70	37	24.67	12	8.00	23	1.33
Value of the work for the community	37	24.60	60	40.30	36	24.00	13	8.67	4	2.67

Pricing of product/service

Regarding the pricing, greater percentage of respondents had low knowledge in terms of negotiating with other parties (60.00%) and preparing estimation of costs (17.33%). At the same time the percentage of the sample time the percentage of the sample students who had low level of knowledge in cost estimation and negotiation with others was 39.33 and 21.33, respectively.

Promotion of business

With regard to business promotion, it was found that the respondents has high level of knowledge in preparing budget for advertisement (41.33%), developing and designing promotional material (39.33%), promotional strategy (36%) and use of quality as promotion (30%). The percentage of the sample students who had low level of knowledge in developing promotional and designing promotional material was 28.67, 18.00, 17.33, respectively. Similarly, 36.00, 27.33 and 30.00 per cent of the respondents had only low level of experience in designing promotional material, budget preparation for advertisement and use of quality as promotion, respectively.

Financial management

Majority of the students had high level of knowledge in terms of selected aspects of financial management such as determining financial need to start and run business (43.33%), forecasting the additional capital (40.67%), preparation of balance sheet and profit loss statement (38.67%), and budget preparation (34%). Similarly, the respondents had low level of knowledge in terms of preparing budget (24%), balance sheet statement (20.67%), forecasting the need for additional capital (17.33%), determining the financial need to start and run business (18%) and identifying appropriate source of loan (14.67%).

Managing business operations

It was noticed that greater percentage of the respondents had high level of knowledge with respect to important aspects of managing business operations such as, buying supply from appropriate source (42.33%), buying reliable equipments (42.67%), negotiating with the suppliers (38.42%), techniques for control of material inventory (32.67%), quality control for products/services (45.33%), coordinating own work with others schedule (40.67%) and system for recording work order (40%). At the same time, 23.33 per cent of the respondents had low level of knowledge of techniques of coordinating own work with others schedule (22.67%), techniques for control of material inventory (21.33%), system for recording work order (19.33%), techniques for control of material inventory (61%), and buying reliable equipments (15.33%).

Management of employee

Majority of the students had high level of knowledge in following aspects of employee management i.e. developing job description (43.33%), scheduling of work (37.33%), interviewing job applicant (33.33%), supervising and motivating employee (33.33%), training of employee (32.67%) and providing feedback (32%).

Project management

With regard to project management, it was noticed that 37.33 and 34.67 per cent of the sample students had high level of knowledge. Similarly, 28.33 and 23.33 per cent of the sampled students had low level of knowledge in terms of project fund raising and project proposal writing. The data indicate that only 18.00 and 12.00 per cent of them had high experience for project writing and finding source of funding, respectively.

Communication

It was also found that a medium percentage of the respondents had high level of knowledge in the following aspects of communication i.e. speaking before the audience (32.67%), expressing ideas quickly and understandably (23.3%), keeping up conversation with partner (37.33%), ending conversation tactic fully (27.33%), writing skill including letters and memo etc. (29.33%) and effective listening (18%).

Policy issues

The percentage of the respondents who had high level of knowledge in terms of GATT and WTO agreement and its effect, opportunity and traits of liberalization on entrepreneurship, government support and incentives and handling legal issues was 34, 33.33, 41.33 and 45.67, respectively. It was noted that 33.33, 30.67 and 23.33 per cent of the respondents had low level of knowledge about GATT an WTO agreement and its effect, opportunity and trait of liberalization and government support respectively.

From the above results, it is noted that greater proportion of the students had low level of knowledge and experience in terms of important aspects of business management required to start and run new venture. This

Table 3. Distribution of agricultural students based on entrepreneurial training need

(n = 150)

Factors for choosing career	Low knowledge		High knowledge		Low experience		High experience	
	f	%	f	%	f	%	f	%
1 Marketing								
1. Assessing the size of market	33	22.00	58	38.67	43	28.67	16	10.67
2. Choosing location for business	28	18.67	66	44.67	40	26.67	16	10.67
3. Identifying potential customer	32	21.33	52	34.67	44	29.3	22	14.67
4. Determine the type of customers	22	14.67	56	37.33	55	36.67	17	11.33
2. Competing with others								
1. Finding out how your competitors are working	32	21.33	63	42.00	43	28.67	12	8.00
2. Determining how own firm is different from competitors	35	23.33	40	26.67	49	32.67	26	17.33
3. Pricing product/service								
1. Estimation of the cost	26	17.33	58	39.33	46	30.66	19	12.67
2. Negotiating contracts	60	60.01	32	21.33	19	12.67	9	6.00
4. Promoting business								
1. Preparing budget for promotion	27	18.00	62	41.33	41	27.33	20	13.33
2. Developing a promotional strategy	43	28.67	54	36.00	41	27.33	12	8.00
3. Using quality as promotion	26	17.33	45	30.00	45	29.00	34	23.67
4. Developing and designing promotional material	23	15.33	59	39.33	54	36.00	14	9.33
5. Managing finance								
1. Determining finance needed to start and run business	26	17.33	65	43.33	40	26.67	19	12.67
2. Forecasting theneed for additional capital	27	18.00	61	40.67	50	33.33	12	8.00
3. Identifying appropriate sources of loan	22	14.67	64	42.67	5	3.34	6	4.61
4. Negotiate loan	122	81.34	16	10.67	5	3.34	46	4.61
5. Establish and use of financial control	34	22.60	61	44.00	41	27.34	9	6.00
6. Prepare balance sheet and profit and loss statement	31	20.67	58	38.67	36	24.00	25	16.67
7. Preparing budget	36	24.00	51	34.00	42	87.00	28	14.00
6. Managing business operations								
1. Buying supplies fromthebest source	30	20.00	62	41.33	35	23.33	23	15.33
2. Buying reliable equipments	24	15.33	63	42.67	48	32.00	15	10.00
3. Negotiate with suppliers	34	22.67	58	38.67	47	31.33	11	7.33
4. Use techniques for control material inventory	32	21.33	49	32.67	56	37.33	13	8.67
5. Coordinating own business with others	34	11.67	61	40.67	38	25.33	17	11.33
7. Project management								
1. Proposal writing	35	28.33	52	34.34	36	24.05	27	18.00
2. Finding source of funding	35	28.33	56	37.32	41	27.33	18	12.00
8. Managing employee								
1. Develop job description	33	22.00	50	43.33	42	28.00	10	6.67
2. Insterview job applicants	33	22.00	49	33.34	44	29.35	23	15.33
3. Supervise and motivate employees	30	20.00	56	34.33	37	23.67	33	22.00
4. Train employees	31	20.00	48	32.67	37	24.67	33	22.67
5. Scheduling work	27	18.00	56	37.33	41	327.33	26	17.33
6. Providing feedback to employees	32	21.33	48	32.00	45	30.00	24	16.60
9. Communication								
1. Speaking in front of audience	23	15.33	49	32.67	45	30.00	33	22.00
2. Expressing your ideas understandably	25	16.67	35	23.33	51	34.00	39	26.00
3. Keeping conversation even when youir partner is not speaking	27	18.40	56	37.33	41	27.31	25	17.33
4. Ending conversation tactic fully	32	21.33	41	27.33	44	29.33	33	22.00
5. Writing memos or letters effectiely	28	19.00	44	29.33	47	31.00	31	20.67
6. Listening toothers effectively	29	19.33	27	18.00	46	30.67	48	32.00
10. Legal and policy issues								
1. Complying with government regulations	50	21.00	51	42.00	39	27.00	10	10.00
2. Government incentives and support	46	30.67	50	33.33	42	28.00	12	8.00
3. Opportunities and traints of GATT and globalization	46	23.33	50	41.33	42	26.00	12	9.37

clearly indicated that there is a gap of knowledge and skill, which could hinder the growth of entrepreneurship development among the students in the study area. This need could be met through proper designing of the course curricula for entrepreneurial training and education of the students by the universities. Recent studies revealed that entrepreneurial education and training encourages graduates to state their own business. Entrepreneurial training programme could include a range of pedagogical techniques to create learning environments through which students could gain knowledge and skills on the new venture/project creation process.

It is suggested that in order to increase academic know-how on entrepreneurship development, the University education should encourage students more towards entrepreneurship and also provide knowledge and expertise on entrepreneurial practice. In addition, a venture support system based on entrepreneurship education and training can stimulate and facilitate entrepreneurial activities of the students. Based on this study, the educational system and the business community can be encouraged about investing in training to develop and nurture entrepreneurship at an early age. The investment in entrepreneurship development for students is essential and it would have long-term positive effects on economic development and global competitiveness.

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Diversified Farming Through Land Modification in Canal Irrigation Command: Impact of 'Rice-Plus' Approach on Livelihood of Farmers

Souvik Ghosh, R. Singh, D.K. Kundu, R.K. Mohanty, K. Kanna and Ashwani Kumar[1]

ABSTRACT

Modification in land topography through construction of raised and sunken beds creates proper condition for growing other crops beside rice. Growing rice + fish or colocasia instead of rice in sunken beds is found profitable. Different vegetable crops combinations like brinjal – okra, tomato – cowpea, pointed gourd + snake gourd, pointed gourd + bitter gourd, cabbage – brinjal, etc. are observed remunerative cropping systems for the raised beds. This system has not only increased farm production and income but also generated additional employment and diversified livelihood options for the small and marginal farmers of canal irrigation commands in Khurda district of Orissa. Impact on livelihood of eight farmers opted this intervention is assessed on the basis of comparative position of physical, social, financial, human and natural assets of the farmers before and after adoption of the intervention. An improvement of all these assets holding has resulted in betterment of overall standard of living of the adopted farmers who otherwise were living at below average level before adoption of diversified farming through land topography modification.

The eastern region of India is endowed with adequate rainfall varying from 1100 mm to more than 1500 mm with nearly 80 per cent of it being received during monsoon period (July to October) spreading over 100 rainy days. Water logging and shallow water table in the canal command of high rainfall area create anaerobic condition in soils and force farmers to grow rice in both wet and dry season. Since rice farming is not remunerative, many farmers in this region do not like to grow two rice crops and prefer to keep their land fallow during dry season. Fallow after rice is common in about 12-16 million ha of eastern India (Singh *et al*, 2005). Use efficiency of applied irrigation water in canal command is very low often 30 per cent or less (Pandey and Reddy, 1988). The outcome of on-farm water management in command areas has been poor (Navalawala, 1999). Among different stakeholders in irrigation system, farmers are the producers of agricultural outputs through the utilization of irrigation services provided to them. Inspite of being the most fundamental stakeholder, the farmers often receive the least attention. It is important to consider the issue of irrigation as a service provided to farmers (Chambers, 1988). Crop diversification through land modification in canal command area has the potential to enhance productivity of canal command area.

Modification of topography of field through construction of alternate raised and sunken beds improve the physical environment, particularly aeration status of the soil and create proper condition for growth of crops other than rice (Siddiq and Kundu, 1993, Tomar *et al*, 1996). It provides an opportunity to partially diversify cropping by growing rice in the sunken bed and different vegetables in the raised bed. Further, converting part of land into pond at lower reach adds the option of fish farming. Rice being the staple food in eastern India, it is very difficult to make complete substitution of rice crop. However, the 'rice-plus' cropping pattern in raised and sunken bed system can be potential option not only for enhancing agricultural productivity in canal command but also for diversifying livelihood of small and marginal farmers.

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In the backdrop of this, crop diversification through land modification was carried out in selected eight farmers' fields in three villages of Balipatna block in Khurda district of Orissa. The potentiality of any intervention lies not only in efficient utilization of resources and enhanced production but also in improving the quality of life of the farmers on adoption of it. To understand the impact of this intervention on livelihoods of selected farmers present study was carried out.

METHODOLOGY

Location of the study

The study was carried out in eight farmers' fields during 2002-2005 in three different villages, *viz.* Biswanathpur, Khamang and Barillo of Balipatna block in Khurda district of Orissa. The sites were located in the command areas of Nimapara branch canal under Puri main canal irrigation system of Mahanadi delta irrigation project. The latitude and longitude of the area covered under this irrigation command are 19.7°-20.4° N and 85.8°-86.2° E, respectively. The system has an irrigation potential of 38,510 ha cultivable area. The command area largely consists of small farmers with average holding size 1 ha or less. Rice- fallow is the predominant cropping system in areas outside the irrigation command while rice-rice is most commonly followed cropping system in the command area (Ghosh *et al*, 2002). The utility of irrigation water supply schedule was assessed from farmers' perspective that revealed that head reach of the system recorded relatively higher utility values as compared to middle and tail reach of irrigation command and the most important factor is found to be predictability followed by tractability and convenience (Ghosh *et al*, 2005).

Topography of the command area is relatively flat with general slope varying from 0.03 to 0.25 per cent. Soils of the command area vary from loamy sand to clay loam in texture. pH of the soil to a depth of 120 cm varies between 5.5 and 7.2. Most of the soils are low in organic carbon (less than 0.5%) and non-saline in nature with electrical conductivity (EC) values ranging from 0.5 to 0.7 dS/m. Mean annual rainfall in this command area is 1480 mm with nearly 80 per cent of it being received during monsoon period spreading over 100 rainy days. Maximum and minimum daily temperature ranges from 35° - 39°C and 13.5° - 18.6°C, respectively. Low input use, absence of field channel, uncontrolled irrigation and late transplanting of rice in wet season contributed to average yield (Singh *et al*, 2004).

Land modification and crop diversification

The selected farmers' field was modified into alternate raised and sunken beds by digging soil of one strip (4-5 m wide) to a depth of 20 to 30 cm and putting the dug out soil over the adjacent strip (4-5 m wide). The raised beds were thus 40 to 60 cm higher than the adjacent sunken beds. The length of beds was fixed as per the availability of land. As the topsoil was removed in sunken beds, farmyard manure or compost was applied @10 t / ha to maintain the fertility. Some soil used to be eroded from raised beds and deposited in sunken beds during rainy season, which was recovered and put on raised bed during dry season every year. Raised and sunken beds may be prepared manually by farmers themselves or by hired labourers requiring one-time investment of about Rs. 34,000 to Rs. 36,000 per hectare depending on soil type.

Modification of topography of land through construction of alternate raised and sunken beds provides the option of crop diversification by growing rice in the sunken bed and different vegetables in the raised bed. Further, converting part of land into pond at lower reach adds the option of fish farming. Altogether 12 cropping systems were tested at different sites in selected eight farmers' fields for three consecutive years including conventional system of growing *rabi* (dry season) rice followed by *kharif* (wet season) rice with no land modification (C1). Other cropping systems tried in alternate raised and sunken bed system are as follows:

C2: rice grown in sunken bed and tomato – cowpea grown in raised bed

C3: rice grown in sunken bed and brinjal – okra grown in raised bed

C4: rice grown in sunken bed and pointed gourd grown in raised bed

C5: rice grown in sunken bed and pointed gourd + papaya grown in raised bed

C6: rice grown in sunken bed and cucumber – leafy vegetables - brinjal grown in raised bed

C7: rice grown in sunken bed and cabbage – brinjal grown in raised bed

C8: rice grown in sunken bed and pointed gourd + bitter gourd grown in raised bed

C9: rice – rice + fish grown in sunken bed and pointed gourd grown in raised bed

C10: rice - fish grown in sunken bed and snake gourd + pointed gourd grown in raised bed

C11: colocasia grown in sunken bed and pointed gourd + papaya grown in raised bed

C12: rice grown in sunken bed and cabbage + snake gourd grown in raised bed

Rabi rice was transplanted in the 2nd week of January and harvested in the last week of April while *kharif* rice was transplanted in 3rd week of July and harvested during last week of November to 1st week of December. Tomato was sown during January to April. Pointed gourd and papaya were planted during 1st week of January to 1st week of February and harvested upto last week of December. Brinjal was transplanted during May to June and harvesting was completed in the last week of December. Cucumber, leafy vegetables, vegetable cowpea and okra were sown in the 1st week of January, 3rd week of March, last week of May and 2nd week of September, respectively; harvesting was completed by 2nd week of March, 1st week of May, 2nd week of September and 3rd week of November, respectively. Cabbage was grown during January to April. Bitter gourd and snake gourd were sown in the 3rd week of April and harvesting was completed by 1st week of October. In sunken beds (with and without rice crop) fish fry (<1.2g) of Indian Major Carps (IMCs) were stocked during last week of July and harvested during 3rd week of November. Colocasia was transplanted in the last week of February and harvesting was completed by 2nd week of November.

Production potential of each of the above-mentioned cropping system was realised in term of rice-equivalent yield (REY) of different crops in the cropping system and rice-equivalent production (REP) in cultivated area. It was calculated as:

REY = (Economic yield of a crop (kg) x Price per kg of the same crop) / Price per kg of rice.

REP = REY x cultivated area

The selling price of rice was Rs. 4 per kg while that of other crops varied several time; therefore the average price was considered for the calculation purpose. Selling price of tomato, vegetable cowpea, brinjal, okra, pointed gourd, papaya, cucumber, leafy vegetable, cabbage, bitter gourd, snake gourd and colocasia was Rs. 3, 10, 10, 10, 10, 4, 6, 6, 4, 12, 7 and 6, respectively. The selling price of fish seed was rupees 40 per kg (Singh *et al*, 2005).

RESULTS AND DISCUSSION

The production pattern of different cropping system is given in Table 1. It is evident that different types of rice based cropping patterns barring C11 (Colocasia grown in sunken bed and pointed gourd + papaya grown in raised bed) were selected including the traditional rice-rice cropping pattern (C1) and two cropping patterns where fish farming was included (C9 and C10). During both the seasons (dry and wet seasons), higher rice yield was obtained from sunken bed as compared to unmodified land (conventional system). Rice yield in dry season was higher than that of wet season except in C7, C8 and C9. Among different vegetable crops, cabbage gave the highest yield followed by tomato and snake gourd while lowest yield was obtained from leafy vegetable. Sharma (2003) also reported that rice yield enhances by 11 to 40 per cent in sunken beds. He also mentioned that adequate surface drainage improves root-zone aeration on raised beds, and as a consequence crops perform better on raised than in control plots.

Rice-equivalent yield (REY) of all the cropping systems was strikingly higher in raised and sunken bed system than in the unmodified fields that was due to the higher yields of different vegetable crops grown on the raised bed and higher price obtained from the fish grown with and without rice in sunken bed. Highest REY was found in C11 where colocasia was grown in sunken bed instead of rice. Among the rice based cropping patterns, maximum REY was observed in C10 followed by C12, C3, C7 and C9.

Impact on livelihood of farmers

The potentiality of any intervention lies not only in efficient utilization of resources and enhanced production but also in improving the quality of life of the farmers on adoption of it. The increased farm production and income is expected to bring changes in livelihood of the farmers that includes physical, social, financial, human and natural assets of the farm households. To gather the data on these aspects interview schedule survey method was followed covering eight farmers who have adopted diversified farming through land modification.

Although there is no change in average land holding of the farmers as well as cultivated area during *kharif* season after adoption of intervention but it is interesting to note the increased area under cultivation during *rabi* season because of assured irrigation that attributed to farmers' investment to tap the ground water through bore well and pump (Table 2). It is evident that about one acre of land (one-third of total land holding)

Table 1. Production pattern of different cropping system under raised and sunken bed system (Pooled and averaged data of three years at different sites)

Cropping system	Yield (t/ha)	Production in cultivated area (t)	Rice-equivalent production in cultivated area (t)	Rice-equivalent yield (t/ha)
C1:				8.01
Rice (Dry season)	4.23	4.23	4.23	
Rice (Wet season)	3.78	3.78	3.78	
C2:				18.10
Rice (Dry season)	4.94	2.47	2.47	
Rice (Wet season)	4.42	2.21	2.21	
Tomato	20.89	10.45	7.84	
Vegetable cowpea	4.47	2.23	5.58	
C3:				27.29
Rice (Dry season)	4.94	2.47	2.47	
Rice (Wet season)	4.42	2.21	2.21	
Brinjal	11.95	5.98	14.94	
Okra	6.13	3.07	7.67	
C4:				12.67
Rice (Dry season)	4.75	2.38	2.38	
Rice (Wet season)	4.64	2.32	2.32	
Pointed gourd	6.38	3.19	7.97	
C5:				18.34
Rice (Dry season)	4.91	2.46	2.46	
Rice (Wet season)	4.69	2.35	2.35	
Pointed gourd +	7.61	3.80	9.51	
Papaya	4.02	4.02	4.02	
C6:				21.51
Rice (Dry season)	4.77	2.39	2.39	
Rice (Wet season)	4.14	2.07	2.07	
Cucumber	5.40	2.70	4.05	
Leafy vegetable	3.30	1.67	2.50	
Brinjal	8.40	4.20	10.50	
C7:				26.70
Rice (Dry season)	4.38	2.19	2.19	
Rice (Wet season)	5.09	2.54	2.54	
Cabbage	27.30	13.65	13.65	
Brinjal	6.66	3.33	8.32	
C8:				22.16
Rice (Dry season)	4.38	2.19	2.19	
Rice (Wet season)	5.09	2.54	2.54	
Pointed gourd +	5.38	2.69	6.73	
Bitter gourd	7.13	3.57	10.70	
C9:				26.04
Rice (Dry season)	4.38	2.19	2.19	
Rice (Wet season) +	5.09	2.54	2.54	
Fish	3.05	1.53	15.25	
Pointed gourd	4.85	2.42	6.06	

C10:				
Rice (Dry season)	4.38	2.19	2.19	38.80
Fish	2.44	1.22	12.22	
Snake gourd +	20.94	10.47	18.33	
Pointed gourd	4.85	2.42	6.06	
C11:				51.16
Colocasia	42.27	21.13	31.70	
Pointed gourd +	12.37	6.18	15.46	
Papaya	4.00	4.00	4.00	
C12:				35.75
Rice (Dry season)	5.40	2.70	2.70	
Rice (Wet season)	4.11	2.06	2.06	
Cabbage +	26.87	13.43	13.43	
Snake gourd	20.07	10.03	17.56	

Table 2. Land utilization pattern and income of the selected 8 farmers before and after intervention

Particulars	Before intervention		After intervention	
	Kharif season	*Rabi* season	*Kharif* season	*Rabi* season
Average cultivated area (acre)	3.41	1.66	3.41	2.58
Average irrigated area (acre)	3.03	2.09	3.03	2.71
Average land holding (acre)	3.47		3.47	
Average area of modified land (acre)	-		1.01	
Average annual income (Rs)	46612		67875	
Average income from farming in modified land (Rs)	-		25175	

Table 3. Farming, average cost of cultivation and income of the selected 8 farmers from the area under land modification before and after intervention

Particulars	Before land modification	After land modification
Farming pattern	4 farmers used to follow rice-fallow, 4 farmers used to follow rice-pulses (black gram, green gram, horse gram), 1 farmer used to grow also vegetables in small-scale and 1 farmer engaged in small-scale fish farming.	All the 8 farmers grow rice in sunken bed and mostly vegetables in raised beds; 4 farmers engaged in fish farming by converting a portion of land in to pond
Average area (acre)	0.839	1.01 (inclusive of average area modified in to fish pond)
Average cost of cultivation (Rs.)	2078	11131
Average income (Rs.)	3412	25175

is modified, farming in which has given an average annual income of Rs. 25175 out of total average annual income of Rs. 67875. The increased income because of diversified farming through land modification may have influenced the farmers to make further investment to utilize ground water for cultivation during dry season.

The farmers have largely followed rice-fallow, rice-black gram, rice-green gram, rice-horse gram sequences prior to land modification, which used to provide a meager income to the farmers as evident from Table 3. The lower return due to poor yield may be attributed to unassured irrigation supply, delayed planting and low input use. Land modification through raised and sunken bed has given the farmers opportunity to grow diversified crops that ensured year around income to the farmers. Cultivation of vegetable crops during both wet and dry season has created employment, reduced migration and met the household consumption from farm produce. Although average monthly household consumption expenditure has increased from Rs. 3156 to Rs. 4610 over a period of three years (before intervention to after intervention in terms of crop diversification through land modification), farmers have met the need of its major part from their own farm produce (Fig. 1). Out of 8 farm-families, member of three families used to migrate to neighbouring villages during crop season (*kharif*) as agricultural labourers with a wage rate of Rs. 40 per day for an average of 58 man-days that has reduced to 15 man-days after adoption of the intervention.

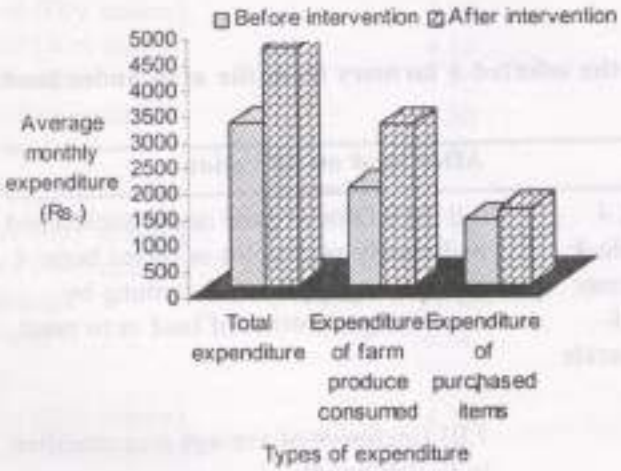

Fig.1. Average monthly household consumption expenditure pattern

The measure of livelihoods gives an idea of the changes on standard of living of the farm families on adoption of diversified farming through land modification. Measure of livelihoods has considered the comparative position of physical, social, financial, human and natural assets of the farmers before and after adoption of the intervention. Physical assets include the type of housing condition, conveyance, electric and cooking facility. Social assets mainly refer to the recognition, social and political participation, active involvement in developmental works and common properties use pattern. Financial assets are measured on the basis of sources of income, kinds of savings and investments, lending and borrowing. Human assets involve communicational characteristics, education/literacy and mobility. Natural assets are the natural resources holdings of the farm family *viz.* farm size, irrigated land, livestock holding, poultry and fishpond. All the above-mentioned variables under the 5 types of assets are measured on the basis of the responses of farmers on a 5-point continuum scale during interview schedule survey. Overall standard of living of 8 adopted farmers is assessed on the basis of their assets holding before and after adoption of diversified farming through land modification.

It is evident from the Fig. 2 that there is an improvement in all the 5 types of assets of farm families during post-intervention period. Maximum improvement is occurred in physical assets followed by human and natural assets that indicate the improvement in living condition, socio-personal profile and natural (farming) resource holding of farm families. The increased income through diversified farming has motivated the farmers to invest and intervene further leading to the growth in physical and natural assets. Improvement in socio-economic condition and social recognition are also reflected which will result in achievement motivation leading to inculcate entrepreneurial abilities of the farmers.

The changes in overall standard of living of all the 8 farmers are presented in Fig. 3. It can be noted that living standard of 6 out of 8 farmers was below average level prior to opting for diversified farming through land topography modification. However, diversified farming has helped in bringing the living standard of farm families at above average level. As stated earlier 4 farmers (farmer 4, 5, 6 and 7 as indicated in the figure) have also engaged in fish farming besides crop diversification through raised-sunken bed technique and their standard of living has relatively highly improved.

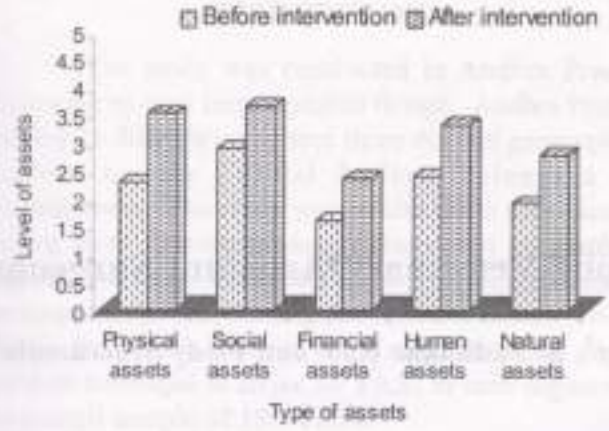

Fig.2. Average level of different types of assets of farm families before and after diversified farming through land modification

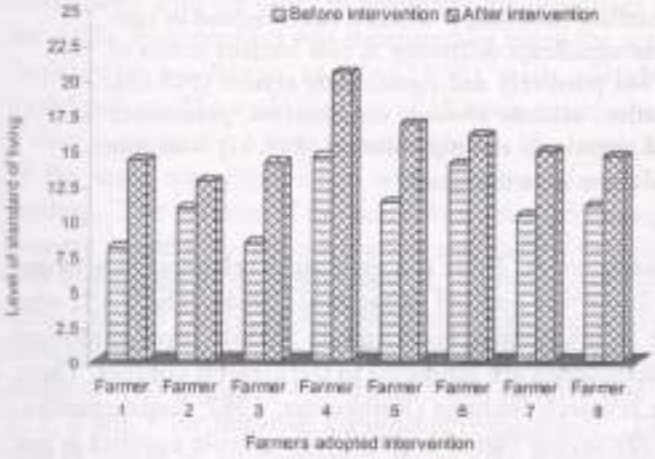

Fig.3. Overall standard of living of selected eight farmers before and after intervention

CONCLUSION

The potentiality of diversified farming through land topography modification has been realized as it has facilitated the multifarious growth of overall farming system of the adopted farmers. The productivity of farming system is enhanced following diversified cropping pattern through growing of vegetable crops on raised bed and fish farming with or without rice crop in sunken bed. It provides a better earning and living to the small and marginal farmers of the canal commands of high rainfall and shallow water table areas. Rice being the staple food, it is very difficult to bring complete substitution of rice crop; however, the "rice-plus" cropping system in sunken and raised bed through land modification can be a potential option for growth and development of farming system and livelihood of small and marginal farmers.

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Correlates of Role Conflict among Veterinary Assistant Surgeons

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ABSTARCT

This study was undertaken to know the extent, nature and correlates of role conflict among the Veterinary Assistant Surgeons (VASs) in Andhra Pradesh. Following ex-post facto research design and random sampling technique nine districts were selected, taking three districts each from Coastal, Telangana and Rayalaseema regions in Andhra Pradesh. Twenty VASs were taken from each district, to arrive 180 VASs as sample. Scale developed by Rizzo *et al.* (1970) was used to measure the role conflict. The VASs were found to be experiencing four types of role conflict: person role conflict or intra role conflict; intra sender conflict; role overload or inter role conflict and; conflicting expectations. There exists a non-significant difference in role conflict scores of VASs in the three regions of the state. Participativeness was positively and significantly related ($P<0.05$), while, job experience, organisational climate, job satisfaction, attitude towards organisation, persistence disposition, coordination and job performance were related negatively and significantly ($P<0.01$) with role conflict. The related implications for animal husbandry department were discussed.

As crucial middle level extension functionaries in Animal Husbandry Department (AHD), Veterinary Assistant Surgeons (VASs) are involved in the functioning of veterinary dispensaries, animal disease investigation units, farms, extension centers, zoos, slaughter houses, etc. VASs are also engaged in transferring the technologies to the farming community besides treating their sick animals. In this process they have to deal with different people like superiors, peers, subordinates, clients, administrative staff, supporting staff and so on. Often, the work situations become unpredictable and uncontrollable because of the multifarious nature of work. Time pressure also occurs when deadlines are fixed and extra work is added or when they work at or near maximum capacity for long periods. Thus, the increased and varied activities demand extra time and energy causing conflict in their roles and affecting their job performance. Further, role conflict could interfere with the physical and psychological functioning of the individual and lead to undesirable consequences. There is a systematic relationship between rank and role conflict (Khan,et.al, 1964). The VASs who are at lower rank level among middle level extension functionaries are subjected to the greatest conflict. There are research findings (Ramkumar, 1982; Satishchandra, 1999) saying that if higher levels of role conflict is not properly coped, it affects the performance in a dysfunctional style resulting in exhaustion, irritation, ineffectiveness and inaction. Factors reportedly influencing the role conflict include organisational structure, communication in the organisation, organisational climate, physical facilities and mode of decision making (Roy, 1975; Pettigrew, 1974). An investigation to find out the role conflict of VASs in AHD has a personal, social as well as organizational significance. Further, if the interdependent information with respect to role conflict coupled with its correlates is available, AHD can try to improve the performance of the VASs on their jobs by minimizing the role conflict, maximizing the job performance and manipulating the related factors.

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METHODOLOGY

The study was conducted in Andhra Pradesh following ex-post facto research design. Andhra Pradesh having 23 districts comprises three distinct geographical regions namely Coastal Andhra, Telangana and Rayalaseema. The study was conducted in nine districts taking three districts randomly from each geographical region so as to represent all the three regions differing in socio-economic and working environment factors. Twenty VASs from each district were selected using simple random technique to arrive 60 VASs in each region with an overall sample of 180 VASs.

The variable role conflict was operationalised as the simultaneous occurrence of four conflicts viz., intra role, intra sender, inter role conflicts and conflicting expectations while a VAS perform various roles prescribed in the job chart and the compliance with one would make more difficult or render impossible compliance with the other in achieving the objectives of the AHD. Role conflict was measured by using the scale developed by Rizzo *et al.* (1970) with suitable modifications. The scale consists of 15 items out of which 8 were positive and 7 were negative items. The reliability of the scale was established with split half (r= 0.79) method. The validity of the scale was obtained through content validity by self-evaluation and judges opinion. The statements of the scale were mixed thoroughly and administered to VASs on five point continuum viz., strongly agree, agree, undecided, disagree and strongly disagree with scores 5, 4, 3, 2 and 1 for positive and 1, 2, 3, 4 and 5 for negative statements respectively. The sum of scores on all statements formed the role conflict score with a range of 15 to 75. Role conflict indices were calculated by dividing the obtained role conflict score with maximum possible score (75) and multiplied by 100. Based on role conflict indices, the respondents were classified into three categories viz., low role conflict (below mean-SD), medium role conflict (mean ± SD) and high role conflict (above mean+SD) (Table 1). Data on role conflict of VASs in Coastal, Telangana and Rayalaseema areas were subjected to analysis of variance (ANOVA) test to see the difference if any in three regions and the results were presented in Table 2. Further, data were subjected to zero order correlation to analyze the nature of relationship of selected independent variables with role conflict and presented in Table 3.

RESULTS AND DISCUSSION

A glance at the Table 1 indicates that a high percentage (86.66 %) of VASs had medium role conflict in Coastal area followed by an equal distribution (6.67% each) of VASs in low and high role conflict categories. In Telangana, 3/4th (75%) of VASs had medium role conflict, 13.33% had low role conflict and 11.67% of VASs had high role conflict. While in Rayalaseema area 78.34%, 18.33% and 3.33% of VASs had medium, low and high role conflicts, respectively. Further overall data indicates that majority (83.33%) of VASs were distributed around the mean indicating thereby, medium role conflict followed by low (10.56%) and high (6.11%) categories, respectively. It could be concluded that majority of the respondent VASs of the three areas and in overall sample were experiencing in more or less medium to high role conflict. The mean role conflict indices obtained by the three areas of VASs were almost same and they were facing four types of role conflict viz., a) person role conflict or intra role conflict b) intra sender conflict c) role overload or inter role conflict and d) conflicting expectations.

Conflict between the VAS's internal standards or values and the defined role behaviour as reflected in items, 2, 3, 13 and 14 of the scale are causing person role conflict or intra role conflict. This happens when role requirement violates moral values. For example when a VAS is forced to achieve artificial insemination targets (or) calf births without having congenial working conditions and facilities and at the same time have to show on record false achievements, will experience person role conflict. VASs experience intra sender conflict (items 1, 6, 8, 9 and 15 of the scale) when their time, resources or capabilities are insufficient to perform duties. For example when superior directs the VAS to acquire certain material which is not available through normal channels and at the same time superior prohibits the VAS to use unfair and underhand means of acquiring it lead to intra sender conflict. Conflict between several roles for the VAS, for example, role of animal breeder, extension role, administrator role etc., which require different or incompatible or changes in behaviour as a function of situation (items 4 and 10 of the scale) leads to role overload or inter role conflict as VAS fills more than one position in the role system. Lastly conflicting expectations (items 5 and 7 of the scale), conflicting requests from others (item 11 of the scale) and incompatible standards of evaluation (item 12 of the scale) also cause conflict on part of VASs. Ramkumar (1982) reported medium inter role conflict and self role conflict among majority of VASs. While Reddy and Sinha (1990) reported general, inter-sender and person role conflicts at medium level among majority of scientists.

Table 1. Distribution of respondents based on their level of role conflict

Category	Coastal		Telangana		Rayalaseema		Total	
	F	%	F	%	F	%	F	%
Low role conflict	4	6.67	8	13.33	11	18.33	19	10.56
Medium role conflict	52	86.66	45	75.00	47	78.34	150	83.33
High role conflict	4	6.67	7	11.67	2	3.33	11	6.11
Total	60	100.00	60	100.00	60	100.00	180	100.00
Mean role conflict index	43.60		44.08		43.73		43.81	
S.D.	8.12		6.36		10.57		8.32	
C.V.	0.19		0.14		0.23		0.19	
Mean role conflict index range	22.67-93.33		46.67-80.00		26.67-76.00		22.67-93.33	

Table 2. Difference in role conflict among the three areas (Coastal, Telangana and Rayalaseema) of VASs

Sample	T (1) Coastal	T (2) Telangana	T (3) Rayalaseema
Mean	43.60	44.08	43.73
S.D.	8.12	6.36	10.17

ANOVA

Source	DF	S.S.	M.S.	F Value
Treatments	2	7.4542	3.7271	0.533 NS
Error	177	12370.7334	69.8912	
Total	179	12378.1875		
C.V. : 0.19		Experimental Mean : 43.81		S.D. : 8.32

There exists no significant difference among VASs in Coastal, Telangana and Rayalaseema areas in respect of their level of role conflict (Table 2). The mean role conflict scores were 43.60, 44.08 and 43.73 for VASs in Coastal Telangana and Rayalaseema areas respectively. The non-significant difference in level of role conflict experiencing by VASs in the three areas could be due to the similar personal, socio, psychological and organisational characteristics of VASs in the three areas.

The data presented in Table 3 reveals that only one variable namely participativeness was positively and significantly related (P<0.05) with role conflict, while, the variables negatively and significantly related includes job experience (P<0.01), organisational climate (P<0.01), job satisfaction (P<0.01), attitude towards organisation (P<0.01), persistence disposition (P<0.01), coordination (P<0.01) and job performance. The variables related positively and non-significantly includes span of control, trainings undergone, technical knowledge, workload perception, work motivation and organisational communication. The remaining variables were negatively and non-significantly related.

Table 3: Relationship between independent variables and role conflict of VASs (N=180)

S No	Independent variables	r value
1	Educational qualification	-0.0816
2	Job experience	-0.3374**
3	Span of control	0.0210
4	Physical facilities	-0.0144
5	Trainings undergone	0.1121
6	Participativeness	0.1508*
7	Technical knowledge	0.1179
8	Workload perception	0.0491
9	Work motivation	0.0632
10	Self reliance	-0.1207
11	Organizational communication	0.0045
12	Organizational climate	-0.1973**
13	Job satisfaction	-0.2190**
14	Attitude towards organisation	-0.2831**
15	Persistence disposition	-0.2045**
16	Coordination	-0.2773**
17	Job performance	-0.2760 **

* Significant at (0.05 %) (r > = 0.148)
** Significant at (0.01 %) (r > = 0.194)

It could be observed that educational qualification had shown negative relationship with role conflict. Naturally, the VASs with higher educational qualification are likely to possess more knowledge and competency and could utilize even the scarce resources and can adjust their role behavior for different role sets.

Job experience is generally believed to have the effect on gaining skill part of a person and there by helping in perfection in the role behavior. The significant negative relationship of experience with role conflict suggests that less experienced were the VASs, more they were facing conflict, which means, gaining more experience was helping in reducing the role conflict. This implied two things. Firstly, they might have acquired the proper skill to perform new assignment with more understanding during the increased course of time and reduced the job tension and secondly, they might have adjusted with the situation by harmonizing with their self concept or perception of self with the real situation prevailing in the organisation. The other possible reason for experiencing less role conflict by the more experienced VASs may be due to their achievement of job perfection and gaining more self confidence and getting acquainted with the prevailing culture of the organisation and clearer role perceptions.

The positive relation of span of control with role conflict could be attributed to the fact that VASs who look after more livestock population and more villages have varied role sets and are understandably prone to role conflict.

Perhaps the most fundamental fact of organizational life is that resources are finite. The most obvious manifestation of this problem comes when the matter is related to performance. As a general rule, the greater the scarcity of resources, the greater the potential for conflict. The negative relationship between physical facilities and role conflict can be easily understood as provision of adequate physical facilities will smoothen the role performance and non availability of such facilities will hinder the role performance and create tension in the mind of role incumbent.

In-service training is the traditional method of learning which can be tailored to suit the specific requirements of each trainee in terms of his background, attitude, needs, expectations, goals and future assignments. However, the positive relationship of trainings with role conflict could be attributed to the fact that the practices and procedures learnt in training sessions might be underused at actual field situation or the atmosphere and scanty resources might have prevented the VASs in using the advanced techniques learned during trainings thus leading to conflict.

Participativeness was positively and significantly related to role conflict. Participation affords an opportunity to clarify expectations, negotiate away conflicting demands, and / or substitute self supplied role expectations for possibly conflicting or ambiguous other expectations. Contrary to this in the present study participation is positively related to role conflict. May be this is due to improper participation of VASs in the decision making process. However, Fisher and Gitelson (1983) in their meta-analysis of correlates of role conflict and ambiguity concluded that participation was negatively related to role conflict .

When the role occupant perceives that there are too many expectations from the significant roles in role set, he experiences over workload (Khan *et al.*, 1964). The overload of work may interfere with how well it may be done which refers to the quality of work. The poor quality of work may lead the VAS to low role satisfaction and thereby role stress or role conflict. The positive relationship between workload and role conflict implies that more a VAS perceives work overload higher the role conflict.

The study has depicted negative relationship between self-reliance and role conflict. This reveals that lesser the sense of self-reliance a VAS was possessing, higher was the feeling of role conflict or in other words, more was the VAS's self confidence, less was his role conflict. The reason one can attribute for this may be the self concept of VASs as to be veterinary doctor which provoked VAS to acquire a high sense of self confidence in performing the role of a veterinary doctor failing which causes conflict.

Organizational climate has shown significant negative relationship with role conflict. This means that more conducive is the organisational climate, lesser will be the conflict. Job satisfaction was negatively and significantly related to role conflict.

Attitude is the degree of positive or negative effect associated with some psychological object (Edwards 1957). The significant negative association of attitude towards AHD and role conflict of VASs could be attributed to interrelation of cognition (unfavorable/ undesirable attributes), feeling (emotions viz., dislikes, displeasing etc.) and action (behavioural readiness) tendencies associated in negative direction.

The drive to remain stead fast in a chosen line of action in spite of conflicting role sets might have resulted in a significant and negative relationship of persistence disposition with role conflict. The behavioural tendency of VAS for not abandoning the pursuit of an achievement goal in the teeth of role conflict could be considered as a positive sign to overcome conflict.

Coordination was negatively and significantly related to role conflict of VASs. It is natural that satisfactory coordination among line departments will increase the chances of eliminating or decreasing the conflict. Job performance had shown significant negative correlation with role conflict. From this trend it could be inferred that, when the amount of role conflict of VASs is related to their performance, we see that there is an optimum level of conflict which maximized job performance.

CONCLUSIONS

The findings indicated that majority of the VASs irrespective of their area of working had medium role conflict; hence, there is need for individuals to be made aware of their conflicting conditions and thus seek proper coping strategies. The conflict of this nature might have its origin a) in misunderstanding of the VAS's own role or b) disregard of the expected role of the VASs by the superiors. It is the responsibility of the superiors to get data about the conflicts in the VASs, find origin of these conflicts and resolve it in an appropriate manner. Ignorance of this is bound to adversely affect the efficacy of the subordinates and ultimately the AHD. A substantial negative influence of job experience, organizational climate, job satisfaction, attitude towards organisation, persistence disposition and coordination and positive influence of participativeness on role conflict brings out the importance of these variables. It implies that if incidence of role conflict is to be minimized and level of job performance is to be maximized, the above factors are to be necessarily addressed.

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Sustainable Livestock Management Using Ethno-veterinary Practices: Diagnostic Study of Tribals' Knowledge Systems

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ABSTRACT

This paper attempts to identify and document ethno-veterinary practices used by tribal people for the treatment of various diseases affecting livestock. Four villages from Dindori district, Madhya Pradesh, India, an area predominantly occupied by tribal people, and veterinary scientists from Jabalpur Veterinary College, Madhya Pradesh, India, were selected for this study and the results from both groups were compared. Data were collected using a combination of interviews and focus group discussions. Study demonstrates that tribal livestock owners cure wounds using an extract from *bhojraj* leaves and *akawan*. Dysentery in animals is successfully controlled using a mixture of mustard seeds and curd. Calves are de-wormed using an extract from *bakine* and *Annona squamosa* L. If the dropping of the placenta is delayed a solution made from the green leaves of *bhojraj* and *tejraj* is used. Foot and mouth disease is usually controlled with a mixture of *Semicarpus anacardium* seeds and mustard oil. Diarrhoea can be treated easily by using a mixture of the roots of palm trees and an extract from banana stems. The opinion of veterinary scientists was found to be compatible with the reported ethno-veterinary practices of livestock owners.

Livestock farmers and healers everywhere have traditional ways of classifying, diagnosing, preventing, and treating common animal diseases. Many of their ethno-veterinary practices (EVP) offer viable alternatives or complement conventional and Western-style veterinary medicine, especially where the latter is unavailable, unaffordable, unreliable, or inappropriate. Indian farming is as old as civilisation and various skills adopted in farming have been passed on from one generation to another. The technologies adopted by farmers cannot be undermined even in the present era of modern agriculture. The research community has often neglected indigenous knowledge despite its value, and researchers could play a vital role of location specific recommendations and the development of sustainable farming systems.

In order to understand the application of indigenous knowledge concerning livestock with particular focus on EVP and local ways of maintaining health of animals, an attempt has been made to correct and document practices currently in use among the chosen tribal community and to consider the opinion of veterinary scientist regarding the appropriateness of already documented, scientifically approved EVP.

METHODOLOGY

The main objective of this study was to document a large variety of practices concerning livestock. Both conventional and participatory methods have been used to document local knowledge in general and ethno-veterinary medicine is particular. To fulfil the study objectives, men, women and children, both rich and poor farmers, healers and non-healers, users and non-users of ethno-veterinary medicine were interviewed. Qualitative data was collected using a combination of participant observation, unstructured interviews and focus group discussions (FGD) with tribal livestock owners (Rajasekaran, 1993). The area of study was confined to the State of Madhya Pradesh, India. On account of ethnicity and geographical remoteness, four villages from the eastern part of Dinbori district dominated by tribal people were selected for the study. Members of each

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village were interviewed including 20 wisemen and 60 livestock owners who were dependent on local means for the treatment of diseases affecting animals. Focus group discussions were organized within the village, with the help of wisemen, village level animal healers, village level extension workers and primary school teachers, in order to establish patterns of treatment in current use. A prior informed consent [(PIC) an important step of IPR] was sought from the village head and concerned knowledge holders to put their knowledge in public domain through this publication. A group of 20 scientists from Jabalpur Veterinary College working in the field of animal husbandry and veterinary sciences, were consulted about the appropriateness of the indigenous EVP in use in the area. Descriptive statistics was used to interpret the qualitative data and draw relevant inference from the study.

RESULTS AND DISCUSSION

Wounds caused by plough share

An extract taken from green *Bhojraj* leaves is applied to the wound. About 10 to 15 ml of extract is applied twice a day and continued for 4 to 5 days for a complete cure. This finding corresponds with the findings of Singh (2003a).

When a would becomes infected by small larvae a dose of 8 to 10 ml tarpin oil is applied twice a day to the affected area for 5 to 6 days.

One hundred gram green *akawan* (*Calotropis gigantia*) leaves are boiled in one litre of water until the water turns brown in colour and reduces to about 200 ml. Then 15-20 ml of the decoction is applied to the wound and used for 4 to 5 days for a completely recovery.

Two to four fruits of *bhelwa* (*Semicarpus anacardium*) are crushed and mixed with 60 to 70 ml niger oil/mustard oil. Twenty to 25 ml is applied to the wound twice a day for 5 to 6 days for a complete recovery (Singh, 2003b). The dosage and application of the remedies outlined above vary according to the nature of the wound and experience and discretion of the livestock owner.

If an animal is suffering from the infection of larvae in the wound, then a mixture of epidermic layer of green bamboo grass, camphor and extract taken from the green leaves of *kukroundha* (*Blumea balsamifera* D.C.) is applied over the wound and tied with the cotton cloth. This treatment is continued for about 3-4 days after an interval of one day.

Dysentery

A mixture of 250 gm of crushed mustard seeds and 200 ml buttermilk is given orally three times a day and the excrement of the animal is monitored for blood content.

To cure the dysentery during summer season, the fruits of *dhatura* (*Datura stramonium*) are taken and put inside the ball made of barley flour. It is roasted on fire and about 3-4 fruits are given to the suffering animal. The practice is continued for about 3-4 days for complete recovery from dysentery.

During the winter season, if animals are suffering heavily from dysentery, a solution made from an extract of about 100-150 gm from the green leaves of lemon and about 100 ml water is given three times a day using a bamboo stick to administer in a dose of 100-150 gm.

Fifteen to twenty per cent of farmers fed animals a paste made from a mixture of mustard oil and turmeric powder. About 150 ml mustard oil is mixed with about 150 to 250 gm turmeric powder and given orally by bamboo stick three times a day. This is continued for about 4 days for a complete recovery.

A few farmers used *mand*, a by product of fermented liquid from cooked rice, to cure dysentery. About 200 to 300 ml of *mand* is given orally by bamboo stick 4 to 5 times in a day and continued for about 3 days for a complete recovery.

De-worming (tapeworm/creamy in calves)

The most popular practice used for dealing with newly born calves suffering from tapeworm or creamy, is to use an extract taken from the green leaves of *Bakaine*. Farmers take about 100 gm green *Bakaine* leaves and crush them. They then take about 40 ml and mix with about 50-60 ml cold water and administer orally, using a bamboo stick, once a day in the morning. This practice is continued for about 5 to 6 days for complete de-worming. Some farmers use the mixture of butter milk and paste of *neem* leaves (*Azadirachta indica*) for de-worming in calf. Some farmers collect the green leaves (about 100 gm) of custard apple (*Annona squamosa* L.) from forest areas and a solution after making paste, is prepared with water and common salt. It is given for the deworming in calf.

Treatment for the retained placenta

Sometimes cows and buffaloes do not drop their placenta easily after giving birth to a calf. In such cases,

tribal livestock owners give the mixture made of 300 gm bamboo leaves and 200-330 gm jaggery. The practice is repeated at the interval of half an hour. In more adverse conditions, they use about 150 gm green leaves of *tejraj* and an equal quantity of green *bhojraj* leaves. These leaves are crushed together with a small amount of cold water to make a solution of 2 liters and a dose of about 400 ml is given orally to the affected animal 4 times in a day, resulting in the dropping of the placenta. A few farmers have adopted the practice of feeding the animal about 1 kg of boiled grains of barley three times a day to tackle this problem.

Throat infection (*Galaghontoo*)

A throat infection locally called *galaghontoo*, is a most dangerous disease that occurs mostly in new calves during the months of July-August. To cure this disease, livestock owners use about 50 to 100 gm of tamarind, 3 to 4 gm of dried chillies and 50 to 100 gm turmeric. This mixture is crushed and made into a paste with a little water and given to the animal (Singh, 2003c). In addition to this practice, livestock owners also tie *pitla* wood (made by wood used for extracting oil from oil seeds) round the neck of the animal. Similarly, *dhajji* (cotton cloth) soaked with lukewarm rice water is also tied around the neck of infected animals to give relief from throat infections.

Some livestock owners cure this disease by using a mixture made from about 50 to 100 gm crushed black pepper powder with ghee. This mixture is boiled for over 10 minutes and then given orally to the animal twice a day for up to 4-5 days for a complete recovery.

Another interesting practice is the use of fresh *jinta* fish placed in the throat of the affected animal. Tribal livestock owners believe that this helps in opening the air passage in the neck of the animal enabling the animal to breathe more easily. Additionally, about 200 ml of edible oil is given orally through a bamboo stick to the animal for relief from gastric trouble, which is another major cause of death.

Bone dislocation

In the case of bone dislocation in animals, the most popular practice of tribal farmers is to apply a mixture of 100 gm green *gurbel* leaves, 100 gm banana root, 100 gm aak root (*Calotropis gigantia*) and 50-60 gm *Thuha* (*Opuntia* spp. wild cactus) stem. These are crushed together with a little water. One dose of 100 gm of the mixture is fed to the affected animal three times a day. In addition, the dislocated bone is tied with a bamboo stick. Similarly, some farmers use the dry stem of *kodo* (milet, *Paspalum scrobiculatum* L.) boiled in water. This lukewarm solution is applied to the dislocated area. This practice is only used by 8-10% of livestock owners. A small percentage (20%) of tribal livestock owners were observed feeding about 50 gm marigold roots mixed with 500 gm wheat straw to the animal to cure the dislocated bone.

Foot and mouth disease

The most popular practice is cure wounds caused by foot and mouth was to apply a mixture of about 50 ml mustard/niger oil mixed with 100 gm crushed *bhelwa* (*Semicarpus anacardium*) seeds to the wound. Another practice is to keep the animals in mud, especially made from black soil, for 3 to 4 days. In addition to this, as the disease is contagious, affected animals are not allowed to freely graze, but kept in isolation.

Flatulence

Flatulence, locally known as *majhakariya*, is a very common disease during the monsoon due to excess grazing and feeding on poisonous green fodder. The animal feels uneasy and restless and has a distended stomach. In extreme cases this disease may cause death. Farmers cure this disease by using a mixture of 600 gm of ash from burned deseeded maize cobs and about 500 gm mustard seeds mixed with 1 litre of *kanji* (fermented rice water from local paddy). This mixture is kept for 24 hours to allow its fermentation and then given to the suffering animal in three doses.

Fevers and cold

When an animal is suffering from cold and/or fever, tribal livestock owners give about 250 ml *Kanji* orally three times a day and this is continued for 2-4 days. In the case of coldness without a fever, farmers administer two eggs with 50 to 60 ml cow ghee orally to give quick relief from the cold.

Advancing the onset of puberty in female animals

Some female animals become sterile due to a succession of several minor disorders, or they do not come in to heat and consequently fail to conceive. In such cases, a paste of the crushed green buds of sesame is placed inside the reproductive organ forcing the release of hormones, which results in the animal coming into heat. Some livestock owners (35%) are knowledgeable in using an extract of about 100 ml *seetaphal* (*Annona squamosa* L.) 50 gm rice bran and 50 gm common salt. This mixture is fed to the animal once a day and

continued for 3 to 4 days to bring the animal into heat. Some livestock owners were found to use the excreta of pigeon. About 40-50 gm pigeon excreta are mixed into bread and given to the cow/buffalo for 3-4 days to activate the heat period. Alternatively, the *tataiya* insect (wasp) may also be given to induce the puberty in she animals. During the months of June-July some farmers try to give the new emerging bamboo shoots (*kareel*) to the cow/buffalo for inducing the heat period.

Control of lice

A severe attack of lice (suching, *Haematopinus asini* and biting, *Damaline equi*) can cause anemia in animals (Getachew *et al.*, 2003). To control lice, farmers make a decoction made from 200 to 250 gm green *seetaphal* (*Annona squamosa* L.) leaves boiled in about 1 litrer of water (the amount of water used is decided according to size and body weight of animal). The solution turns dark brown in colour and reduces to around 300 ml. This solution is smeared on to the skin of lice suffering animals.

Local feed resources for animals

Commercial livestock feed is expensive with feed costs comprising 70 per cent of total production costs. Many tribal livestock owners are not able to afford the higher cost of marketed animal feed and instead use a wide variety of leaves and other locally available materials for the health care of livestock. They have identified many plants, trees, shrubs and grasses, according to the season, for feeding their animals. For the most part livestock were fed on the green leaves of locally available trees like *neem* (*Azadirachta indica*), *jamun* (*Syzygium cumini*), *mahua* (*Madhuca indica*), *bamboo* leaves (*Bambusa arundinacea*), *doob* grass (*Cynodon dactylon*), *motha* grass (*Cyprus rotendus*), *ber* (*Zyzyphus jujuba*), *Peepal* (*Ficus religiosa*), *bargad* (*Ficus bengalensis*) and *babool* (*Acacia nilotica*). During the drought period additional wild shrubs, leaves and grasses are used to supplement dietary requirements and to sustain health. Green leaves from shrubs like *Acacia tgortilis, Zizyphus nummularia,* (Jhaberi), *Tamarix articulata, Dalbergia sissoo* (the leaves are given in controlling the diarrhoea), *Acazcia senegal, Bauhinia variegata* are popular, as are *Ficus subnincisa* syn. *F. clavata, Ficus semicardata, Melia azedirach, Dalbergia latifolia, Ficus tinctoria, Terminalia arjuna,* which are collected from forest areas.

Grasses, such as *Sehemia nervosum* and *Dachantheum annulatum* are the most popular during drought conditions. These are collected from nearby forest areas and form an essential part of the animals diet. These resources are naturally conserved on common, barren or fallow land, where animals can access them easily. During drought conditions, livestock owners collected tubers of *motha* grass (*Cyprus rotendus*), pods of *babool* (*Acacia nilotica*), *mahua* flowers (*Madhuca indica*) and fruits of *peepal* (*Ficus religiosa*), which are given to animals as a protective and nutritious feed. Especially, the pods of *Accessia indica* is considered best source of nutritious feed for the lactating goat. The farming system of tribal livestock owners is diversified to ensure productivity, and most keep a few pigs and poultry birds. The tubers of *Cyprus rotendus* are collected by tribal people who follow the paths of foraging pigs that dig for the roots of different grasses under the moist blackish soils. The *motha* tuber is used as food for both people and animals. The larger tubers are used as a nutritious vegetable whilst the smaller, inferior quality tubers are given as feed to animals. Women primarily perform the collection process of local produce from forest areas.

Livestock owners' attitude regarding EVP

Having collected data from 20 wisemen and 60 livestock owners, the following similarities have been identified regarding attitudes concerning EVP. These are presented in the Table 1. The majority of livestock owners (78%) were in agreement that existing EVP are more

Table 1. Factor responsible for increasing attitudes of EVP

S. No.	Factors for increasing attitude	Response in %
1.	Cost of western drugs	70.0
2.	Cost of effectiveness	68.0
3.	Poor infrastructure	60.0
4.	Abundance of plants available in the locality	75.0
5.	Poor access and availability of modern drugs	55.0
6.	Cheaper	78.0
7.	Less toxic and fewer side effects	50.0
8.	Can be done without continuous veterinary supervision and is good as first aid	

popular as they present a cheaper, affordable option. The abundancy and local availability of natural resources (75%) was the next most popular factor in determining which EVP farmers used. Approximately 70 per cent of local farmers felt that the higher cost of western drugs in comparison to free locally available medicinal plants was the third most popular factor in shaping attitudes, whilst 68 per cent felt that the cost of existing EVP was effective. Farmers comprising 63 per cent were of the opinion that existing EVP required little supervision. Whilst 60 per cent were of the opinion that modern EVP had a poor infrastructure to support the needs of livestock owners and consequently they were forced to depend on locally available EVP.

Scientists' argument and appropriations regarding EVP

Animal husbandry and veterinary scientists generally argued that greater attention should be paid to EVP (Table 2). A majority of 80 per cent of scientists thought that it would be appropriate to give greater attention to EVP due to its easy availability and low cost nature, while 78 per cent argued that most often EVP are having no adverse side effects of EVP and its continuous use were the important reasons to pay it greater attention.

Table 2. Scientists' arguments appropriateness of giving greater attention to the EVP

S. No.	Appropriateness of giving the greater attention	Response in %
1.	Need to understand poor veterinary structure and cost of modern drugs	70.0
2.	Maintain the tradition	60.0
3.	If it is continuously using by farmers, attention must be given	75.0
4.	More readily available and cheaper than the modern drugs	80.0
5.	Plants are the basis for modern drugs	65.0
6.	Thought provoking and interesting to look at the past	58.0
7.	Farmers are resource-poor in terms of money but not in experiencial wisdom	62.0
8.	No side effects	78.0
9.	Increasing drug resistance by many diseases	55.0

Approximately 70 per cent of scientists argued that it was time to understand the poor infrastructure and costs of modern drugs, which compelled farmers to continue the EVP. Scientists (65%) argued that EVP are appropriate methods for the care of livestock and indeed deserved greater attention as most of EVP is plant and herb based and that this could form the basis for many modern drugs. Hence, it offers the scope for further research and validation. Whilst, 62 per cent of scientists defended local people's EVP by raising the point that experimental wisdom in comparison to the economic status (in monitory term) possessed by local livestock owners was much greater. It is necessary to look at the appropriateness of EVP and age-old methods as these had worked over time (about 58% 'scientists' arguments) and it has been highlighted the fact (55%) that many disease are becoming resistant to modern drugs, where EVP can provide the substantial solutions.

CONCLUSION

From this study it can be concluded that the tribal livestock owners consulted live in varied geographical regions and climatic zones have developed their own ethno-veterinary practices intrinsically linked to their culture and economic status. They are flexible and their own skills and knowledge is well adapted to cope with new challenges in the field of livestock. All, but a few of the practices are cost free in nature. Farmers distinguish between those practices that are very effective and those that are reasonably effective. Thus, until EVP is supported by quantitative studies of an internationally accepted standard, it would not make any lasting impact in veterinary research/training institutions. The range in the variety of EVP treatments and practices available are always going to be limited and any work on evaluation should start on those most likely to be effective and which have the greatest potentials for being transferred to other livestock owners (Fielding, 2001). Livestock owners have positive attitude towards EVP for its appropriateness due to its compatibility to the existing culture, local availability, cheaper cost and effect against a variety of diseases. Veterinary scientists are also in favour of improving EVP. Therefore, there is a need for research to test the scientific rationality of all ethno-veterinary practices for its validation and the validation would need to be a high order involving as far as possible specified numbers of animals, levels of caused infections, the plants being investigated and their preparation, laboratory techniques to be used and the length of the study.

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Farmer Participatory Assessment of Bt. Cotton and Its Socio-economic Implications

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ABSTRACT

The study was conducted with a sample of 160 farmers (120 adopters and 40 non-adopters) drawn randomly from Mansa and Bhatinda districts of Punjab as well as khandwa and Khargone districts of Madhya Pradesh. Matrix ranking revealed the yield, incidence of pest and management cost, germination potential, input use and requirement of irrigation with respective mean scores as 9.33, 9.00, 8.33, 8.33 and 8.00 to be the major criteria for selecting cotton varieties. Criteria based ranking by the farmers of Madhya Pradesh revealed their higher preference to MECH 162 (score 10) with respect to criteria of germination potential, less incidence of bollworm and yield in comparison to other Bt. hybrids and non-Bt.hybrids/varieties, while MECH 12 was ranked higher for boll size, quality and market value. In Punjab, RCH 134 was the most popularly accepted Bt. Cotton hybrid among the farmers of the several recommended Bt. Varieties viz. MRC 6301, MRC 6304, RCH 134, RCH 317, Ankur 651 and Ankur 2534. Cultivation of Bt. Cotton reduced the frequency of spray by 62% and health hazards by 89%; while increased the yield by 67% and income by 142 %. The farmers had high level of information and training needs (MPS 2.76) for successful cultivation of Bt.cotton.

Overtaking US, India has become the second largest cotton producing country in the world, after China with Bt.cotton being a major factor in the spectacular increase in production from 15.8 million bales in 2001-02 to 31 million bales in 2007-08 (Financial Express, 2008). Deployment and adoption of transgenic crops across the world have been unprecedented. Beginning with acreage of 1.7 mha across six countries in 1996, the global acreage under approved biotech crops increased to 114.3 million hectares in 2007 (ISAAA, 2007). Development of Bt.cotton hybrids and their use among 12 million farmers across 23 countries amply demonstrate the supremacy and the cutting edge of biotechnological tools and techniques in crop improvement and progress of mankind. However, India remained watchful for some years and after some successful trials, gave consent to cultivation of Bt. cotton. The first approval for commercial cultivation of Bt cotton in India was granted to three cotton hybrids MECH 12 Bt, MECH 162 Bt, MECH 184 Bt developed by Mahyco. Following the approval of GEAC, commercial cultivation of Bt cotton was undertaken during 2002 in 6 states in India i.e. Andhra Pradesh, Gujarat, Madhya Pradesh, Karnataka, Maharashtra and Tamil Nadu (Barwale *et al*, 2004) and the total area under cultivation was .038 mha. By 2007, its acreage soared to 6.2 million hectares. However, the reports of mixed response of their on-farm performance have kept the nation wide debate upon the use of transgenic crop alive. The transgenic technology faces criticism primarily for the bio-safety concerns, which include transgene movement to other varieties and wild relatives leading to possible development of super weeds, erosion of genetic diversity and ecological disturbances; widespread apprehension about toxicity or allergencity induced by transgenic products to humans and animals; its adverse impact on non-target organisms; emergence of more virulent forms of pests and pathogens; etc (Arora and Ahuja, 2006 & Owusu-Biney, 2006). Besides biosafety concerns, IPR, ethical and moral issues form the basis of debate towards adoption of transgenic crops.

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There are cases of undesirable results of transgenic technology, which further strengthen the apprehension about such technology. For example, transgenic soybean genetically modified to increase its sulphur containing amino acids by incorporating Brazilian nut *2S* gene was found allergenic to serum of people who are allergenic to Brazilian nut *2S* protein. Report of death of cattle by grazing Bt.cotton plants in Andhra Pradesh also fueled the debate on use of transgenic crops. Hence the present study was conducted for participatory assessment of Bt cotton and its socio-economic implication.

METHODOLOGY

The study was conducted in the cotton belts of khandwa and Khargone districts of Madhya Pradesh and Bhatinda and Mansa districts of Punjab. Bt. cotton cultivation in Madhya Pradesh was started in the year 2002, while in Punjab it started in 2005. The sample of respondents comprised of 160 farmers drawing 20 farmers (15 with Bt.cotton crop and 5 with non-Bt. cotton crop) from each of the eight villages selected randomly from the above mentioned districts of Madhya Pradesh and Punjab. Criteria based ranking method was used for identification of the decision parameters as well as evaluation of the Bt hybrids *vis-a- vis* non-Bt hybrids/ varieties. Matrix of decision criteria with respect to selection and adoption of hybrids/varieties as well as the relative performance of different Bt hybrids and non-Bt hybrids/varieties was administered to 20 key informants individually as well as in groups. Ranking for the relative performance of the Bt hybrids and non-Bt hybrids/ varieties against each criteria was done with scoring pattern of 0-10. Primary data were collected with interview schedule based survey and personal observation. The training need was assessed on three-point continuum of most needed, needed and not needed with respective weightage of 3, 2 and 1.

RESULT AND DISCUSSION

Identification of farmers' criteria of varietal assessment

For ensuring participatory assessment, farmers' criteria for varietal assessment were elicited and their prioritization was done with ranking. With the highest mean score of 9.33, the yield potential was considered as the first and foremost criteria for selection of any hybrid / variety followed by the incidence of pest and low cost of their management (MS:9.00), input requirement (MS:8.33) and germination potential (MS:8.33) (Table 1). Size of boll and plant and irrigation intensiveness with equal mean scores of 8.00 were the fourth most important criteria followed by suitability to farm (MS:7.66), quality (MS:6.66), cost of seed (MS:6.33), labour saving (MS:6.33), drudgery in picking (MS:6.33), harm to soil (MS:6.00) and harm to other crops (MS:5.00).

Table 1. Farmers' criteria for varietal assessment

Sl. No.	Criteria	Mean Score (MS)
1.	Yield	9.33
2.	Pest incidence and management cost	9.00 8.33
3.	Inputs requirement	
4.	Germination potential	8.33
5.	Size of boll and plant	8.00
6.	Irrigation intensiveness	8.00
7.	Suitability to farm	7.66
8.	Quality	6.66
9.	Cost of seed	6.33
10.	Labour saving	6.33
11.	Drudgery in picking	6.33
12.	Harm to soil	6.00
13.	Harm to other crops	5.00

Performance and farmers' assessment of Bt cotton *vis-à-vis* non-Bt.cotton

The criteria based comparative assessment of various Bt. hybrids viz., MECH 12, MECH 162, MECH 184 and RCH 2 *vis-à-vis* non-Bt hybrids/varieties (Bunny, Ajit, Ankur, etc) cultivated by the farmers was done. A matrix of criteria for assessment as prioritized by them alongwith Bt hybrids and non-Bt hybrids/ varieties grown by them was made on a large chart paper or ground and administered to a set of 20 key informants (preferably the Bt and non-Bt cotton cultivators). They were asked to rank with score range of 0-10 for each combination by placing the pebbles or plastic coins (Fig. 1). Higher the degree of trait /property with respect to the criteria, higher was the score given. The findings revealed differential performance not only between Bt. cotton hybrids and non-Bt cotton hybrids/varieties but also among the several Bt. hybrids with respect to the criteria (Table 2).

For yield all the Bt hybrids were given higher score in comparison to non-Bt hybrids/ varieties. The average yield of Bt cotton was 9.9 qtls/acre in MP as

Table 2. Performance of Bt and non-Bt hybrids in MP

Criteria	Non-Bt hybrids	Bt hybrids				Mean score of Bt hybrids
		MECH12	MECH162	MECH184	RCH2	
Germination potential	9	7	10	9	8	8.50
Incidence of American bollworm	9	3	1	2	1	1.75
Incidence of sucking pest	9	8	5	9	5	6.75
Cost on spray	8	5	4	3	3	3.75
Boll size	5	10	6	8	9	8.25
Yield	5	8	10	9	7	8.50
Cotton%	5	8	6	8	6	7.00
Quality	7	10	8	9	9	9.00
Staple length	7	10	9	9	8	9.00
Market value	6	10	8	9	8	8.75
Ease in picking of cotton	3	8	6	4	5	4.75
Irrigation intensiveness	7	6	6	7	6	6.25
Suitability to light soil	7	5	7	3	10	6.25
Suitability to heavy soil	8	10	9	8	6	8.25
Incidence of boll drop	4	6	6	8	7	6.75
Stem splitting	2	4	-	8	3	4.25
Wilting	2	5	-	8	2	4.25
Reddening of leaves	6	6	-	7	7	5.00

against 5.9 qtls/ acre in case of non-Bt cotton. However, among the Bt hybrids MECH 162 was ranked higher for yield where the yield was obtained in range of 10-23 qtls per acre followed by MECH 184 and MECH 12. MECH 162 and RCH 2 were preferred for lesser incidences of pests both American bollworm and sucking pests than other Bt hybrids. Bt hybrid MECH 184 was considered at par with non-Bt Bunny for incidences of sucking pests. For germination potential, MECH 162 was considered the best with score of 10 followed by MECH 184, RCH 2 and MECH 12. Interestingly the non-Bt Bunny variety was found the second best in germination potential. MECH 12 was ranked the best followed by MECH184 for boll size, cotton percentage, cotton quality, staple length, ease in picking and high market value (Rs 100-125 per qtl more). Astonishingly the Bt hybrid MECH 184, which had been given better score on many a parameter in comparison to other Bt hybrids, was rated much inferior even than the non-Bt hybrids/varieties for incidences of boll drop, stem splitting, wilting and reddening of leaf. Because of these problems, farmers were baffled in the initial years of Bt cultivation and disenchantment with Bt cotton hybrids and related protest gained momentum. Such incidences underline the importance of communicating technology packages besides seed. Mere seed alone cannot be a sufficient technology to assure production and profit. The farmers observed that Bt hybrids were irrigation intensive. For light soil RCH 2 was ranked the best, while for heavy soil MECH 12 was found the best (MS: 10).

MRC-6301, MRC-6304, RCH-134, RCH-317, Ankur-651, Ankur 2534 were the major Bt cotton hybrids deployed in Punjab. The criteria based ranking by the farmers revealed RCH-134 as the most popular approved Bt hybrid and mean scores for it were higher than unapproved Bt hybrids/ varieties and non- Bt hybrids/ varieties for all criteria (Table 3). However, cases of cultivation of unapproved Bt hybrids/ varieties were rampant.

Table 3. Comparative assessment of approved Bt, unapproved Bt and non-Bt cotton in Punjab

Sl.No	Criteria	Approved Bt hybrids	Non-Approved Bt hybrids/ varieties	Non-Bt hybrid/ varieties
1.	Yield	9	9	8
2.	Size of ball	9	8	8
3.	Less incidence of pests (Bollworm)	9	8	2
4.	Market rate	9	7	6
5.	Low irrigation requirement	7	4	5
6.	Ease in picking of cotton	10	8	7
7.	Suitability to light soil	6	5	5
8.	Germination potential	9	8	7
9.	Input requirement	7	7	9

The farmers preferred unapproved Bt hybrids/ varieties because of low cost of seed, easy accessibility and availability of seed, no incidence of American bollworm like in case of approved Bt. hybrids, early development of bolls and the yield secured by the unapproved Bt hybrids/ varieties being almost at par with approved Bt hybrids. If approved Bt hybrids secured yield in range of 10-16 qtls/ acre, farmers could get 8-16 qtls/ acre from unapproved Bt hybrids seed. Early development of bolls facilitated the process of sale contractual arrangement and ensured better deal to farmers as the contractors got assured of yields from the crop by observing the bolls. Boll development in case of approved Bt hybrid seed began 90 days after sowing, while in case of unapproved Bt hybrids seed it started only 40 days after sowing. Though there was no guarantee of seed purity, farmers with previous experiences relied upon unapproved Bt hybrids seed with the trust and hope that all plots would not be affected. Moreover, the very low cost and provision of availability on credit lured them to go in for unapproved Bt hybrids seed. Generally the seeds of unapproved Bt hybrids were traded illegally and were available through informal network. Convenience factor again played a role in adoption of unapproved Bt hybrids seed because approved Bt hybrids seed could be purchased only on cash payment and seeds were available only through the authorized dealers and that too on the basis of prior demand. One had to place demand of his requirement in advance before the season and if more seeds were required later either for enhancing the acreage or gap filling in the plot, seeds were not available even on higher rate. Black marketing had become common and farmers suffered. On the contrary the unapproved Bt hybrids seed were readily available and could be procured even on credit, which was highly convenient for the farmers particularly the small and marginal. Availability on credit saved the farmers from struggling for loans.

Besides the concerns of higher seed rate, use of second generation of hybrid seed (F2) and more number of irrigation required than the approved Bt hybrids seed, the major disturbing issue is lack of direction of using refuge lines. Refuge lines connotes planting of same hybrid as of Bt hybrids but without Bt gene (non-Bt hybrid) along the borders of Bt hybrid crop plot to contain the development of resistance in the American bollworm against the Bt gene and for higher longevity of the Bt hybrid. Generally 5 lines or 20 per cent of area of Bt crop plot are to be put under non-Bt hybrid along the border of Bt hybrid crop. It is one of the vital practices of biosafety management. Alarmingly, there is no direction at all about use of refuge lines in case of unapproved Bt hybrids seed like the approved Bt hybrids seed. The packets of approved Bt hybrids seed not only contain along with it the separate packet of non-Bt hybrid seed for sowing as refuge lines but also the necessary guidelines and method of planting refuge lines. The gross negligence on biosafety measure needs attention to manage any kind of technology-led undesired consequences.

Benefits of Bt cotton cultivation

The cultivation of Bt cotton offered many an advantage and benefits to the farmers. American

bollworm has been the most dreaded insect pest of cotton and of the total pesticide application in cotton it appropriated the maximum for its management. However, with advent of Bt. cotton hybrids, wherein the incorporated Bt gene (*cry 1AC*) provides security to the hybrids against the American bollworm, there is no need of pesticide application for its management. As the insect feeds upon the leaves or any part of plant of Bt cotton, the crystal protein in the gene *cry 1AC* binds and kills by destroying the intestinal gut of the insect. With adoption of Bt cotton hybrids, the average number of total pesticide spray has reduced by about 62 per cent and as a result the average cost on total pesticide spray reduced by 73 per cent and average number of health hazards due to pesticide spray (number of persons affected by pesticide induced health problems per season per village) reduced by over 89 per cent (Table 4). Besides these benefits, farmers secured 67 per cent higher average yield and 142 per cent higher monetary return from Bt cotton hybrids than the non-Bt cotton hybrids/ varieties.

There was a highly significant ($P<.01$) increase in yield of cotton in both the states after adopting Bt cotton hybrids (Table 5). As against average yield of about 6 qtls per acre from non-Bt hybrids/varieties farmers secured an average yield of about 10.4 qtls per acre from Bt hybrids in Punjab. In Madhya Pradesh, farmers got 9.9 qtls per acre yield from Bt cotton hybrids as against 5.9 qtls per acre fro non-Bt hybrids/varieties.

Information and training need of farmers

Though farmers accepted the potential advantages of Bt cotton hybrids, they were cautious in their fuller adoption. Mixed pattern of cotton cultivation i.e. putting acreage under Bt cotton hybrids, unapproved Bt cotton hybrids (in case of Punjab) and non-Bt cotton hybrids was observed. Though the pace of adoption was phenomenal, the cases of disenchantment with Bt hybrids, where the expectations were not met, were the concerns of significance to boost up the adoption and fuller utilization of the technology. As the public extension system is not in fray for dissemination of knowledge about transgenic technology, there was enormous void related to knowledge and skill about proper application of Bt cotton technology. Since Bt cotton was deployed by private seed agencies, the extension services related to it were largely carried out by them, whose major focus was on promotion of sale of seeds and as a result the issues of bio-safety, agro-techniques and risk communication remained unattended. There was enormous lack of communication about Bt. technology and related issues. Farmers just knew that Bt cotton was a technology which saved crop against American bollworm without use of pesticide but they hardly knew that all Bt hybrids were not same and different hybrids were suitable for different situations. For example RCH 2 was suitable for light soil and MECH 162 was suitable for heavy soil (Table 2). Bt hybrids for rainfed and irrigation systems have to be different. However, in want

Table 4. Comparative assessment of approved *vis-à-vis* unapproved Bt hybrids

Character	Approved Bt hybrids	Unapproved Bt hybrids/varieties
Yield	10-16 qtls/acre	8-16 qtls/ acre
Incidence of bollworm	Nil	Nil
Boll development	90 DAS	40 DAS
Seed rate		
· Recommended	450 g per acre	450 g per acre
· Practised	450-650 g per acre	450 – 900 g per acre
Seed cost	Rs 1395 (Revised cost Rs 750/ per 450 g)	Rs 300-600/ per 450 g
Seed availability	On cash	On cash and credit
Seed accessibility	Authorized seed dealers	Informal networks
Purity of seed	Guaranteed	Not guaranteed
Irrigation frequency	5-7	8-10
Refuge lines	5 (20% area)	No direction

DAS: Days After Sowing.

Table 5. Benefits of Bt cotton cultivation

Particulars	Non-Bt cotton	Bt. cotton	Benefit (%)
Average no. of pesticide spray	8.4	3.2	61.90
Average cost on pesticide spray	5350	1400	73.1
Health hazards due to pesticide spray (Number of persons/season/ village)	11.5	0.4	89.6
Average yield (Qtls/ acre)	6.1	10.2	67.21
Net return (Rs)	4725	11430	142

Table 7. Information and training need of farmers

Sl.No.	Training areas	Mean Score (MS)
1.	Identification of genuine seed	2.84
2.	Selection of Bt hybrids suitable to farm situations	2.88
3.	Seed rate	2.74
4.	Method of sowing	2.62
5.	Planting density	2.62
6.	Planting of refuge lines	2.92
7.	ETL based pest management	2.96
8.	IPM schedule for Bt cotton	2.94
9.	Nutrient management	2.65
10.	Critical stages of irrigation	2.46

ETL: economic threshold level

of proper knowledge the farmers just in the name of Bt cotton adopted Bt hybrids irrespective of their situation and location specificity and as a result the performance was poor and disenchantment set in. Similarly some Bt hybrids (e.g. MECH 184) due to nutritional deficiency suffered from reddening of leaves and yield was affected. Farmers lacked knowledge about agro-techniques of Bt cotton cultivation. Even spacing and plant density varied which led to higher seed rate as farmers followed the same crop geometry as with earlier hybrids/ varieties keeping in view their plant vigour. They were not communicated about importance and use of refuge lines. Many farmers just kept aside the packet of non-Bt hybrids, which were given to be sown as refuge lines with the opinion that these would invite the problem of American bollworm again and affect the productivity of Bt hybrids. Many farmers pooled the packets of non-Bt hybrid seeds and sowed them in a separate plot to save Bt plot from American bollworm. Realizing the gap in knowledge among the farmers about the transgenic technology, information and training needs of the farmers were assessed. The mean scores of above 2.6 on a scale with maximum score of 3 showed a very high information and training need among the farmers in almost all the areas (Table 6).

Conclusion and implications

Assessment of Bt cotton hybrids on the criteria and parameters identified and prioritized by the farmers facilitated participatory process. Bt hybrids were found superior to non-Bt hybrids/ varieties on almost all parameters like yield, no incidence of American bollworm, less incidence of pest and management cost size of boll and quality of cotton, etc. however, they were rated to be irrigation intensive. The farmers in Punjab preferred unapproved Bt hybrids/ varieties because of low cost of seed, easy accessibility and availability of seed, no incidence of American bollworm like in case of approved Bt. hybrids, early development of bolls and the

Table 6. Average yield of Bt. cotton and non-Bt.cotton hybrids

State	Average Yield (qtls per acre)		t-value	P-value
	Bt. Cotton	Non-Bt.cotton		
Punjab	10.40	6.20	12.818**	0.000
Madhya Pradesh	9.90	5.94	11.485**	0.000

**(P<.01)

yield secured by the unapproved Bt hybrids/ varieties being almost at par with approved Bt hybrids. Adoption of Bt cotton hybrids led to reduction in the average number of total pesticide spray, reduction in the average cost on total pesticide spray and reduction in the average number of health hazards due to pesticide spray (number of persons affected by pesticide induced health problems per season per village), while it increased the average yield and income from cotton cultivation. However, there was urgent need to address the problems of lack of knowledge and information to help farmers advantageously utilize the potential of Bt. cotton technology. Based on the findings of the study, the major suggestions to overcome the deployment and dissemination concerns include: recommendations of Bt hybrids to be made according to their suitability to agro-ecological conditions; standardization and dissemination of agro-techniques; development of communication content and dissemination of extension literature related to Bt cotton cultivation, Bt technology and related biosafety concerns as well as organization of scientists-farmers interface to bring clarity about the transgenic technology and to remove unfounded apprehension about the risks of transgenic technology among the farmers and end-users; ensuring easy availability of quality and authentic seeds of Bt hybrids; and augmenting the role of public extension system in deployment and dissemination of Bt technology.

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Training Needs of Extension Managers in Managerial Skills and Practices

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ABSTRACT

The first step in improving the managerial competencies of extension managers will be to assess their training needs. This paper describes the findings of the study undertaken in two states of India to assess the training needs of extension managers in managerial skills and practices. A total of one hundred extension managers selected from two states (Tamil Nadu and Rajasthan) through random sampling technique formed the sample of the study. The training needs of extension managers in management competency were assessed based on task analysis. In order to validate as well as supplement the findings of need assessment using a five-point continuum scale. Findings of this study clearly indicate a need for in-service training in the following areas of management; 'planning', 'leadership', 'communication', 'team building', 'creativity management', 'problem solving & decision-making', 'information management', ' personal effectiveness', 'performance appraisal', 'information management & network techniques', 'stress management', 'time management', and 'evaluation of programs'.

It can be stated that the main problem of increasing agricultural production and productivity in developing countries like India is more of a management problem than a technical one (Vijayaragavan, 1994). The need for improving the managerial skills of extension managers has also increased in recent years due to changing scenario in agriculture, economy and communication. Extension in the coming years will have to go beyond the role of mere dissemination of technology and get involved in new roles such as technology assessment and refinement, capacity building, establishing coalition among different stake holders, etc. Successful performance of new roles calls for efficient extension professionals with skills of modern management practices. In developing countries like India most of the extension personal have very little formal training in management skills. Further, most of the in-service training programs do not pay an attention to their management competencies while improving technical skills have always received greater attention. Therefore, development of managerial skills should be the focus of extension organisations in the coming years. The first step in improving the managerial competencies of extension managers will be to assess their training needs.

This paper describes the findings of the study undertaken in two states of India to assess the training needs of extension managers in managerial skills and practices.

METHODOLOGY

A total of one hundred extension managers selected from two states (Tamil Nadu and Rajasthan) though random sampling technique formed the sample of the study. Extension managers in this study refer to extension professional who have managerial responsibility at junior, middle and senior levels. The training needs of extension managers in management competency were assessed based on task analysis, which refers to an analysis of important job tasks performed by extension managers and is based on importance of the task as well as frequency of doing the same. The frequency of task performed was measured on a five-point continuum beginning with "seldom" and followed by "occasional", "monthly", "weekly" and had a respective

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score of 1, 2, 3, 4 and 5. Likewise, the level of importance was measured on a five-point continuum starting with "very low" and followed by "low", "moderate", "high" and "very high", and carried a score of 1, 2, 3, 4 and 5 respectively. The combined score based on the frequency of task areas. It was assumed that the task, which was performed frequently and considered important by extension personnel, needed training since new developments have taken place in every area of managerial function. In order to validate as well as supplement the findings of need assessment through task analysis, training need was also assessed based upon self-assessment using a five-point continuum scale.

RESULTS AND DISCUSSION

Training Needs of Extension Managers in Managerial skills and practices based on task analysis

The training need was worked out based on task analysis, which consisted on an analysis of frequency of performance of task as well as importance of task, as perceived by the extension personnel. The combined score on the frequency of task performance and the importance of the frequently and considered as important needed training since new developments have taken place in the area of management functions. The data (Table 1) revealed that the most important area of training was found to be 'management of time', followed by 'leadership (team building)', 'problem solving and decision making', 'supervision', 'leadership (motivation), 'creativity management', 'directing and coordinating', 'planning', 'leadership (communication)', 'staffing and human resource development', 'information management' and 'personal effectiveness'.

Table 1. Training needs of extension managers based on task analysis (N=100)

Areas of training	Frequency of performance@	Level of importance @	Total training need score*	Rank
Planning	2.34	2.99	5.33	IX
Leadership (Communication)	2.07	2.81	4.88	X
Leadership (team-building)	5.85	3.53	6.46	II
Leadership (motivation)	2.82	3.34	6.16	V
Staffing and HRD	1.95	2.50	4.46	XI
Supervision	2.85	3.44	6.29	IV
Creativity management	2.65	3.41	6.07	VI
Problem solving and decision making	2.80	3.55	6.36	III
Information management	2.63	3.31	6.00	VII
Time management	3.73	3.55	7.28	I
Perfornal effectiveness	1.95	2.38	4.33	XII
Directing and coordinating	2.55	3.13	5.68	VIII

@Manaximum possible score = 5, minimum = 1;
* Maximum possible score = 10, minimum = 1

The analysis of data also revealed different sub-areas of training under each major above major area, which can be seen, from the data in Tables 2 to 7.

Table 2. Training needs under the area of management of time

Areas of training	Frequency of performance@	Level of importance @	Total training need score*	Rank
Planning every day schedule of activities	3.38	3.22	6.66	II
Prioritization of activities	4.08	3.89	7.97	I

@Manaximum possible score = 5, minimum = 1;
* Maximum possible score = 10, minimum = 1

According to the data in Table 2, 'prioritization of activities' was given the first rank followed by 'planning every day schedule of activities' under the area of time management.

It is evident from Table 3 that "inculcating the spirit of team work' and 'appreciating and rewarding teamwork' emerged as the important areas under leadership (team building).

Table 3. Training needs under the area of leadership (Team building)

Areas of training	Frequency of performance@	Level of importance @	Total training need score*	Rank
Inculcating the spirit of team work	3.13	3.61	6.74	I
Appreciating and rewarding team work	2.72	3.48	6.18	II

@Manaximum possible score = 5, minimum = 1;
* Maximum possible score = 10, minimum = 1

Regarding the areas under problem solving and decision-making the two main sub areas were 'solving problems in implementation of programmes' and 'participatory decision making' (Table 4).

Table 4. Training needs under the area of problem solving and decision making

Areas of training	Frequency of performance@	Level of importance @	Total training need score*	Rank
Soloving problems in implementation of programmes	2.94	3.60	6.54	I
Participatory decision making	2.67	3.51	6.18	II

@Manaximum possible score = 5, minimum = 1;
* Maximum possible score = 10, minimum = 1

The two most critical sub areas of supervision were found to be 'monitoring progress through field visit' and 'evaluation of work of subordinates' (Table 5).

Table 5. Training needs under the area of supervision

Areas of training	Frequency of performance@	Level of importance @	Total training need score*	Rank
Monitoring progress through field visit	3.38	3.84	7.22	I
Follow up action for programme implementation	2.80	3.52	6.32	III
Impact analysis of programme and finding out progress and problems	2.24	2.84	5.08	IV
Evaluation of work of subordinates	2.98	3.57	6.55	II

@Manaximum possible score = 5, minimum = 1;
* Maximum possible score = 10, minimum = 1

The crucial training need sub areas identified under leadership (motivation) were 'having trust and confidence or subordinates' and 'providing opportunities for free and fair discussion' as is evident from Table 6.

Table 6. Training needs under the area of leadership (motivation)

Areas of training	Frequency of performance@	Level of importance @	Total training need score*	Rank
Having trust and confidence on subordinates	3.85	3.65	7.50	I
Providing opportunities for free and fair discussion	3.50	3.86	7.46	II
Praising subordinates for good work	2.91	3.60	6.51	III
Providing inspiration	2.80	3.51	6.31	IV

@Manaximum possible score = 5, minimum = 1;
* Maximum possible score = 10, minimum = 1

The data in Table 7 reveal that 'inviting creative ideas from subordinates' and 'searching for innovative ideas to improve performance' were the two main training needs under creativity management.

Table 7. Training needs under the area of creativity management

Areas of traiping	Frequency of performance@	Level of importance @	Total training need score*	Rank
Inviting creative ideas from subordinates	2.67	3.56	6.23	I
Searching for innovative ideas to improve performance	2.64	3.27	5.91	II

@Manaximum possible score = 5, minimum = 1;
* Maximum possible score = 10, minimum = 1

Training needs based on self-assessment of extension managers

In order to validate as well as supplement the results of training need assessment through task analysis the study also investigated the training requirements based on self-assessment. The extension managers were asked to indicate the extent of training need against different areas in which they needed improvement. The results (Table 8) revealed that the most important areas of training as per the assessment of extension personnel were : 1. Modern methods of performance appraisal, 2. Planning techniques, 3. Information processing and retrieval, 4. Creative problem solving, 5. Leadership (Group process & styles), 6. Evaluation of programmes,

7. Personnel Effectiveness, 8. Communication (Interpersonal), 9. Decision making, 10. Management of team, 11. Management of time, and 12. Motivation of employees.

Table 8. Training needs based upon self-assessment

	Areas of training	Score*	Rank
1.	Modern methods of performance appraisal	3.57	I
2.	Planning-Different planning techniques	3.47	II
3.	Information Management (Information processing and retrieval)	3.45	III
4.	Creative problem solving	3.29	IV
5.	Leadership (Group process and leadership styles)	3.21	V
6.	Evaluation of programmes	3.19	VI
7.	Personal effectiveness	3.17	VII
8.	Communication (Interpersonal communication)	3.06	VIII
9.	Decision making	3.04	IX
10.	Management of team	3.03	X
11.	Management of time	3.01	XI
12.	Motivation of employees	3.00	XII

*Manaximum possible score = 5, minimum = 1;

A comparison of the training needs identified through task analysis and self-assessment is given in Table 9. A perusal of the data in Table reveals that the common training areas identified by both task analysis and self-assessment are as follows: Planning, Leadership, Communication, Team building, Creativity management, Decision-making, Information management and Personal effectiveness.

Table 9. A comparison of training needs identified through task analysis and self-assessment

Training needs identified through	
Task analysis	**Self-Assessment**
Planning	Planning techniques
Leadership	Leadership (group process and styles)
Staffing and HRD	----
Communication	Communication
Team building	Management of team
Motivation	---
Creativity Management	Creative problem solving
Problems solving and decision making	Decision making
Information management	Information processing and retrieval
Time management	---
---	Performance appraisal
---	Evaluation of programmes

The self-assessment has revealed that extension managers wanted training in areas like performance appraisal and evaluation of programmes. The areas like staffing and human resources development, motivation and time management that have been identified by task analysis did not find place under self-assessment. The overall picture of training needs identified shows that self-assessment has validated the results of task analysis.

CONCLUSIONS

According to task analysis the most important area of training was found to be "management of time", followed by 'leadership (team building)', 'problem solving and decision making', 'supervision', 'leadership (motivation), 'creativity management', 'directing and coordinating', 'planning', 'leadership communication', 'staffing and human resource development', 'information management' and 'personal effectiveness'.

As per the self-assessment of extension managers the most important areas of training need were: 'modern methods of performance appraisal', 'planning techniques', 'information processing and retrieval', 'creative problem solving', 'leadership (group process & styles), 'evaluation of programmes', 'personnel effectiveness', 'communication', 'decision making', 'management of team', 'management of time', and 'motivation of employees'. A comparison of the training needs identified through task analysis and self-assessment revealed that the common training areas identified by both task analysis and self-assessment are as follows: 'planning', 'leadership', 'communication', 'team building', creativity management', 'decision-making', 'information management', and 'personal effectiveness'.

The self-assessment has revealed that extension managers wanted training in areas like performance appraisal and evaluation of programmes. The areas like 'staffing and human resource development', 'motivation' and 'time management' that have been identified by task

analysis did not find place under self-assessment. The overall picture of training needs identified shows that self-assessment has validated the results of task analysis.

Findings of this study clearly indicate a need for in-service training in the following areas of management: 'planning', 'leadership', 'communication', 'team building', 'creativity management', 'problem solving & decision-making', 'information management', 'personal effectiveness', 'performance appraisal', 'information management & network techniques', 'stress management', 'time management', and 'evaluation of programmes'. The needs assessment results reported in this study represent a first step towards developing in-service training programmes to improve the managerial skills of extension professionals. There is a need for developing training modules on the different areas identified in the study, suiting to the needs of agricultural a extension professionals. This task has to be undertaken by the faculty members of agricultural universities in collaboration with the officers of state department of agriculture. The job of developing training modules provides opportunities for international collaboration to make use of expertise of different countries. This will go a long way in addressing specific and critical needs of extension managers in improving their management skills. A state level Management Development Institute has been proposed to address training needs of extension personnel.

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Sustainability of Rice-Wheat System in Punjab: Farmers' Perceptions

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ABSTRACT

The present study endeavoured to delve into the perceptions of the rice-wheat growers regarding the sustainability issues of rice-wheat system in Punjab. The formulations of the study were based on the primary data collected through specifically structured interview schedule from 120 rice-wheat growers selected from three rice-wheat blocks; Verka (District Amritsar), Nadala (District Kapurthala) and Patran (District Patiala). The results revealed that area under rice-wheat rotation constituted 70 per cent of the net sown area. It was observed that 89.4 per cent of rice area was followed by wheat whereas 84.5 per cent of wheat area came from rice. The extent of knowledge of the farmers on the issues concerning sustainability of agriculture has been measured by using the methodology of Beus and Dunlap (1990). This is based on both the conventional and sustainable agriculture paradigms to measure beliefs and values within six major dimensions i.e. centralization vs. decentralization; dependence versus Independence; competition vs. community; domination of nature vs. harmony with nature; specialisation vs. diversity; and exploitation vs. restraint. The findings of the study revealed that the mean index of the statements representing sustainable agricultural paradigm (76.8) was significantly higher ($p<0.05$) than that of the statements representing conventional paradigm (67.8). The views of the respondents on the sustainability issues were not found to be in consonance with the crop management practices being followed by them as these were not in tune with the goal of sustained agricultural growth being envisaged for the state, in particular, and the country, in general. This calls for an urgent need to well equip the farmers with the knowledge of sustainable crop management practices.

The rice-wheat production systems occupy about 25 million ha of cultivated land in the Asian Subtropics. In South Asia alone, the systems occupy about 13.5 milloion ha (10 million ha in India, 2.2 million ha in Pakistan, 0.8 million in Bangladesh and 0.5 million in Nepal), extending across the Indo-Gangetic flood plains into the Himalayan foothills. Rice wheat systems cover about 2 per cent of the total rice area and 42 per cent of the total wheat area in these countries and account for one third of the total rice and wheat production (Huke *et al.*, 1994). In India, the rice and wheat together contribute around three fourth of the country's food grain production in 2002, up from just one half in 1950. In the process of attaining food security and the self reliance on the food grain production, huge costs, both economic and ecological in nature, have been incurred, mainly due to monoculture of crops. Four decades after the Green Revolution, India's soil and water quality have deterionated, indiscriminate use of chemicals and intensive cropping have robbed the soil of its nutrients; the unscientific tapping of water has led to over exhaustion of ground water. This has posed a threat to the food security system of the country. Punjab agriculture on the whole has been marred by the widespread stagnation in both agronomic and economic productivity, which has raised doubts on the very sustainability of the current crop system. The sustainability, most aptly defined by Ikerd (1990), is the ability to keep farms both ecologically sound and economically viable, Assuring the sustainability of crop system calls for a system of agriculture that will continue indefinitely to be protective and profitable, conserve resources, protect the environment and enhance the health and safety of the citizens. Most of the studies have been

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done from the perspective of the researcher or professional conservationist rather than to looking at the decision making process from the farmers' perspective. The present study, therefore, endeavoured to delve into the perceptions of the rice-wheat growers regarding the sustainability issues of rice-wheat system in Punjab.

METHODOLOGY

The formulations of the present study were based on the primary data collected, by way of a personal interview method, from a cross section of 120 farmers practicing rice-wheat system, sampled through three stage random sampling technique with selection of blocks at the first stage, villages at second stage and farmers as the third stage sampling units. The criterion adopted for the selection of the rice-wheat blocks is that at least 80 per cent of the net sown area should have been put to rice and wheat cultivation. Out of a total of 19 blocks identified as rice wheat blocks, the three randomly selected blocks were; Verka (Distt. Amritsar), Nadala (Distt. Kapurthala), and Patran (Distt. Patiala). From each selected block, two villages were randomly selected and from each village, a sample of 20 farmers, practising rice wheat rotation on at least half of their operational holding, were purposively selected. The extent of knowledge of the farmers on the issues concerning sustainability of agriculture has been measured by using the methodology of Beus and Dunlap (1990). This is based on both the conventional and sustainable agriculture paradigms to measure beliefs and values within six major dimensions i.e. centralisation vs. decentralisation; dependence vs. Independence; competition vs. communtiy; domination of nature vs. harmony with nature; specialisation vs. diversity; and exploitation vs. restraint. Each item was measured on a multi point scale; from strongly disagree to strongly agree. By allocating score of 1 to strong disagreement, 2 to disagreement, 3 to neutral, 4 to agreement and 5 to strong agreement, mean weighted score was worked out for each statement, weights being the respective number of respondents falling under above mentioned five categories.

RESULTS AND DISCUSSION

The findings of the study based on the primary data collected from the rice wheat growers, sampled from three selected rice wheat blocks of Punjab, have been presented under the following heads.

Background information of the selected farmers

The study revealed that the age of the sampled farmers varied from 28 to 62 years, with mean age recorded at 43 years. It has been observed that the majority of the respondents (68 per cent) were in the age group of 30 to 50 years. More than a quarter of the respondents (29 per cent) wer above 50 years of age and only three respondents were below 30 years.

It was observed that 62.5 per cent of the respondents were educated. Nearly 39 per cent of the respondents had studied upto primary, while 20.8 per cent had formal education upto the matriculation level and only 2.5 per cent of the respondents were graduate. However, 37.5 per cent of the respondents did not have any formal education but could read and write. The selected farmers on an average had 27 years of experience in farming and the range varied from 10 to 50 years. It was found that 43 per cent of the respondents had farming experience betgween 15 to 25 years and only one respondent had farming experience of less than 10 years.

The extension agencies like State Agriculture Department, IFFCO, *etc*, play a significant role in imparting the much-needed knowledge on variouis agricuiltural practices suited to the current agricultural scenario. In spite of the all out efforts put in by the extension agencies, only 37 per cent of the selected farmers were found to be affiliated with such agencies. Amongst them, nearly 90 per cent of the respondents were affiliated with PAU Extension Services. However, the proportion of the respondents affiliated with State Agriculture Department and other agencies like Cooperative Societies has been found to be negligible.

Farming profile of the selected farmers

The average size of the operational holding in case of the selected farmers has been recorded at 5.1 hectares, out of which 84 per cent was owned and 16 per cent was leased. None of the selected farmers had leased out the land. From Table 1, it can be observed that all the selected respondents followed rice wheat rotation and the area covered by this rotation on an average stood at 3.6 hectares. A little less than one tenth of the respondents followed basmati-wheat crop rotation and the area apportioned to it being two hectares per adopter. As high as 94.2 per cent of the respondents followed fodder-fodder crop rotation. The reason could be rational integration of livestock and crop enterprises. The study revealed that 10.8 per cent of the respondents followed rice-wheat based crop rotations like rice-pea-wheat and rice-potato-wheat on an average area of 2.3 and 2.0 hectares, respectively. The rice-based crop rotations followed were rice-fodder, rice celery and rice-pea-celery. On an average, the area under rice-pea-celery was 2.6

Table 1. Differnt crop systems adopted by the selected farmers

System	Extent of Adoption			Area as % of Net Sown Area
	Frequency	Per cent	Mean Area, ha	
Rice-Wheat	120	100.0	3.6	70.1
Basmati-Wheat	11	9.2	2.0	3.5
Rice-Wheat based				
Rice-Pea Wheat	9	7.5	2.3	3.3
Rice-Potato-Wheat	4	3.3	2.0	1.3
Rice based				
Rice-Fodder	6	5.0	0.7	0.7
Rice-Celery	6	5.0	1.8	1.8
Rice-Pea-Celery	2	1.7	2.6	0.9
Wheat based				
Vegetable-Wheat	3	2.5	0.9	0.5
Sugarcane-Wheat	2	1.7	3.2	1.0
Cotton-wheat	11	9.2	3.2	5.6
Fodder-wheat	6	5.0	0.8	0.8
Other				
Fodder-Fodder	113	94.2	0.6	10.4

hectares followed by rice-celery (1.8 hectares) and rice-fodder (0.7 hectares). The wheat based crop rotations like sugarcane-wheat; cotton-wheat, vegetable-wheat and fodder-wheat were followed by 2, 11, 3 and 6 farmers respectively.

The importance of differnt cropping systems in terms of acreage can be seen from the area apportioned to a particular crop rotation as per cent of net sown area (NSA). The rice wheat system has been found to be the most important cropping system constituting 70.1 per cent of the NSA. It can mainly be attributed to the Minimum Support Price Programme for these two crops. The other major crop rotation system prevalent in the region was fodder-fodder accounting for nearly one tenth of the NSA. Cotton-wheat system followed by 9.2 per cent of the respondents constituted 5.6 per cent of the NSA. Five crop rotations namely, rice-fodder, rice-pea-celery, vegetable-wheat, sugarcane wheat and fodder wheat together constituted merely 4 per cent of the NSA. The information presented in the table conclusively established the importance of rice wheat system.

According to the results of the study it was found rice and wheat acreage on an average has been recorded at 4.2 and 4.5 hectares, respectively, which individually constituted more than 80 per cent of the NSA. The area under the rice wheat rotation has been recorded at 3.8 hectares, which accounted for 73.6 per cent of the NSA. It could be observed from the table that as high as 89.4 per cent of the rice area was followed by wheat, whereas only 84.5 per cent of wheat area came from rice.

Issues concerning the rice wheat system

The views of the respondents were sought on the issues concerning the paddy wheat system in Punjab, which are being presented in Table 2. The data revealed that the highest index value of 88.2 has been secured by the statement 'The problem of declining water table can mainly be attributed to rice wheat rotation" indicating thereby farmers' agreement with the fact that the predominance of rice-wheat rotation is the major cause of the problem of declining water table in Punjab. All the respondents showed their agreement, about the role of suitable crop management practices in arresting the declining trend in productivity. The statement, 'the government should look for some alternative to disposal of paddy/wheat straw by way of burning' attained the index value of 81.2, indicating thereby that the farmers were aware of the fact that the disposal of paddy wheat straw by way of burning has been posing a threat to the environment. There is a general agreement that the Minimum Support Price Programme for paddy and wheat, with assured market and assured price, has contributed significantly to predominance of rice-wheat system.

Table 2. Farmers' views on the issues concerning rice-wheat system in Punjab

S.No.	Statements	SD	D	N	A	SA	Mean score	Index
A.	The predominance of rice-wheat system can mainly be attributed to Minimum Support Price Programme	-	-	-	115 (95.8)	5 (94.2)	4.04	80.8
B.	The problem of declining water table can mainly be attributed to rice wheat rotation	-	-	-	71 (59.2)	49 (40.8)	4.41	88.2
C.	Balanced fertilization is a prerequisite to increase the productivity	-	-	1 (0.8)	117 (97.5)	2 (1.7)	4.01	80.2
D.	The probloem of declining productivity can be arrested by adopting suitable crop management practices	-	-	-	1-2 (85.0)	18 (15.0)	4.15	83.0
E.	Diversification is a good solution to rice wheat rotation	-	21 (17.5)	11 (9.2)	79 (65.8)	9 (7.5)	3.63	72.7
F.	The government should look for some alternative to disposal of paddy/wheat straw by way of burning	1 (0.8)	-	-	109 (90.8)	10 (8.3)	4.06	81.2
G.	Zero/conservation tillage increases the productivity level	-	1 (0.8)	51 (42.5)	62 (51.7)	6 (5.0)	3.61	72.2
H.	Influx of migrant labour in Punjab is the outcome of predominance of rice wheat rotation	-	6 (5.0)	2 (1.7)	11 (92.5)	1 (0.8)	3.89	77.8

Majority of the respondents (92.5%) agreed that the influx of migrant labour is the outcome of the predominance of rice-wheat rotation.

The need to diversify from the present rice-wheat system provoked mixed response from the respondents. The statement 'Diversification is a good solution to rice wheat rotation' attained the index value of 72.7. Nearly one tenth of the respondents were neutral towards it. To the statement regarding the productivity enhancing capability of zero tillage, 51.7 per cent respondents agreed, 5 per cent strongly agreed, 42.5 per cent respondents remained neutral and only one respondent disagreed.

Conventional and sustainable agricultural paradigm

The farmers' basic beliefs and values have been measured using the conventional and sustainable paradigms developed by Beus and Dunlap (1991). The survey included 14 statements to be measure beliefs and values within six major dimensions. The items listed as D, F, G, J and N represented conventional agricultural paradigm, while the items A, B, C, E, H, I, K, L and M represented sustainable agricultural paradigm. The detailed information pertaining to this aspect has been presented in Table 3. The statement 'in agriculture, the primary emphasis shouild be on speed, quantity and profit' attained the highest index value of 95.0, which indicated farmers' strong agreement towards the statement. More than half (58.3 %) of the respondents agreed and 41.6 per cent strongly agreed that agriculture is a business and it shoiuld be treated that way. The statement 'Sustainable Agriculture is not practical for a large number of farms' secured the index value of 57.8, which indicated farmers' disagreement towards the statement. As many as 61 per cent of the respondents were neutral to the statement 'There is no need for Integrated Pest Management'. Majority of the respondents (72.5%) disagreed that sustainable agriculture is a fad and it would pass.

Regarding the statements corresponding to sustainable agricultural paradigm, the respondents showed no consistent pattern. The index values varied from 62.0 to 90.5. The statement 'Farming is a way of life, as well as a business' attained the highest index value of 90.5 indicating farmers' agreement towards the statement. As high as 86 per cent of the respondents agreed and 14 per cent strongly agreed that the primary emphasis, in agriculture should be laid on conserving natural resources. The item. 'Farmers should have a responsibility for maintaining the environment' attained the mean score of 4.03, indicated farmer's agreement, in general, towards the statement. The table further revealed that 98.3 per cent of the respondents were concerned about the future generations and agreed to the statement that 'the interest of the future generations should not be lost sight of.' The statement 'Farmers should have a responsibility for maintaining the envionment' secured an index value of 80.5, which shows farmers' concern regarding the

Table 3. Farmers attitudes on conventional and sustainable agricultural paradigm

S.No.	Statements	SD	D	N	A	SA	Mean score	Index
A.	There is lot ot public support for sustainable agriculture	-	-	17 (14.2)	103 (85.8)	-	3.86	77.2
B.	There is lot of local support for the practice of reduced tillage	-	-	19 (15.8)	101 (84.2)	-	3.84	76.8
C.	In agriculture, primary emphasis should be placed on conserving natural rsources	-	-	-	103 (85.8)	17 (14.2)	4.14	82.8
D.	There is no need for Integrated Pest Management	5 (4.2)	41 (34.2)	73 (60.8)	1 (0.8)	-	2.58	51.7
E.	Integrated Pest Management increases returns	-	-	76 (63.3)	43 (35.8)	1 (0.8)	3.38	67.5
F.	Sustainable Agriculturee is not practical for a large number of farms	-	53 (44.2)	27 (22.5)	40 (33.3)	-	2.89	57.8
G.	Sustainable Agriculture is a fad and it will pass	-	87 (72.5)	30 (25.0)	3 (2.5)	-	2.30	46.0
H.	Agriculture is essential to rural communities	15 (12.5)	33 (27.5)	-	69 (57.5)	3 (2.5)	3.10	62.0
I.	The interest of the future generations shouild not be lost sight of	-	-	-	118 (98.3)	2 (1.7)	4.02	80.3
J.	In agriculture, the primary emphasis should not be on speed, quantity and profit	-	-	-	30 (25.0)	90 (75.0)	4.75	95.0
K.	Farming is a way of life, as well as a business	-	-	-	57 (47.5)	63 (52.5)	4.53	90.5
L.	Farmers shoiuld have a responsibility for maintaining the environment	-	-	-	117 (97.5)	3 (2.5)	4.03	80.5
M.	Future success of agriculture will depend on whether or not it is socially acceptable	-	1 (0.8)	34 (28.3)	85 (70.8)	-	3.70	74.0
N	*Agriculture is a business and it should be treated that way*	-	-	-	70 (58.3)	50 (41.7)	*4.42*	*88.3*

Italicized statement correspond to conventional agricultural paradigm, rest of the statements refer to sustainable agricultural paradigm

Index = (Mean Score/5)*100, where, 5 is the maximum attainable score for each statement

maintenance of environment. Most of the respondents agreed that there is a lot of local support for the practice of reduced tillage, whereas 15.8 per cent respondents remained neutral. Majority of the respondents showed their neutrality towards pest management issues. The mean index of the statements representing sustainable agricultural paradigm (76.8) has been found to be significantly higher ($p<0.05$) than that of the statements representing conventional paradigm (67.8).

CONCLUSIONS

It can be concluded that the farmers, mostly, are aware of the sustainability issues concerning the rice wheat system. There is no denial of the fact that sustainable agricultural paradigm score was significantly higher than that for conventional agricultural paradigm, but that does not, in any case, ensure that the sustainability issues can be resolved at the farmer level. It calls for extension efforts to well equip the farmers with the knowledge of sustainable crop management practices. Stringent research efforts, crafted to focus on finding feasible alternatives to rice wheat rotation regime, can go a long way in securing the long term sustainability goal.

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Hard Black Nut to Soft White Pop: Indigenous Technology of Mallah Community

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Abstract

Several case studies conducted in recent past have shown that indigenous knowledge system, when properly recorded and intelligently presented, can play an important role in establishing the dialogue between rural population, development workers and policy makers. In this back drop, the present investigation is an endeavour to study and document the indigenous skills possessed by the poor members of a particular fishing community from Bihar in harvesting the hard and black seeds of a highly potential aquatic cash crop, makhana (*Euryale ferox Salisb.*) from the pond bed under the water, and finally processing the same into its edible form- the soft-white-pop. The study also throws light on the intricacies and hardships involved in various operations.

A small segment of a traditional Mallah (fishing) community in Bihar is observed to be the possessors of skills in harvesting and processing of makhana, *Euryale ferox* Salisb. The members of this community also migrate to different other states of India like Tripura, Assam, West Bengal, Orissa for farming, harvesting and processing of makhana, which is an arduous task and involves some exemplary skills which are unique to this segment of population only. It is worthy to note that given a set of natural resources and constraints how a community involving male, female and children is responding to that situation and eking out a livelihood from managing these resources often in hostile environments. Therefore, an attempt has been made to record and document this traditional knowledge and skills of this specific category of indigenous people.

Makhana, *Euryale ferox* Salisb. is considered an aquatic cash crop in India. It is widely cultivated in several districts in North Bihar, where it is a main support for livelihood of poor people. Makhana cultivated water bodies are also integrated with fish culture, which is a common practice and a major source of income for a sizeable chunk of poor mass. Makhana is a perennial aquatic floating leaved herb, but is cultivated as a seasonal annual crop, which dies out after maturity of the fruits. The plant grows in fallow wetlands of standing shallow water of about 0.6-2.5 m depth and has rhizomatous stem. It was widely distributed in India, covering along range. Now its distributions is mostly confined in Bihar followed by West bengal, and Assam. It is found to have sparse vegetation in the states like Orissa, MP, Rajasthan, J&K, Tripura, Manipur, etc. It prefers tropical and sub-tropical climate as; temperature 20°C-35°C, humidity 50%-90%, rainfall 100 cm-250cm (Dutta, 1984). Makhana is traditionally eaten by the people of North India and is an important component of their daily meal. It is either eaten as raw pulp or blended with vegetables, dal (pulses), etc. The processed seed known as makhana pop is suitable for human consumption and is highly nutritious as compared to staple foods like rice, wheat and millets. The superior food quality of makhana is reflected in its high amino acid index (89%-93%) and arginine: lysine: proline ratio (4.74-7.6). Calorievalue (362 K. cal/100 gm) is also remarkable as compared to staple foods. These all have earned makhana a prominent place in Indian dietary chart. Not only that, along with some other aquaphytes it finds a place in the indigenous systems of medicines of India,

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Japan and China. It has powerful medicinal properties against a number of human ailments involving respiratory, circulatory, digestive, excretory and reproductive systems (Jha *et al.*, 1991). Essentially, regular consumption of makhana tones up all the vital organs of the human body. Quite obviously, poped makhana is sold at a price as high as Rs. 150-250 kg in the retail market, and holds enough potential for export in the International market.

Makhana harvest, however, is a very arduous task and requires skilled labours. It involves sweeping of pond bottom to pool up the scattered seeds by diving in the water holding the breath, sometimes even for a long time. the entire plant, except the root, is covered withspines, which make it difficult for a person to enter into a makhana pond without an injury. Like harvesting of seeds from the pond bottom the entire process of post harvest processing is equally cumbersome and highly skill oriented. This involves a series of operatons to be performed not only timely but also efficiently. Particularly frying of dried makhana seeds involves extreme drudgery, as it requires the womenfolk sit as the fire for a long time and continuously tolerate the excessive heat emanating from the oven. Despite all the hardships the members of the fishing community have been involved in cultivation, harvest and processing of makhana with infinite passion and tolerance. Realizing the food, nutritional, medicinal and economic values of makhana on one hand, and the unique indigenous skills of the traditional people in performing difficult tasks like harvesting and processsing on the other, the authors were tempted to study and document the age-old skills demonstrated with utmost care and perfection by this particular fishermen community. This study is an endeavour for documentation of the indigenous skill as performed traditionally by the fisher community. It throws ligh on the intricacies and hardship involved in operation, and point to the interventions required to: alleviate drudgery, refine and build upon technology, establish socioeconomic equity and bring about overall improvement of poor fishers.

METHODOLOGY

A case study approach involving methods of observation, interview as well as individual and group discussion was adopted for this study carried out in the fish farm of Central Institute of Freshwater Aquaculture (CIFA), Bhubaneswar, Orissa during July-December 2006. The interview and discussion in this study were mainly open ended by nature. Due to proximity of location, it was convenient for the authors to make several visits to the makhana pond, have close observation of all the opertions as they were being performed, and intract with the fishermen community engged in harvesting and processing of makhana. The fishermen community in this study comprises members of the traditional 'Mallah' (fisher) caste from Darbhanga, who migrated to CIFA, Bhubaneswar and took lease of its about 5 hectare swamp, which is also a natural ground of Makhana vegetation. The authors experienced and got themselves acquainted with their unique performance of harvesting makhana seeds from the pond bed and processing them to edible/ marketable product. The present study thus is an account of this unique skill possessed by this specific fisher community in harvesting and processing of an endangered but extremely useful aquatic crop. Facts have also been gathered from various published sources for going deep in to the study, preparation of the report and drawing recommendation.

RESULTS AND DISCUSSION

Harvesting and processing of makhana involves several operations, which are unique in their nature. The members of fishing community are performing these traditionally. In this study, harvesting involves collection of scattered seeds from the pond bottom and their thorough cleaning with pond water. The processing operations start once the cleaned seeds are brought to their hut. Processing involves operations like drying, grading, heating, roasting, packing and storage. These all are delineated below.

Technique of makhana harvest

Each fruit of makhana contains about 25-35 numbers of seeds, which are like hard coated black nut. When the fruit bursts, the seeds get scattered at the bottom of the pond during August-September. Techniques of harvesting makhana seeds involves collection of the raw seeds from the pond bed and their repeated cleaning in the pond, which renders them suitable for processing.

Collection

The members of the fishing community were carying out harvesting of makhana from about 10 am to 3 pm. This is an age-old practice confined in this particular community only. Four to five men collect seeds at a time from the pond bottom. They fix a bamboo pole, locally known as 'Kaara' in one place and cover up to 2-3 m radius around it during collection. Holding their breath they together dive into water at the base of the bamboo pole and then diverge in different directions to the outward. Each of them drag seeds with the help of

their both palms and gather them to the base of the bamboo pole. One dip for one person lasts 40-80 seconds and varies from person to person. the whole procedure of seed collection surrounding one pole takes 1-1.5 hr and depends upon the amount of scattered seeds lying on the pond bed. Seeds gathered at the based of 'Kaara' are thoroughly thrashed by the feet to remove the papery membranous cover from the seeds. Seeds are then colected in an indigenously made cylindrical perforated bamboo basket, locally known as 'Auka', for washing and cleaning in the water before they are packed and carried to the shore for further cleaning. During this operation the adult members of the group often smoke bidi. The packet containing bidi and matchbox are kept in a small polythene bag tied at the top of the 'Kaara' to save them from water. Once the seeds from a particular area demarcated by 'Kaara' are swept and gathered, the group moves to other area. This way the entire water body is covered. If required the same area is swept two or three times depending upto the quantity of left over seeds after a particular sweep.

Cleaning

The day's collection comes to an end at about 3 pm. The seed brought ashore are taken in another indigenously devised crescent shaped perforated bamboo basket, locally known as 'Gaanja' which is then swung well and shaken repeatedly in the water until all the seeds get cleaned' this practice remove all the unnecessary waters and dirt adhered with seeds. The seeds are again poured into 'Auka', and this time it is rolled over the ground for mutual rubbing of the seed coats among themselves, which provides further cleanliness and smoothness. The thoroughly cleaned seeds are then packed into small polythene bags, each with a carrying capacity of about 20-30 kg, and carried to the makeshift hut for another intricate and arduosus task: processing and popping.

Technique of seed processing

Drying

The seeds brought to the hut after a thorough wash and cleaning at the pond embankment are left as such overnight. Next morning the female members spread them over a mat for drying under the bright sun of 2-3 hours, even for 7-8 hours in case of cloudy weather. They call the dry seed as 'nut', the nuts are then put for grading.

Grading

Grading of dried makhana seeds is done by use of different size sieves, locally known as 'Jhara', a rectangular thin iron plate of about 1.25 sq.ft, bounded by wooden frame of 2.5 inches height. These sieves are marked with number 1-10 according to their mesh size. Sieve no. 1 is having the biggest size mesh whereas the no- 10 has the smallest. Grading of seeds esures quality and facilitates uniform heating of each nut during roasting. The bigger nuts obtained through grading technique fetches a higher price than the smaller ones, if sold as a raw material. Seeds graded into different categories are then stroed separately for heating and roasting.

Heating

As soon as seeds get dry, they need to be heated for conditioning; otherwise they may deteriorate in quality and ultimately get spoiled. Heating is done in a round aluminium pot placed on an earthen oven locally known as 'Chullah'. The women prepare this by diging out of earth. Its periphery has three ridges made up of sticky consolidated mud, plastered with semisolid cow dung, which provides strength and stability for a long time. Heating is mostly done by the ladies. About 600 gm nuts, taken in a hot vessel on the oven, are heated for about 5 minutes and stirred continuously with the help of a stirring device, knwon as 'Larna', which comprises about 20 bamboo or iron sticks, each 1.5 ft. long. A 'Larna' has a convenient wooden handle at its base. The time of heat treatment of nuts is very important, and women have learned to do this job very efficiently through experences.

Storage and tempering

After heating, nuts are preserved in acontainer make up of bamboo splits or reeds, one kid of long grass; it is plastered with semisolid cow dung. The upper portion of the container is shielded with coarse cloth so as the maintain ambient moisture and temperature inside. duration of tempering varies from 50-70 hours. Tempering of nuts facilitates the loosening of kernels from the hard seed coat and helps in equal distribution of moisture within the nut.

Roasting, popping and grading

Once heated and tempered, the nuts are to be heated second time after 50-70 hours to obtain ready-to-eat white makhana pops. Roasting and popping are the most important but laborious and painstaking operations. Popping is the process of creating superheated vapour within the conditioned nut by heating the contained moisture and suddenly relesasing the pressure to cause a volume expansion of the kernel (Jha and Prasad 2003). About 200-250 gm nuts are spread in a single layer in a

cast iron pan on a hot oven and roasted for 2-3 minutes, when a crackling sound is heard. This sourd is perceived to be the indication of optimum roasting of nuts. The lady engaged in roasting now scoops out 6-12 fried nuts from the pan with a wooden spoon, called 'Sipi', and hands over the same, which are in a very hot condition, to be left palm of the other lady sitting just beside her. In no time, she transfers them on a wooden base, known as 'Pata'/ 'Aphara', and thrashed them immediately with a wooden hammer called 'Pata'/'Aphara', resulting into breaking of hard shells and popping out of white kernl in expanded form. Size of popped makhana is about 3 times more than that of the nut. They call entire process as 'Bhaja'.

Polishing, rubbing and storage

After roasting, the residues of black seed coat and the red pericarp are found to remain attached with the popped makhana. To remove this dirt and enhance its quality, the popped makhana are polished by rubbing action among them in a basket made of bamboo splits. This operation adds more whiteness and lustre to the makhana, besides removing unwanted substances. Polishing of makhana is done immediately after popping otherwise it may absorb moisture and render polishing difficult. Clean and polished makhana is graded into 2-3 grades depending upon the size, shape and quality. The light, large, swollen and spotless white makhana, locally known as 'rasgulla', fetches the maximum price. The other grade, 'samundha', is also swollen but it may have a few reddish and black spots on it. The third grade, 'thurri', may be half popped, hard and reddish. The graded popped makhana is stored in plastic bags or small polythene packets. A standard plastic bag which may contain 100 kg of wheat can accommodate 10 kg of popped makhana. Being highly voluminous and lightweight makhana requires large spcae for storage.

Marketing

Despite several nutritional and health benefits of makhana, the members of the fishing community were finding it quite difficult to sell their produce in Orrisa market. The reason could be that people here are not aware about various benefits and uses of makhana. Although the retail price of makhana pop in Bhubaneswar main market is about Rs. 170/kg and the farmers were ready to sell makhana @Rs. 1000/kg, but the local traders were not even ready to buy from them because of its very less demand among the customers here. A small amount was sold by the fisher children by vending in CIFA colony and near by areas @ Rs. 100-120/kg. The rest of the produce, after exploring the marketing possibility, was transported by train to Andhra Pradesh markets for bulk disposal.

Gender involvement and drudgery

Harvest and processing both are considered arduous and difficult tasks. The authors monitored each and every step performed by the fishers during harvest and processing. Members were also taken to a discussion and interviewed to know about the degree of hardship and drudgery involved in various activities. Accoding to them roasting of makhana seeds was the most difficult and painful task. This was followed by collection of the seed from the pond bottom and heating and tempering. Other operations like cleaning, transportation, drying, cleaning, rubbing and storage were perceived to be less difficult. In the present study it was observed that roasting and preheating were done by the female members only, whereas seed collection was done exclusively by men. Seed collection under pond water and subsequent operation on pond embankment involve lot of risks like physical injury to eyes and fisher's body, snake and insect bites, pathogenic infections, skin diseases, irritation, gulping of unclean pond water, etc. Going by the time devoted to each activity, it was estimated that maximum time was consumed by the seed collection activity followed by roasting and pre-heating. It was also seen that roasting and preheating together accounted for over 50% of the total time. This indicates that womenfolk are not only performing the hazardous task but also doing them for a long duration. Members of a wide range of age group from aged to children are involved in different activities, and works are performed by either male or female or together, but there is no hard and fast rule for gender specific work except the seed collection from the pond sediment, which is exclusively done by men.

Interventions needed

In view of large scale drudgery and hardship involved in harvesting and processing, the following measures could be thought of which will make these operations fast, safe and easy for the fisher folk:

i) A diving suit attached with oxygen mask and glass wear may specially be designed to cary out all the difficult operations under-water visibility and also protect fisher's body from injury, irritation, insect bite and pathogenic infection.

ii) Development of machines which can harvest, sieve, clean, dry, grade and process the makhana seeds may be considered as a priority.

Makhana is a crop which has immense food, nutritional, medicinal and economic values, but yet to receive the due importance and attention. Without losing time any more we must initiate concerted efforts for its promotion, utilization and wise exploitation in all possible ways. A few points as given under are just some pointers.

i) The World Health Organisation estimates that 80% of world population depends on traditional medicines for primary health care. Possibility of applying advanced tools of biotechnbology/nenotechnology may be explored for isolation of medically active ingredients available in makhana , which may help to prepare the commercial drugs.

ii) The fisher folk should be empowered by imparting them training on methods of preparation of various processed, value added and ready-to-eat products from popped makhana. this will solve the problems in marketing on one hand and create wider acceptability of the product among the people on the other.

iii) It is time that we use a variety of media, both modern and traditional, to make wide publicity about the benefits and various used of makhana in our daily life, which will not only help this crop secure an appropriate place but also contribute to achieving an economically sound society free from hunger and disease.

CONCLUSION

Till today cultivation of makhana in India is confined in a few pocket only. Reports regarding cultivation of makhana in Orissa are completely lacking. Hence this paper seems to be the first authentic document in this regard so far cultivation of makhana in Orissa state is concerned. Like many places in India, in Orissa state also there are extensive wetland area, where apares vegetations of makhana are found growing wildly. Those areas, however, can offer a great potential for its cultivation on a large scale, leading further to its exploitation for food and medicine. Wherever possible makhana should be integrated with fish farming for quality products, better income and employment opportunities (Thakur and Radheyshyam, 1996.) A concerted effort with scientific interventions needs to be launched to educate people about the strategic integration and health benefits of both makhana and fish, with a comprehensive package for technological, economic and scial empowerment of the farming community. Besides, mechanization of harvesting and processing methods may be of immense help in reducing the drudgery of fisher community.

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Factors of Technology Gap in Sustainable Cultivation Practices (SCP) among Sugarcane Growers

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ABSTRACT

The research study was conducted in Belgaum and Bagalkot District of Karnataka during 2005-2006, with the sample size of 180 respondents. The expost facto research design was used for the study. It was observed that majority of the respondents (62.77%) belonged to medium technological gap fallowed by high technological gap category (28.88%). Education, risk orientation, management orientation, achievement motivation of the respondents had negative and significant relationship with their technological gap of sustainable cultivation practices at 1 per cent level of probability. Similarly, attitude towards sustainable cultivation practices, extension contact of the respondents had negative and significant relationship with the technological gap of sugarcane sustainable cultivation practices at 5 per cent level of probability. Multiple regression analysis indicated that, all the selected seventeen independent variables put together could explained 42.61 per cent (R^2=0.4261) variation in technological gap in adoption of sustainable cultivation practices in sugarcane. Development of technological gap index by determination of weightage and importance for different sustainable cultivation practices in sugarcane.

Sugarcane is one of the important commercial crops in the tropics and sub-tropics and serves as the main source of sugar in world. Globally, it is cultivated over an area of 19.37 million ha, with an annual production of 1252.91 million tonnes and productivity of 64.69 tonnes per ha. India is one of the leading countries in sugarcane cultivation with an area of 4.41 million ha and annual production of 265 million tonnes and average recovery of 10.30 per cent (Anonymous, 2002). In India, area under sugarcane during 2000-01 was 4.32 million ha as against 4.41 million ha in 2003-04 with slightly higher average productivity than world average (66.92 t/ha) and good recovery of period. Indian sugar industry, second largest after the textiles industry, has been playing a vital role in the socio-economic transformation of the country. About 50 million sugarcane farmers and their dependants have been involved in sugarcane cultivation. There is an urgent need to develop techniques, which are sustainable from environmental, production and socio-economic points of view. With this background, the present study was undertaken to analyse factors in relation to technology gap of sustainable cultivation practices among sugarcane growers.

METHODOLOGY

The present study was conducted in the year 2005-06 in Belgaum and Bagalkot districts of Karnataka. The districts were purposively selected as Belgaum and Bagalkot districts stands first and second in sugarcane area in Karnataka. The *ex-post facto* research design was used for the study. Two taluks having maximum area under sugarcane were selected from each districts. The selected taluks were Athani and Chikodi from Belgaum district. Similarly, Mudhol and Jamakhandi from Bagalkot district. Three villages from each taluk were selected randomly for the investigation, fifteen respondents from each village were selected thus total sample size contributes 180 respondents. There were seventeen independent variables used to find out correlation with the knowledge level of sugarcane growers about selected SCP. The required data from the respondents were collected with help of pretested

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interview schedule. The extent of correlation & multiple regression between the independent variables was ascertained by using suitable statistical tool.

Development of technological gap index of sustainable cultivation practices in sugarcane

Technological gap has been operationalized as the gap between sustainable cultivation practices of sugarcane and their actual adoption by the growers. It is true that all the sustainable cultivation practices do not demand the equal competence and also contribute equally to the sustainable yield. Hence it was felt necessary to determine the relative importance of selected practices by assigning scores according to their importance. For this purpose a list of selected sustainable cultivation practices having much importance in determining the sustainable yield were framed by selecting the sustainable cultivation practices from the recommendation of scientists from University of Agricultural Sciences Dharwad on sugarcane crop in determining the technological gap in sugarcane crop. Broadly eight sustainable cultivation pratices were considered where in the experts working in the different areas of this crop in University of Agricultural Sciences, which consist of extension and research staff were asked to assign weightages to each of them to totaling to 100 the total weightage keeping in view the relative importance of each practice in determining the yield levels. Thus, the proposed list was administered to 45 experts in sugarcane crop. After obtaining weightages pertaining to the selected sustainable cultivation practices the data were tabulated and mean weightages were calculated. The selected cultivation practices and the mean weightages are given below:

Mean weightages of Individual sustainable Cultivation practices as given by the experts

S. No.	Sustainable cultivation pratices	Mean Weightages (Average of 45 Experts)
1	Land preparation	04
2	Planting (setts)	12
3	Sugarcane based cropping system	05
4	Integrated Nutrient Management	22
5	Water Management	20
6	Integrated Pest Management	24
7	Ratoon Management	10
8	Maturity and harvesting	03

Further, in order to be more scientific in the calculation of total adoption score it was also felt essential to consider the partial adoption of the respondents. Based on the research findings available the experts were asked to subdivide and assign scrores depending on the percentage decrease in the yield due to partial adoption or non adoption of the individual sustainable cultivation practices (Bheemappa 2001).

RESULTS AND DISCUSSION

Technological gap of sugarcane growers in adoption of Sustainable Cultivation Practices of sugarcane

The analysis of results presented in Table 1 indicated that majority of the respondents (62.77%) belonged to medium technological gap followed by high technological gap category (28.89%). Whereas, only 8.33 per cent of respondents belonged to low technological gap category. Distribution of more respondents in medium technological gap might be due to lack of knowledge about sustainable cultivation practices. No standardized package of practices developed either by Agricultural Universities/ ICAR /ARS institutions resulting in less dissemination of sustainable technology which inturn affected the adoption of these practices by the sugarcane growers. This brings to focus the need for strengthening the extension efforts by the concerned extension agency to increase the knowledge and increase adoption of sustainable cultivation practices.

The findings of the study were in agreement with the results obtained by Kalaniya *et al.* (1998), Patil (1990b), who also highlighted the occurrence of medium technological gap by the large majority of paddy and cotton growers.

Table 1: Distribution of sugarcane growers according to their overall technological gap of sustainable cultivation practices in sugarcane

(N=180)

Sl. No.	Technological gap category	Sugarcane growers	
		Frequency	Per cent
1.	Low (below mean– SD) (<10.54)	15	8.33
2.	Medium (mean ± SD) (10.54 – 20.10)	113	62.78
3.	High (above mean +SD) (>20.10)	52	28.89
	Mean (X)	15.32	
	SD (σ)	4.78	

Correlation of coefficients of independent variables of sugarcane growers with their technological gap of sustainable sugarcane cultivation practices.

It is apparent from the Table 2 that education, risk orientation, management orientation, achievement motivation of the respondents had negative and significant relationship with their technological gap of sustainable cultivation practices at one per cent level of probability. Similarly, Attitude towards SCP, extension contact of the respondents had negative and significant relationship with the technological gap of sugarcane sustainable cultivation practices at 5 per cent level of probability. This implied that above variables played a important role in reducing technological gap in adoption of SCP in sugarcane. The findings are in line with the results obtained by Bheemappa (2001).

It implied that, high education status of the farmers wants to take risks in farming, favourable orientation towards systematic management and achieve higher levels satisfaction and look for delayed satisfaction. The prevelance of higher achievement motivation would demand the individual to work consistently towards reaching the destination and tried to exceed others and this ended up lesser technological gap.

The findings of the study highlighted (Table 3) that all the selected independent variables put together could explain 42.61 per cent (R^2 = 0.4261) variation of technological gap in adoption of sustainable cultivation

Table 2: Correlation coefficients of independent variables of sugarcane growers with their technological gap of sustainable sugarcane cultivation practices

(N=180)

Sl. No.	Independent variables	Correlation coeffcients (r) with knowledge level of sustainable cultivation practices
1.	Age	0.009 NS
2.	Education	-0.280**
3.	Land holding	0.013 NS
4.	Farming experience	0.090 NS
5.	Risk orientation	-0.272**
6.	Scientific orientation	-0.029 NS
7.	Attitude towards sustainable cultivation practices	-0.247*
8.	Management orientation	-0.304**
9.	Achievement motivation	-0.276**
10.	Innovative proneness	-0.2150
11.	Deferred gratification	0.018 NS
12.	Extension contact	-0.209*
13.	Organizational participation	0.090 NS
14.	Mass media participation	-0.045 NS
15.	Cropping intensity	0.099 NS
16.	Annual income	0.015 NS
17.	Land productivity	0.006 NS

* - Significance at 5% level of probability
** - Significance at 1% level of probability
NS – Non-significant

Table 3: Multiple regression of technological gap of sustainable sugarcane cultivation practices with their independent variables of sugarcane growers

(N=180)

	Independent variables	Regression coefficient	Standard error	't' value
X_1	Age	-0.2108	0.0631	0.3980 NS
X_2	Education	0.2107	0.1134	- 0.265*
X_3	Land holding	0.1016	0.0866	-0.2940 NS
X_4	Farming experience	0.2064	0.5192	-1.0631 NS
X_5	Risk orientation	0.3394	0.0991	-1.3300*
X_6	Scientific orientation	0.1245	0.0760	-0.2410 NS
X_7	Attitude towards sustainable cultivation practices	0.3694	0.1398	-1.6180*
X_8	Management orientation	0.0291	0.2248	-1.3420 NS
X_9	Achievement motivation	0.0502	0.1317	-1.0080 NS
X_{10}	Innovative proneness	0.1002	0.4039	-1.0100 NS
X_{11}	Deferred gratification	0.0356	0.0994	0.0350 NS
X_{12}	Extension contact	0.2383	0.1302	-1.0070 NS
X_{13}	Organizational participation	0.1137	0.1741	0.0090 NS
X_{15}	Mass media participation	0.0689	0.0342	0.2400 NS
X_{16}	Cropping intensity	0.0217	0.0241	0.0040 NS
X_{17}	Annual income	0.0398	0.0824	0.1180 NS
X_{18}	Land productivity	0.0724	0.1806	0.2060 NS

R_2 - 0.4261; F – 3.1205
* - Significance at 5% level of probability
** - Significance at 1% level of probability
NS – Non-significant

practices in sugarcane. These results led to the conclusion that, all the 17 variables of the respondents together play a role in reducing technological gap in adoption of sugarcane sustainable cultivation practices.

The findings are in agreement with results obtained by Laxminarayan (1997), Kalasariya *et al.* (1998) and Bheemappa (2001).

CONCLUSION

It is concluded that, majority of the respondents belonged to medium technology gap category. Education, risk orientation, management orientation and achievement motivation of the respondents had negative and significant relationship with technological gap of sustainable cultivation practices at 1 per cent level of probability. Selected seventeen independent variables put together could explain 42.61 per cent (R2 = 0.4261) variation of technological gap in adoption of SCP in sugarcane. Majority of the respondents were addicted with application of non-sustainable cultivation practices in the study area particularly in nutrition, pest and irrigation management, which necessitates the need for strengthening extension efforts by the concerned extension agency to increase the adoption of SCP and automatically reduces the technological gap. There is an urgent need to develop technologies and standard package of practices for SCP, which deals technologies are sustainable from environmental, production and Socio-Economic point of view.

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IPM Practices in Tomato: Participatory Analysis of Impact

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ABSTRACT

Tomato is an important winter season vegetable crop in Orissa which is severely affected by biotic stresses like fruit borer, leaf miner, cutworm, wilt and damping off. Farmers use mainly pesticides to manage these pests and diseases. Farmers' participatory trials were conducted for two years in four villages of two districts to identify the constraints in tomato cultivation and to introduce IPM technologies and evaluate their effectiveness through demonstration. Farmers identified nine constraints of which, increased severity of pests like fruit borer, leaf miner, cut worm and diseases like damping off, leaf curl and blight were important. Performance of eleven tomato varieties from various sources evaluated by farmers at their own field revealed that variety "Best of All" was best in preference, followed by "F1 Hybrid-7610". Implementation of IPM package involving *Trichoderma* NPV, trap crop marigold, imidachloprid, crop staking and poison bait led to nearly 50 per cent reduction in the usage of pesticides. Out of various IPM practices, four important component viz. *Trichoderma* application in nursery and main field, imidachloprid (in nursery-root dip treatment and in main field), application of NPV and use of marigold as trap crop, staking of plants and use of poison bait were of significant importance since their impact was perceived to be maximum by farmers.

It is estimated that vegetables are grown on less than three per cent of the total cropped area but receive approximately 17.16 per cent of total insecticide used in the country (Singh and Kalloo, 1999). Pesticide use by most of the farmers has created many unwanted ill effects in the Agro-ecosystem. This warrants a need to bring in more protection technologies that are relevant, sustainable, eco-friendly and with in the reach of farmers. IPM is such one of the strategies that addresses pesticide related problems and therefore it need to be introduced, demonstrated and evaluated for popularization. Most of the technologies to be implemented at farm level need to be location specific and users friendly. Mahapatra (1992) states that only 0.5 to 1 per cent of the available technology in the horticultural sector have reached the farming community in coastal area in Orissa. Tomato is grown in large scale throughout Orissa wherein fruit borer, leaf miner, cutworm, wilt and damping-off have been reported to be the key biotic stresses. Biotic constraints can be overcome by introduction and evaluation of IPM technologies with farmers participation and as such, the production and productivity of crops can be enhanced (Ooi, 1998). Indonesian model of IPM training and demonstration has shown that farmers can design and conduct experiments at their own fields to evolve management techniques for minimizing the damage by pests. The present work was initiated with a view to assess the constraints in tomato cultivation and to introduce, demonstrate and evaluate the efficacy of IPM technologies with farmers' participation in Coastal Orissa.

METHODOLOGY

Four villages from two Coastal districts of Orissa namely Puri and Cuttack, were selected for the study. On the basis of their willingness, ten farmers from each village were selected for participation in programmes at the onset of the study. A list of constraints faced by tomato growers was prepared during village meetings and on the basis of group consensus data, 10 constraints were

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short-listed and ranked using Rank Based Quotient (RBQ) as given in the following formula (Sabarathnam, 1998):

$$R.B.Q. = [\sum_{i=1}^{n} fi\ (n+1-I) / Nn)] * 100$$

where fi is the frequency of respondents for the i^{th} rank of a constraint; N and n denote the number of respondents and number of constraints, respectively. 'I' denotes the rank of the constraint.

While selecting a suitable variety out of many varieties of tomato available with the shopkeepers, farmers' choice depends mainly on shopkeepers' advice or sometimes fellow farmers' suggestions. The target area is prone to bacterial wilt and no effective tool is available for the management of wilt except resistant varieties. Therefore, to identify a suitable variety for the region, a farmer's participatory varietal evaluation trial was conducted including the varieties popular among farmers. All varieties (Table 2) were grown following uniform agronomic and cultural practices. The varietal selection parameters were identified in consultation with the growers. All 40 growers ranked the tomato varieties on 5 parameters i.e. resistance to bacterial wilt, fruit shape, fruit size, firmness and yield on a three point weighted scale i.e. Most preferred (3), Preferred (2) and Not preferred (1). The selected best variety was cultivated with an IPM package next year in two villages.

IPM trial was conducted with Utkal Kumari (Bt-10), a bacterial wilt resistant variety in first year and "Best of All" (found best in trial) in second year. African marigold nursery was raised 20 days before tomato nursery. Tomato nursery area was solarized using black polythene mulch, raised and added with *Trichoderma* enriched FYM, one week before sowing. Nursery was sprayed with imidacloprid (0.3 ml/l) at 15 days after sowing (DAS) and again treated by root dipping for 5 minutes before planting. Fields were prepared using standard Agronomic practices. One tone of FYM, contributed by participants, was enriched with *Trichoderma*, 15 days prior to field application as per standard methodology (Krishna Moorthy *et al.*, 2003). At the time of last ploughing this enriched FYM was shared by farmers and mixed with the rest quantity of FYM and applied in the field. Twenty five days old tomato and 50 days old marigold seedlings were transplanted simultaneously in a pattern of one row of marigold after every 16 rows of tomato. At 15 DAP, imidachloprid (0.3 ml/L) was sprayed and leaf curl and other virus affected plants were destroyed with the appearance of the symptoms. At 20 DAP, neem cake @ 250 kg/ha was applied in furrows. NPV (250 LE/ha) was sprayed at 28 DAP and thereafter repeated twice at one week interval. Endosulfan 2 ml/l was sprayed once in first year and twice in second year. In addition, fungicide was applied thrice in first year and twice in second year.

Tomato is normally cultivated without staking in the area. At fruiting stage the crop becomes heavy, clumsy and shady at ground level which provides ideal hiding place for cut worm (*Spodoptera*) and enables it to escape from the insecticide spray. Thus, even frequent spray becomes ineffective and damage by the cutworm goes very high. In order to overcome the problem, staking of tomato plants was done and poison bait applied. Poison bait was prepared by using jaggery, rice bran and monocrotophos as per methodology standardized at IIHR, Bangalore (Krishna Moorthy *et al.*, 2003). The bait prepared in the morning was sprinkled in tomato field uniformly in the evening. Simultaneously, non-IPM plots were maintained and all the plant protection practices adopted by farmers were recorded. Incidence of diseases, insect pests, number of sprays and yield were recorded in both the plots. During the study over two years period, a total of 19 training course and interactive demonstrations were organized for farmers to impart knowledge on identification of insect-pests, diseases and various IPM practices.

On the basis of group consensus weighted rank of various IPM practices was also calculated. At the end of the two IPM cropping season, a meeting was convened with all the tomato growers in the village. The probable impact and advantages of IPM in tomato were discussed. Growers were asked to note down all IPM practices and their impact as perceived by them (Table 4). On the basis of visible impact and perceived benefits, farmers ranked the IPM practices on a four point weighted rank.

On the basis of significance of impact, advantages and farmers' experience, critical IPM components were ranked (Table 5). Advantages of IPM as perceived by farmers were ranked using a three point scale of Most important (3), Important (2) and Not important (1). Finally the importance of advantage was worked out as given below:

$$\text{Mean score of each IPM practices} = [(\sum_{i=1}^{n} Si) / 3N]$$

Where S=score given by each farmer, N=total number of farmers and 3 is the maximum score for each advantage.

Partial budget analysis was also done to work out the economics of IPM of tomato compared to non-IPM of tomato on per hectare area basis.

RESULTS AND DISCUSSION

Constraints in tomato cultivation as perceived and prioritized by the farmers are presented in Table 1. Increased severity of pests with special reference to fruit borer, leaf miner and cut worm and, diseases like leaf curl and early and late blight was one of the most important problems that farmers were facing in the area. Poor knowledge of pest and disease, IPM practices and non-availability of pest and disease resistant varieties led to higher losses. Although bacterial wilt was a major problem but now with the availability of bacterial wilt resistant varieties, the problem is solved to a great extent. Cost of inputs such as labour, fertilizer, seed and pesticides is high and many times there becomes the shortage of fund but sources of finance are meager.

Table 1. Constraints in tomato cultivation as perceived by participants

S.No.	Factors	RBQ values	Rank
1.	Heavy loss due to pest and disease like leaf miner, fruit borer, leaf curl, blight etc.	93.1	I
2.	Poor knowledge of pests and diseass and IPM practices and non-availability of pest and disease resistant varieties	88.5	II
3.	High cost of labour, fertilizer, seed and pesticides	81.3	III
4.	Shortage of timed advisement in emergency	77.6	IV
5.	Shortage of fund and meager sources of finance	77.1	V
6.	Imbalance fertilizer dosage	73.1	VI
7.	Shortage of irrigation water and salty water	63.4	VII
8.	Wide fluctuation in price of the produce and too low price at the time of glut	51.2	VIII
9.	Natural calamities especially at the time of transplanting	19.3	IX
10.	Non-availability of organic and bio pesticides (soaps, neem, seed powder, Bt, NPV etc.) at the district level	11.1	X

Table 2. Performance of tomato varieties at farmers field as evaluated by farmers

S. No.	Variety	Bacterial wilt	Fruit shape	Fruit size*	Fruit Firmness	Marketable Yield (t/h)	Mean score	Rank
1.	Arka Saurabh	Susceptible	Round nipple tipped	Medium	High	**		Not ranked
2.	Arka Abha	Resistant	Round	Medium	Medium	27.00	0.89	9
3.	Arka Alok	Resistant	Round	Large	High	33.0	0.76	4
4.	Utkal Kumari (Bt-10)	Resistant	Round	Small	Good	27.50	0.69	8
5.	Hybrid-7610 (F_1)	Resistant	Round	Large	Good	35.00	0.85	2
6.	Jyoti	Partially	Round	Medium	Medium	31.00	0.64	5
7.	Best of All	Resistant	Round	Large	V. Good	36.00	0.98	1
8.	Swarna Naveen	Resistant	Oblong	Small	Good	29.50	0.61	7
9.	Swarna Lalima	Resistant	Round	Large	Good	30.00	0.55	6
10.	Swarna Samridhi	Resistant	Round	Medium	Good	34.50	0.53	3
11.	Swarna Vaibhav	Highly susceptible	-	-	-	**		Not ranked

*Small < 70 g, medium > 70 and < 100 g, Large < 100 g

** There was high mortality due to bacterial wilt; hence observation on yield was not recorded.

Eleven Varieties/Hybrids were evaluated for performance. Observations on Arka Saurabh and Swarana Vaibhav varieties were not recorded in the evaluation trial due to heavy mortality caused by bacterial wilt. Thus the performance of the only nine varieties was ranked based on the five parameters (Table 2). On the basis of performance with special reference to fruit shape, fruit size, fruit firmness, fruit yield and wilt resistance, the variety "Best of All" was found to be the best followed by "F_1 Hybrid 7610".

It is evident from the quantitative data on performance of IPM (Table 3) that there was considerable reduction in the usage of insecticides and fungicides in the IPM plots when compared with non-IPM plots. The frequency of pesticide application was reduced to two or three times from five or seven applications of insecticides and four applications of fungicides. The reduced need for pesticide application, in itself, was observed to be a good achievement as it may directly address the residue problem and enhance the activities of natural predators, making the IPM intervention more sustainable in the long run. There was reduction in the incidence of diseases like damping off (1.65%), bacterial wilt (3.23%) and blight (4.0%) in IPM plots when compared to non-IPM plots (12.38%, 6.46% and 7.79%, respectively). Seed as an input is very costly therefore, each seedling is costly. Mortality due to damping-off in nursery can severely affect their cost of production and reduce the acreage. President intervention reduced damping off from 12.38 to 1.65 per cent which enabled the farmers to sell the additional seedling for extra income. There was considerable decrease in the incidence of leaf miner (8.50%) and fruit borer (5.75%) in IPM plots when compared with non-IPM plots (21.61% and 12.88%, respectively).

Growing of marigold as a trap crop along with application of NPV (250 LE/ha) at 15 days interval in tomato fields has been recommended the control of Tomato fruit borer (Anon., 1999). Results revealed that staking and application of poison bait reduced cutworm damage 2.84 per cent in IPM plots when compared with Non-IPM plots (10.36%) which was also evident from the visual impact on dead larvae in the field after two to three days of bait application. As a result of all IPM intervention packages put together the estimated marketable fruit yield in IPM plots was increased over non-IPM plots by 4.45 t/ha (Table 3).

Table 3. Performance of IPM field as against Non-IPM

S.No.	Particulars	IPM		Average	Non IPM		Average
		2004	2005		2004	2005	
1.	Frequency of insecticides	2	3	2.50	7	5	6.00
2.	Frequency of fungicides	3	2	2.50	4	4	4.00
3.	Leaf miner in nursery (% leaf affected)	1.31	3.35	2.33	6.23	8.14	7.18
4.	Leaf miner in main field (% leaf affected)	9.50	7.50	8.50	25.00	18.25	21.61
5.	Fruit borer (% fruit damaged)	6.15	5.36	5.75	11.52	14.23	12.88
6.	Cutworm (% fruit damaged)	3.32	2.35	2.84	9.36	11.36	10.36
7.	Incidence of damping off in nursery (%)	1.5	1.8	1.65	11.42	13.34	12.38
8.	Wilt (% plant affected)	3.21	3.24	3.23	6.54	6.37	6.46
9.	*Alternaria* blight (% leaf affected)	4.34	3.67	4.00	8.26	7.32	7.79
10.	Marketable yield (t/ha)**	26.00	37.50	31.75	23.00	31.60	27.30

*Based on data from 15 plots, ** Marketable yield denotes fruits free from bore holes and dmage symptoms

Overall impact analysis revealed *Trichoderma* application in nursery and main field had impact on disease incidence and led to the saving on seed cost. Imidachloprid application in nursery, seedling root dip and main field had great impact on leaf miner. This led to the reduction in incidence of pest in nursery and negligible incidence of leaf miner in main field. Use of NPV and trap crop of marigold reduced the incidence of fruit borer in main field which is supposed to minimize health hazards due to reduction in frequency and quantity of insecticide sprays. Further, the cost of insecticides and

Table 4. Impact of IPM Practices as perceived by farmers

S.No.	Practices	Advantage from farmers point of view as per importance	Weighted Rank
1.	*Trichoderma* application	* Reduction in seedling mortality in nursery and low incidence of wilt in main field (1) * Saving in seed cost (2)	Very high (****)
2.	Imidachlorpid in nursery, main field and seedling root dip as prophylactic measure	* Less incidence of pest in nursery (1) * Very less incidence of leaf miner (2) * Preplanned spray, without waiting for the pests (3)	High (***)
3.	Use of NPV and marigold trap	* Low incidence of borer (1) * Saving in cost on insecticides (2) * Health hazard while spraying is reduced due to NPV(3)	Very high (****)
4.	Stacking and poison bait	* Larvae were exposed as they did not have place to hide (1) * Poison bait could kill even big size larvae (2)	Average (**)

Table 5. Ranking of advantages of IPM as perceived by farmers*

S. No.	Advantages	Score values (3)	(2)	(1)	Total score**	Mean score value	Rank
1.	Increased marketable yield	84 (28)	16 (8)	4 (4)	104	0.87	3
2.	Reduced incidence of insect-pests and diseases	96 (32)	10 (5)	3 (3)	109	0.91	1
3.	Less seedling mortality in nursery and optimum plant stand in field	87 (29)	16 (8)	3 (3)	106	0.88	2
4.	Pre-planned schedule reduces the dependence on outside agencis for information	72 (24)	16 (8)	9 (9)	97	0.81	5
5.	Low expenditure on pesticides	78 (26)	14 (7)	7 (7)	99	0.83	4
6.	Saving of labour and minimized health hazard	66 (22)	14 (7)	9 (9)	89	0.74	7
7.	Getting premium price for IPM produce in future	60 (20)	16 (8)	12 (12)	88	0.73	8
8.	Increased knowledge and self confidence	66 (22)	16 (8)	10 (10)	92	0.77	6

*Based on the responseof 40 farmers (3-Most important, 2-important, 1-not much important)
Figures in parentheses indicates the frequencyof farmers
** Maximum possible score for each factor = 120

Table 6. Partial budget analysis (for IPM in tomato per ha)

Debit (Rs/ha) Increase in costs		Credit (Rs/ha) Decrease in cost	
Trichoderma	255.00	Saving in cost	
Neem Cake	1735.00	Insecticides	3500.00
NPV	1788.00	Fungicides	1400.00
Imidachloprid	523.00		
Staking cost per season**	4226.00		
Marigold	500.00		
Poison bait	1500.00	Total decrease in cost	4900.00
Total increase in cost	10,527.00	**Increase in returns**	
Decrease returns	-	Increase in yield (4450 kg)*	11125.00
A. Total increrease cost and reduced return	10,527.00	B. Total reduced cost and increased returns	16025.00
Net change in income/loss	(B-A) = 5498/-		

* Average sale rate of tomato @ Rs. 2.5/kg during rabi season
** Total cost of staking for 3 years was Rs. 12,678

its spraying was saved. Staking was very effective in managing the cut worms as it created open space and larvae was exposed to poison bait due to non-availability of hiding place. Due to availability of limited space for hiding, cut worm larvae were congregated within a limited area near by root zone of tomato plans. Application of poison bait within a limited space near root zine in a concentrated manner was effective in killing maximum larvae. There were nine advantages of implementation of IPM as perceived by farmers (Table 4). Reduced incidence of insect pests and diseases was the most visible advantage followed by less plant mortality and optimum plant stand in field (Table 5). Evidently, farmers were more concerned about pest problem and rated it as the first advantage and increased yield as third advantage. Obviously, farmers' participation in the programme led to better understanding of IPM tools, impact and advantages of IPM program. Net income of farmers increases in Participatory Pest Management intervention programme (Tirkey *et al.*, 1999). Participatory IPM programmes have been reported to be implemented successfully in many countries like China (Wage, 1998); sub-Saharan Africa (Huis-A-Van *et al.*, 1997) and Philippines (Stock, 1996).

The economic analysis for cost and monetary return of IPM over non IPM indicated that IPM components like *Trichoderma*, neem cake, NPV, imidachloprid, staking, marigold and poison bait led to the increase in the production cost to the tune of Rs. 10,527/ha (Table 6). Monetary benefits due to saving on pesticide and additional yield in IPM plot was Rs. 4900 and Rs. 11125, respectively. Thus, there was direct benefit of Rs. 5498 due to adoption of IPM in addition to indirect benefits due to non application of pesticides.

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Entrepreneurial Behaviour of Vanilla Growers of Tamil Nadu and Kerala

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ABSTRACT

The present study was conducted to measure the entrepreneurial behaviour of vanilla growers of Kerala and Tamil Nadu. The sample comprised of 160 farmers. Majority of the farmers belonged to middle age and had higher secondary shool education, medium family status, medium social participation and middle socio-economic status. Majority of the farmers had medium level in all the entrepreneurial behaviour dimensions. All the entrepreneurial dimensions correlated with factors such as education, family status, farm status and social participation status. Risk taking, hope of success, persuability, manageability, self confidence and achievement motivation negatively correlated with age..

Vanilla cultivation is a labour intensive enterprise and has the potential for generating higher income, opportunity for value addition and huge market. It is emerging as a potential area for agricultural entrepreneurs. Vanilla, "the Prince of Spice" is obtained primarily from the fully grown but un-ripe fruits or beans of climbing orchid *Vanilla planiofolia* Andrews that has been subjected to fermentation curing process to produce the characteristic aroma. Vanilla essence is largely used in the preparation of ice creams, chocolates, bakery products, pudding, pharmaceuticals, liquors and perfumes. Vanilla is the second most expensive spice traded in the world market.

Though vanilla cultivation requires higher capital investment, monetary output is uncertain due to highly fluctuating international prices. It is also a high risk crop considering natural hazards. All these aspects points out that the vanilla growers are the real agripreneurs in comparison to other entrepreneurs and farmers. However, very few researches have been conducted in the past on their entrepreneurial behavioiur. Keeping this view the present study was conducted to measure the entrepreneurial behaviour of vanilla growers in Kerala and Tamil Nadu with following specific objectives:

i. To study the socio economic status and entrepreneurial characteristics of vanilla growers
ii. To study the relationship between the profile characteristics and entrepreneurial behaviour.

METHODOLOGY

The study was carried out in Kerala and Tamil Nadu states of India. Among these two states, Kottayam and Ernakulam districts of Kerala and Coimbatore district of Tamil Nadu were purposively selected as they have maximum area under cultivation. From these districts twenty villages were randomly selected for the study. The sample of respondents comprised 70 vanilla farmers from Tamil Nadu and 90 vanilla farmers from Kerala making the total of 160. The required data were collected with well structured and pre-tested interview schedule. The entrepreneurial behaviour of vanilla farmers was studied with respect to eleven behavioural dimensions, which were measured by using an entrepreneurial self-assessment scale developed by Techonet Asia (1981) and Udaipareek (1992).

RESULTS AND DISCUSSION

The socio-economic characteristics of vanilla growers presented in Table 1 revealed that majority of

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the farmers from both Tamil Nadu and Kerala (58.57% and 62%) belonged to middle age category, followed by old (24.29% and 31.11%) and young (17% and 6.7%) age categories. The educational level of vanilla growers indicated that 44.3 per cent of vanilla farmers of Tamil Nadu belonged to the category of high and higher secondary educational level followed by collegiate (27.1%), middle school (24.3%) and primary school (4.3%) levels.

In Kerala, about 66.7 per cent of vanilla farmers were in the category of high and higher secondary school level of education followed by collegiate level (26.6%) and middle school (6.7%) level. It is gathered from the data that most of the vanilla farmers had high educational status, which motivated them to adopt highly risky enterprises like vanilla cultivation. However, it would be important to conclude that formal schooling was essential for promotion of vanilla. More than 90 per cent of the vanilla farmers of both the states belonged to medium to high-level family status. Less than 8 per cent of vanilla farmers belonged to low-level family status. Double the percentage of vanilla farmers of Kerala belonged to high status (17.78) as compared to Tamil Nadu (8.57). It could be concluded from the study that when compared to Tamil Nadu most of the Kerala vanilla farmers dwelt in well-constructed mosaic floored and electrified houses. This was because of the foreign income earned and sent by their sons and daughters working in foreign countries. It was observed that in both the states vanilla farmers owned

Table 1. Socio-economic characteristics of vanilla growers

Category	Tamil Nadu respondents (n=70)		Kerala respondents (n=90)		Total (n=160)		Z value
	f	%	f	%	f	%	
Age							
Young (35 & below)	12.00	17.14	6.00	6.67	18.00	11.90	1.803^{NS}
Middle (36-59)	41.00	58.57	56.00	62.22	97.00	60.40	
Old (59 and above)	7.00	24.29	28.00	31.11	45.00	27.70	
Mean	45.6						
Educational status							
Illiterate	0	0	0	0	0	0	
Functional literate	0	0	0	0	0	0	
Primary school	3	4.3	0	0	3	1.87	
Middle school	17	24.3	6	6.7	23	14.43	
High and higher secondary school	31	44.3	60	66.7	91	56.84	
Collegiate education	19	27.1	24	26.6	43	26.86	4.79**
Family status							
Low	4.00	5.71	6.00	6.67	10.00	6.19	6.824**
Medium	60.00	85.71	68.00	75.56	128.00	80.63	
High	6.00	8.57	16.00	17.78	22.00	13.17	
Mean	10.14		11.37				
Social Participation							
Low	20.00	28.57	34.00	37.78	54.00	33.17	2.089*
Medium	36.00	51.43	52.00	57.78	88.00	54.60	
High	14.00	20.00	4.00	4.44	18.00	12.22	
Mean	2.27		1.19				
Socio-Economic status							
Lower	0.00	0.00	0.00	0.00	0.00	0	0.535^{NS}
Lower middle	5.00	7.14	16.00	5.56	21.00	13.13	
Middle	55.00	78.57	60.00	61.11	115.00	71.87	
Upper middle	4.00	5.71	12.00	4.44	16.00	10.00	
High	6.00	8.57	2.00	6.67	8.00	5.00	
Mean	24		27.2				

medium to high size land holding with bore well irrigation and employed substantial amount of labour force for the cultivation of labour intensive vanilla crop.

Medium level of social participation was found with about 51 per cent of the respondents of Tamil Nadu followed by low (20%) and high (14%) level of social participation status. Among the vanilla farmers of Kerala, 52 per cent had medium level of social participation, 37.78 per cent had low and 4.44 per cent had high level of social participation status.

The socio-economic status of the vanilla farmers was computed by considering the educational status, occupational status, family status, farm status, farm power and equipment status, material possession status and social participation status. More than three fourth (78.57%) of Tamil Nadu vanilla farmers and more than half (60%) of Kerala vanilla farmers had medium level of socio-economic status. About 9 per cent of both Tamil Nadu and Kerala farmers had high-level socio-economic status. Nearly equal percentage of farmers (5%) had upper middle and lower middle socio economic status in Tamil Nadu. In both the states, none of the farmers belonged to the low level of socio-economic status. Since the study was conducted in agriculturally progressive area, majority of the vanilla farmers belonged to middle level socio-economic status. The tendency to earn more through diverse occupations also improved their socio-economic status. The Z statistic reported that there was no significant difference between Tamil Nadu and Kerala vanilla farmers in terms of their age and socio-economic status.

Entrepreneurial characteristics of vanilla growers

The distribution of vanilla farmers based on their entrepreneurial characteristics and the correlation between entrepreneurial characteristics and socio-economic characteristics of vanilla farmers are given in Table 2 and 3, respectively.

More than three forth (75%) of the vanilla farmers from both Tamil Nadu and Kerala were moderate risk takers. About 13 per cent of vanilla farmers of Tamil Nadu and 11 per cent of vanilla farmers of Kerala were high risk takers. In Tamil Nadu 11.40 per cent of respondents came under low risk taking category, while in Kerala 13.3 per cent of vanilla farmers came under low risk taking category. Past studies of McClelland (1961), Devi (1986) and Murali (1997) have clearly shown that entrepreneurs are calculative and moderate risk takers as against the myth that entrepreneurs are high risk takers. Risk taking was significantly and negatively correlated with age (r = -0.003) at 0.05 level of significance. This indicates that younger the individual more is his risk taking ability.

Majority of Tamil Nadu (74.30%) and Kerala vanilla farmers had medium level of hope of success. While 18.60 per cent of respondents from Tamil Nadu scored high level, 7.10 per cent of them had low level of hope of success. Among Kerala vanilla farmers, 20 per cent scored low on this dimension, while (11.10%) per cent scored high. Past studies have clearly indicated that entrepreneurs have medium to high hope of success than fear of failure. The correlational matrix revealed a positive contribution of education (r=0.319* at 0.01 level) in enhancing this dimension.

The overall analysis of data revealed that 71.25 per cent vanilla farmers scored medium, whereas high and low level of persuability were secured by 14.38 and 12.13 per cent of farmers. It can be seen from Table 3 that education (r = 0.291), family status (r = 0.322), farm status (r = 0.307) and Social participation status (r = 0.492) were highly significant at 0.01 probability level. However, age was found significant at 0.05 levels and was correlated negatively with it, thereby indicating that, as a person matures in age he makes less effort in getting his way through. In rural society, age is usually respected and older persons expect others to accept their views without much effort or persuasion.

More than three fourth (77.10%) of Tamil Nadu respondents had medium level of manageability. About 13 per cent had high and 10 per cent of respondents had low level of manageability. In Kerala 84.40 per cent vanilla farmers possessed medium level manageability behaviour, while low and high were possessed by 8.90 per cent and 6.70 per cent, respectively. It could be seen from table 3 that all the variables were significantly related to manageability. This indicated that the richer a person was with experience, higher education and high social participation status, better was his ability to manage the enterprise. It could be inferred from the study that majority of the vanilla farmers had high level of education, which led to greater awareness and knowledge and influenced their managerial capacity.

It can be seen from Table that nearly 90.00 per cent of vanilla farmers from both the states had medium to high level of self-confidence. Confidence was found to be positively related with education, family status farm status and social participation status (Table 3). Among these four variables, social participation status (r = 0.493)

Table 2. Distribution of respondents based on their entrepreneurial behaviour dimensions

Category	Tamil Nadu respondents (n=70)		Kerala respondents (n=90)		Total (n=160)		Z value
	f	%	f	%	f	%	
Risk taking							
Low	8.00	11.40	12.00	13.30	20.00	12.50	
Midium	53.00	75.70	68.00	75.60	121.00	75.63	
High	9.00	12.90	10.00	11.10	19.00	11.88	
Mean	18.40						2.498**
Hope of success							
Low	5.00	7.10	18.00	20.00	23.00	14.38	
Medium	52.00	74.30	672.00	68.90	114.00	71.25	
High	13.00	18.60	10.00	11.10	23.00	14.38	
Mean	17.86		18.73				1.905**
Persuability							
Low	9.00	12.90	12.00	13.30	21.00	13.13	
Medium	48.00	68.60	68.60	75.60	116.00	72.50	
High	13.00	18.50	10.00	11.10	23.00	14.38	
Mean	16.61		18.53				3.843**
Manageability	-						
Low	7.00	10.00	8.00	8.90	15.00	9.38	
Medium	54.00	77.10	76.00	84.40	130.00	81.25	
High	9.00	12.90	6.00	6.70	15.00	9.38	
Mean	16.99		18.93				3.976**
Self confidence							
Low	7.00	10.00	4.00	4.40	11.00	6.88	
Medium	52.00	80.00	74.00	82.20	126.00	78.85	
High	7.00	10.00	12.00	14.00	19.00	11.88	
Mean	17.03		17.36				0.687
Knowledgeability							
Low	4.00	5.70	6.00	6.70	10.00	6.25	
Medium	57.00	81.40	74.00	82.20	131.00	81.88	
High	9.00	12.90	10.00	11.10	19.00	11.88	
MEAN	17.93		19.58				4.856**
Persistence							
Low	2.00	2.90	14.00	15.60	16.00	10.00	
Medium	53.00	75.40	66.00	73.30	119.00	74.38	
High	15.00	21.40	10.00	11.10	25.00	15.63	
Mean	17.64		19.73				5.241**
Use of feedback							
Low	5.00	7.10	4.00	4.40	9.00	5.63	
Medium	52.00	74.30	70.00	77.80	122.00	76.25	
High	13.00	18.60	16.00	17.80	29.00	18.13	
Mean	17.43		19.87				5.274**
Innovativeness							
Low	11.00	15.70	8.00	8.90	19.00	11.88	
Medium	50.00	71.40	70.00	77.80	120.00	75.00	
High	9.00	12.90	12.00	13.30	21.00	13.13	
Mean	16.54		18.09				2.722**

Table 2 contd...

Category	Tamil Nadu respondents (n=70)		Kerala respondents (n=90)		Total (n=160)		Z value
	f	%	f	%	f	%	
Achievement Motivation							
Low	4.00	5.70	14.00	125.60	18.00	11.25	
Medium	53.00	75.70	62.00	68.90	115.00	71.88	
High	13.00	18.60	14.00	15.60	27.00	1.88	
Mean	16.70		18.58				3.486**
Locus of control							
Low	6.0	8.60	12.00	13.30	18.00	11.25	
Medium	51.00	72.90	60.00	66.70	111.00	69.38	
High	13.00	18.60	18.00	20.00	31.00	19.38	
Mean	26.19		28.80				3.783**
Total entrepreneurship behaviour							
Low	0.00	0.00	2.00	2.20	2.00	1.25	
Lower middle	6.00	8.60	12.00	13.30	18.00	11.25	
Middle	49.00	70.00	62.00	68.90	111.00	69.38	
Upper middle	13.00	18.60	14.00	15.60	27.00	16.88	
High	2.00	2.90	0.00	0.00	2.00	1.25	
Mean	199.31		217.00				4.211*

Table 3. Matrix of correlation between entrepreneurial and socio-economic dimension

S.No.	Variable	Age	Education	Family status	Farm status	Social participation status
1.	Risk taking	-0.182**	0.323**	0.383**	0.224**	0.429**
2.	Hope of success	-0.195**	0.319**	0.351**	0.22**	0.427**
3.	Persuability	-0.187**	-0.291**	0.322**	0.307**	0.492**
4.	Manageability	0.183*	0.228**	0.3**	0.169**	0.312**
5.	Self confidence	-0.191*	0.258**	0.201**	0.24**	0.493**
6.	Knowledgeability	0.105	0.289**	0.384**	0.415**	0.328**
7.	Persistence	0.06	0.423**	0.486**	0.391**	0.27**
8.	Use of feedback	0.105	0.273**	0.362**	0.398**	0.34**
9.	Innovativeness	0.065	0.31**	0.204**	0.292**	0.433**
10.	Achievement motivation	-0.190**	0.385**	0.329**	0.337**	0.379**
11.	Locus of control	0.035	0.257**	0.33**	0.399**	0.392**

was highly and positively related to self-confidence. It could be concluded that as a person got along with other people frequently his confidence level improved.

More than four fifth (80.00 %) of the respondents were in medium category of knowledge about technical and management aspects of their ventures. High-level knowledgeability was found in 12.90 and 11.10 per cent of vanilla farmers of Tamil Nadu and Kerala, respectively. Respective percentages for both the states in low category were 5.70 and 6.70. As reported in table 3 except age, all other variables i.e. education (r = 0.239), family status (r = 0.334), farm status (6.415) and social participation status (r = 0.328) were significantly related to knowledgeability. This indicated that individuals with high education, farm status, and social participation status were more aware of their surroundings and hence had more knowledge. Entrepreneurship in vanilla cultivation required a keen sense of the market, exploitation of opportunities and willingness to adopt to environment for which knowledge was essential.

Majority (96.80%) of the respondents from Tamil Nadu had medium to high level of persistence. About 3 per cent had low level of persistence. In Kerala 84.40 per cent of vanilla farmers had medium to high level of persistence where as 15.60 per cent had low level. It could be observed from Table 3 that among socio-personal characteristics, except age, all other variables had significant relationship with persistence. Past studies guide that entrepreneurs tend to persist in the face of difficulties or obstacles. Failure does not easily discourage them, rather they carry on with more enthusiasm and self-confidence.

The ability to seek and use feedback on one's performance and decisions is an important quality of entrepreneurs. Medium level of feedback usage was found among the majority of respondents of Tamil Nadu (74.30 per cent) followed by high (18.60) and low (7.10) levels. Similar was the distribution pattern in Kerala. It could be observed that only less than 7 per cent of vanilla farmers had low level of feed back usage. Correlational analysis (Table 3) revealed that except age all other variables i.e. education ($r = 0.273$), family ($r = 0.362$), farm status ($r = 0.398$) and social participation ($r = 0.34$) were positively and significantly related with feed back usage. Openness to feedback was reflected by positive correlation of education and social participation with feedback usage.

It is quite obvious from the Table 2 that more than 90 per cent of Tamil Nadu vanilla farmers had medium to high level of innovativeness followed by low level (15.70%). In Kerala, 77.80 per cent had medium level of innovativeness followed by high (13.30) and low (8.90%) level of innovativeness. The correlational analysis (Table 3) revealed significant relation of social participation ($r = 0.843$), farm status ($r = 0.292$), family status ($r = 0.204$) and education ($r = 0.31$) with innovativeness.

Three fourth (75.70) of Tamil Nadu vanilla farmers had medium level of achievement motivation, followed by high (18.60%) and low (5.70%) levels of achievement motivation. More number of vanilla farmers of Kerala (66.70%) were found under medium level of achievement motivation, followed by equal per cent of high (15.60%) and low (15.60%) levels of achievement motivation. Achievement motivation was found to be significantly correlated with age ($r = -0.190$), education ($r = 0.385$), family status ($r = -0.329$) farm status ($r = 0.337$) and social participation status ($r = 0.379$) (Table 3). Age was negatively correlated which indicated that at younger age there was strong motivation to achieve. Hence, in vanilla enterprise, individuals who were younger and had high education, social participation status and high farm status were more achievement oriented than those who were older in age; less educated and had lower farm status.

Locus of control is one of the important aspects to be probed while studying the entrepreneurial behaviour. It is gathered from Table 2 that three fourth (75.70%) of vanilla farmers from Tamil Nadu and 68.90 per cent from Kerala vanilla farmers had medium level of locus of control, while 18.60 per cent and 20.00 per cent vanilla farmers from Tamil Nadu and Kerala, respectively were found to be internal. On the contrary 8.60 per cent Tamil Nadu Vanilla farmers and 13.30 per cent of Kerala vanilla farmers were externals. On the whole nearly seventy per cent of respondents were found to have medium level of locus control followed by internals (19.38%) and externals (11.25%). Except age, other socio economic variables like education, family status and farm status and social participation status were found to be positively and significantly related to locus of control. It could be concluded from the study that majority (90%) of the respondents were in medium level of locus of control and strongly believed in themselves, which was an important characteristic of entrepreneurs.

The Z statistic analysis revealed that there exists a significant difference between Tamil Nadu and Kerala vanilla farmers with respect to risk taking, hope of success, persuability, manageability, knowledgeability, persistence, use of feed back, innovativeness, achievement motivation, locus of control and overall entrepreneurial behaviour.

The sums of score on individual attributes discussed above were taken to find overall entrepreneurship in individuals. Seventy per cent of vanilla farmers from Tamil Nadu and 68.90 per cent of vanilla farmers of Kerala exhibited medium level of entrepreneurship (Table 2). In Tamil Nadu one fifth (20%) of vanilla farmers exhibited upper middle to high entreprenеurship behaviour followed by lower middle. In Kerala, 15.60 per cent of farmers had upper middle entrepreneurship followed by lower middle (13.30%) and low (2.20%). None of the farmers of Tamil Nadu and Kerala belonged to low and high entrepreneurship behaviour. No farmer had low entrepreneurship in Tamil Nadu while none of the farmers belonged to high entrepreneurship group.

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Adoption of Zero Tillage Technology

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ABSTRACT

Zero tillage is seeding mechanism in one go with a narrow/knife type disc. The adoption of zero tillage technology has gone upto one million hectare in recent years. The experiment was conducted at four permanent sites for three successive years from 2001-02 to 2003-04. A survey was also conducted to know the perception of farmers about zero tillage technology. Zero tillage showed lesser population of *Phalaris minor* population whereas more population of *Chenopodium album* and rumex species compared to conventional tillage. The incidence of termites, powdery mildew and karnal bunt was either less or same in zero tillage fields whereas the incidence of pink stem borer was more at Kurali and Darad sites under zero tillage. Farmers were able to get at par/slightly higher yield under zero tillage and were able to save Rs. 370/ton of wheat on cost of cultivation. Farmers adopted zero tillage because of more yield, cost saving and less *Phalaris minor* infestation and they were satisfied with this technology. Due to non availability of machine and less yield, some of the farmers discontinued zero tillage.

The term zero tillage or no-till means single pass seeding with a narrow/knife type tyne or disc seeding (Rainbow and Slee, 2004). One of the transformations that are taking place in the cultivation of wheat in rice wheat cropping system is the evolution of zero tillage technology (Malik *et al.*, 2000). The adoption of zero tillage has spread from 120 ha (1997) to 1200 ha (1998) to 12,000 ha (1999) (Hobbs *et al.*, 2000) to one million ha in 2004 (Anonymous, 2004). During last few years, the number of zero tillage adopters has increased considerably in India. The number of farmers adopting zero tillage will increase markedly because the fuel prices are soaring up. The farmers contemplating adoption of zero tillage has many queries in their mind. The move requires different seeding equipment as well as management skills.

Wheat is generally grown after intensive tillage involving 6 to 17 tractor passes using different implements which is termed as conventional tillage. In the years ahead there will be a steep rise in the energy demand for agriculture due to mechanisation (Sharma, *et al.*, 2005). Therefore, adoption of zero tillage will decrease the cost of production without compromising the yield.

Zero tillage has several advantages over conventional tillage. Lower cost, reduction in wind and water erosion, improvements in soil structure and water harvesting, lower weed infestation resulting from reduced weed weed bank burial and increases in farm efficiency (Rainbow, 2004). The intensity of *Phalaris minor* was less by 30-40% in zero tillage compared to conventional tillage, whereas the intensity of broad leaf weeds increased due to zero tillage (Singh *et al.*, 2002). There was no definite trend of broad leaf weeds infestation in zero tillage fields but *Malwa parviflora* and *Rumex retroflex* were found to increase in the rice-wheat system in general, and zero tillage in particular (Yadav *et al.*, 2002). The researchers felt that though the *Phalaris minor* population has decreased under zero tillage but the broad leaf weeds population has increased. Besides, it controls environmental pollution by releasing 135 kg/ha less CO_2 (assuming 2.6 kg CO_2 production/litre of diesel burnt), which is one of the major causes of global warming. Apart from benefits to farmers and to the soil, zero tillage combined with stubble retention, has environmental benefits too. The soil becomes depository

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of carbon dioxide which is essential for soil microbial activity (Rainbow and Slee, 2004).

The study was aimed to find out the adoption of resource conservation technologies in rice-wheat cropping areas.

METHODOLOGY

The experiments were conducted for three years from 2001-02 to 2003-04 at four permanent sites, each having an area of about one hectare in Darar, Kurali, Barota and Newal villages of district Karnal, Haryana, India. The soils at all the sites where loam, sandy loam to clay loam with pH in the range of 8.0 to 8.5 the fields were under rice-wheat cropping system for the last three decades. In all the experiments wheat cultivars PBW was sown using a seed rate of 100 kg/ha. Recommended dose of herbicides (Clodinafop @60g/ha, Sulfosulfuron @25 g/ha, Metsulfuron @4 g/ha) were applied to control weeds. The row to row spacing was maintained at 20 cm. During the two consecutive years *i.e.* 2004-05 & 2005-06, slightly early wheat sowing (25 October to 31 October) was done under zero tillage and conventional tillage in an area of one acre each to evaluate the effect of tillage on weeds. An untreated control plot of 50 × 50 cm was left at three places in each tillage option during these two consecutive years. From these places weed density and fresh weight were recorded at 120 days after sowing. Sowing of wheat was done from 1st November under timely sown conditions, however, the sowing date at a particular location was same for all the treatments. The qualitative data for pests was recorded under various tillage practices. The influence of tillage system of pest situation was observed in the field across the locations. The visual observations and qualitative data were also collected.

A field survey was conducted to know the adopters' perception about zero tillage technology. The term adopter is operationalised as a farmer who had used zero tillage on any part of his cropping area. One hundred zero tillage adopter from Gonder, Bhaini Khurd, Dacchwa, Pundrak, Jundla, Sultanpur, Gorgarh, Bastali, Brass, Dabri, Pakhan, Shonkra, Manjura, Janeshro, Hathlana, Northa, Jalmana villages of Karnal district were selected for the purpose. The responses were recorded in a pre designed interview schedule.

In this study the tillage system are defined as:

Conventional tillage (CT) means more than two passes prior to seeding operations.

Zero tillage (ZT) means one pass seeding using knife points/knife type tynes.

RESULTS AND DISCUSSION

Weed Management

The infestation of *Phalaris minor* was less in the zero tillage fields as compared to conventional (Table 1). The lower population of *P. minor* in zero tillage was due to lesser soil disturbance as compared to CT system. These findings are well supported by Singh *et al.* (2002). Earlier it has been reported that zero tillage farming coupled with herbicide rotations and weed management strategies lead to reduction in total weed numbers.

The data in the Table 2 indicates that infestation of broad leaf weeds particularly *Chenopodium album* and *Rumex Species* were slightly more in zero tillage fields than conventional. A new weed *Malva parviflora* has emerged in some of the zero tillage fields. The findings are in line with Singh *et al.* (2002) and Yadav *et al.* (2002).

Table 1 Effect of tillage options on *Phalaris minor* (no/m^2) during 2001-02 to 2003-04

Village	Zero tillage	Conventional
Kurali	30.3	38
Darar	15	27.7
Barota	29	71
Newal	35.7	59
Mean	27.5	49

Table 2. Effect of tillage options on broad leaf weeds (no/m^2) during 2001-02 to 2003-04

Village	Weeds	Zero tillage	Conventional
Kurali	*C. album*	11.7	3.3
	Rumex species	7.3	2.3
Darar	*C. album*	13.3	12.0
	Rumex species	11.3	7.7
Barota	*C. album*	1.3	1.0
	Rumex species	14.0	5.7
Newal	*C. album*	5.7	7.3
	Rumex species	9.0	6.0
Mean	*C. album*	8.0	5.9
	Rumex species	10.4	5.4

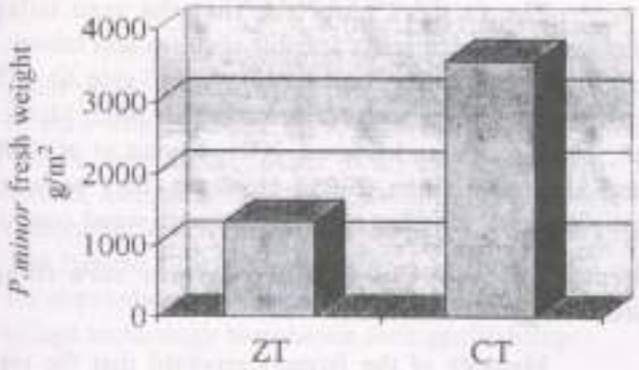

Figure 1. Effect of tillage on *P.minor*

The fresh weight of *Phalaris minor* was found to be only one-third under zero tillage as compared to conventional tillage (Fig. 1) fields.

Pest situation in zero and conventional tillage

The influence of the tillage was observed on pink stem borer (*Sesamia* sp.), termite, powdery mildew and Karnal bunt diseases. The influence on other pests was not significant or minimal. The termite damage was reasonably low in zero tillage plots which can be attributed to either frequent irritations or the hard soil conditions. Similarly, the powdery mildew was also less in zero tillage compared to conventional tillage. The stem borer incidence was sporadic with high intensities in few fields and increased when temperature goes up in first fortnight of December in zero tillage compared to conventional tillage. The incidence, in general was equal or more in zero compared to conventional tillage. Similarly, the post harvest disease data suggests that the Karnal bunt incidence was also low in zero tillage plots. Thus there is a need to initiate a systematic study on the influence of tillage on pest dynamics (Table 3).

Wheat productivity and economic parameters

The results have shown that almost similar grain yields were obtained in both the zero and conventional tillage, but the net return was higher in zero tillage (Rs. 10, 187/ha) compared to conventional (Rs. 8214/ha). The per unit cost of wheat production was less under zero tillage (Rs. 4330/tonne) compared to conventional (Rs. 4700/tonne) (Table 4).

The main saving under zero tillage was in land preparation apart from the indirect advantages such as low depreciation of machinery, labour savings, time saving and comparatively lower water requirement.

Table 3. Pest situation in zero tillage *vis-a-vis* conventional tillage

Location	Pink Stem borer	Termite	Powdery mildew	Karnal bunt
Kurali	More	Less	No change	Less
Darar	More	No change	Less	Less
Barota	No change	Less	No change	Less
Newal	No change	No change	No change	Less

Table 4. Effect of tillage options on wheat productivity and economic parameters

Parameters	Tillage Technologies	
	Zero tillage	Conventional
Yield (t/ha)	5.25	5.24
Cost of cultivation (Rs/ha)	26058	27943
Net return (Rs/ha)	10187	8214
Cost of production	4330	4700
B:C ratio	1.38	1.29

Farmer's survey

Change in area under zero tillage technology

A survey of the 100 farmers was conducted during 2001-02 and it was again repeated with the same set of respondents (97) in 2005-06. All the zero tillage adopters have increased their area under this technology over a period of time, irrespective of their size of holding (Figure 2).

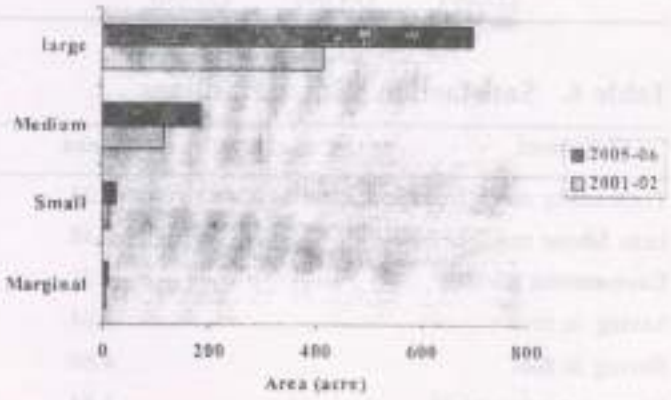

Figure 2. Changes in zero tillage area during 2001-02 to 2005-06

Residue Management

The rice residue management is one of the major problems in adoption of zero tillage. The farmers face problem in seeding wheat crop in full crop residues, which compels them to fully or partially burn the rice residues. Majority of the farmers (53%) partially burn the rice residue followed by removal (33.33%) and full burning (14%). All the small and marginal farmers removed the rice residues for fodder purpose. However, the large and medium farmers preferred to partially or fully burn rice residues. Burning of rice residue has posed a challenge to the researchers and new initiatives in the form of rotary disc drill and happy seeder have been taken to avoid burning and to improve environment.

Satisfaction of Farmers

The level of satisfaction was measured on a five point continuum *viz.* highly satisfied, satisfied, not satisfied, dissatisfied and highly dissatisfied and assigned scores of 5, 4, 3, 2 & 1 respectively.

Table 5. Residue management

Categories	Removed	Full burning	Partial burning	Total
Marginal (< 1 ha)	6 (100)	-	-	6
Small (1-2 ha)	8 (100)	-	-	8
Medium (2-4 ha)	8 (22.22)	4 (11.11)	24 (66.67)	36
Large (> 4 ha)	11 (22.0)	10 (20.00)	29 (58.00)	50
Overall	33 (33.00)	14 (14.00)	53 (53.00)	100

Table 6. Satisfaction with zero tillage

Statement	Mean
Technically not a feasible technology	4.38
Less labour requirement	4.48
Environment friendly	4.21
Saving in time	4.64
Saving in fuel	4.66
Improvement in yield	3.84
Weed control	3

The farmers reported, that the zero tillage technology is technically feasible requires less labour, is environment friendly, saves time, fuel (Table 6). The findings are in line with Nagarajan *et al.* 2002, Malik *et al.*, 2005, Singh and Kumar, 2005, Kumar *et al.*, 2005 and Sinha and Singh, 2005. However, they were less satisfied with yield but not satisfied with weed control.

Reasons to adopt and or discontinue zero tillage technology

Majority of the farmers reported that the yield was more or at par under zero tillage over conventional. Fuel and labour savings were the important reasons to adopt zero tillage. The findings are supported by Nagarajan *et al.*, 2002, Malik *et al.*, 2005 and Singh and Kumar, 2005. The other notable reasons were less infestation of *Phalaris minor*, water saving and less lodging (Table 7).

A significant percentage of the farmers had discontinued zero tillage due to non availability of zero till drill machines (Table 8). The other problems as perceived by the farmers were low yield, more broad leaf weeds, bund making and crop damage due to rats (Table 4).

Table 7. Reasons to adopt zero tillage technology

Reasons	Rank
More or at par yield over conventional	I
Fuel saving	II
Labour saving	III
Less infestation of weeds (*Phalaris minor*)	IV
Water saving	V
Less lodging	VI

Table 8. Reasons to discontinue zero tillage technology

Reasons	Rank
Non availability of machine	I
Low yield	II
Problem in bund making	III
More broad leaf weeds	IV
Rat problem	V

CONCLUSION

Zero and conventional tillage produced similar grain yield. The problem of *Phalaris minor* was lesser in zero tillage compared to conventional. Broad leaf weeds were almost same in all the treatments. The termite damage and incidence of powdery mildew was reasonably low in zero compared to conventional tillage. The Benefit Cost ratio was higher in zero tillage *vis-a-vis* conventional. Therefore, the farmers can adopt zero tillage technology to enhance their profitability.

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Adoption Trends of Improved Agricultural Technology in the Villages of Uttaranchal

Nirmal Chandra and K.K. Bisht[1]

ABSTRACT

A study was undertaken in five groups of villages adopted during different phases of Transfer of technology (TOT) programme in last 15 years, to determine the current status of improved agricultural technologies and to identify the thrust areas to achieve a higher degree of sustainability in respect of their adoption. Improved seeds and improved agricultural equipment, respectively, were found to be the most and the least still in use technologies. Over the 15 years the area under HYV decreased from about 70 per cent to 20 per cent. It was found that in the sampled population there were 2.4 per cent innovators, 12.0 per cent early adopters, 37.6 per cent early majority, 15.2 per cent late majority, 16.8 per cent laggards and 16 per cent non-adopters. Social participation, innovativeness, attitude and knowledge were found to be the chief contributing factors in adoption.

The hill and mountain agriculture is unique in respect of topography, climate, and production system. The undulated topography, rugged terrain, harsh climate, under irrigation and lack of production and marketing infrastructure have made the region poorest in terms of production and productivity of the crops. Most of the hill farmers have small and scattered land holdings, low investment capacity and very little technical know and uneconomic production system. The farmers in north-western (NW) Himalayan region extensively follow the agri-horti-livestock production system.

Infrastructural facilities in hills are generally poor. Farmers in low -hills have better access to various infrastructural facilities as compared to the farmers in and above mid- hills. Though the agriculture is the most important source of employment and accounts for more than 75 per cent of the total work force, its share in the household income is only about 25 per cent. Women in hills are over burdened with work load.

Thought a lot of agricultural technology has been generated for hills, it has not reached to the farmers and subsistence farming is still the norm for them.

Among the many factors, contributing to the growth in agricultural productivity, technology is the most important. The rate of adoption of a new technology is subject to its profitability and the degree of risk and uncertainty associated with it, and it highly influenced by the capital requirement, agricultural policies, and the psycho-socio-economic characteristics of farmers.

Vivekand Parvatitya Krishi Anusandhan Sansthan (VPKAS) being the pioneer institute in hill agricultural research, has been playing a great role in developing improved agricultural technologies like better (high yielding, input responsive and biotic/abiotic stress resistant/to learnt) crop varieties and associated packages of practices, remunerative cropping systems and soil and water management practices, remunerative cropping system and soil and water management practices. These improved technologies are being demonstrated at farmers' field for a long time under Transfer of Technology (ToT) programme and it was experienced that the farmers show maximum responsiveness towards adoption of high

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yielding varieties. However, it was observed that the farmers of the villages adopted under ToT program gradually revert to the traditional local cultivars and the proportion of improved varieties dwindles with the passage of time.

A study was undertaken in the villages adopted during last 15 years under ToT programme to determine (1) farm-level impact of introduced technologies, (2) identifying and analysing the psycho-socio-economic characteristics that influence adoption, including the acceptance of technology, adoption rates, performance, and constraints in adoption. An understanding of how individual characteristics tend to influence adoption decisions could improve the effectiveness of technology in enhancing growth in productivity.

METHODOLOY

The study involved two main categories of farmers from Almora in Uttaranchal. The first group consisted of farmers from the villages adopted under Transfer of Technology program during last fifteen years. The second group consisted of the farmers from non-adopted area where no extension efforts had been made in the past by the Institute. This served as the control group. Twenty five farmers from each adopted group of villages and 25 farmers from non-adopted group village were randomly selected. The selected farmers were interviewed and their responses were recorded with the help of pre-structured interview schedule.

Adoption rate was measured by the percentage of farmers using the technology on a continuing basis and degree of adoption was measured by the proportion of land under the improved crop variety. If the estimated coefficient of a particular variable is positive, it means that higher values of that variable result in a higher probability of adoption. A lower value implies a lower probability of adoption. Intensity of adoption was measured by the amount of modern inputs used per unit area. The data was analysed using a multiple liner regression model.

Responses matrices were prepared and percent share of each response was calculated to determine (1) the most/least used improved technologies still in use, (2) the distribution of farmers in different categories of adopters, and (3) the major constraints in adoption of improved technology.

Time elapsed was calculated as the difference between the year of study (2003) and the mid-point of the interval during which the ToT programme was undertaken at the village. Microsoft Excel' program was used to draw the trend curve between time elapsed and percent area under HYV, which was calculated as follows:

$$\% \text{ area under HYV} = \frac{\text{Total area currently under HYV}}{\text{total land holding}} \times 100$$

where the areas, both in numerator and denominator, refer to those belonging to the interviewed farmers.

Multiple regression analysis was used to examine the relationship between the study phenomenon (y)and explanatory variables (xs).

RESULTS AND DISCUSSION

The data in Table 1 show that the area under HYV declines with the passage of time since adoption. A visual representation of it is presented in Figure 1. The figure shows that the rate of decline is rapid during earlier years and stabilizes after 12 years since adoption. This indicates that the farmers, who stick to the practice of using improved seed for more than a decade, are highly likely to continue with the practice. It is this group of the farmers that need identification and intensification of extension efforts in order to increase the area under high yielding varieties.

Table 2 presents the percentage of farmers falling in different categories of adopters of improved technology. The table shows that the least number of farmers (2.4%) were innovators. About 12 per cent fall in the category of 'early adopters' whereas the maximum number of the farmers (37.6%) fall in the category of early majority (termed as 'coat-tailors') by Sevier and Lee, (2003) , who perfer to wait and see the improved technology and about 15 per cent of the farmers take relatively long time to decide about adoption of technology and can be categorized as late majority. This suggests that we ought to concentrate on early adopters and extend as many improved technologies as feasible in order to shorten the gestation period for 'coat tailors' and 'slow adopters.' A visual representation of it is presented in Figure. 2.

Table 3 presents the two most/least used improved agricultural practices that are still in use. The most in-use technology is the use of improved varieties. This unconsistent with the informal observation stated earlier. The reason behind the popularity of improved varieties still in use is that once a farmer becomes convinced about the merit(s) of a variety and possesses

Table 1 Status of adoption of improved varieties in adopted villages

(N=125)

S. No.	Vilage group	Year of adoption	Total area* (ha)	% of farmers using improved varieties	Awareness about HYV	Area under HYV* (ha)	% area under HYV
1.	Mahat Gaon	1986-89	10.1	20.00	All	2.00	20.00
2.	Babur khola	1989-93	10.8	24.00	All	2.40	22.20
3.	Matela	1993-95	9.3	36.00	All	3.50	37.50
4.	Khunt	1995-98	9.4	64.00	All	6.70	71.50
5.	Sakar	1998-01	9.6	60.00	All	6.60	68.80
	Oveall		49.2	40.00	100%	21.20	43.10%
6.	Raun-Dal (Control)	-	18	4.00	32%	0.04	0.20

* - Area belonging to the interviewed farmers

Table 2. Farmers in different categories of adopters

(N=125)

Category	Number	% farmer
Innovators	3	2.4
Early adopters	15	12.0
Early majority (Coat-tailors)	47	37.6
late majority (slow adopters)	19	15.2
Laggards (Do it because it is there)	21	16.8
Non-adopters	20	16.0

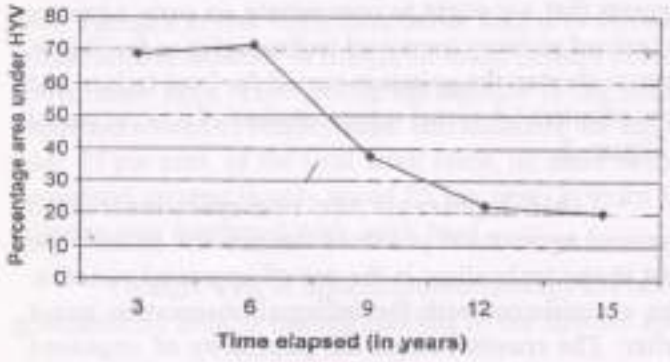

Fig. 2 Influence of time on degre of adoption

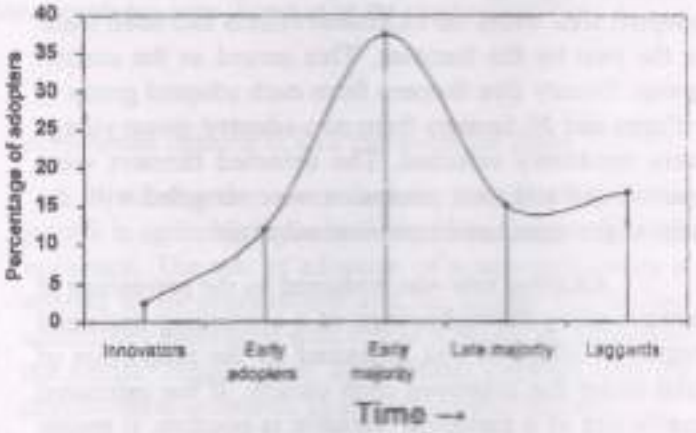

Fig. 2 Adopters categories in dopted ares

a positive attitude, he will maintain the seed for next season. The second most in-use practice is the use of fertilizer. This may be ascribed to the fact that the farmers are slowly diversifying agriculture and they have started growing crops which were not there earlier and these crops require fertilizer application in order to become remunerative. The least used technologies are the use of weedicides and improved agricultural equipment. The least used technologies are the use of weedicides and improved agricultural equipment. The reasons for the less use of weedicides are (1) prevailing weed incidence during rabi, (2) almost all the weedicide being used in the irrigated area, which amount to about 10 per cent of the total area under agriculture in the region, and (3) use of weeds as fodder.

Table 3 Two most/least improved technologies still in use

(N=125)

Usage	Technology	Per cent usage
Most used	Improved seed	21.6
Second-most used	Fertilizer	16
Least used	Improved agricultural equipment	3.2
Second-least used	Weedicide	4.8

The reason for improved agricultural equipment being the least popular are (1) prevailing geo-agricultural conditions in hills, which render their use as impractical or highly uneconomic, and (2) poor economic condition of farmers, in general.

Analysis of variance technique was used to determine the significance of difference among means of different variables under study. Except for land holding, age, education and income, village groups were significantly different for all other variables.

Simple correlations of different variables with 'adoption' are presented in Table 4. The Table shows that social participation, innovativeness and knowledge are the contributing factors in adoption in all the cases where attitude showed significant correlations for the sample from current villages adoption. The variables up to the degree of trend curve were included in the multiple regression equation and gradually dropped out from the equation based on the level of statistical significant and finally the relationship for the whole sample was arrived at.

Table 4. Correlation coefficients of differnt variable with 'Adoption'

	Villages adopted in past	Currently adopted villages	All
land holding	0.087	-0.066	-0.004
Age	-0.028	-0.327	-0.099
Education	0.080	0.233	0.229**
Income	0.052	0.228	0.065
Social participation (SP)	-0.315**	0.622**	0.511**
SES	0.260**	0.116	0.383**
Innovativeness	0.436**	0.404*	0.508**
Attitude	0.023	0.442*	0.366**
Knowledge	0.273**	0.441*	0.542**

$$y = 48.1839 + 11.6744x_1 - 0.9788x_1^2 + 0.3250x_2 + 2.6529x_3 - 0.0547x_3^2 + 0.1966\ x4,\ R^2 = 0.5204$$

Where, Y is adoption, x1 the social participation x2 the innovativeness, x3 the attitude and x4 the knowledge. All the coefficients were found to be highly significant (at 0. 1% level) except for (attitude) and knowledge which were significant at 0.5% level.

Constraints

Among the constraints in adopting technology, timely non- availability of improved seed was the most common response (62%) followed by lack of information regarding the latest development in respect of technology (37%) and low capacity to invest in expensive, though profitable, technologies.

CONCLUSION

The study showed that the thrust areas for extension to achieve large-scale and rapid result are (1) motivating the 'coat-tailors ' and 'slow adopters' through focusing more on early adopters' (2) incorporating more diversity in terms of technology to render more options to choose from, (2) strengthening and broadening the long time user base through continuous interaction, (3) assuring timely availability of improved seeds, (4) wide diffusion of new technologies, and (4) development of low-cost technologies. There is a curvilinear relationship between innovation and explanatory and the explanatory variables appear in varying degrees (the highest exponent associated with a variable) in the relationship.

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Use of Herbal Plants and Food Items of Medicinal Value by the Rural Women

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ABSTRACT

The study was conducted purposively in two selected districts of Punjab *viz.*, Gurdaspur and Ludhiana related to the two agro climatic zones *i.e.* submountain undulating zone and central zone, respectively, with the possibility of having different herbal plants and food items of medicinal value due to varied agro climatic conditions. Two blocks from each selected district were randomly selected. Eight villages were selected randomly from both the selected districts. A sample of 200 rural women above the age group of 25 years selected for the investigation. Twenty seven herbal plants and thirty-one food items were identified from both districts by the rural women. Rural women were aware of some of the uses of these plants and food items to cure different ailments/diseases and they were used in pure or mixed and solid or liquid forms.

Since ancient times, India has been known to be a rich repository of medicinal plants. India is one of the largest producers, consumers and exporters of medicinal plants in the world. The country is blessed with a wide variety of climate and soil on which wide range of medicinal plants can be grown. The indigenous system of medicine has given an extra special place to food items because of their unique medicinal properties. Food items not only improve palatability but also perform a very important task of curing many ailments/diseases. This is made possible because of the anti-bacterial properties of the food items.

This trend is becoming popular throughout the developed world now as people strive to stay healthy in the face of chronic stress and pollution, and to treat illness with medicine that work in concert with the body's own defenses by avoiding side effects of modern medicine. Though herbal plants and food items are studied from Vedic period, these are still to be recognized for their medicinal value. Keeping the above in view, the present study was conducted with the specific objective to study the pattern of use of identified herbal plants and food items of medicinal value by the rural women.

METHODOLOGY

The study was conducted purposively selected in two districts *viz.*, Gurdaspur and Ludhiana *i.e.* related to the two agro climatic zones *i.e.* sub-mountain undulating zone and central zone, respectively, with the possibility of having different herbal plants and food items of medicinal value due to varied agro climatic conditions. Out of all the blocks, two blocks were selected randomly from each of the selected district. Out of all the villages of a block, two villages from each of the selected block were randomly selected for study. So, eight villages were selected from both the districts for the purpose of study. Twenty five households from each of the selected villages were randomly selected. Thus, a total sample of 200 rural women were selected for the investigation. An interview schedule was developed to collect the data for the pattern of use of identified twenty-seven herbal plants and thirty-one food items of medicinal value with respect to purpose *i.e.* pure or mixed and form of use *i.e.* solid or liquid.

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RESULTS AND DISCUSSION

Rural women identified twenty-seven herbal plants namely *Akk, Aswgandha, Arend, Amla, Arjuna, Bahera, Harad, Neem, Dharek, Brahmi, Bhakha, Mukoh, Babool, Beal, Dhudhi, Isabgol, Roadside itsit, Kawargandhal, Motha, Marua, Pudina, Safed Musli, Tulsi Bohar, Puthkanda, Patharchat* and *Thor* from both districts *i.e.* Gurdaspur and Ludhiana. The data in Table 1 reveal that the use pattern of different herbal plants used by rural women in pure or mixed and solid or liquid form. The herbal plants namely *Arjuna, Marua* and *Safed Musli* were not identified by the rural women in district Gurdaspur and other three namely *Bohar, Puthkanda* and *Thor* could not be identified in district Ludhiana. *Amla, Neem, Dherek, Babool, Isabgol, Kawargaandhal, Pudina* and *Tulsi* were used by majority of the respondents from both the districts whereas few of the respondents used *Beal, Aswagandha, Mukoh, Dhudhi, Motha, Safed musli, Marua, Roadsideitsit* and *Bhakhra.*

On the perusal of the data in Table 2 it is clear

Table 1. Distribution of the respondents according to the use pattern of identified herbal plants (n varies for each source)

Name of Plants	Purpose of use	Part used	Gurdaspur District				Ludhiana District			
			Actual use		Form of use		Actual Use		Form of use	
			PF (F&P)	MF (F&P)	S (F&P)	L (F&P)	PF (F&P)	MF (F&P)	S (F&P)	L (F&P)
Akk			(n=75)				(n=59)			
	Stomach ache	Fruits	65 (86.7)	-	65 (86.7)	-	15 (25.4)	-	15 (25.4)	-
Aswagandha (Aksana)			(n=3)				(n=7)			
	Heart problems	Fruits	-	3 (100)	3 (100)	-	-	7 (100)	7 (100)	-
Arend			(n=69)				(n=57)			
	Swelling	Leaves	65 (94.2)	-	65 (94.2)	-	37 (64.9)	-	37 (64.9)	-
	Stomach ache	Fruits	-	18 (26.1)	18 (26.1)	-	-	23 (40.4)	10 (17.5)	13 (22.8)
Amla			(n=90)				(n=90)			
	Swelling	Fruits	12 (13.3)	-	12 (13.3)	-	16 (17.8)	-	16 (17.8)	-
	Hair wash	Fruits	-	68 (75.6)	-	68 (75.6)	-	72 (80.0)	-	72 (80.0)
	Constipation	Fruits	-	35 (38.9)	35 (38.9)	-	25 (27.8)	-	25 (27.8)	-
Arjuna							(n=12)			
	Heart diseases	Leaves & fruits	-	-	-	-	12 (100)	-	-	12 (100)
Bahera			(n=35)				(n=42)			
	Cooling effect	Fruits	-	25 (71.5)	25 (71.5)	-	-	28 (66.7)	28 (66.7)	-
	Stomach problems	Fruits	-	25 (71.5)	25 (71.5)	-	-	26 (61.9)	26 (61.9)	
Harad			(n=35)				(n=43)			
	Cooling effect	Fruits	-	25 (71.5)	25 (71.5)	-	-	28 (65.1)	28 (65.1)	
	Stomach problems	Fruit	-	25 (71.5)	25 (71.5)	-	-	26 (60.5)	26 (60.5)	
Neem			(n=82)				(n=75)			
	Hair care	Leaves	15 (18.3)	-	-	15 (18.3)	22 (29.3)	-	-	22 (29.3)
	Tooth ache	Stems	66 (80.5)	-	66 (80.5)	-	62 (82.6)	-	62 (82.6)	-
	Skin diseases	Fruits	-	28 (34.1)	7 (8.4)	22 (25.6)	21 (28.0)	-	-	21 (28.0)

Name of Plants	Purpose of use	Part used	Gurdaspur District				Ludhiana District			
			Actual use		Form of use		Actual Use		Form of use	
			PF (F&P)	MF (F&P)	S (F&P)	L (F&P)	PF (F&P)	MF (F&P)	S (F&P)	L (F&P)
Dharek			**(n=60)**			**(n=43)**				
	Mouth blisters	Stems	15 (25.0)	-	-	15 (25.0)	12 (27.90)	-	12 (27.90)	-
	Blood purification	Leaves	30 (50.0)	-	-	30 (50.0)	14 (32.55)	-	-	14 (32.55)
	Tooth ache	Stems	45 (75.0)	-	45 (75.0)	-	26 (60.46)	-	26 (60.46)	-
Brahmi			**(n=26)**			**(n=23)**				
	Nerve tonic	Leaves	-	13 (50.0)	-	13 (50.0)	-	18 (78.26)	-	18 (78.26)
	Hair wash	Leaves	-	19 (73.07)	19	10 (73.07)	10	(43.47)		(43.47)
Bhakhra			**(n=28)**				**(n=22)**			
	Pregnancy problems	Fruits	-	28 (100)	28 (100)	-	8 (36.4)	-	8 (36.4)	-
	Indigestion	Fruits	-	-	-	-	-	- (86.4)	19 (86.4)	19 -
Mukoh			**(n=20)**				**(n=18)**			
	Joint pain	Fruits	-	16 ((80.0)	16 (80.0)	-	6 (33.3)	-	6 (33.3)	-
	Indigestion	Fruits	-	5 (25.0)	5 (25.0)	-	-	12 (66.7)	12 (66.7)	-
Babool			**(n=79)**				**(n=45)**			
	Tooth prblems	Stems	75 (94.13)	-	75 (94.13)	-	40 (88.9)	-	40 (88.9)	-
	Jaundice	Flowers	20 (25.32)	-	9 (11.4)	11 (13.9)	16 (35.5)	-	-	16 (35.5)
Bael			**(n=18)**				**(n=12)**			
	Health tonic	Fruits	-	15 (83.3)	-	15 (83.3)	-	12 (100)	-	12 (100)
	Pimples/acne	Roots	-	4 (22.2)	-	4 (22.2)	-	-	-	-
Isabgol			**(n=92)**				**(n=93)**			
	Constipation	Stems	92 (100)	-	58 (63.4)	34 (36.96)	93 (100)	-	55 (59.14)	38 (40.86)
Kawargandhal			**(n=60)**				**(n=64)**			
	Cold and coiugh	Leaves	20 (33.3)	22 (36.66)	-	42 (70.0)	-	38 (59.4)	-	38 (59.4)
	Constipation	Leaves	-	22 (36.66)	-	22 (36.66)	-	28 (43.7)	-	28 (43.7)
	Diabetes	Leavs	8 (13.3)	-	-	8 (13.3)	8 (12.5)	-	-	8 (12.5)
Marua							**(n-25)**			
	Indigestion	Leaves	-	-	-	-	-	25 (100)	25 (100)	-
Pudina			**(n=99)**				**(n=95)**			
	Gastric problems	Leaves	20 (20.4)	79 (80.6)	13 (13.3)	86 (87.7)	8 (8.42)	86 90.5)	12 (12.6)	82 (86.3)
	Cooling effect	Leaves	-	96 (97.9)	-	96 (97.9)	-	89 (93.68)	-	89 (93.68)
Safed Musli							**(n=10)**			
	Physical weakness	Roots	-	-	-	-	-	10 (100)	-	10 (100)
Tulsi			**(n=75)**				**(n=65)**			
	Weakness	Leaves & fruits	-	25 (33.3)	-	25 (33.3)	-	19 (29.2)	12 (18.46)	7 (10.77)

Name of Plants	Purpose of use	Part used	Gurdaspur District				Ludhiana District			
			Actual use		Form of use		Actual Use		Form of use	
			PF (F&P)	MF (F&P)	S (F&P)	L (F&P)	PF (F&P)	MF (F&P)	S (F&P)	L (F&P)
	Cold and cough	Leaves & fruits	-	58 (77.3)	58 (77.3)	-	-	24 (36.9)	24 (36.9)	-
	Fever	Leaves & fruits	-	60 (80.0)	15 (20.0)	45 (60.0)	-	26 (40.0)	-	26 (40.0)
Bohar			**(n=19)**							
	Skin problems	Leaves	19 (100)	-	19 (100)	-	-	-	-	-
Puthkanda			**(n=24)**							
	Cold and cough	Fruits	-	24 (100)	24 (100)	-	-	-	-	-
Patharchat			**(n=42)**				**(n=29)**			
	Skin problems	Leaves	42 (100)	-	42 (100)	-	29 (100)	-	-	29 (100)
Thor			**(n=37)**							
	Skin problems	Leaves	37 (100)	-	37 (100)	-	-	-	-	-

Multiple response; F-Frequency, P-Percentage, PF-Pure form, MF-Mixed form, S-Solid and L-Liquid.

Table 2. Distribution of the respondents according to the use pattern of identified food item of medicinal value

(n varies for each source)

Name of Plants	Purpose of use	Gurdaspur District				Ludhiana District			
		Actual use		Form of use		Actual Use		Form of use	
		PF (F&P)	MF (F&P)	S (F&P)	L (F&P)	PF (F&P)	MF (F&P)	S (F&P)	L (F&P)
Adrak		**(n=52)**				**(n=42)**			
	Cold and cough	10 (19.23)	35 (67.30)	-	45 (86.53)	-	40 (88.9)	-	40 (88.9)
	Diarrhoea	-	20 (38.46)	-	20 (38.46)	-	25 (55.6)	-	25 (55.6)
	Indigestion	-	50 (96.15)	50 (96.15)	-	-	42 (93.3)	42 (93.3)	-
Sundh		**(n=75)**				**(n=79)**			
	Cold	-	35 (46.7)	35 (46.7)	-	-	45 (56.96)	45 (56.96)	-
	Extra energy	-	70 (93.3)	70 (93.3)	-	-	70 (88.6)	70 (88.6)	
Aswain		**(n=89)**				**(n=84)**			
	Cholera	-	12 (13.5)	12 (13.5)	-	-	30 (35.7)	-	30 (35.7)
	Diarrhoea & dysentery	-	8 (8.98)	8 (8.98)	-	-	44 (52.4)	-	44 (52.4)
	Stomach ache	17 (19.1)	68 (76.4)	65 (73.0)	20 (23.5)	20 (23.8)	55 (65.48)	60 (71.43)	15 (17.86)

Name of Plants	Purpose of use	Gurdaspur District				Ludhiana District			
		Actual use		Form of use		Actual Use		Form of use	
		PF (F&P)	MF (F&P)	S (F&P)	L (F&P)	PF (F&P)	MF (F&P)	S (F&P)	L (F&P)
Saunf		**(n=86)**				**(n=82)**			
	Indigestion	68 (79.1)	-	68 (79.1)	-	45 (54.9)	-	45 (54.9)	-
	Cooling effect	72 (83.7)	-	72 (83.7)	-	62 (75.6)	-	62 (75.6)	-
	Mouth freshener	60 (69.77)	18 (20.9)	78 (91.8)	-	70 (85.4)	5 (6.09)	75 (91.46)	-
Dalchini		**(n=22)**				**(n=21)**			
	Tooth ache	20 (90.9)	-	20 (90.9)	-	15 (71.4)	-	15 (71.4)	-
	Cold	-	5 (22.7)	-	5 (22.7)	-	8 (38.1)	-	8 (38.1)
Elaychi		**(n=42)**				**(n=40)**			
	Indigestion	-	32 (76.2)	-	32 (76.2)	-	34 (85.0)	-	34 (85.0)
	Mouth freshener	22 (52.4)	-	22 (52.4)	-	25 (62.5)	-	25 (62.5)	-
Alsi		**(n=64)**				**(n=35)**			
	Blood purification	-	55 (85.9)	55 (85.9)	-	-	28 (80.0)	28 (80.0)	-
	Strengthening	-	50 (78.1)	50 (78.1)	-	-	21 (60.0)	21 (60.0)	-
Chasku		**(n=67)**				**(n=24)**			
	Obesity	-	16 (23.88)	16 (23.88)	-	-	10 (41.7)	10 (41.7)	-
	Skin infection	-	65 (97.01)	65 (97.01)	-	-	16 (66.7)	16 (66.7)	-
Long		**(n=77)**				**(n=75)**			
	Cold	12 (15.6)	-	-	12 (15.6)	-	23 (30.7)	-	23 (30.7)
	Tooth ache	62 (80.5)	-	62 (80.5)	-	60 (80.0)	-	60 (80.0)	-
Jamun Seed		**(n=12)**				**(n=10)**			
	Diabetes	-	12 (100)	12 (100)	-	-	10 (100)	10 (100)	-
Mullathi		**(n=28)**				**(n=35)**			
	cough	28 (100)	-	28 (100)	-	34 (97.1)	-	34 (97.1)	-
	Hair wash	2 (7.14)	-	-	2 (7.14)	2 (5.7)	-	-	2 (5.7)
Hing		**(n=48)**				**(n=60)**			
	Stomach problems	-	40 (83.3)	40 (83.3)	-	-	45 (75.0)	45 (75.0)	-
	Indigestion	-	42 (87.5)	42 (87.5)	-	-	48 (80.0)	48 (80.0)	-
Kesar		**(n=12)**				**(n=15)**			
	Asthma	-	10 (83.3)	-	10 (83.3)	-	12 (80.0)	-	12 (80.0)
	Cough and cold	-	8 (66.7)	-	8 (66.7)	-	10 (66.7)	-	10 (66.7)
Zeera			**(n=32)**			**(n=38)**			
	Tooth ache	18 (56.5)	8 (25.0)	26 (81.25)	-	-	32 (84.2)	32 (84.2)	-
	Indigestion	-	30 (93.5)	30 (93.75)	-	-	35 (92.1)	35 (92.1)	-

Name of Plants	Purpose of use	Gurdaspur District				Ludhiana District			
		Actual use		Form of use		Actual Use		Form of use	
		PF (F&P)	MF (F&P)	S (F&P)	L (F&P)	PF (F&P)	MF (F&P)	S (F&P)	L (F&P)
	Cooling effect	-	30 (93.75)	-	30 (93.75)	-	22 (57.89)	14 (36.8)	8 (21.05)
Dhania		(n=23)				(n=32)			
	Joint pain	-	23 (100)	8 (34.8)	15 (65.22)	-	32 (100)	-	32 (100)
Kali mirch		(n=62)				(n=58)			
	Tooth ache	60 (96.77)	-	60 (96.77)	-	56 (96.6)	-	56 (96.6)	-
	Indigestion	-	45 (72.6)	45 (72.6)	-	-	54 (93.1)	-	54 (93.1)
Magh		(n=70)				(n=60)			
	Tooth ache	50 (71.4)	-	50 (71.4)	-	45 (75.0)	-	45 (75.0)	-
	Stomach ache	-	66 (94.28)	66 (94.28)	-	-	58 (96.7)	58 (96.7)	-
Pyaj		(n=15)				(n=13)			
	Ear problem	-	7 (46.7)	-	7 (46.7)	-	5 (38.4)	-	5 (38.4)
	Toothache	-	10 (66.7)	-	10 (66.7)	-	12 (92.3)	-	12 (92.3)
	Vomiting	5	-	-	5 (33.3)	4 (30.8)	-	-	4 (30.8)
Lasun		(n=52)				(n=60)			
	Cold and cough	-	12 (23.07)	-	12 (23.07)	-	25 (41.7)	-	25 (41.7)
	Skin diseases	13 (25.0)	29 (55.77)	-	42 (80.77)	40 (66.7)	-	-	40 (66.7)
	Indigestion	-	50 (96.1)	50 (96.1)	-	-	48 (80.0)	48 (80.0)	-
Haldi		(n=53)				(n=65)			
	Skin diseases	-	52 (98.1)	-	52 (98.1)	-	60 (92.3)	-	60 (92.3)
	Gum problems	- (22.6)	12	-	12 (22.6)	-	25 (38.5)	-	25 (38.5)
	Internal injury	- (75.5)	40	- (75.5)	40	- (69.2)	45	- (69.2)	45
Nimbu		(n=92)				(n=89)			
	Pimples/acne	35 (38.04)	-	-	35 (38.04)	45 (50.6)	-	-	45 (50.6)
	Dandruff	- (42.4)	39	-	39 (42.4)	12 (13.48)	30 (33.71)	-	42 (47.19)
	Cholera	-	12 (13.04)	-	12 (13.04)	-	18 (20.2)	-	18 (20.2)
	Indigestion	-	89 (96.74)	-	89 (96.74)	-	80 (89.89)	-	80 (89.89)
Karela		(n=15)				(n=12)			
	Diabetes	6 (40.0)	-	-	6 (40.0)	5 (41.67)	-	-	5 (41.67)
	Skin diseases	14 (93.3)	-	-	14 (93.3)	10 (83.3)	-	-	10 (83.3)
Metha		(n=36)				(n=19)			
	Back ache	-	32 (88.9)	32 (88.9)	-	-	5 (26.3)	5 (26.3)	-
	Indigestion	-	22 (61.1)	22 (61.1)	-	-	19 (100)	19 (100)	-

Name of Plants	Purpose of use	Gurdaspur District				Ludhiana District			
		Actual use		Form of use		Actual Use		Form of use	
		PF (F&P)	MF (F&P)	S (F&P)	L (F&P)	PF (F&P)	MF (F&P)	S (F&P)	L (F&P)
Anar		**(n=54)**				**(n=66)**			
	Increase HB	54 (100)	-	-	54 (100)	66 (100)	0-	20 (30.3)	66 (100)
Soye		**(n=11)**				**(n=17)**			
	Menopause problems	-	11 (100)	11 (100)	-	-	17 (100)	17 (100)	-
Til		**(n=80)**				**(n=85)**			
	Extra energy	-	80 (100)	80 (100)	-	21 (24.7)	64 (75.29)	85 (100)	-
Triphla		**(n=18)**				**(n=12)**			
	Constipation	8 (100)	-	8 (100)	-	12 (100)	-	12 (100)	-
Gurmar		**(n=5)**							
	Diabetes	-	5 (100)	5 (100)	-	-	-	-	-
Tumma						**(n=42)**			
	Stomach problems	-	-	-	-	-	42 (100)	42 (100)	-
Munacca		**(n=15)**				**(n=7)**			
	Heart problems	5 (100)	-	5 (100)	-	7 (100)	-	7 (100)	-

that thirty-one food items of medicinal value namely *Adrak, Sundh, Ajwain, Saunf, Dalchini, Elaychi, Alsi, Chasku, Long, Jamun seed, Muillathi, Hing, Kesar, Zeera, Dhania, Kali mirch, Magh, Pyaj, Lasun, Haldi, Imli, Nimbu, Karela, Metha, Anar, Soye, Til, Triphla, Gurmar, Tumba* and *Munacca* were identified by the respondents from both the selected districts.

The respondents identified equal number of food items and they use for medicinal purpose in their day-to-day life. However, a variation was observed with reference to two food items. The respondents of district Gurdaspur and Ludhiana did not identify the food items namely *Tumba* and *Gurmar* respectively. *Nimbu, Ajwain, Saunf, Til, Long Adrak, Kali mirch, Magh, Lasun, Haldi* and *Sundh* were frequently used by rural women in both the selected districts. They were aware about some of the purposes of use of these food items to cure different ailments/diseases. *Munacca, Triphla, Soye, Kesar, Jamun seed, Pyaj* and *Karala* were being used by the small number of the respondents.

CONCLUSION

Twenty-seven herbal plants and thirty-one food items were identified from both districts *i.e.* Gurdaspur and Ludhiana. In the sampled district, 24 herbal plants and 30 food items were identified by the rural women. However, a variation of three herbal plants namely *Arjuna, Marua* and *Safeda musli* and one food item *i.e. Tumba* were not identified by the rural women in district Gurdaspur and three other herbal plants namely *Bohar, Puthkanda* and *Thor* and one food item *i.e. Gurmar* had from district Ludhiana. Majority of the rural women were frequently used some of the herbal plants and food items of medicinal value both in the selected districts *i.e. Pudina, Isabgol, Amla, Neem, Babool, Aikk, Tulsi, Nimbu, Ajwain, Saunf, Til, Long* and *Sundh*. They were aware about some of the purposes of use of these herbal plants and food items to cure different ailments/diseases. *Aswagandha, Beal, Mukoh, Munacca, Triphla, Soye, Kesar, Jamun seed, Pyaj* and *Karela* were being used by the few number of the respondents.

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An Analysis of Entrepreneurship Development Process Among Women

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ABSTRACT

Women Entrepreneurship Development has emerged as an effective method of empowering our fifty percent of population especially the rural women. But not much is known about the total process as research studies are limited and those which focus on all the associated factors are non-existent. The present study was conducted on women entrepreneurs based in National Capital Region of Delhi. It focused on the process of enterprise launching; the factors associated with the launch itself, the reasons for opting for self-enterprise in lieu of safety and security of a government or public sector job etc. It was found that the idea for enterprise came from EDP promotional activities for Low Profit Earners whereas it was their own desire and motivation in case of High Profit Earners. Women from poorer segments of society got motivated to pursue entrepreneurship for availing incentives and lucrative offers from entrepreneurship programmes of EDP organisations or government schemes. For majority of the entrepreneurs it was their own idea, which propelled them to take up entrepreneurship. The largest number 45.6 per cent of the respondents decided on the basis of the market demand for a particular product in their area of operation.

As per survey conducted by National Foundation of Women Business Owners, USA and United Nations women owned businesses in advanced countries are more than 25 per cent of all businesses whereas in Asia, Africa, Eastern Europe and Latin America, women owned enterprises are growing rapidly. Thus, change is bearing a woman's face in both developed as well as developing economics. Economic globalization has encouraged the expansion of female business ownership.

Women entrepreneurship needs to be studied separately as it is well recognized now that it is an untapped source of economic growth. Women entrepreneurs create new jobs for themselves and others. Also by being different they provide society with different solutions to exploitation of entrepreneurial opportunities, management, organization and business problems. A number of authors in the area of entrepreneurship theory have argued that there is need to feminize the research on entrepreneurship since much is not known about the ways women contribute to entrepreneurship and problems they face.

Women entrepreneurship is both about women's position in society and the role of entrepreneurship in the same society. Women face family responsibilities and are placed in particular social-situational circumstances which may act as barriers to her entrepreneurial role. Thus, both the factors affecting gender as well as the factors affecting entrepreneurship in society need to be studied to understand the whole process of entrepreneurship development among women.

Two major dimensions of entrepreneurship are the person (the entrepreneur) and the society in which the person operates. The understanding of first helps in designing strategies of identifying, stimulating and reinforcing the inner psychological mainsprings of entrepreneurial behaviour. And the understanding of the

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second is useful in designing programmes which develop relevant entrepreneurship contributing to social development.

The present study aimed at the finding out the profile, entrepreneurial traits and performance of women entrepreneurs. It also identified sociological and psychological factors promoting and inhibiting entrepreneurship among women.

METHODOLOGY

In order to investigate into the above-mentioned aspects of entrepreneurship development process, the research design followed in the investigation was 'Ex-post facto'. The study was conducted in the National Capital Region of Delhi including Gurgaon (Haryana) and NOIDA (Uttar Pradesh). The area is endowed with good infrastructure for manufacturing, servicing and marketing along with some functioning entrepreneurship parks. Consortium of Women Entrepreneurs of India (CWEI), FICCI Ladies Organisation (FLO), World Assembly of Small and Medium Enterprises (WASME), Federation of Women Entrepreneurs of India (FIWE), Rural Development and Self Employment Training Institute (Rudset-I) and Bhartiya Yuva Shakti Trust (BYST) were contacted to prepare a list of women headed enterprises operating in the region. A sample size of 206 women entrepreneurs formed the respondents.

Women headed/managed enterprises constituted units of investigation and women entrepreneurs were the respondents. The women entrepreneurs' experiences, their socio-economic and entrepreneurial antecedents yielded necessary data for the exploration. The data were collected through personal interviews. Appropriate standardized instruments were used to collect relevant data like Thematic Apperception Test (Mehta 1994), Personal Entrepreneurial Competence (PEC) instrument of ICECD, (1988), Muthayya (1971) and Empowerment Scale (Mehta, 1998). For measuring Entrepreneurial Performance, a scale was developed using The following dimensions: 1. Earning Profit (P); 2. Expanding Enterprise, growth, diversification or refinement of the products/services (G); 3. Increased Decision Making share (D.M.) ; 4. Autonomy Enhancement (A.E.) and 5. Importance granted to woman entrepreneur and her abilities by significant ones in her social space (R.M.).

The five point rating scale was constructed by framing 3 statements for each of the five performance indicators. Care was taken while framing the statements that they should adequately reflect the performance indicator unambiguously. The five indicators of the performance do not seem making uniform contribution to entrepreneurial performance. Hence their relative strength or weightage for making contribution to entrepreneurial performance was sought from judges from the discipline. The ranks assigned by them were averaged which determined the relative strengths of each indicator. The obtained scores from respondents were multiplied by the judges rating which gave the final score obtained by respondent for particular indicators of entrepreneurial performance.

$$E.P. = (P \times W_1) + (G \times W_{2-} + (D.M. \times W_3) + (A.E. \times W_4) + (R.M. \times W_5)$$

where EP denoted Entrepreneurial Performance; P, Profit score of a respondent; G, Growth score; D.M., decision making score; A.E., Autonomy Enhancement score and R.M., role model score; where as W_1, W_2, W_3, W_4 and W_5 denoted respective average weightages given by judges.

The data collected were scored, tabulated and categorized. These were subject to appropriate methods of analyses, *viz*, empirical, content and logical as per the objectives of the study. Statistical tools like median, range, quartiles, quartile deviation paired t - test and correlation etc. were used to comprehend and interpret the data in a meaningful way.

RESULTS AND DISCUSSION

Profile of a Woman Entrepreneur

Women entrepreneurs were categorized as low profit earners (LPE) and high profit earners (HPE) on the basis of their earnings from their enterprises. 105 respondents were found to be earning low comparatively in the range of Rs. 2000-Rs.7000 per month. Another 101 respondents were high profit earners with monthly earnings in the range of Rs.8000-Rs. 80,000. Majority of women entrepreneurs (69.9%) were found to be middle aged, 31-50 years of chronological age. Further, high profit earners were slightly older as compared to low profit earners. A large majority of women entrepreneurs (65.5%) were married, 26.7 per cent of total respondents were either divorcees or widows and only 7.8 percent unmarried girls had established their own units. Women entrepreneurs in general were educated, 51.9 per cent being graduates/post graduates and over 40 per cent school certificate holders. Only 6.8 per cent were school dropouts. More HPE members were found to be graduates than LPE members. Women entrepreneurs either acquired knowledge through informal training

within their family, neighbourhood or among relatives, or enrolled for formal training courses to upgrade their skills and knowledge. Some of them also worked as apprentices in a similar enterprise and got hands-on-the-job training. Majority (70.9%) underwent formal training while 29.1 per cent acquired skills informally. More than half of the respondents (55.8%) underwent pre enterprise training course whereas 24.3 per cent underwent on-the-job-training. Most common family type of women entrepreneurs was nuclear and family size was small comprising of upto four members. Low profit earners were from medium sized families whereas high profit earners had small families. Women entrepreneurs came from service or agricultural family backgrounds. Low profit earners were from agriculture background whereas high profit earners' family background was that of secondary occupations like service or business. 72.3 per cent women entrepreneurs selected their enterprises independent of the occupations of their birth or marital families. The LPE members moved away from the businesses pursued by their families as compared to high profit earners who took up similar enterprises as their family was pursuing. As existing businesses of LPE families were giving low returns, they moved away from those and selected new enterprises of their own. Most women entrepreneurs (73.3%) belonged to upper castes and only 21 per cent were from lower castes. Women entrepreneurs were distributed almost evenly among the four quartiles of socio-economic-status scores with range from 6 to 171. Low profit earners were found slightly lower on scale as compared to high profit earners who scored high on SES scales.

Entrepreneurial traits

Women entrepreneurs were scored on Entrepreneurial Competence Scale whereby thirteen entrepreneurial traits were studied. Entrepreneurial traits like initiative, opportunity seeking, self-confidence, persuasion ability, assertiveness, influence, persistence, information seeking, concern for high quality (quality consiousness), commitment, sense of efficacy, systematic planning and problem solving form the scale. The respondents were found to possess good entrepreneurial competence in general.

Table 1. Profile of women entrepreneur

(N= 206)

		LPE		HPE		Total	
		Freq.	%	Freq.	%	Freq.	%
	Age (years)						
1.	Upto 30 (young)	34	32.4	13	12.9	47	22.8
2.	31-50 (middle aged)	65	61.9	79	78.2	144	69.9
3.	51 and above (elderly)	6	5.7	9	8.9	15	7.3
	Mean age in years	34.55		38.48			
	Marital Status						
1.	Married	64	60.95	71	70.3	135	65.5
2.	Unmarried	9	8.6	7	6.93	16	7.8
3.	Widow	4	3.8	5	4.95	9	4.4
4.	Divorcee/Separated	28	26.7	18	17.82	46	22.3
	Educational Status						
1.	Can read & write	4	3.8	4	3.96	8	3.9
2.	Primary	3	2.9	3	2.97	6	2.9
3.	X pass	10	9.5	8	7.9	18	8.7
4.	XII pass	37	35.2	39	29.7	67	32.5
5.	Graduate	38	36.2	41	40.6	79	38.3
6.	Postgraduate	13	12.4	15	14.9	28	13.6

	Training Received						
1.	Informal training only	18	17.1	42	41.6	60	29.1
2.	Formal Training	87	82.9	59	58.4	146	70.9
	a) Pre enterprise	61	58.1	35	24.7	96	46.6
	b) On the job	18	17.1	13	12.9	31	15.1
	c) Pre enterprise as well as on the job training received	8	7.7	11	10.9	19	9.2
	Family Type						
1.	Nuclear	81	77.1	80	79.2	161	78.2
2.	Joint	24	22.9	21	20.8	45	21.8
	Family Size						
1.	Small (Upto 4 members)	42	40.0	51	50.5	93	45.1
2.	Medium (5-6 members)	45	42.9	39	38.6	84	40.8
3.	Large (>6 members)	18	17.1	11	10.9	29	14.1
	Occupations						
1.	Service only	7	6.7	19	18.8	26	12.6
2.	Business only	9	8.6	17	16.8	26	12.6
3.	Agriculture only	37	35.2	5	4.9	42	20.4
4.	Labourer only	15	14.3	1	0.9	16	7.8
5.	Service major	22	20.9	44	43.5	66	32.0
6.	Business major	3	2.9	3	2.9	6	2.9
7.	Agriculture major	12	11.4	12	11.9	24	11.6
	Occupation Related to						
1.	Family (born)	9	8.6	24	23.8	33	16.0
2.	Family (married)	4	3.8	20	19.8	24	11.7
3.	Not related to either	92	87.6	57	56.4	149	72.3
	Caste						
1.	Upper caste	82	78.1	69	68.3	151	73.3
2.	Backward caste	9	8.6	11	10.9	20	9.7
3.	SC/ST	9	8.6	14	13.9	23	11.2
4.	Minority community	5	4.8	7	6.9	12	5.8
	Social Participation (No. of Organization)						
1.	Only one	100	95.2	91	90.1	191	92.7
2.	Two	3	2.9	7	6.93	10	4.9
3.	More than two	2	1.9	3	2.97	5	2.4
1.	As member	105	100.0	101	100.0	206	100.0
2.	As activist	8	7.6	6	5.9	14	6.8
3.	As office bearer	6	4.8	6	5.9	11	5.3
	Total	**105**	**100.0**	**101**	**100.0**	**206**	**100.0**

Table 2. Quartile distribution of respondents as per entrepreneurial competence scores

Quartile	Score	LPE		HPE		Total	
		Freq.	%	Freq.	%	Freq.	%
I	Upto 221	34	32.4	20	19.8	54	26.2
II	222 to 241	29	27.6	31	30.7	60	29.1
III	242 to 251	22	20.9	27	26.7	49	23.8
IV	252 to 277	20	100.0	101	100.0	2036	100.0
	Total	105	100.0	101	100.0	206	100.0

Intrinsic difference was found between low profit earners and high profit earners in this aspect. Of all the thirteen traits, high profit earners lagged behind low profit earners in terms of persistence, concern for quality and commitment. Initiative, sense of efficacy and systematic planning were found to be much below in both the groups.

In terms of seven traits out of thirteen, low profit earners lagged behind high profit earners. These traits were initiative, sensing of opportunities, information seeking, problem solving, self-confidence, assertiveness, persuasion ability and influence.

Entrepreneurial performance

Mean entrepreneurial performance of all the respondents was found to be 193.1 which were above the obtainable mean value of 144 indicating that women's average entrepreneurial performance was towards the high side. As far as earning profit dimension of performance was concerned, most women entrepreneur's profit earning performance was found to be very good. HPE members were way ahead of LPE in this aspect.

A large member of women had fair performance in terms of enterprise growth with scores ranging from 24 to 37. The women usually improved their products or services rather than expanding or volume increasing of enterprises which they kept in abeyance till they consolidate their existing business. In this dimension also, HPE members were found superior than LPE members who for obvious reasons of capital inadequacy could not grow their enterprises.

More than half (51.4%) women entrepreneurs reported increased decision making responsibility being bestowed on them in recognition of their success as entrepreneurs. This social dimension was important from the point of view of women who thought that their credibility has increased after seeing their ability to earn. Thus it also emerged as an important indicator of entrepreneurial performance. HPE entrepreneurs scored better in this aspect as well than LPE members.

Autonomy enhancement also occurred for most women entrepreneurs who obtained fair to very good scores on the scale. As a consequence of success of their enterprise, their dependency level on others declined considerably, though scope for more improvement in this aspect was found for both LPE and HPE members.

As their enterprises started doing well, most entrepreneurs were respected and others came to them for advice. Younger ones started treating them as role models. All women entrepreneurs were found to experience an increase in their status and credibility. Negligible relationship was found between entrepreneurial performance and socio-psychological characteristics of women entrepreneurs like socio-economic status, aspiration, orientation to social values, entrepreneurial competence, empowerment and need for achievement. Low aspiration on part of low profit earners impacted their entrepreneurial performance adversely.

Orientation to social values and entrepreneurial performance were also found to be related only slightly. Attachment to social value of economic independence was very strong and may have brought in a kind of satiety where the women entrepreneurs stop thinking about growth and diversification of their enterprises. As soon as they start earning profit and have money, low profit earners were found to think less about increased recognition and status. This was found to be more pronounced in case of high profit earners as compared to low profit earners.

Table 3. Socio-psychological variables (factors) and entrepreneurial performance of the respondents – relational analysis

No.	Socio-psychological factors	Entrepreneurial performance		Total response on
		LPE (r value)	HPE (r value)	
1.	Socio-economic status	-0.1873	0.0372	-0.05068
2.	Aspiration	-0.0111	0.0747	-0.00233
3.	Orientation to social values			
	a) Bread earning restrictions	-0.0734	0.0477	0.00711
	b) Interaction restrictions	-0.0012	0.0787	-0.009829
	c) Economic independence	-0.0197	-0.1574	0.04345
	d) Empowerment	0.0744	-0.0933	-0.01987
4.	Entrepreneurial Competence			
	a) Initiative	-0.0345	0.0990	-0.0201
	b) Seeks opportunity	0.0071	0.0601	-0.03437
	c) Persistence	0.0851	0.1351	-0.02316
	d) Information seeking	0.0010	-0.0837	-0.011295
	e) Quality concern	-0.1629	0.0705	-0.06182
	f) Commitment	-0.0511	0.0171	0.0053
	g) Sense of efficacy	-0.0049	0.0331	0.0417
	h) Systematic planning	0.0320	-0.0374	-0.00953
	i) Problem solving	0.1165	0.0224	0.024515
	j) Self confidence	0.0650	0.0273	0.08155
	k) Assertiveness	0.0404	0.1404	-0.08329
	l) Persuasion	0.0788	0.1671	-0.11217
	m) Influence	-0.0540	0.0529	-0.03511
	n) Entrepreneurial competence	0.0485	0.1157	-0.08935
5.	a) Autonomy vs dependence	0.0075	0.0650	-0.0041569
	b) Self esteem vs self depreciation	0.1454	0.0413	-0.06587
	c) Repetitive vs reflective behaviour	-0.0618	0.0388	-0.093698
	d) Empowerment quotient	-0.1110	0.0777	-0.08398
6.	Need for achievement	-0.0586	0.1028	0.104941

Eight entrepreneurial traits out of thirteen, namely, initiative, opportunity seeking, information seeking, commitment, sense of efficacy, systematic planning, influence and self confidence were found to be missing from the consciousness of women entrepreneurs as far as their contribution towards entrepreneurial performance was concerned. There is need to make these women aware of their importance through appropriate training interventions. Training programs specially designed to give importance to these aspects of competence may be designed for women entrepreneurs as their absence proves to be adversely affecting the overall entrepreneurial performance.

Entrepreneurial performance and empowerment were found to be inversely correlated, though of negligible proportion as per the statistical standards. This may be because as women are more autonomous than dependent, have higher self-esteem than self-depreciating behaviour and possess more reflective thinking than repetitive behaviour, they become less inclined to involve other's help in achieving their objective.

Entrepreneurial performance was positively correlated to motivational status of women entrepreneurs. High motivational status of women entrepreneur resulted into higher performance.

Nature and extent of societal support

Government and non-governmental efforts in supporting women entrepreneurship are worth applauding. The support is of seven types, in the form of finance or credit support, motivational training support, skill based product training, provision of marketing avenues, infrastructural support, mentorship guidance and finally recognition in the form of awards. Finance support is provided in terms of loans, subsidies, sales tax waiver and special rates of interest on loans for women entrepreneurs. Many schemes and special programmes have been formulated but most women entrepreneurs were unaware of all these. Though these kind of support exist, most of the women entrepreneurs expressed ignorance about them indicating that there is need to publicize these measures more among the target groups. For this media must also be involved for creating mass awareness.

Problems faced by women entrepreneurs

The major problems which women entrepreneurs faced were lack of resources, lack of awareness, dual responsibility, poor family support, mobility constraint, marketing woes, non-payment by clients and non-availability of a guarantor. Besides these, the threat of competition by local entrepreneurs and as a consequence of the liberalization of economy, the entry of global players also poses a serious threat to small time entrepreneurs.

Besides listing out problems as above, women entrepreneurs voiced some concerns which could be termed as threats which they usually felt. The major threat mentioned by them was competition. It was experienced as less demand due to mushrooming of similar units by tiny and cottage enterprises. Others felt competition from

Table 4. Distribution of respondents as per the problems faced by women entrepreneurs

Problems	LPE		HPE		Total	
	Freq.	%	Freq.	%	Freq.	%
Lack of resources	82	78.1	74	73.3	156	75.7
Lack of awareness	48	45.7	29	28.7	77	37.4
Dual responsibility	23	21.9	25	24.8	48	23.3
Poor family support	52	49.5	54	53.5	106	51.5
Mobility constraint	45	42.9	46	45.5	91	44.2
Marketing constraint	45	42.9	60	59.4	105	50.9
Non-payment by clients	15	14.3	12	11.9	27	13.1
No guarantor available	25	23.8	21	20.8	46	22.3
Total	105	100.0	1201	100.0	206	100.0

bigger industrial units with economic scale of production. It was observed that big unit competition was more in case of manufacturing sector while small and similar unit's competition was more in trading and service sectors. All the respondents who were into manufacturing soft toys and dolls puppets lamented the flooding of market with cheaper similar stuff from China. They highlighted that for an average sized stuffed teddy bear, the cost of manufacturing comes around sixty rupees but the selling price they get by shopkeepers in the market is usually much lower ranging from Rupees 20-50 per piece. Chinese products were better looking and available at lower price, thus customers also want them and shopkeepers stock them. The threat of competition was plaguing almost all women entrepreneurs but more so for those making soft toys and dolls.

CONCLUSION

Understanding of the whole processs of entrepreneurship development among women with the facilitators and inhibitors give us a holistic view of the subject. Training programmes may be designed to promote entrepreneurship among women. These may include process and product based courses whereby women may be encouraged to learn knowledge, skills and abilities to run a business. The self-sphere of women entrepreneurs, their motivational level, their entrepreneurial competence, major mobilizing forces, aspirations and sense of efficacy has been found related to their performance/ success. These must be enriched through specially designed behavioural training programmes. The role of initiative, persuasion, problem solving, sensing opportunities, information seeking and other entrepreneurial competencies is important. Special attention to the needs of low profit earners may be given while designing and implementing the training programmes. It is recommended to enhance the awareness regarding various components of motivation so as to heighten the motivational level of women entrepreneurs through behavioural interventions. Entrepreneurs must be able to visualize impending danger, be vigilant, take anticipated action, be able to exert influence and think of overall social well being through their endeavours. Behavioural trainers may be involved to spread awareness and develop these abilities among women entrepreneurs.

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Extent of People's Participation in Soil and Water Conservation Programme

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ABSTRACT

People's participation in natural resources conservation programme like watershed development is utmost important at different stages such as programme planing, implementation and maintenance. It is a collective effort by the local people for sharing common benefits. The study was conducted during 1998-2001 in the Integrated Wasteland Development Project (IWDP), Antisar Watershed, located in Kapadwanj Taluka of Kheda district in Gujarat state of India to measure the extent of people's participation in watershed development programme. A detailed structured three-point- continuum schedule was developed by the investigators regarding people's participation in soil and water conservation programme for watershed development as well as a people's Participation Index (PPI) was developed under the study to compute the extent of people's participation. The overall extent of people's participation in the Soil and Water Conservation (SWC) programme of Antisar Watershed development was 71.55 per cent. The extent of people's participation in the Antisar watershed development programme was of high level.

People's participation at the time of preparing a watershed development programme is very much needed to take decisions because the programme should meet the basic needs of the majorty of the local people like supply of drinking water, fodder for cattle and fuel for kitchen. The watershed development programmes are made for local people; hence the local people should take interst and participate in implemention of programme by contributing labour and money in construction of soil and water convervation structures on their field and common land. Participation in maintenance is required because without protection and care by the local people the programe will not be successful. The involvement of local people in evaluation of programe is also necessary, so that it may provide points to be considered for improving in future programme planning. The present research study was framed to measure the extent of people's participation in soil and water conservation programme for sustainable production in the watershed.

METHODOLOGY

The study was conducted during 1998-2001 in the Integrated Wasteland Development Project (IWDP), Antisar watershed purposively, because the Antisar development programme was sanctioned by the Ministry of Rural Area and Employment, Govt. of India, to the Central Soil and Water Conservation Research and Training Institute, Research Centre, Vased.The study was taken with the main objective to find out the extent of people's paraticipation in soil and water conservation in the Antisar watershed development programme. The Antisar watershed farms and 76 hectares is owned by Panchayat community/Government. Antisar watershed is under Kapadwanj Taluka of Kheda district in Gujarat of India.

The population of the study consisted of all the farmers who possesed land in the Antisar Watershed areas. Therefore, all the 284 farmers of Antisar watershed area were considedred as the sample for the study. Hence, it was a population study.

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A detailed structured three-point continuum schedule was develoed by the investigators to assess the extent of people's participation in soil and water conservation programme. The responses of the respondents were recorded in the especially developed three-point continuum scale i.e. great extent, some extent or never and scores were assigned as 3,2 and 1 respectively.

Statement Intensity Index:

Statement Intensity Indices (SII) were calculated for people's participation in planning, implementation and maintenance of soil and water convervation programme suggested by Bagdi (2002):

$$SII = \frac{\sum_{I=1}^{N} X_i}{N}$$

where,

SII = Statement Intensity Index

$\sum_{I=1}^{N} X_i$ = Sum of total scores of ith respondents towards a particular statement.

N = Total number of respondents

The level of participation for each activity or statement was decided as following criteria:

Range of SII	Participation level
1.00 to 1.59	Less participation
1.60 to 2.59	Moderate participation
2.60 to 3.00	More participation

People's Participation Index (PPI):

The overall extent of people's participation in SWC programme in Antisar watershed was measured by the Prople's Participation Index (PPI) as given below (Bagdi, 2002):

$$PPI = \frac{\text{Mean Participation Score (P)}}{\text{Maximum Participation Score}} \times 100$$

where,

$$P = \sum_{i=1}^{N} P_i / N$$

where,

N = Total number of respondents

$$P_i = \sum_{j=1}^{K} \left(PP_j + PI_j + PM_j \right)$$

where,

PP_j = Total scores of people's participation in programme planning

PI_j = Total scores of people's participation in programme inplementation.

PM_j = Total scores of people's participation in programme maintenance.

K = Total number of statements on which responses of the respondents were recorded.

Categorization of PPI

The overall people's participation index in a particular watershed development programme can also be categorized into three categories as suggested by the authors based on the normal distribution curve values as given below.

Sr. No.	Normal distribution curve range	PPI value range	People's participation category
1.	<Mean – S.D.	0 to 34.13	Low level
2.	Mean ± S.D.	34.14 to 68.26	Moderate level
3.	>Mean + S.D.	68.27 to 100	High level

RESULTS AND DISCUSSION

People's participation in planning stage

The data in Table 1 reveal that fifty per cent or more of the respondents participated to a great extent in the activities related to the planning of the SWC programme such as suggesting ideas during planning of Check dams (76.76%), participating in planning meetings of the Soil and Water Conservation (SWC) programme (76.05%) and motivating fellow farmers to participate in planning (55.63%). Some fifty per cent or more of the respondents participated in planning of SWC programme to some extent in the matters like planning of fruits plantation (66.20%), giving suggestions to be considered in planning (54.93%) and suggesting ideas in planning of

Table 1. Statement wise percentage distribution and intensity indices according to the extent of farmer's participation in programme planning stage.

(N-284)

S. No.	Statements (Activities)	GE* (%)	SE* (%)	LE/N* (%)	SII**
1.	Participate in planning meetings of Soil and Water Conservation (SWC) programme.	76.05	18.31	5.64	2.70
2.	Suggest ideas during planning of Check dams.	76.76	15.49	7.75	2.69
3.	Motivate fellow farmers to participate in planning	55.63	31.69	12.68	2.42
4.	Give suggestions for inclusion in planning	26.05	54.93	19.02	2.07
5.	Suggest ideas in planning of land leveling works.	35.21	36.62	28.17	2.07
6.	Share experience about soil and water conservation with your fellow farmers after participation in planning meetings.	32.39	42.96	24.65	2.07
7.	Suggest ideas in planning of agricultural crop cultivation	25.35	50.71	23.94	2.01
8.	Participate in planning of fruits plantation.	17.60	66.20	16.20	2.01
9.	Suggest information in planning of forest trees plantation.	33.80	31.69	34.51	1.99
10.	Contact the Programme Implementing Agency (PIA) about primary needs fuel, fodder and food to be taken care of in the planning.	34.51	11.97	53.52	1.80

*GE= Great Extent; *SE= Some Extent; *LE/N= Least Extent/No; **SII= Statement Intensity Indices

agricultural crops cultivation (50.71%). Fifty per cent or more of the male respondents participated in planning of SWC programme to the least extent or never in activities such as contacting the Programme Implementing Agency (PIA) about primary needs for food, fodder and fuel to be taken care of in the planning (53.52%).

The data further revealed that the intensity indices of people's participation in the programme and its planning, as the respondents reported, ranged from 1.80 to 2.70. The respondents showed high intensity indices in the soil and water conservation programme planning activities as participating in planning meetings of the SWC programme (2.70) and suggesting idea in planning of check dams in their fields (2.69). The respondents showed moderate intensity indices in the activities of planning of the soil and water conservation programme such as motivating fellow farmers to participate in planning of SWC programme (2.42), suggesting information to be considered in planning of the SWC prgramme (2.07), suggesting ideas for planning of land leveling works carried out in the different fields of the watershed area (2.07), share information or experience about soil and water conservation with their fellow farmers after participation in planning meetings (2.07), participating in planning of fruits plantation work (2.01), suggesting ideas in planning of agricultural crops cultivation in the watershed area (2.01), suggesting information in planning of forest trees plantation work (1.99) and contacting the Programme Implementing Agency (PIA) about primary needs such as fuel, fodder and food to be taken care of in the programme planning (1.80).

The overall extent of the people's participation in the programme planning stage, as explained by the respondents was analysed with the help of the People's Participation Index (PPI) and it was found 72.60 per cent, showing high level of participation in SWC technologies.

People's participation in implementation stage

Fifty per cent or more of the respondents participated in implementation of SWC programme to a great extent in the activities as allowing Programme Implementing Agency (PIA) to implement soil and water conservation programme works (83.09%) and asking fellow resource users to contribute with labour and money contribution towards construction of structures (62.68%) (Table 2).

Table 2. Statement wise percentage distribution and intensity indices of the extent of people's participation in the SWC programme implementation stage

(N=284)

S. No.	Statements (Activities)	GE* (%)	SE* (%)	LE/N* (%)	SII**
1.	Allow Programme Implementing Agency (PIA) to implement soil and water conservation programme works.	83.09	12.68	4.23	2.78
2.	Ask fellow resource users for labour and money contribution towards construction of structures.	62.68	17.60	16.72	2.42
3.	Help during plantation work of forest plants.	40.14	31.69	28.17	2.11
4.	Help in plantation work of forest plants.	40.14	31.69	28.17	2.11
5.	Provide any material to help construction of soil and water conservation structures	17.61	64.79	17.60	2.00
6.	Provide equipment to the PIA during construction of soil and water conservation measures.	42.96	13.38	43.66	1.99
7.	Provide help during purchase of materials.	35.27	28.17	36.62	1.98
8.	Contribute money in construction of SWC structures.	33.10	28.87	38.03	1.95
9.	Contribute labour in construction of SWC sturctures.	28.87	31.69	39.44	1.89
10.	Participate in training programme on the soil and water conservation programme organized by the PIA.	7.75	65.49	26.76	1.80

*GE= Great Extent; *SE= Some Extent; *LE/N= Least Extent/No; **SII= Statement Intensity Indices

Fifty per cent or more of the respondents participated in implementation of SWC programme to some extent in the matters like participating in training on the soil and water conservation programme organized by the PIA (65.49%) and providing material to help construction of soil and water conservation structures (64.79%).

Forty per cent or more of the respondents participated in implementation of SWC programme to the least or no extent in the activities as helping during plantation work of fruit plants (43.94%) and providing equipment to the PIA during construction of soil and water conservation measures (43.66%).

Table 2 further showed that the intensity indices of participation in the programme at the stage of implementation on the part of the respondents ranged from 1.80 to 2.78. The respondents showed high intensity index for the activity of allowing programme implementing agency to implement SWC programme works (2.78). This indicated that the respondents contributed to this activity of the SWC programme during implementation with high level participation.

The respondents showed moderate level of participation in the activities of the soil and water conservation programme during implementation stage as asking fellow resource users to contribute with labour and money towards construction of SWC structures (2.42), helping during plantation of fruit plants (2.12), providing help in plantation of forest plants (2.11), providing material to help construction of SWC stuctures (2.00), providing equipment during construction of SWC measures (1.99), providing help during purchase of construction materials (1.98), contributing with money in construction of SWC structures (1.95), contributing with labour in construction of structures (1.89) and participating in training programme on the soil and water conservation technologies organized by PIA (1.80).

The overall extent of the respondents' participation in the programme at the stage of its implementation was calculated also with the help of the PPI and it was found to be 69.29 per cent. It means that level of participation of farmers in the implementation stage was also high.

People's participation in maintenance stage

The data in Table 3 revealed that forty per cent respondents participated in maintenance of the SWC programme to a great extent in the activities like protecting the forest plantation done in the watershed area (72.57%), contributing with money towards repair and maintenance of SWC structures (55.63%), protecting the SWC structures from natural calamities (41.55%) and caring of forest plants and fruit plants during summer by providing adequate irrigation (40.84%). Forty per cent or more respondents participated in maintenance of the SWC programme to some extent in the activities such as protecting fruit plants grown in the watershed area (65.49%), motivating fellow farmers to extend contribution with labour to the repair and maintenance of SWC structures in the watershed (44.37%), inform the PIA officers to repair the damage SWC structures (42.25%) and motivating fellow farmers to extend contribution with their money to repair and maintain SWC programme to the least extent or never in the activities like taking care of forest plants and fruit plants during the summer by providing adequate irrigation (39.44%) and consulting the programme implementing agency to learn about repair and maintenance of conservation structures (35.21%).

The data further showed the intensity indices of participation in programme maintenance stage by the respondents. It ranged from 2.01 to 2.62. The respondents showed high participation level in the activity of protecting forest plantation done in the watershed area from animals (2.62). The respondents showed moderate participation level in the activities of the soil and water conservation programme at the maintenance stage such as contributing with money towards repair and maintenance of SWC structure in their field (2.35), protecting SWC structures from the natural calamities (2.21), informing PIA officers to repair the damaged SWC structures (2.19), motivating fellow farmers to extend contribution with their labour to the repair and maintenance of SWC structures (2.11), contributing with labour to repair and maintenance of SWC structures (2.07), consulting the PIA to learn more about the repair and maintenance of conservation stuctures (2.02) and take care of the forest and fruit plants during summer by providing irrigation (2.01). It means respondents moderately participated labour and money in repair and

Table 3. Statement wise percentage distribution and intensity indices of the extent of people's participation in programme at the maintenance stage

(N=284)

S. No.	Statements (Activities)	GE* (%)	SE* (%)	LE/N* (%)	SII**
1.	Protect the forest plantation done in the watershed areas.	72.54	17.61	9.85	2.62
2.	Contribute money towards repair and maintenance of SWC structures.	55.63	24.65	17.72	2.35
3.	Protect the SWC structures from natural calamities.	41.55	38.73	19.72	2.21
4.	Inform the PIA officers to repair the damaged SWC structures.	38.73	42.25	19.01	2.19
5.	Motivate fellow farmers for labour contribution towards repair and maintenance of SWC structures in the watershed.	35.21	44.37	20.42	2.14
6.	Protect fruit plants grown in the watershed ares.	23.24	65.49	11.27	2.11
7.	Motivate fellow farmers for money contribution towards repair and maintenance of SWC structures in the watershed.	35.21	40.85	23.94	2.11
8.	Contribute own labour towards repair and maintenance of SWC structures.	35.92	35.21	28.87	2.07
9.	Consult with the programme implementing agency to learn about repair and maintenance of conservation structures.				
10.	Take care of the forest and fruit plants during summer by providing irrigation.	40.84	19.72	39.44	2.01

*GE= Great Extent; *SE= Some Extent; *LE/N= Least Extent/No; **SII= Statement Intensity Indices

maintenance of structures in their fields and also protected plantations.

The overall extent of people's participation in the SWC programme maintenance stage was also calculated with the help of the PPI as 72.76 per cent. It showed that farmers exhibited high level of participation during maintenance stage of SWC programme.

The overall extent of people's participation in the Soil and Water Conservation (SWC) programme of Antisar watershed development during planning, implementation and maintenance stages was calculated 71.55 per cent with the help of PPI and it shows that the farmers exhibited high level of participation during Antisar watershed development programme.

CONCLUSION

It can be concluded that the respondents participated highly in the SWC programme planning meetings and suggested ideas in planning of Check dams in their fields. Respondents had high participation in the activities related to the SWC programme during implementation stage and they contributed material, labour and money in construction of structures, provided help during plantation works in watershed. Respondents also had high level of participation in the soil and water conservation programme maintenance activity of protecting forest plantation done in the watershed area from animals.

The implications drawn from this study are: i) Bottom-up approach should be adopted in soil and water conservation programme on watershed basis. The soil and water conservation programme should be developed by the rural farmers, for the farmers and of the farmers. ii) Local people should be motivated and encouraged to contribute their own labour, money, implements and materials in construction of soil and water conservation structures during implementation and maintnance stage of the SWC programme.

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Workload of Tribal Farmwomen of Gujarat

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ABSTRACT

This study reports the workload of triball farmwomen in terms of nature of work, and time consumption. Fifty tribal farmwomen, randomly selected from Panchmahals district of Gujarat state, were the respondents. Data were collected through Participatory Rural Appraisal tool namely Daily Routine Schedule Tribal farmwomen spent 14 hours, 42 minutes on daily routine activities. Farm & animal management was the major consumer of their time (5 hours, 31 minutes), followed by home management (4 hours, 42 minutes), and self-care (2 hours, 44 minutes). Cleaning utensils, cooking and serving food, cleaning home, washing clothes, fetching water were the major household activities. The farm activities were weeding, irrigation, manure application, harvest, post harvest operations, *etc.* Feeding and milking buffaloes were the major animal managements activities, followed by tying, cutting grass, cleaning cattle yard, etc. The childcare activities were getting them ready for school, sending them to school, feeding, *etc.* The leisure activities were taking rest and gossiping. Major self-care activities were eating, getting ready, and praying.

Tribal farmwomen work 24 X 7 with no holidays, and no weekly off. They delicately balance their household chores and farm work. Household activities range from cleaning, cooking food, to caring children. Beside household duties, they provide a lending hand to farm men in farming like contribution of labour towards transplanting, weeding, manure application, harvest, post harvest operations, animal husbandry, *etc.* Household and farm are mutually interactive, complementing each other, former providing labour and later providing meaningful employment, food for human beings, fodder for animals. It is imperative to understand the nature of duties performed and time spent on each activity in order to assess the workload. It provides the vital information for planned organizational intervention in the form of generation of gender-friendly technologies, knowledge and skill empowerment of tribal farmwomen, and so on. Women influence well-being of their families, communities and local natural resources, and women's deprivation and inequities affect well-being of those institutions and resources which they influence (Mukherjee, 1997). Innumberable development projects, government programmes, research studies, and theoretical models have demonstrated that the improvement of women's access to agricultural research and extension services must being with an analysis of men's and women's participation in the agricultural production process along two related dimensions: their role in agriculture and their role in the household (Jiggins *et. al.*, 1997). Hence this study is undertaken to enumerate the daily routine activities performed by the tribal farmwomen, and time spent on each activity.

METHODOLOGY

The study was conducted in Panchmahals district of Gujarat state during April- September 2004. Five villages were randomly selected and from each village 10 tribal farmwomen were randomly selected. Finally, 50 tribal farmwomen were the respondents of the study. They were interviewed at their home using the Participatory Rural Appraisal tool namely Daily Routine Schedule.

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RESULTS AND DISCUSSION

Daily routine of tribal farmwomen

Based on the performance of a particular activity, at particular time, by the majority of the tribal farmwomen, a daily work schedule was constructed and presented in Table 1. A typical day of the tribal farmwomen broke at the early morning 4 *a.m.* and spanned up to midnight. Early morning (4 *a.m.* to 6 *a.m.*) they got up, cleaned home, got ready, and milked buffaloes. During first couple of hours in the morning (6 *a.m.* to 8 *a.m.*) they prayed God, fetched water, washed clothes, attended miscellaneous household work, cooked, served and ate breakfast and tea. During the middle couple of hours in the morning (8 *a.m.*to 10 *a.m.*) they cleaned home, washed clothes, got children ready to school and prepared lunch. During the last couple of hours in the morning (10 *a.m.* to 12 noon) they sent children to school, went to farm, served and ate lunch, attended farm work. During afternoon (12 noon to 4 *p.m.*) they continued farm work, took rest, and fed water and grass to buffaloes. In the evening (4 *p.m.* to 8 *p.m.*) they cleaned home, secured and milked buffaloes, attended miscellaneous household work, and prepared supper. During night (8 *p.m.* to 12 midnight) they served and ate supper, cleaned utensils, attended miscellaneous household work, and went to bed.

In India, the ideal tribal farmwomen were the first member of the household to get up and the last member to go to bed. Their activities were manifold ranging from cleaning home, utensils and washing clothes; cooking and serving food; child care; farm hand; to feeding and milking buffaloes.

The activities performed by the employed women of United States of America on a working day were intimate relations, socializing, relaxing, pray/worship/ meditate, eating, exercising, watching TV, shopping, preparing food, on the phone, napping, taking care of children, computer/e-mail/internet, housework, working, and commuting (Kahneman *et. al.* 2004). Shah *et.al.* (1993& 1994) observed that the tribal farmwomen performed the routine activities cooking and serving the food, caring children, cleaning the house, fetching water, washing clothes, cleaning the utensils and shopping.

Time spent on daily routine activities

Table 2 revealed that tribal farmwomen spent 14 hours, 42 minutes on daily routine activities. Farm &

Table 1. Daily routine of tribal farmwomen

Time	Activities
4 a.m. to 5 a.m.	Gets up; cleans house
5 a.m. to 6 a.m.	Get up; gets ready; cleans home; milks buffaloes
6 a.m. to 7 a.m.	Gets ready; prays God; collects water; cooks, serves and eats breakfast and tea
7 a.m. to 8 a.m.	Cleans home; washes clothes; collects water; attends miscellaneous household work; prays god; serves and eats breakfast and tea
8 a.m. to 9 a.m.	Cleans home; washes clothes; prepares lunch
9 a.m. to 10 a.m.	Washes clothes; prepares lunch; gets ready children to school
10 a.m. to 11 a.m.	Sends children to school; goes to farm; serves and eats lunch
11 a.m. to 12 noon	Goes to farm; attends field work
12 noon to 1 p.m.	Attends field work; secures buffaloes
1 p.m. to 2 p.m.	Collects water; takes rest
2 p.m. to 3 p.m.	Feeds water to buffaloes
3 p.m. to 4 p.m.	Attends field work; feeds grass to buffaloes
4 p.m. to 5 p.m.	Attends field work; returns home
5 p.m. to 6 p.m.	Cleans home; milks buffaloes
6 p.m. to 7 p.m.	Prepares supper; attends miscellaneous household work; milk buffaloes
7 p.m. to 8 p.m.	Prepares supper; secures buffaloes
8 p.m. to 9 p.m.	Cleans utensils; prepares supper; attends miscellaneous home work; serves & eats supper
9 p.m. to 10 p.m.	Serves and eats super; goes to bed
10 p.m. to 11 p.m.	Attends miscellaneous household work; goes to bed
11 p.m. to 12 midnight	Goes to bed

Table 2. Time spent on daily routine activities

Activity	Time spent (minutes)
Home management	282
Farm & animal management	331
Childcare	43
Leisure	82
Self-care	144
Total	882

animal management was the major consumer of their time (5hours, 31 minutes), followed by home management (4 hours, 42 minutes), and self-care (2 hours, 24 minutes). They followed this schedule throughout the year with no break. Their daily routine involved house keeping, childcare, farm management and animal husbandry. They were the makers of the family, shapers of the next generation, managers of the home, labourers at farm, maintainers of animals.

The female heads of migrants in Banka district, Bihar state spent daily an average time of 9 hours on household; 6 hours, 8 minutes on farm; 1 hour, 24 minutes on dairy activities (Bala and Singal, 2003). During peak season the maximum time spent by rural women, of Parbhani, Nanded and Jalna districts in Maharashtra state, was in farming activities (3.01 hours), followed by kitchen work (1.56 hours), household work (1.49 hours), personal care (1.38 hours), and care of children and family members (1.37 hours), whereas during slack period maximum time was spent in kitchen work (2.18 hours), followed by household (2.05 hours) (Antwal and Bellurkar, 2000).

Home management

From Table 3 it was evident that tribal farmwomen spent 4 hours 42 minutes on home management activities. Cleaning utensils, cooking, cleaning home, washing clothes, fetching water were the major activities. Tribal farmwomen spent 1 hour, 29 minutes in cooking and serving food; 52 minutes in cleaning utensils; 42 minutes in cleaning home; 18 minutes in fetching water; 15 minutes in washing clothes.

Employed women of United States of America spent, mean hours / day, 1.1 on preparation of food, and 1.1 on housework (Kahneman *et. al*. 2004). The female heads of migrants in Banka district, Bihar state spent daily an average time of 3 hours, 16 minutes in cooking and serving food; 23 minutes in cleaning untensils; 39 minutes in fetching of water; 1 hour, 9 minutes in

Table 3. Time spent on home management activities

Activity	Time spend (minutes)
Cleaning home	42
Cleaning utensils	52
Washing clothes	15
Cooking and serving breakfast and tea	05
Cooking and serving lunch	44
Cooking and serving supper	40
Fetching water	18
Attending miscellaneous household work	66
Total	282

collection of fuel, wood twigs, *etc;* 2 hours, 4 minutes in collection of cow dung and preparation of cow dung cakes; 42 minutes in cleaning of house sweeping / mud plastering; 47 minutes in caring of clothes; 27 minutes in caring of family members; 47 minutes in social activities; 62 minutes in self-grooming (Bala and Singal, 2003). The rural women of Junagadh district, Gujarat state, spent, daily 6.23 hours in completing the household chores of which maximum time i.e. 2.53 hours were spent on cooking and serving food, very less time i.e. 17 minutes was spent in bringing water, weekly 2.85 hours of which 0.5 hour was spent in *ghee* making, 1.16 hours on plastering floors, and 1.19 hours on grain storage; seasonally 34-40 hours of which preparation of non-perishable food (Pickels, *dal, papad, masala, etc.*) accounted for 20-25 hours, and grain storage consumed 14-15 hours (Bariya and Thakkar, 2001 & 2002). Pre-cooking (56.5%), daily cooking (57.2%), post cooking (55.8%), collection of fuel wood (49.9%), fetching of water (54.0%), cleanliness of the home (57.1%), washing of clothes (57.9%), care of children (54.8%), care of elderly (43.6%), were performed by most of the rural women, of Karnal, Kurukshetra, and Hisar districts of Haryana state, always independently (Rani *et. al;* 2000) The women of *seervi* caste in Jodhpur district, Rajasthan state spent 21 per cent of time in household work during agriculture season and 33 per cent during slack season (Kavia and Tewari, 2000). Tribal farmwomen performed the routine activities cooking and serving the food, caring children, cleaning the house, fetching water, washing clothes, cleaning the utensils and shopping (Shah et. al. 1993&1994).

Farm and animal management

The data in Table 4 indicate that tribal farmwomen spent 5 hours 31 minutes on farm and animal management activities. Farm consumed 3 hours 17

Table 4. Time spent on farm & animal management activities

Activity	Time spent (minutes)
Attending field work	197
Cleaaning cattle yard	08
Milking buffalo	33
Cutting grass for cattle	10
Feeding water to buffalo	39
Feeding grass to buffalo	32
Tying buffalo	12
Total	331

minutes and animal husbandry took 2 hours 14 minutes. Tribal farmwomen spent 39 minutes in feeding water to buffalo; 33 minutes in milking buffalo; 32 minutes in feeding grass to buffalo; 12 minutes in tying buffalo; 10 minutes in cutting grass for cattle; 8 minutes in cleaning cattle yard. The farm activities were weeding, irrigation, manure application, harvest, post harvest operations, *etc.* Feeding and milking buffaloes were taking much of her time followed by typing, cutting grass, cleaning cattle yard, *etc.* These are economic activities. In farm they contributed as family labourer. Animal husbandry was the second important component in the dryland farming providing assured, sustainable, supplementary income to the farm family. Its role became primary during drought years. It played vital role in the food and nutritional security of the household by providing milk, egg, and meat. The white revolution in India was achieved primarily due to the contribution of millions of farmwomen who tended the cattle with care, supplied milk to the cooperative in a thoroughly professional manner.

The female heads of migrants in Banka district, Bihar state spent daily an average time of 6 hours, 8 minutes in farm activities 27 minutes in cleaning and bathing of animals; 25 minutes in cleaning of shed; 20minutes in cleaning of utensils for milking; 59 minutes in bringing of fodder from field; 33 minutes in chaffing, preparing and offering fodder to animal; 7 minutes in milking (Bala and Singal, 2003). The rural women of Junagadh district, Gujarat state, spent, 7.30 hours in harvest and post harvest operations, 7.21 hours in weeding, 5.31 hours in application of manure; 3.49 hours per day for animal based tasks of which 1.40 hours were spent in cleaning cattle shed dung collection, dung removing, making dung cakes, *etc.* (Bhariya and Thakkar, 2001 & 2002). The women of *seervi* caste in Jodhpur district, Rajasthan state spent 50 per cent of time in agricultural work in field during agriculture season; 8 per cent of time in cleaning and animal care during agriculture season and 29 per cent during slack season (Kavia and Tewari, 2000). The average hours spent per day in gathering fuel by women are 1-5 in Nepal; 3-5 in Bangladesh; 8 in Tanazania; 3.5 in Kenya; and 2.5 in peru (Mukherjee,1997). Farm women of Bolangir district, Orissa state spent majority of their time in harvesting (5.37 hours / week), planting (4.97 hours /week), weeding (3.93 hours/ week), collection of Mahua flower and seeds (1.81 hours / week), nursery raising and planting of Vegetables (1.77 hours / week), feeding of animals and poultry birds (1.22 hours / week), and preparation of farm yard and compost (1.18 hours / week) (Sadangi *et al.*, 1996).

Childcare

It was evident from table 5 that tribal farmwomen spent 43 minutes towards childcare. The childcare activities were getting them ready for school, sending them to school, feeding, *etc* Family was an institution. Mother played the primary role in physical and intellectual growth of the children. She sustained the *Homosepian* species on the earth. Thus mother acted as the builder of the society.

Employed women of United States of America spent 1.1 mean hours / day on taking care of the children (Kahneman *et. al.*, 2004). Rural women had medium level of knowledge about child food, child clothing and child health care (Patel *et. al.*, 1993& 1994)

Leisure

Table 6 revealed that tribal farmwomen spent 1 hour 22 minutes towards leisure. The leisure activities were taking rest and gossiping. Leisure was essential for relaxation in between the hectic schedule. This leisure could be better utilized by involving hobbies that are relaxing as well as income generating.

Employed women of United States of America spent, mean hours / day, 0.2 on intimate relations, 2.3 on socializing, 2.2 on relaxing,2.2 on watching TV, 0.4 on shopping, 0.9 on napping, and 1.9 on computer/e-mail/ internet (Khaneman *et al.*, 2004). The female heads of migrants in Bank district, Bihar state had 1 hour, 6 minutes on an average for lesiure (Bala and Singal, 2003). Women of Avale village, Murbad *Tehsil*, Thane district, Maharashtra state spent 3 hours everyday in bamboo work except during the cultivation period when such time for bamboo work was not avilable (Mukherjee, 1997).

Self-care

The dat in Table 7 indicate that tribal farmwomen spent 2 hours 24 minutes towards self-care. Major self-care activities are eating,getting ready, and praying. The time spent on each self-care activity was optimum

Employed women of United States of America spent, mean hours / day, 0.4 on pray/worship/meditate, 2.2 on eating and 0.2 on exercing (Kahneman *et. al.*, 2004).

Table 5. Time spent on childcare activities

Activity	Time spent (minutes)
Getting ready the children to school	19
Feeding children	07
Sending children to school	11
Helping children go to bed	06
Total	43

Table 6. Time spent on leisure activities

Activity	Time spent (minutes)
Taking rest	50
Gossiping	32
Total	82

Table 7. Time spent on self-care activities

Activity	Time spend (minutes)
Getting ready	32
Praying god	9
Eating breakfast and tea	28
Eating lunch	36
Eating supper	39
Total	144

CONCLUSION

Tribal farmwomen's daily routine involved house keeping, childcare, farm management and animal husbandry. Tribal farmwomen spent 14 hours, 42 minutes on daily routine activities. Farm & animal management ws the major consumer of her time (5 hours, 31 minutes), followed by home management. (4 hours, 42 minutes), and self-care (2 hours, 44 minutes). Cleaning utensils, cooking, cleaning home, washing clothes, fetching water were the major home activities. The farm activities were weeding, irrigation, manure application, harvest, post harvest operations, *etc.* Feeding and milking buffaloes were the major animal management activities followed by tying, cutting grass, cleaning cattle yard, *etc.* The childcare activities were getting them ready for school, sending them to school, feeding *etc.* The leisure activities were taking rest and gossiping. Major self-care activities were eating, getting ready, and praying.

Any planned intervention should accommodate the problems, priorities of tribal farmwomen and lessen their drudgery and complement and supplement their functional responsibilities in home management, farm & animal management, childcare, *etc.* Creation of income generating activities should fit in with their spare-time, local resources, their properties, *etc* It is essential to, empower the tribal farmwomen in knowledge, skill; facilitate them in creation, ownership, operation, maintenance and sustainment of assets.

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Adoption of Improved Management Practices of Sheep in the Semi-Arid Region of Rajasthan

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ABSTRACT

Sheep is an important source of livelihood for resource poor farmers in rural areas of arid and semi-arid region of Rajasthan. Adoption of improved sheep management practices bears pivotal role to improve the livelihood in such marginalised environments. This study was carried out to assess the knowledge level and adoption of improved sheep management practices and to identify the factors determining their adoption. The study utilizes field level data collected from 107 farmers of Tonk district of Rajasthan. The adoption of improved management practices was nearly 40 per cent only. More than 65 per cent farmers had knowledge regarding selection of superior breeding rams, vaccination against diseases, drenching the animals for control of parasites and washing the animals before shearing. Adoption of these technologies was also high. However, the adoption of exchange of breeding rams, fodder enrichment, supplementation with mineral mixture, treatment of anoestrous animals and grading of wool before marketing was low. The main factors determining the adoption were age of farmer, flock size and membership in farmers' organizations.

The role of livestock is increasing in Indian economy. It contributed to nearly 16 per cent of total income from agriculture in 1970-71, which increased to over 25 per cent in 2002-03. This will continue to be so in the coming period due to various economic factors like increase in the population, urbanization and per capita income growth. The role of livestock is much pronounced in the arid and semi arid regions like Rajasthan, which is prone to drought and resultant crop failure. At the time of crop failure, livestock sector acts as a cushion on which the farmers can fall upon. As per 2002 Livestock Census, Rajasthan had 10.9 million cattle, 10.4 million buffalo, 10.0 million sheep and 16.8 million goats. Sheep is one of the major livestock contributing to the livelihood security of farmers in Rajasthan. They can thrive well in adverse climatic conditions using sparse vegetation. The major sheep breeds are Chokla, Nali, Marwari, Magra, Jaisalmeri, Malpura, Sonadi and Pugal. Sheep are mainly reared by socially and economically backward people of the society for whom they act as a store of wealth of high liquidity, a resource for meeting the household nutritional security and a source of regular income. The farmers rear sheep mainly in an extensive management system using traditional management practices relying on common pasturelands for grazing. Various improved sheep management technologies were developed at the Central Sheep and Wool Research Institute, Avikanagar, Rajasthan to cater the needs of sheep farmers. They pertained to the broad areas of breed management, nutrition, health care, reproduction and product management. Adoption of improved management practices is expected to increase the income of farmers.

According to Rogers, "adoption is the mental process through which an individual passes from hearing about an innovation to final adoption". However, adoption of improved management practices of sheep in the field is low due to various reasons. Considering the importance of sheep in the livelihood of rural poor in marginalized environments as in Rajasthan, it is imperative to enhance the adoption of improved management technologies of sheep farming. However, such studies are lacking in literature and this paper intends to bridge that gap. In this backdrop the study was undertaken with the following objectives:

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1. To assess the knowledge regarding selected improved sheep management practices and the extent of its adoption in the semi arid regions of Rajasthan.
2. To examine the factors affecting the adoption of improved sheep management practices in semi-arid region of Rajasthan.

METHODOLOGY

Data source

The Transfer of Technology Division of Central Sheep and Wool Research Institute, Avikanagar undertakes field-testing of various technologies and management practices developed by the institute in selected villages. For this study, 20 villages from Malpura and Toda Raisingh tehsils of Tonk district of Rajasthan, which were to be adopted for the transfer of technology programme was purposively selected for bench mark information with each village forming a cluster. All the farmers from each cluster were personally interviewed using structured survey schedule during March 2005. The sheep management practices followed in the villages very well represents that followed in the semi-arid regions together.

Analytical methods

The knowledge and extent of adoption of improved management practices was captured with the help of a schedule developed by listing important management practices in consultation with subject matter scientists. Altogether 10 practices pertaining to breeding, feeding, health, reproduction and product management were identified. The level of adoption was measured by a choice response scale of three-point continuum as always, sometimes and never with the scores as 2, 1 and 0 respectively. The total adoption score obtained by each respondent was sum total of the responses for all the 10 practices and the adoption quotient was worked out for each respondent by following method:

$$\text{Adoption quotient (AQ)} = \frac{\sum_{i=1}^{10} AS}{20}$$

Where, AS = Adoption score

The Overall Adoption Index (OAI) was calculated as,

$$OAI = \frac{\sum_{i=1}^{N} AQ}{N}$$

where, N= Number of respondents

Determinants of adoption

Understanding the factors that affect the adoption is critical in formulating policies for effective technology dissemination. Adoption of technology is affected by a number of factors like the personal, farm and technology specific characters (Adesina and Zinnah, 1993 and Shakya and Flinn 1985). In this study we try to understand the factors determining the adoption of improved sheep management practices. Limited dependent variable provide excellent framework to study the adoption behaviour in agriculture. Some of the most appropriate models are Probit, Logit and Tobit. Tobit model (Tobin, 1958) is considered as most appropriate one, as it measures not only the probability that a farmer will adopt the technology, but also the intensity of use of technology once adopted. The Tobit model has the flexibility of censoring the lower limit and/or the upper limit of variables or any one of them and it uses maximum likelihood method to estimate the coefficients of the equation. The regression coefficients are asymptotically efficient, unbiased and normally distributed (Ramasamy *et al.*, 1999). However, our thrust was to identify the factors affecting the extent of adoption of the improved management techniques.

Following functional form is specified for Tobit model.

$$Y_i = X_i \beta \text{ if } I^* = X_i \beta + \mu i > T$$

$$= 0 \quad \text{if } I^* = X_i \beta + \mu i < = T$$

Where, Y is the probability of the farmers adopting the improved management practices, I^* is a non-observable latent variable and T is non-observed threshold level, where i_i is an independently normally distributed error term with zero mean and constant variance σ^2. The equation is a simultaneous and stochastic decision model. If the non-observed latent variable I^* is greater than T, the observed qualitative variable Y_i becomes continuous function of the explanatory variable, and zero otherwise. The empirical model used in the study is that the extent of adoption of the improved management practices depends on the farmer specific character like age, literacy, caste and membership in organization and farm specific characters like the size of operational holding and flock size. The literacy of the farmer was measured by using dummy variable of 1 for literate farmers and 0 for non-literate farmers. Similarly the membership in organization was also measured by dummy variable. The caste of the farmer was used in the regression analysis using dummy variables of 1 for forward caste, 2 for backward caste, 3 for scheduled caste

and 4 for scheduled tribe. Both joint and nuclear family type of household settlement are observed in the locality. The type of the family is used as an explanatory variable as it serves as a proxy for the potential household labour supply. The joint family was given a value of 1 and nuclear family a value of 0.

RESULTS AND DISCUSSION

Sheep farming in the locality is of extensive type depending on common pasturelands with minimum application of external inputs. The important socioeconomic variables of the farmers are given in Table 1. The average age of the farmers was nearly 45 years. The average size of operational holding was 5.00 ha, but the cultivability of the land is limited due to poor irrigation facility. Other than sheep, the farmers raise other livestock like cattle, buffalo and goat. The farmers were poorly developed in terms of literacy. The average literacy rate was 37 per cent only. The female literacy was much worse (below 10%). Joint family system is widely prevalent among sheep farmers of Rajasthan and it accounted for more than 53 per cent of total households. The average family size was 9.5 consisting of 4.8 males and 4.7 females.

Table 1. Important farm and family characters of the respondents

Particulars	Mean Value
No of farmers (no)	107
Average age of farmers (years)	44.5
Literacy (%)	37.4
Average size of operational holding (ha)	5.0
Sheep flock size (no)	54.3
Family size (no)	9.5
Proportion of joint family (%)	53.3
Average number of cattle (no)	2.6
Average number of buffalo (no)	3.4
Average number of goat (no)	6.7
Average of total livestock (no)	66.9
Average of adult cattle unit (ACU)(no)	19.3
Distribution of farmers under land category	
1. Landless (0 ha)	4.7
2. Marginal (0-1 ha)	10.3
3. Small (1-2 ha)	21.5
4. Semi-medium (2-4 ha)	26.2
5. Medium (4-10 ha)	21.5
6. Large (> 10 ha)	15.8

ACU is calculated as 1 cattle = 0.75 buffalo = 5 goat = 5 sheep

Knowledge level and adoption

Knowledge level and adoption of improved management practices by the farmers is given in Table 2. Use of superior breeding rams is pivotal to improve the productivity of the flocks. In order to have high conception rate and for producing healthy progenies, farmers select the breeding rams with certain characters. Nearly 70 per cent farmers knew the criteria for selecting superior breeding rams and almost 65 per cent farmers always adopt the selection procedure. However 30 per cent farmers seldom adopt any such practices. Hence it is necessary to impart the knowledge regarding the selection criteria of breeding rams to the farmers.

Exchange of rams is considered as a better management practice so that the inbreeding can be avoided. But only 21 per cent of farmers knew about such practices. Exchange of the rams requires a level of mutual understanding between the farmers. Usually the farmers are reluctant to share the breeding rams, which they consider superior. Nearly 80 per cent farmers never exchanged the breeding rams.

Enrichment of fodder is a way to mitigate the nutrient deficiency arising out of poor quantity and quality of fodder. Scientific technologies are available to enrich the fodder with nutrients so that the deficiency can be mitigated as well as fodder can be conserved for lean season. However, only 10 per cent farmers knew about such practices and almost 90 per cent farmers never adopted fodder enrichment techniques.

The main nutrition source for the sheep farming is common grazing land. Dry fodder like straw of Jowar and wheat are also sometimes fed to the animals. Supplementing the sheep with concentrate mixture and animals are found to improve the productivity of flock. But hardly 10 per cent farmers knew about this technology. Of this, only six per cent farmers always adopted this technology and almost 91 per cent farmers never supplemented concentrate mixture.

Knowledge about artificial insemination (AI) is very poor among the farmers. AI is used to spread the germplasm of superior breeding rams to a larger number of ewes so that the productivity can be enhanced. Non-

Table 2. Knowledge level and technology adoption

(No.)

	Technology	Knowledge level		Adoption		
		Yes	No	Always	Sometimes	Never
1.	Selection of rams	70.1	29.9	65.4	4.7	29.9
2.	Exchange of rams	20.6	79.4	9.3	11.2	79.5
3.	Fodder enrichment	10.3	89.7	8.4	1.9	89.7
4.	Supplementation	9.3	90.7	5.6	3.7	90.7
5.	Artificial insemination	4.7	995.3	0	0	100
6.	Treatment of anoestrous animals	9.3	90.7	5.6	3.7	90.6
7.	Vaccination	96.3	3.7	94.4	1.9	3.7
8.	Dipping/ drenching of animals	67.3	32.7	65.4	1.9	32.7
9.	Grading of sheared wool before marketing	39.2	60.7	26.2	13.1	60.7
10.	Washing of animals before shearing	98.1	1.9	78.5	19.7	1.8

Table 3. Adoption of sheep management practices

Farmer Category	Percentage of farmers	Adoption Score			
		Mean	Minimum	Maximum	Standard Deviation
Small	27	0.36	0.10	0.70	0.11
Medium	39	0.37	0.20	0.70	0.12
Large	34	0.44	0.25	0.80	0.16
Overall	100	0.40	0.10	0.80	0.13

conception is another important problem existing in the flocks. Though there are scientific ways and means to solve this problem to a great extent, only 9 per cent farmers were aware of it and more than 90 per cent farmers never adopted it. The reason to such a thing is more of economic in nature.

Various diseases impart great loss to the flock productivity and income of the farmers in terms of production loss and treatment cost. Vaccination techniques are available for some of the diseases like sheep pox, foot and mouth disease and enterotoxaemia, which are very much prevalent in the flocks. Nearly 96 per cent farmers knew about the vaccination techniques and 94 per cent farmers claim to always adopt it for one or other disease, which is rather a high figure. Sheep are susceptible to both internal and external parasites and dipping and drenching with medicines are prescribed for controlling them. More than 65 per cent farmers claims to always adopt it.

Wool is a major source of income to the sheep farmers. Graded wool fetches more price in the market than the un-graded one. But only 39 per cent farmers

Table 4. Results of Tobit estimates for technology adoption

Sl. No.	Variable	Descriptive statistics		Regression Coefficient	Standard Error	t value
		Mean	SD			
	Dependent variable					
	Adoption Score	0.40	0.13			
	Independent Variables					
1.	Age	44.5	12.7	0.00268**	0.000891	3.006
2.	Literacy	0.37	0.49	0.01154	0.02678	0.341
3.	Operational holding	5.00	5.8	-0.0036	0.00264	-0.372
4.	Caste	2.2	0.58	0.07175**	0.01628	4.405
5.	Membership in organization	0.14	0.35	0.0734*	0.03977	1.846
6.	Flock size	54	35	0.00199**	0.00039	5.100
7.	Dummy for family type	0.53	0.50	0.00607	0.03133	0.194
	Sigma			0.1365		
	- log likelihood			60.9967		
	N			107		

** and * indicates significance at 1 and 5 percent level

knew about this practice and more than 60 per cent farmers never adopt this technique. The cleaning/ washing of the animals before shearing ensures better quality of wool. Knowledge as well as adoption of this practice is quite high (adoption was nearly 98 per cent)

Considering the overall management practices adoption index was constructed (Table 3). The overall adoption index was 0.40 (can be considered as 40 per cent for practical purposes). The large flock owners had higher adoption index compared to the lower flock size groups (0.36 for small flocks, 0.37 for medium flocks and 0.44 for larger flocks).

Factors determining adoption

The determinants of adoption of improved sheep management practices was analysed using Tobit model and the results are given in Table 4. The results indicated that the elder farmers are more receptive towards the improved sheep management practices. Similarly the lower caste people turned out to be early adopters of improved management practices. The dummy variable for organizational membership of the farmers positively affected the technology adoption behavior. This might be because of the farmers' ability to gather information regarding the benefits of the technology due to increased contacts with developmental agencies and extension workers. The most significant variable affecting technology adoption was the flock size. The larger the flocks size, the more proneness for the farmers to adopt the technology. Larger flocks were also found to undertake short-term migration to nearby districts and states in search of fodder and feed. The larger the flock, sheep farming becomes more important in the income portfolio of the farmers and therefore, they seem to be more receptive towards better management techniques.

CONCLUSION

Sheep farming is an important occupation for the rural poor in arid and semi-arid environments as in Rajasthan. Sheep farming is mainly extensive depending mostly on the common grazing land with minimal application of external inputs. The adoption of improved management practices for sheep is only 40 per cent. Nearly 70 per cent of farmers adopt the selection procedure for the breeding rams and 95 per cent farmers adopt vaccination against one or other diseases. Dipping or drenching is followed by nearly 70 per cent farmers. But other practices like exchange of breeding rams, enrichment of fodder, supplementation of the concentrate mixture, treatment of anoestrous sheep and artificial insemination is followed by relatively smaller number of

farmers. This indicates that considerable scope exists in improving the income of farmers through adoption of improved management practices. The main factors determining the adoption of improved management practices were the flock size and organizational membership. However, more intensive extension system can help a long way in spreading the technology to the field and its effective adoption.

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Employment Status of Agricultural Labourers

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ABSTRACT

The investigation was designed to study the employment status of agricultural labourers. The study revealed that a majority (59.30%) of the respondents had a low level of employment status interms of average per month income. As much as 45 per cent of the labourers was getting a daly wage in range of Rs. 41-60. It was interesting to note that about 41.3 per cent of the labourers expressed satisfaction with the level of their income. The study also reports findings related to involvement of labourers in different activities related to farm, animal care, domestic and non-farm activities.

The landless agricultural labourers constitute a very important section of Indian rural society. About 80 per cent of the poor live in rural areas and invariably all of them are agricultural labourers and marginal farmers. Underemployment is the basic cause of poverty. Agricultural labourers, being too numerous in some regions, do not find employment in their locality. The migrant agricultural labourers are more vulnerable, and suffer doubly on account of migration. On the one hand money lenders of their village exploit their situation giving them loan at exorbitant rate of interest for their travel to the place of migration and on the other they are brutally exploited by their employer where they also lack support of their own people. In addition to being unorganised they are politically exploited by vested interest; and consequently their bargaining capacity for determining their wages, taking decisions for their development and participating in the planning and implementing process of programmes and schemes is minimal and sometimes insignificant.

The present investigation was designed to study the employment status of the agricultural labourers and to assess the quality of their employment.

METHODOLOGY

The study was conducted in Haryana State. A multistage random sampling procedure was adopted to select the villages. In the first stage, three districts were selected randomly. In the second stage from each of the three districts, one Block was identified randomly. In third stage two villages were selected on random basis from each Block. These were Asoda Shivan and Jakhoda (District Jhajjar, Bahadurgarh Block), and Nacholi and Bhopani (District Faridabad, Faridabad Block).

All adults of farm labour household of the six selected villages constituted the respondent's population for the purpose of the present study. The list of the working male and female labour respondents was prepared with the help of respective village leaders. Fifty agricultural labour respondents were selected randomly from each of the said villages. The whole process resulted in selection of 300 labour respondents for the present study.

The term employment status is used in context of number of man-months on an average that an agricultural labour is employed in a year and wage he/she is paid in relation to minimum wages. It was scored as per the following formula:

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Employment Status = Man-months of employment score x daily wage score

Man months employment was scored on the basis of number of months respondents were employed during the previous year.

Wages means amount of payment received for any work done or services rendered. This may be in cash or kind or in both. In addition to measuring employment status their quality of employment was also taken into consideration in terms of nature of work and extent of satisfaction with their employment status.

RESULTS AND DISCUSSION

Personal profile of agricultural labourers

The findings of the study show that majority of respondents, i.e. 47.3 per cent were less than 35 years of age followed by age group of 36-50 years which were less than 35.30 per cent. The older age group of those who were above 51 years comprised 17.30 per cent. Male and female respondents accounted for 59.30 per cent and 40.60 per cent of the sample respectively.

Twenty four per cent of respondents belonged to joint family system while remaining 76.00 per cent were from nuclear families. It indicates the nuclearisation of families in rural areas as well. Majority of the respondents (53.30 %) had family size of 6-10 members. 44.70 per cent respondents were small family size, of up to 5 members. Only 2.00 per cent were from large families having more than 11 members. This is because of large number of nuclear families and also the younger generation might be aware about small family norm. The data in Table 1 shows that 45.30 per cent of respondents belonged to illiterate families having primary school level. The findings suggest that literacy level of the agricultural labourers is still low.

Table 1 Personal profile of agricultural labourers

(N=300)

Attributes	Category	Frequency	Percentage
Age	1. Less than 35 years	142	47.30
	2. 36-50 years	106	35.30
	3. More than 51 years	52	17.30
Gender	1. Male	178	59.30
	2. Female	122	40.60
Family type	1. Joint	72	24.00
	2. Nuclear	228	76.00
Family size	1. Upto 5 members	134	44.70
	2. 6-10 members	160	53.30
	3. 11 & above	6	2.00
Family's Education	1. Illiterate	118	39.40
	2. Primary school	136	45.30
	3. Upto Xth	46	15.30

Table 2. Levels of employment status of the respondents

(N=300)

	Level of Employment status	Frequency	Percentage
1.	High (14-20)	35	11.70
2.	Medium (8-13)	87	29.00
3.	Low (1-7)	178	59.30

Table 3. Distribution of the respondents according to daily wages

(N= 300)

Daily wages (in Rupees)	Frequency	Percentage
1. Upto 40	10	3.30
2. 41-60	136	45.40
3. 61-80	60	20.00
4. 81-100	94	31.30

Employment status

Table 2 reveals that majority, 59.30 per cent of respondents had low employment status in terms of average per month income, 29.00 per cent had medium employment status and only 11.70 per cent had high employment status. Low employment status of the majority of the respondents was because of seasonal nature of agriculture. However labourers who were employed round the year on salary basis had higher employment status but their percentage was very small.

As regards to daily wages of respondents (Table 3), it was found that 45.40 per cent were getting daily wages in the range of Rs. 41-60. Nearly one third of the women were earning from Rs. 81-100 and 20 per cent Rs. 61-80. Wages of only 3.30 per cent were below Rs. 40 per day. This group comprised of mostly women who were working for half a day. The wages earned by these women were in the form of cash, cash plus cereal or cereal only.

Table 4. Distribution of the respondents on the basis of remuneration

(N=300)

	Basis of Remumeration	Frequency	Percentage
1.	Wage basis	240	80.00
	Cash	232	77.70
	Cash + Cereal	12	4.00
	Only cereal	6	2.00
2.	Term contract	22	7.30
3.	Monthly Salary	28	9.30

Table 4 reveals that majority (80.0 % of agricultural labourers) were hired on wage basis and 77.70 per cent were paid in cash on daily basis and in some cases (40 %) they were partly paid in cash and partly through food (Cereal). In still fewer cases given in lieu of labour jobs. Nearly one-fourth of the respondents were being hired on monthly cash salary basis.

A small minority (73.00 %) were employed on 'term contractual basis' for carrying out particular jobs like sowing, harvesting etc.

Quality of employment of agricultural labourers

Quality of employment of agricultural labourers was studied in context of their nature of involvement i.e. agricultural and domestic, their level of satisfaction and employment profile, their preferred and non preferred work activities and their perception in terms of difficult and easier jobs.

Perceived satisfaction of the respondents with their income

It was interesting to note that a substantial percentage (41.30 %) was satisfied with their existing levels of income. Though majority (58.70 %) respondents expressed dissatisfaction with their income (Table 5).

Table 5. Perceived satisfaction of the respondents with their with income

(N=300)

Category	Frequency	Percentage
Satisfied	124	41.3
Dissatisfied	176	58.7

During informal conversation with respondents, it was observed by researcher that this satisfaction was more in case of migrant labourers than the local ones. It appeared that main reason for satisfaction was their inability to earn that much in their own village and also they felt a sense of achievement on coming out of their native place and earning a comparatively larger amount than their brethren in their native place.

Involvement of respondents in activities related to farm, animal care, domestic and other non-agricultural activities

In the course of the study it was found that agriculture labour is hired for the specific farm activities. The involvement of respondents in various activities is reported in Tables 6, 7, 8 and 9. The results of present study show that among farm related activities that involve land preparation and sowing a large percentage of labourers (72.00%) were involved in intercutural operations that ranked I in terms of most frequent activity followed by weeding, (67.30 % rank II),' sowing' (44.70 % rank III), irrigation, (41.30 % rank IV) and land preparation, (40.70 % rank V). A little less than one third of the respondents were involved in ploughing.

Among allied farm activities, majority of respondents were employed for post harvest activities such as harvesting, (94.30 % rank I), followed by threshing, (61.30 % rank II) and storage activities, (27.30 % rank III). Gardening was mainly performed by respondents in Gurgaon district since labourers were employed in farm houses (4.70 % rank IV) and equal percentage (4.7%) were reported engaged for cart pulling. Those engaged in cutting trees were (1.30 % rank VI) and (0.60 % rank VII) were involved in a soil filling and preparing channels.

Table 6 : Involvement of respondents in land preparation and sowing activities

(N=300)

Activities	Frequency	Percentage	Rank
Land preparation	122	40.70	V
Ploughing	90	30.00	VII
Sowing	134	44.70	III
Irrigation	124	41.30	IV
Fertilizer application	116	38.70	VI
Weeding	202	67.30	II
Intercultural Operations	216	72.00	I
Pesticide Spray	72	24.00	IX
Caretaking (watchman)	73	24.30	VIII

Table 7: Involvement of respondents in allied farm activities

(N=300)

Activities	Frequency	Percentage	Rank
Harvesting	283	94.30	I
Threshing	184	61.30	II
Storage	88	27.30	III
Pulling cart	14	4.70	IV
Tractor operator	12	4.00	V
Soil filling	2	0.60	VII
Preparing channels	2	0.60	VII
Cutting trees	4	1.30	VI
Gardening	14	4.70	IV

Table 8 : Involvement of respondents in activities related to animal care

(N=300)

Activities	Frequency	Percentage	Rank
Fodder cutting	62	20.70	I
Preparing feed	62	20.70	I
Feeding	60	20.00	II
Milking	44	14.70	IV
Bathing	54	18.00	III
Cleaning of Yard	60	20.00	II
Poultry farming	4	1.30	V
Selling milk	4	1.30	V

Table 9. Involvement of respondents in domestic activities

(N=300)

Activities	Frequency	Percentage	Rank
Cooking	3	1.000	II
Cleaning	6	2.00	I
Preparing case for storing cow dung cakes (*Bitora*)	3	1.00	II

The labour intensive activities like harvesting, intercultural operations and weeding were observed to be the most frequent activities for which labour is commonly hired. These activities are drudgerous and do not require any skill. In contrast activities like fertilizer application and preparing channels which require some skill and are less labour intensive are largely done by the farmers themselves.

Table 8 discusses the respondents involvement in activities related to animal care. It was observed that respondents were broadly engaged in eight major activities. Fodder cutting and preparing feed activities were reported by majority of respondents, i.e., 20.70 per cent each and these both ranked I among all the animal care activities. 'Feeding' and 'cleaning of yards' were the second ranked activities reported by 20.00 per cent of the respondents. While 18.00 per cent of the labourers were involved in bathing of animals which was ranked third followed by 14.70 per cent who were in milking job-rank I. Last in the rung were poultry farming and selling of milk.

Table 10. Distribution of the respondents as per their involvement in non-agricultural skill based activities

(N=300)

Activities	Frequency	Percentage	Rank
Pottery	6	2.00	I
Rope making	2	0.70	I
Band drummer	2	0.70	I
Plumber	4	1.30	II
Mining	4	1.30	II
Driving	2	0.70	II

Table 11. Distribution of the respondents as per their involvement in non-agricultural non-skill based activities

(N=300)

Activities	Frequency	Percentage	Rank
Construction	94	31.30	I
Brick making	4	1.30	IV
Shop keeping	12	4.00	II
Cleaning in school	1	0.30	VI
Anganwari worker	2	0.70	V
Rickshaw pulling	6	3.00	III

The agricultural labourers comprising the sample of the study was also found to be engaged in activities other than agriculture. Such non-agricultural activities were further divided into skill based and non-skill based activities (Tables 9 and 10).

Very few respondents were involved in skill based activities. Maximum percentage of the respondents, i. e , 2.00 from this category were employed in plumbing and mining, 1.30 per cent each. Lastly 0.70 per cent each were employed in rope making, band drummer and driving.

Among non-skilled activities, majority of respondents i.e. 31.30 per cent were involved in construction work followed by shop keeping, (4.00 per cent). Only 3.00 per cent of the respondents were involved in rickshaw pulling.

Table 12 depicts the distribution of respondents according to their most preferred work activity. A large percentage (86.70) of the respondents did not have any specific preference for work. Whatever job they got, they were ready to do for their earnings. This lack of choice for work is a clear indication of desperation of the respondents to earn daily income by doing whatever jobs they can get. This also reflects lack of opportunities for this class of unskilled, uneducated and unorganized group of people. However, from the few (13.3%) who expressed their choice, it was found that a higher level of preference was given to animal husbandry (3.3%), followed by sowing and harvesting (2.7 %).

In order to gain further insight into choice of work as preferred/ not preferred by the labourers, they were querried on their least preference of labour jobs (Table 13). It was worth noting that a large majority, i.e. 90.00 per cent did report any activity as their least preference. This clearly reflects readiness on their part to undertake any job that ensures them to earn their daily bread. The choices of jobs were those that ensured them to earn their daily bread. The choices of least preferred job were expressed by small percentage of respondents. These were 'working in the open fields' (4.00 %), 'spraying' pesticides, (2.70 %) 'ploughing' (2.00 %) and 'electrical work (1.30 %).

According to Table 14 majority of the respondents, i.e. 85.3 per cent did not consider any job given to them as difficult. Among others the most difficult jobs were ploughing (4.7 %) spraying (4.0 %), farming as a job and electrical work (2.0 %) construction work (1.3 %) and threshing (0.7 %).

These findings on perceived most difficult job strengthen the earlier findings that labourers rarely have any choice and they do not think on these lines. In fact finding work is probably the most difficult and critical aspect rather than making choices in various categories of work.

Table 12. Distribution of the respondents in relation to most preferred work activity

(N=300)

Choice	Frequency	Percentage
No specific preference	260	86.7
Animal Husbandry	10	3.3
Shop keeping	4	1.3
Sowing and harvesting	8	2.7
Floriculture	6	2.0
Caretaking	4	1.3
Driving	2	0.7
Constructionwork	2	0.7

Table 13. Distribution of the respondents in relation to least preferred work

(N=300)

Choice	Frequency	Percentage
None	270	90.00
Ploughing	6	2.00
Spraying	8	2.70
Working in the open field	12	4.00
Electrical work	4	1.30

Table 14. Distribution of the respondents in relation to their perception of difficult jobs

(N=300)

Choice	Frequency	Percentage
None of the jobs	256	85.30
Ploughing	14	4.70
Spraying	12	4.00
Farming	6	2.00
Construction	4	1.30
Threshing	2	0.70
Electrical work	6	2.00

Employment profile

The employment profile of the agricultural labourer was analysed in terms of the nature of their contract, number of employers and their means of sourcing the job.

None of the respondents had any written document for their contractual job (Table 15). Ninety per cent of respondents were working with more than one landlord. A large majority of respondents, (88.70 %) were personally called by employers, while 26.70 per cent had personally searched the job for themselves. Only two per cent of the respondents in each case, found the jobs through neighbours and labour market.

It is quite obvious from the above finding that agricultural labour is a totally unorganized sector where casualness prevails and obviously the supply is more than the demand.

Table 15: Distribution of the respondents according to employment profile

(N=300)

Attributes	Category	Frequency	Percentage
Type of contract	Written	0	0
	Verbal	300	100.00
Number of employer	One	30	10.00
	More than one	270	90.00
Job source	Personally called by employer	266	88.70
	Neighbouirs	6	20.00
	Relatives	4	13.00
	Personally Searched	80	26.70
	Labour market	6	2.00

SUMMARY AND CONCLUSION

The low employment status of the majority might have been due to the fact that underemployment is prevalent among agricultural labourers because of seasonal nature of agriculture. It was found that 45.40 per cent were getting daily wages from Rs. 41.60 and majority comprising three forth were getting daily wages in cash. It was interesting to note that 41.30 per cent respondents expressed satisfaction with their income. In farm related activities respondents were involved mainly in sowing, intercultural operations, weeding, harvesting and threshing. In majority cases, women workers were employed for intercultural operations and weeding. The major activities involving milch animals were confined to the collection, preparation and feeding of animals Respondents did not have any specific preference for work. Whatever job they get, they were ready to do and earn. This lack of choice for work is a clear indication of desperation of the respondents to earn daily income by doing whatever they can get. This also reflects lack of opportunities for this class of unskilled, uneducated and unorganized group of people. Similarly majority of them did not consider any job given to them in terms of difficult, or easy. None of the respondents had any written document for their contractual job. Ninety per cent of respondents were working with more than one landlord.

Lack of employment opportunities, underemployment, delayed payment of wages and unequal wages of male and female labourers were found to be the major economic problems. The proper enforcement of adequate labour legislation to protect them against irregular and low-quality employment, low wages, lack of social justice, safety and health regulations is important for overall improvement in socio-economic condition of agricultural labourers.

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Mussel Farming Technology Dissemination to the Self Help Groups

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ABSTRACT

The study is an attempt to assess the socio-economic impact of mussel farming by mobilising self-help groups in Kerala and Karnataka coastal belts. The study showed that mussel farming faced a number of impediments such as water salinity, seed avaiability, climatic vagaries, problems related to identification of proper beneficiaries and problems in marketing of mussels. The correlational analysis revealed a proportional relationship between group dynamics effectiveness and average yield obtained for each self-help group, which ensured a reasonable profit as a consequences of adoption of mussel farming.

Transfer of technology constitutes an inevitable link in the chain of development in marine fisheries sector of India. With the dwindling catch rate in marine fisheries, alternate employment generation is vital for livelihood security of coastal fishers. A situational analysis points to the need for empowering them using appropriate development strategies enabling adoption of technical innovations like mussel culture for entrepreneurship development and income generation. The advent of mussel culture technology has borught a tranition in the fisheries sector. Creating awareness through training and demonstration programmes is mandatory for commercializing musel farming technologies developed by the institute. Lack of knowledge about the farming methods and its profitability is one of the major factors, which has restrained adoption of these technologies by fishermen. The experimental trials conducted by CMFRI have proved the techno-economic feasibility of mussel farming. (Ashokan *et al.*, 2001 and Vipinkumar V.P. *et al.*, 2001). *Karwar* region in Karnataka, *Goa* and *Ratnagiri* region in *Maharashtra* are identified as suitable areas for adoption of mussel culture.

The major objectives taken care for the study were:

i. To disseminate the mussel culture technology to the selected Self Help Groups in Karnataka coastal belts through appropriate training and first line demonstrations.

ii. To evaluate the social economic consequences of adoption of mussel farming by the selected Self Help Groups.

METHODOLOGY

A situational analysis though PRA in Karnataka coasts was undertaken to identify suitable sites for mussel farming in open sea and estuaries. Self Help Groups were mobilised in Karnataka coastal belts and offered training through demonstration on mussel culture in open sea and estuaries at three sites namely Majali, Sunkeri and Bhatkal. Initially, training and demonstration programmes in two sites in Karwar were undertaken, one for raft culture in open sea in Majali of Dendebag and one for rack culture in Sunkeri of Kali estuary. The training was imparted to 45 members of three Self Help Groups each in 2 sites separately comprising a total of 90 participants. At Majali in open sea, a 5 x 5 metre raft and at Sunkeri of Kali estuary a 5 x 5 metre rack constructed for mussel culture. In Bhatkal, four Self Help Groups of 15 members each exclusively of women fisherfolk comprising a total of 60 participants were trained on mussel farming with a trial in 5 x 6 metre rack culture by long method in Mundalli river of Bhatkal estuary and Sunkeri of Kali

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estuary was identified as a suitable site for mussel culture and three Self Help Groups of 15 members were mobilized. Training was imparted on the mussel culture technology by technical experts in Sunkeri of Kali estuary for the beneficiaries of Self Help Groups. The growth parameters were recorded periodically and harvest was undertaken in time with the following results. A pre-tested well-structured interview schedule was prepared and a survey was undertaken among the beneficiaries to make out the profile of behavioural pattern and socio economic characteristics.

In the present study, the Effectiveness on Group Dynamics of these SHGs' was worked out based on Group Dynamics Effectiveness Index (GDEI). Group Dynamics Effectiveness was operationally defined for the study as the sum-total of the forces among the member of SHG based on the sub-dimensions, such as participation, influence and styles of influence, decision making procedures, task functions, maintenance functions, group atmoshpere, membership, feelings, norms, empathy, interpersonal trust and achievements of SHG. (Vipinkumar and Baldeo Singh 1998, 2001). For the computation of the Group Dynamics Effectiveness Index (GDEI) the scores obtained for each of the above mentioned sub-dimensions were first made uniform and then multiplied by the corresponding weightage assiged to each as by expert judges. These scores were then added up to get the GDEI score of each respondent. An attempt to assess the social system consequences and socio economic consequences over a period of time especially after the interventions on mussel farming was made based on the expressed opinion of the members of the SHG.

RESULTS AND DISCUSSION

The SHGs' of Majali and Sunkeri were mobilized by the project team of CMFRI and the SHG's of Bhatkal were mobilized by a NGO namely Snebakunja. The first two trials and demonstrations were under the funding of CMFRI and for the last one, only the technical helps during the training and demonstration were offered by CMFRI. The major expenditure required for mussel farming is for the materials such as bamboo, nylon rope, coir, cloth, seed, etc. and labour costs essentially for construction, seeding, harvesting etc. The yield particulars in all the ten SHGs' was noted and found as substantially good which proves the profitability of mussel farming in the subsequent trials becuase the material costs such as those of bamboo, rope, cloth and labour cost in construction etc. are negligible, this ensures reasonable profit as a major consequence of adoption of Mussel farming enterprise bringing about economic empowerment of rural women through organised Self Help Groups.

The yield in Kg per metre length of the rope recorded in all SHGs' as average yield showed a positive relationship with GDEI score. The correlation (r=0.958139) was found significant owing to the 't' value 9.465624 at 1 per cent level of significance (Table 1). Experience and observations already indicated that for a group to be developed as an SHG, it requires a period of at least 36 months and it is a hectic process. It has to pass through various phases such as Formation phase, Stabilisation phase and Self Helping Phase.

These Self Help Groups promote a cooperative and participative culture among the members, which ensures the empowerment culture of the Self Helping phase. The utilization of fund sources, accounts maintenance etc. are all perfectly accomplished with proper maintenance of the documented records by the group members. This ascertains the fulfillment of norms and standards of the SHG leading to economic empowerment of the members. The utilization of fund sources, accounts maintenance etc. are all perfectly accomplished with proper maintenance of the documented

Table 1. Relationship of Yield and GDEI of SHG's

SHG	Yield in Kg/m	GDEI score	Correlation Coefficient (r)	't' value
SHG1	9.2	53.71		
SHG2	9.1	52.31		
SHG3	8.9	51.91		
SHG4	12.6	57.32		
SHG5	12.7	56.68	0.958139	9.4656248**
SHG6	12.5	57.14		
SHG7	13.6	60.01		
SHG8	13.1	59.98		
SHG9	13.8	61.29		
SHG10	13.2	60.02		

Table 2. Constraints faced by the SHG members in mussel farming

Constraints	Rank
Unpredictable seed availability	1
Mortality of seeds during transportation	2
Reduced growth during certain period of the year	3
Marketing of mussels	4
Meat shucking problems	5
Social constraints like caste, conflicts, politics etc.	6

records by the group members. This ascertains the fulfillment of norms and standards of the SHG leading to economic empowerment of the members.

Constraints faced by the fisherfolk in mussel farming

Mussel farming faces a number of impediments like water salinity, seed availability, selection of loaction/ site, climatic vagaries, identification of proper beneficiaries and proper monitoring opportunities. The major constraints faced by the fisherfolk in mussel cultivation are given in Table 2.

The open sea mussel culture in this particular case met with the impediment of unfortunate sabotage of the seeded mussel by some miscreants. It was rectified by reseeding, but the yield was not that much conspicuous compared to the trials undertaken in estuaries. All the SHG members are of unanimous opinion that the government agencies should come forward with improved marketing facilities, as marketing of the mussel was perceived as one of the biggest constraints. Provision of loans with reduced interest rates and freezer facility for storage of harvested mussels can bring about a breakthrough in this sector in the near future. Though the lucrative Goa market proximity was an added advantage for these mussel culture trials, appropriate strategies to address the socio-legal issues encountering mussel farming, awareness building and market development are the inevitable requisites for further expansion of mussel culture through community participation for sustainable development.

Table 3. Social system consequences

S.No.	Items	Percentage		
		Increased	Un changed	Decreased
1.	Litigation	50	49	1
2.	Political participation	48	41	11
3.	Participation in co-operation	30	63	7
4.	Dowry	19	70	11
5.	Recreational activities	53	37	10
6.	Social & religious fund	70	20	10

Social system consequences and socio economic consequences

An attempt to assess the social consequences and socio economic consequences over a period of time expecially after the interventions on mussel farming was made based on the expressed opinion of the members of the SHG. The social system consequences was assessed in terms of the parameters such as Lititgation, Political participation, Participation in co-operation, Dowry, Recreational activities Social and religious fund provision was made in percentage value. The socio economic consequences were assesses on the parameters such as Price, Cost of inputs, Credit availability, Labour availability, Labour cost, Local availability of inputs, Subsidy of inputs, Co-operation and Transportation cost.

From the (Table 3) it is noted taht 70 per cent of the fishermen expressed that social and religions fund has increased and 68 per cent of them told that their level of political participation is increased. Regarding the Socio Economic consequences from the (Table 4) it is noted that the transportation cost is increased by 82 per cent and labour cost is increased by 79 per cent and 67 per cent expressed change in their housing pattern. Similar interpretations can be made on other parameters also.

Table 4. Social economic consequences

S.No.	Items	Percentage		
		Increased	Un changed	Decreased
1.	Price	65	35	0
2.	Cos of input	63	23	14
3.	Credit availability	43	41	16
4.	Labour availability	25	24	51
5.	Labour cost	79	17	4
6.	Local availbility of inputs	29	53	18
7.	Subsity of inputs	28	39	33
8.	Co-operation	33	39	28
9.	Transportation cost	82	16	2
10.	Change in housing pattern	67	28	5

CONCLUSION

An attempt has been made to assess the socio economic impact of mussel farming by mobilizing Self Help Groups in Kerala and Karnataka coastal belts. Mussel farming is slowly achieving considerable significance becuase of its profitability. But it is inevitable to take care of the selection of suitable sites fulfilling the essential parameters for undertaking mussel culture trials. It would be pertinent to have study on the effect of coir retting zones on growth and attachment of mussel seeds to the strings, which often found to be not suitable by experiences and observations. The export potential of mussel can be promoted through value addition experiments on depuration plants in filtered seawater. Organised fishermen's cooperatives can play a vital in various stages of seedling, harvesting, sorting, grading, packing, and marketing with an intention of export potential.

The study emphatically disclosed the deep rooted influence of Group Dynamics network among the farmer folk as influenced by their participation, influence and styles of influence, decision making procedures, task function, maintenance function, group atmosphere, membership, feelings, norms, empathy, interpersonal trust and achievements of SHG. Irrespective of the location specific problem orientied resource based alternative programmes for income generation, this study emphasises on the economic empowerment of rural women through mussel farming as a means of poverty eradication through Self Help Groups because, poverty can only be alleviated by mobilising the poor to solve their actual problems in the form of organised SHG's. In the impact assessment, the correlation analysis revealed, a proportional relationship between the Group Dynamics Effectiveness and Average Yield obtained for each SHG, which ensures reasobale profit as a major consequence of adoption of Mussel farming enterprise bringing about economic empowerment of fisherfolk through organised Self Help Groups. Similarly the social system consequences and socio economic consequences over a period of time, after the interventions on mussel farming were also assessed made based on the expressed opinion of the members of the SHG.

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Research Note

Impact of Training on Knowledge of Fishermen Trainees on Freshwater Fish Culture

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In any enterprise, there always exists a scope for increasing the efficiency and thereby the income generated. This requires updating the knowledge of the person engaged in such enterprises and also imparting the needed skill so that they can utilise them to the maximum extent possible. Providing training of various kinds related to the enterprises being practiced is considered the best way to achieve this. This aim is to improve their knowledge and skills in handling new technologies. But it is essential to assess in detail the training needs of such persons. Further it is often said that knowledge gap and training need go hand in hand.

Technology in fisheries sector has been developed significantly during the last three decades. But the impact of improved technology has yet to reach the fish farmers and to activate them to produce more fish production and market them in the most economic way. Training on various aspects of inland fish culture practice has created more opportunities, motivation, create awareness and confidence in the farmers (Seenappa and Surendra, 1988). The socio-economic characters *viz.*, age, education and land holdings etc., also plays a role in the knowledge and attitude of the trainees (Singh and Kunzroo, 1985). Inland Fisheries Training Center, Department of Fisheries at Fish Breeding unit located near Bhadravathi, Shimoga district has organized series of training on various aspects of a carp culture to disseminate the technology to the fish cultivations with out attributing their socio-economic characteristics. The success of any training programme depends on the impact it had on the trainees. This paper makes an attempt to evaluate the knowledge of participants towards fish culture at the beginning and at the end of the training programme by considering their socio-economic factors *viz.*, age, education, land holdings etc.

METHODOLOGY

The study was carried out at Fisheries center, Fish of Breeding unit, Shimoga district of Karnataka. As a mandate of the Institute the training course on inland fish culture in tanks/ponds was scheduled according to the participants (SSLC/PUC dropouts). The institute selected the participants from 14 districts of the state through an oral interview. A batch of 36 trainees who participated in a 90 days training course of inland fish culture were the respondents for the present study. A knowledge aptitude test by preparing questionnaire on preparation of fish ponds, fertilization and liming of fish pond, Food and feeding of fish, fish breeding techniques, diseases of fish and their management covering 20 marks for each category. The test was conducted at the beginning of the training programme to know the knowledge level of the participant trainees. They were trained on different aspects of fish culture for 90 days (both theory and practical aspects). The same test was repeated at the end of the training programme to know the improvement in knowledge and skills gained by the participants on particular topics of the subject in which training was given. Similarly the respondents reaction were also recorded for their opinion about the training topic utility and duration of the programme. The knowledge of participants on fish culture management technology was measured by assigning scores (Jha and Sharma, 1973). For eliciting the knowledge of the participants on the total score obtained by trainees were classified into low, medium and high knowledge.

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RESULTS AND DISCUSSIONS

The study showed that majority of respondents were belonged to SSLC dropped (25%) or SSLC passed (53%) and PUC (22%) and they were between the age group of 18 to 35 years. The trainees who attended the training programme were from large family background, the average size of the family accounted was 9.30. As many as 61.11 % of trainees had rainfed land and only 19.44% belonged to land less category. Percentage of both rainfed and irrigated land constitute 19.45 %. The trainees (58.33%) had more than four years of farm experience.

The mean percentage knowledge score of the trainees at the beginning of the training was 14.11 and has increased to 73.61 per cent after the training programme. In the training programme there was a provision to provide information through visual aids about the technology, followed by field demonstration on various aspects of fish culture technology. This enabled the individuals to develop certain amount of skills and knowledge to the subject deliberated. Since, the group was relatively small there was a provision for asking questions and getting clarifications. This further implies that the course content drawn for the various aspects of inland fish culture were well designed keeping in view the needs of the clientele. The calculated 't' value for test of significance after training programme was 26.54. The knowledge level of the trainees after the training programme was considerably higher. (Table 1). Similar knowledge gains was reported by Hussain *et al.* (1994). The study reveals that majority of the participants expressed their satisfaction for the inclusion of various relevant topics *viz.*, pond preparation, fertilization and liming, food and feeding of fishes, fish breeding techniques and disease management in their trainig course for transfer of these technologies in their respective workings areas. The trainees belonged to young age (18-35 age group) and were poor in social participation. As the data indicates none of the participants have actively involved in the cooperative sector. Poor use of extension literature and technical persons were identified. Even now they were found to have greater degree of information from relatives and friends rather than from the media (Radio, T.V. film shows). Bhaumik *et al.* (1992) observed that farmers contact with extension agency is very important for adoption of technology. The present study indicates that the trainees had shown interest and there was improvement in understanding the basic concepts of fish culture technology. This is becuase of the trainees had their education upto SSLC/PUC level and made scoring significantly after the training programme rather than age and other social characteristics.

Table 1. Impact of knowledge and aptitude test of the training programme on different aspects of fish culture

S. No.	Preparation of fish ponds		Pond Fertilization and liming		Food and feeding of fish		Fish Breeding techniques		Fish disease management		Total score	
	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
1	5	16	2	16	4	17	2	14	5	18	18	81
2	4	15	4	13	3	19	2	17	4	15	17	79
3	3	16	5	14	4	18	2	13	5	17	19	78
4	3	14	4	18	4	16	1	12	6	16	18	76
5	5	17	2	16	5	18	2	18	3	17	17	86
6	4	16	3	15	2	15	2	16	2	18	13	80
7	2	14	4	10	6	15	2	12	5	17	17	68
8	1	17	2	15	3	17	1	11	2	17	9	77
9	1	15	2	18	5	14	0	10	4	18	12	75
10	1	11	4	11	5	16	3	12	5	17	18	67
11	2	9	1	13	3	10	0	3	2	11	8	46
12	6	16	5	15	4	17	3	18	5	17	23	83
13	2	18	1	16	2	17	1	17	2	12	8	85

S. No.	Preparation of fish ponds		Pond Fertilization and liming		Food and feeding		Fish Breeding techniques		Fish disease management		Total score	
	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
14	4	15	5	18	3	19	0	17	5	15	17	84
15	2	14	5	18	3	17	0	13	4	19	14	81
16	1	17	2	14	5	15	0	15	3	19	11	80
17	1	13	2	16	3	18	1	15	2	15	9	77
18	1	13	2	9	3	15	1	12	1	13	8	62
19	3	10	3	7	2	8	1	6	3	14	12	45
20	3	18	3	16	4	16	2	18	2	17	14	85
21	2	3	2	5	3	8	1	4	2	6	10	27
22	5	9	5	7	3	12	3	12	4	14	20	54
23	2	18	1	15	2	18	0	15	2	17	11	84
24	2	17	6	16	5	17	0	16	3	18	16	84
25	5	16	2	18	2	18	0	15	2	17	11	84
26	4	8	5	15	4	15	1	6	5	11	19	55
27	2	15	2	16	6	18	1	13	4	17	15	79
28	2	12	4	16	3	17	1	13	2	15	12	73
29	2	16	3	18	2	18	1	14	3	16	11	82
30	3	16	2	15	6	14	0	12	4	16	15	73
31	2	13	5	16	3	17	3	13	1	17	14	76
32	3	15	4	14	3	17	2	15	4	19	16	80
33	2	15	2	16	3	15	0	17	1	18	8	81
34	4	14	2	15	5	12	1	13	3	13	15	67
35	4	16	4	15	5	15	2	14	6	17	21	77
36	3	17	3	16	4	17	1	14	4	16	16	80

CONCLUSION

The training programmes organized by the department of fisheries had desirable impact on the rural educated SSLC/PUC drop outs to acquire knowledge on various aspects of fish culture and to become self employed. Majority of the trainees had minimum contact with extension agency. Extension contact is one of the most significant factors contributing towards knowledge level of the farmers. It may be difficult to resume the level of adoption of an improved technology unless is it first known to the person who is going to adopt it. Rogers and Shoemaker (1971) considered knowledge as a function of an innovation decision process. Hence, it is most important that the rural youths/school drop out should have extension contact by various agencies to strengthen their knowledge for future and effective adoption of the new technology. There is a need to set up extension efforts to motivate them to adopt all the recommended practices. Steps may also be taken to overcome the constraints faced by trainees/youths in the adoption of fish culture production technology. It may be suggested that similar training programmes may be planned in collaboration of Fisheries scientists of the Agricultural Universities for successful implementation of the training programmes.

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Research Note

Knowledge and Adoption of Improved Fruit Preservation Practices Among Rural Women

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Role of women in household food security is vital and unique. Women alone are responsible for the methods adopted for nutritional security of household particularly food processing and food preservation. The nutritional status of family members are greatly influenced by sound knowledge, attitude, belief and values possessed by them. The knowledge of eatables about calories, presence of vitamins and minerals in food items guide the home practices in fruits, vitamins and minerals are to be preserved, being the essential component of balanced diet. In our daily life, the diet should include fruits which are essential to keep the body fit and maintain immunity. The fruits are being produced in different climates. In order to ensure availability of fruits throughout the year, they should be preserved. Fruit preservation is done by different methods. In permanent method of fruit preservation, the fruits are kept safe for a long period. One of the methods of permanent fruit preservation is through the use of chemicals, for example, tomato sauce, mango pickle, lemon pickle etc. The present study is an attempt to understand to the knowledge and adoption of improved fruit preservation practices being followed by rural women. The specific objectives of the study are as follows:

1. To study the socio-economic profile of the respondents.
2. To study the knowledge and adoption of improved fruit preservation among the respondents.
3. To study the constraints faced by the respondents in adoption of improved fruit preservation practices.

METHODOLOGY

The present study was conducted in two randomly selected villages namely Lalupur and Pusaina of Sultanganj block of Mainpuri district of U.P. state. A total of 80 respondents (rural women) were selected through random sampling technique for the study. The data were collected from the respondents with the help of a structured interview schedule developed for the purpose. The knowledge of respondents regarding improved fruit preservation practices was assessed through a knowledge test specially developed for the purpose. The knowledge of respondents was categorized into three categories viz. low, medium and high on the basis of scores obtained by them. (Low level >7 scores; medium level 8-14 scores and high level 15-21 scores). The adoption of improved fruit preservation practices was estimated in terms of acceptance of technology by the respondents. The extent of adoption was categorized into three levels viz. full, partial and nil. The statistical tools like percentage, mean and standard deviation were used to analyse and interpret the data.

RESULTS AND DISCUSSION

Socio-economic profile of the respondents:

The majority of the respondents were in the middle age group (66.25%) educated graduate and above (62.5%); married (92.50%); belonging to nuclear families (58.75%); occupation as housewife (75%); with family income in the middle group (47.5%).

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Knowledge of respondents regarding improved fruit preservation practices

The information relating to knowledge of rural women regarding improved fruit preservation practices are presented in Table 1. A perusal of data given in Table 1 indicates that the majority of respondents possessed medium level of knowledge regarding improved fruit preservation practices. However, in the case of tomato sauce, the majority of the respondents (40%) were found to have low level of knowledge. The mean knowledge score was observed to be maximum in case of tomato sauce (14.56%), followed by mango pickle (11.51%) and lemon pickle (4.99).

Adoption of improved fruit preservation practices

The relevant data pertaining to adoption of improved fruit preservation practices among the respondents are depicted in Table 2. A close look at the data provided in Table 2 reveal that the extent of adoption of improved fruit preservation practices among the respondents was 'partial' in respect of all the three practices taken together. The full adoption was observed to be maximum in case of mango pickle (33.27%). On the other hand, the non-adoption was observed to be highest in case of tomato sauce (36.98%). The overall findings suggest that the adoption of improved fruit preservation need to be promoted through an appropriate strategy.

Constraint faced by the respondents in adoption of improved fruit preservation practices

The findings regarding the constraints faced by the rural women in adoption of improved fruit preservation practices are summarized in Table 3.

The data in Table 3 reveal that lack of adequate training facilities occupied the first rank (70%) followed

Table 1. Level of knowledge of respondents regarding improved fruit preservation Practices

(N=80)

S.No.	Preservation practice	Knowledge level (%)			Mean knowledge score
		Low	Medium	High	
1.	Mango pickle	31.25	37.50	31.25	11.51
2.	Tomato sauce	40.00	35.00	25.00	14.56
3.	Lemon pickle	30.00	42.50	27.50	4.99
4.	Overall	30.37	42.22	27.41	24.10

Table 2. Extent of adoption of improved fruit preservation practices among the respondents

(N=80)

S.No.	Preservation practice	Extent of adoption (%)			Mean adoption score
		Full	Partial	Nil	
1.	Mango pickle	33.27	39.68	27.05	12.61
2.	Tomato sauce	28.64	34.38	36.98	11.10
3,	Lemon pickle	26.83	39.34	33.83	04.96
4.	Over all	29.58	37.80	32.62	19.94

Table 3. Constraints faced by the respondents in adoption of improved fruit preservation practices.

(N-80)

Sl.No.	Constraints	Frequency	Percentage	Rank
1.	Lack of adequate training facilities.	56	70.00	I
2.	High cost of technology.	52	65.00	II
3.	Lack of technical advice from fruit preservation centers.	48	60.00	III
4.	Skeptical due to adverse effect on health due to use of chemicals.	46	57.50	IV
5.	Lack of accessibility to procure technological inputs from market.	43	53.75	V

by costly technology (65%), lack of technical advice (60%), skeptical due to adverse effect on health (57.50) and lack of accessibility to procure technological inputs from market (53.75). It is pertinent that the training facilities and cheaper availability of technology are the important factors in adoption of improved fruit preservation practices.

CONCLUSION

The study has revealed that the majority of rural women possessed medium level of knowledge regarding improved fruit preservation practices namely mango pickle, tomato squace and lemon pickle together. The extent of adoption of improved fruit preservation practices among the respondent was partial in respect of all the practices taken. The lack of knowledge and high cost of technology were the major constraint perceived by the respondents in adoption of improved fruit preservation practices. The overall findings of the study make a strong case for developing capacity building through training programmes and ensuring accessibility to technology for promoting adoption of improved fruit preservation practices among the rural women.

The implications based on the findings of study are highlighted below:

i) Adequate training should be provided to rural women to equip them with knowledge and skills in improved fruit preservation practices.

ii) Technical advice on improved fruit preservation technology should be ensured by the fruit preservation-training centre to the clientele.

iii) Potential of mass media like television, radio, newspaper, magazine, extension literatures should be fully utilized for increasing awareness and knowledge on the subject of fruit preservation.

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Research Note

Jatropha Cultivation in Udaipur District of Rajasthan : Practices among Farmers

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Ever increasing prices of petroleum products are adversely affecting Indian economy and therefore, it is a time that we seriously make attempts to find a dependable alternative. In this context, it is gratifying to learn that India would be using a blend of biodiesel with petro-diesel in future. Although we used to see Jatropha *curcas* plants, almost everywhere as a hedge plant, in its new role it is to be used as a source of biodiesel which will have major impact on our economy. Conventionally, this plant had great medical importance and the non-edible oil obtained from the seeds was used for soap and many other products. In India, it occurs almost, everywhere including Andaman and Nicobar Islans. Being a drought tolerant perennial, it can be grown on degraded and barren wasteland, fallow lands, roadside, bordering the agricultural fields as well as land under agroforestry programmes. By Jatropha plantation, unproductive wasteland can be converted into green oilfield. All these attributes make it a versatile plant and needs a greater attention to workout cultivation practices and extensive efforts to promote its cultivation on large scale, which will help in economic empowerment, social upliftment and poverty alleviation within marginalized communities. Keeping in view the above facts, the present study aimed, "to find out the prevailing Jatropha cultivation practices among the farmers in the study area"

METHODOLOGY

The present study was conducted purposively selected in Udaipur district of Rajasthan. The Udaipur district consists of eleven panchayat samities in total, out of which two panchayat samities were selected on the basis of maximum number of Jatropha growers. For selection of villages, five villages having highest number of Jatropha growers were selected from each identified panchayat samiti. From each selected village ten tribal ten non-tribal Jatropha growers were selected randomly with the help of random table. Thus the total sample consisted of 200 respondents, out of which 100 tribal and 100 non-tribal Jatropha growers were from all the selected villages. Data were collected with the help of well prepared and structured interview schedule employing personal contact. Therefore, data were analyzed, tabulated and interpreted in the light of objective of the study.

RESULTS AND DISCUSSION

An effort was made to find out the prevailing Jatropha cultivation practices among the respondents. For this, a schedule was developed containing twelve major practices about cultivation of Jatropha. The result about each practice are presented under following headings.

Use of varieties

The data incorporated in the Table 1 clearly indicate that 86.50 per cent of total respondents were using deshi/local variety of Jatropha on their field boundaries, wasteland, degraded land etc. whereas, only 13.50 per cent respondents were adopting improved varieties/species of Jatropha plants on grazing and cultivated lands. Further analysis of table reveals that 90 per cent tribal and 83 per cent non-tribal respondents were growing deshi variety of Jatropha. Whereas, 10 per cent tribal and 17. 00 per cent non-tribal Jatropha growers

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planted improved species of Jatropha plants. It was further observed that central and state governments are providing due emphasis on promotion and production of Jatropha throughout country. Scientists and research observed that Jatropha plants provide benefit to the farmers, who can cultivate them on arid and wasteland. The present findings are similar to the findings of Vashishtha (1997).

Table 1 Distribution of respondents on the basis of prevailing Jatropha cultivation practices (n=200)

S.No.	Practices	Tribal farmers (%)	Non-tribal farmers (%)	Total (%)
1.	**Use of Varieties**			
	i. Deshi varieties	90.00	83.00	86.50
	ii. Improved varieties	10.00	17.00	13.50
2.	**Use of land**			
	i. Field boundaries	93.00	100.00	99.00
	ii. Wasteland	81.00	23.00	52.00
	iii. Grazing land	3.00	6.00	4.50
	iv. Cultivated land	2.00	6.00	4.00
	v. Degraded and sodic land	7.00	17.00	12.00
	vi. Stony and gravel land	38.00	17.00	26.50
3.	**Plantation method**			
	i. Cutting	95.00	98.00	96.50
	ii. Seeds	20.00	23.00	21.50
	iii. Transplanting from nursery	8.00	15.00	11.50
	iv. Transplanting one year old plants	2.00	4.00	3.00
4.	**Plant spacing**			
	i. No recommended plant spacing	48.00	37.00	42.50
	ii. 2 x 2 mts plant spacing under normal soil condition	14.00	2.00	8.00
	iii. 1.5 x 1.5 mts plant spacing under high density energy plantation and rainfed condition	2.00	4.00	3.00
	iv. Bio-fencing at spacing of 1.5 mts apart in single/ double row system surrounding orchards/ cultivated fields	36.00	57.00	46.50
5.	**Planting time**			
	i. February - March	27.00	30.00	28.50
	ii. At the on set of monsoon (June-July)	66.00	65.00	65.50
	iii. during rainy season	7.00	5.00	6.00
6.	**Pit size used**			
	i. 30 x 30 x 30 cm	50.00	55.00	52.50
	ii. 45 x 45 x 45 cm	32.00	33.00	32.50
	iii. 60 x 60 x 60 cm	18.00	12.00	15.00
7.	**Irrigation schedule**			
	i. No irrigation (rainfed)	89.00	82.00	85.50
	ii. Only at plantation stage	9.00	12.00	10.50
	iii. Only at fruiting stage	0.00	4.00	2.00
	iv. Both at plantation and fruiting stage	2.00	2.00	2.00
8.	**Use of manures**			
	i. No use of FYM/manure	80.00	76.00	78.00
	ii. Application of manure @ 2.5 kg/pit before sowing of seed	20.00	24.00	22.00
9.	**Time of pruning**			
	i. No pruning	30.00	26.00	28.00
	ii. In the month of March	67.00	72.00	69.50
	iii. In the month of April	3.00	2.00	2.50
	iv. In the month of June	0.00	0.00	0.00

Table 1 contd....

S.No. No.	Practices	Tribal farmers (%)	Non-tribal farmers (%)	Total (%)
10.	**Hoeing and weeding**			
i.	No hoeing and weeding	83.00	78.00	80.50
ii.	1-2 hoeing and weeding	11.00	13.00	12.00
iii.	3-4 hoeing and weeding	4.00	5.00	4.50
iv.	5-6 hoeing and weeding	2.00	4.00	3.00
11.	**Time of picking**			
i.	In the month of October-November	50.00	48.00	49.00
ii.	In the month of December - January	22.00	13.00	17.50
iii.	In the month of February-March	28.00	19.00	23.50
iv.	No picking of fruits	0.00	20.00	10.00
12.	**Marketing channels**			
i.	Local merchant	80.00	71.00	75.50
ii.	Middleman	13.00	17.00	15.00
iii.	Local market	5.00	7.00	6.00
iv.	Cooperative society	2.00	5.00	3.50
v.	Regulated market	0.00	0.00	0.00

Use of land

Table 1 reveals that 100.00 per cent non-tribal and 93.00 per cent tribal respondents used the field boundaries for cultivation of Jatropha plants. Likewise, 81.00 per cent tribal and 23.00 per cent non-tribal farmers have planted Jatropha on 81.00 per cent tribal 23.00 per cent non-tribal farmers have planted jatropha on wasteland. The data further show that stony and gravel lands were also for cultivation of Jatropha plants 38.00 per cent tribal and 17.00 per cent non-tribal and 17.00 per cent non-tribal farmers used degraded and sodic land for cultivation of Jatropha plants. While, very few numbers among total respondents cultivated Jatropha plants on grazing and cultivated lands in the study area. The reason behind the fact is that majority of the respondents were not full aware of the benefits derived from Jatropha plants, which can be grown in scientific manner on grazing and cultivates lands.

Plantation methods

The data incorporated in Table 1 reveal that out of total 200 respondents, 193 respondents were following cutting method for plantation of Jatropha plants in their field during onset monsoon, out of these, 95 were tribal and 98 were non-tribal respondents. Nearly 21.50 per cent of total respondents were raising Jatropha plants by seeds. They have used 2-3 kg Jatropha seeds per hectare by this method. Further analysis of table shows that 8.00 per cent tribal and 15.00 per cent non-tribal respondents followed transplanting method for plantation of Jatropha. The seedlings raised in nursery beds were planted at proper plant spacing under well prepared pits. The 4-6 weeks old seedlings were transplanted during the rainy season.

It was further noted that only 3.00 per cent respondents have sown the Jatropha by transplanting one year old plants in the month of September. One year old plants generally grown up automatically under the old plants are used for cultivation of Jatropha on a suitable land. This technique saves the expenditure for raising the nursery and time for development of plant. From the above discussion it could be inferred that majority of tribal and non-tribal farmer were sowing Jatropha plants by cutting technique, which is common in the study area.

Plant Spacing

Table 1 shows that bio-fencing of at spacing of 1.50 mts apart in single/double row system surrounding orchards/ cultivated fields was prevailed among 36.00 per cent tribal and 57.00 per cent non-tribal respondents while, majority of tribal (48%) and non-tribal (37%) farmers had not adopted plant spacing as recommended by scientists for cultivation of Jatropha plants. This may be due to the fact that farmers are still not fully convinced of cultivation of

Jatropha plants on scientific lines in cultivated/ wastelands/grazing lands. Therefore, so many government and non-government agencies are working from last few years in this regard. Further analysis of table indicates 2x2 mts plant spacing under normal soil condition was followed by 14 per cent tribal and 2 per cent non-tribal farmers. It was also found that very few number of tribal (2) and non-tribal (4) respondents maintained 1.5 x 1.5 mts plant spacing under high density energy plantation and rainfed condition in the study area. The finding are borne out by the finding Ramachandra (2005).

Planting time

It is clear from the Table 1 That maximum number of tribal (66%) and non-tribal (65%) respondents cultivated the Jatropha plants at the onset of monsoon i.e. in the month of June-July. This may be due to the fact that June-July month is very appropriate time for plantation of not only Jatropha plants but also a;; kind of forest plants in the study area. Majority of respondents were of the opinion that poor mortality of plants is achieved when these are planted in the month of June-July. Further analysis of table shows that 27.00 per cent tribal and 30.00 per cent non-tribal Jatropha growers also planted Jatropha plants in the month of Feb-March on the boundaries of cultivated fields, where enough irrigation facility is available to irrigate the plants.

A close analysis of table further shows that 6.00 per cent of the total respondents, of which 7.00 per cent were tribal 5.00 per cent were non-tribal respondents, cultivated Jatropha plants during rainy season in the study area.

Pit size used

The data included in the Table 1 visualize that out of 200 respondents, majority (52.50%) of them used pit size 30 x 30 x 30 x cm for cultivation of Jatropha plant. On the other hand, 65 (32.50%) jatropha growers used pit size 45 x 45 x 45 cm for plantation of seedling/ seeds of jatropha and remaining 30 (15.00%) respondents planted jatropha plants in pit size 60 x 60 x 60 cm in the study area. It was also observed that majority of the jatropha growers did not fill the pits with mixture of normal soil, compost/biodynamic manures before sowing of seedling/seeds in the pits.

A Comparative view of pit size used by tribal and non-tribal farmers highlights that 30 x 30 x 30 cm pit size was used by majority of tribal (50.00%) and non-tribal (55.00%) Jatropha growers for sowing of Jatropha. Further, 32.00 per cent tribal and 33.00 per cent non-tribal respondents adopted pit size in the shape of 45 x 45 x 45 cm, while less number of tribal (18.00%) and non-tribal (12.00%) respondents were using pit size 60 x 60 x 60 cm in the study area. It was noted during the investigation that the respondents dug the pits in the month of April and May for the plantation of seedling/ seeds of jatropha plants.

Irrigation schedule

Table 1 vividly indicates out of total 200 respondents, 85.50 per cent had not applied any kind of irrigation to the jatropha plants. It means that these farmers were raising jatropha plants in totally rained condition because jatropha plants possessed most tolerant capacity to with stand under stress moisture condition, which does not require much irrigation. It was also noted from the table that 10.50 per cent of total respondents applied irrigation only at plantation stage because these farmers had the knowledge that light irrigation is required at plantation stage because these farmers had the knowledge that light irrigation is required at plantation stage for better establishment of plants. While, only 2.00 per cent jatropha growers found in the category of irrigation of jatroph plants at fruiting stage and both at plantation and fruiting stage respectively.

Further analysis of table clearly indicates that 89.00 per cent tribal and 82.00 per cent non-tribal farmers had not applied irrigation to jatropha plants at any stage whereas, 9.00 per cent tribal and 12.00 per cent non-tribal respondents irrigated jatropha plants only at plantation stage for better establishment of plants. Likewise, only 4.00 per cent non-tribal farmers were irrigated jatropha plants at fruiting stage for more fruit setting in the plants. Further, it can be observed from the table that equal number of tribal (2.00%) and non-tribal (2.00%) respondents were applying irrigation at plantation and fruiting stage of jatropha plants for getting more production.

Use of manures

The data incorporated in the Table 1 reveal that out of 200 respondents, majority of farmers (78.00%) did not use the Farm yard manure/compost/biodynamic organic manures in the pits before sowing of jatropha plants. Whereas 22.00 per cent of total respondents applied manure @ 2-3 kg/pit before sowing of seedlings/ seeds of Jatropha plants. Future analysis of table clearly reveals that 80.00 per cent tribal farmers and 76.00 per cent non-tribal respondents did not apply any kind of manures in the pits before sowing of jatropha seeds/ seedling. On the other hand, 20.00 per cent tribal and

24.00 per cent non-tribal farmers used manures as recommended through scientists per pit before sowing of jatropha seeds. This may be due to the reason that some of the farmers selected under study were trained by BAIF (non-government agency) in jhadol tehsil about scientific cultivation of jatropha plants. It was also observed during the investigation that none of the jatropha growers were using NPK mixture before sowing of jatropha seeds and after establishment of seedling in the study area.

Time of pruning

The data presented in Table 1 explicate that 69.50 per cent of the total respondents were pruning their jatropha plants in the month of March to improve the bearing potential of plant. Whereas, 28.00 per cent respondents did not prune the thinner and condensed shoots of jatropha plants because they were not aware of the advantages of pruning of plants. The pruning of thinner and condensed shoots of jatropha plants was practised in the month of April only by 2.50 per cent jatropha growers. While not a single respondents was pruning the jatropha plants in the month of June for higher production of jatropha seeds.

Further analysis of table clearly indicates that 67.00 per cent tribal and 72.00 per cent non-tribal respondents pruned their jatropha plants in the month of March to get maximum yield potential of plants. It was further noted that 30.00 per cent tribal and 26.00 per cent non-tribal jatropha grower were noted that 30.00 per cent tribal and 2.00 per cent non-tribal farmers pruned their plants in the month of April to get more yield from the same plants. It was noticed that jatropha is a bushy statured plant and vegetative growth dormancy showed during the winter months. The flowering and fruiting is also affected due to current shoot growth. Thus, pruning of thinner and condensed shoots is very essential in the month of March to improve the bearing potential of plant.

Hoeing and weeding

Table 1 illustrates that nearly 80.00 per cent of the total respondents were not practising hoeing and weeding in jatropha plants whereas, 12.00 per cent respondents practised 1-2 hoeing and weeding for removal of weeds and proper growth of the plants. It was further noted that 4.50 per cent jatropha growers were doing 3-4 hoeing and weeding in jatropha and very number (6) of respondents were observed in the category of 5-6 hoeing and weeding of jatropha plants. Thus hoeing and weeding practices were not followed by majority of respondents it may be due to the fact that most of the jatropha growers were not fully acquainted with advantage of intercultural operations.

Further, analysis of table shows that 83.00 per cent tribal and 78.00 per cent non-tribal were not doing any kind of intercultural operation in the cultivation jatropha plants. While, 11 tribal and 13 non-tribal jatropha growers performed 1-2 hoeing and weeding for weed control and proper growth of the plants. It was also found that 3-4 hoeing and weeding were reported by 4.00 per cent tribal and 5.00 per cent non-tribal respondents. Likewise, 2.00 per cent tribal and 4.00 per cent non-tribal jatropha growers practised 5-6 hoeing and weeding during raising of jatropha plants. These farmers possessed more scientific knowledge about improved aspects of jatropha cultivation. From the above discussion it could be concluded that slightly more number of non-tribal respondents adopted hoeing and weeding practices than tribal respondents in the study area.

Time of picking

The data presented in the Table 1 indicate that out of 200 respondents, majority of respondents (49.00%) picked jatropha seeds in the month of October-November. It means that most jatropha growers were picking the Jatropha crop not in right time as per cent the recommendations of scientists in the literature. Whereas, 17.50 per cent respondents were picking the fruits of jatropha in the month of December-January. Likewise, the picking of fruits was practised in February-March by 23.50 per cent farmers and only 10.00 per cent of the total respondents did not pick the fruits of jatropha in the study area.

A comparative view of picking time followed by tribal and non-tribal respondents visualizes that 50.00 per cent tribal and 48.00 per cent non-tribal respondents were picking the jatropha seeds in the month of October-November. Whereas, 28 tribal and 19 non-tribal were picking the jatropha fruits at the right time i. e. in the month of February-March. Likewise, 22.00 per cent tribal and 13.00 per cent non-tribal respondents collected the jatropha fruits in the December-January month. It is interesting to note that only 20.00 per cent tribal and 13.00 per cent non-tribal respondents collected the jatropha fruits in the December-January month. It is interesting to note that only 20.00 per cent of non-tribal farmers did not collect the jatropha seeds. It was observed that the average seed yield varied according to plant population, age of plantation and irrigation facilities. It was also noted that majority of tribal and non-tribal respondents were not growing jatropha plants on

scientific lines as recommended by experts so poor seed yield was observed. However, the average yield of dry seed per plant varied from 2-5 kg in the study area.

Marketing channels

Data present in Table 1 shows that nearly three-fourth of the total respondents were seeding their jatropha seeds to the local merchant at the rate of Rs. 6 to 9 per kg. Whereas, 15.00 per cent jatropha growers approached middleman for the selling of jatropha kernel and 6.00 per cent respondents sold their jatropha yield in the local market at the rate of Rs. 8 to 11 per kg. Amount 3.50 per cent of total respondents utilized cooperative society as a marketing channel to sell the produce of jatropha. None of the respondents sold the jatropha seeds in the regulated market in the study area.

A close observation of data clearly shows that 80.00 per cent tribal and 71.00 per cent non-tribal farmers were selling their jatropha produce to the locale merchant in the village. Majority of both the categories utilized local merchant as marketing channel for selling of produce, which may be due to the fact that local merchant is easily accessible in the village. It was further noted that middle man was the second important marketing channel for tribal (13.00%) and non-tribal (17.00%) respondents with regard to seeding of jatropha seeds. Whereas, a very small number of tribal (2) And non-tribal (5) were selling the jatropha seeds to cooperative society. But not a single respondent of both the categories went to regulated market to sell. But not a single respondent of both the categories went to regulated market to sale their produce for higher rate. This may be due to the fact that majority of respondents were getting very poor yield from the jatropha plants and also had poor knowledge about various marketing channels where produce of jatropha plants can be sold.

CONCLUSION

From the above results it can be concluded that majority of respondents were using deshi/local variety, which were plantation on the field boundaries through cutting method at spacing of 1.50 mts apart in single/ double row system. Further, majority of the jatropha growers cultivated jatropha plants at the onset of monsoon (June-July) in the pit size 30 x 30 x 30 cm without any kind of irrigation and manures in the pits before sowing of jatropha plants. It was also found that majority of respondents were pruning their jatropha plants in the month of march and harvesting the jatropha seeds in the month of October- November. The harvested seeds were selling by 70 per cent respondents to the local merchant.

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Research Note

Information and Decision Support System as a Tool in Technology Transfer: A 'SWOT' Analysis

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As part of artificial intelligence technology, information and decision support systems have been recognized as a powerful tool to store human knowledge in computers for the purpose of making expert's knowledge available to users. Information and decision support systems are knowledge processing computer programs intended to capture, preserve, use and extend the knowledge of experts (Waterman, 1986). They combine heuristics or rules of thumb, with computer graphics and hyper text to provide need based and highly specific information.

There are very good reasons to explore the possibilities of using information and decision support system in agriculture. The changing role of public extension in the era of globalization is the first and foremost. In the new environment, public extension have to play more of a regulatory role. And to play the new role, extension has to strengthen its control over the technology delivery mechanism. Therefore, the need of identifying the strengths, weaknesses, opportunities and threats of the information and decision support system as a transfer of technology tool for agricultural extension was greatly felt. Hence, the present investigation was structured to carry a "SWOT" analysis.

METHODOLOGY

The study was carried out with both *expost facto* and explorative design in the top ten banana producing states. The states selected include Tamil Nadu, Maharashtra, Karnataka, Andhra Pradesh, Gujarat, Madhya Pradesh, Bihar, Assam, Kerala and West Bengal in the order of banana production. And the required data was collected through from the three groups of respondents namely farmers, extension personnel and research scientists. A sample of 30 respondents (10 from each group) was drown based on purposive sampling technique.

The strengths, weaknesses, opportunities and threats of the information and decision support system as a transfer of technology tool for agricultural extension were also assessed. Strengths means the basic assets contained in the system. Weaknesses means the inherent deficiencies associated with the system. Opportunities are the possible ways of improvement the system can make. And threats represent the hidden problems that may come out on the use of the system. The data for 'SWOT' analysis were collected through an open-ended questioner and was content analyzed. Hereafter, ranking of the identified strengths, weaknesses, opportunities and threats were done and the top five was selected.

RESULTS AND DISCUSSION

Strengths

Strengths means the basic assets contained in the information and decision support system. They are considered as an inherent part of the system and they will remain throughout. The major strengths identified are given below:

Improves the cover of extension (83 %) : Through information and decision support system expert advice can be made available anywhere and at any time. Most of the techno-savvy farmers can easily access and use the information systems. And during the process the widening farmer-extension ratio can be effectively bridged.

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Brings a multidisciplinary approach to extension (73 %) : One of the greatest challenges before extension is to bring people from different disciplines together and pool their resources. With the popularization of the concept of information system, technical experts from different disciplines need to join the work together to develop better systems.

Brings a logical approach in problem solving (57 %): The structuring of message in the informationand decision support system is done through various principles of logic. The science of logic works correctly when the information is in the right form. By way of presenting the information in right form, complex problems can be explained through the information system.

Regulates the technology delivery mechanism (50 %): In the era of globalization extension is supposed to perform the role of a regulator. Developing and implementing information system brings greater control over the technology delivery mechanism. And thus regulators can effectively monitor the quality of the technology.

Makes reduction in printing cost (43 %): The software materials are relatively cost effective when we go for reproducing more copies. Thus, materials can be prepared and spread to more number of people in relatively less time. This will not be the case when we start printing the materials.

Weaknesses

Weaknesses are the inherent deficiencies associated with the system. They always disturb the normal working of the system. Some of the weaknesses of the system identified include:

Require computers and other accessories to work (87%): The information and decision support system can work only in a computerized environment. To install a computer and it's setting it needs something around 25,000 to 50,000 Rupees. Since most of our extension organizations are still far away from computerization, it will be a difficult task to think of such system at the present moment.

Needs basic knowledge in computers to operate (80 %) : Most of our extension personnel are above forty-five years in old and are trained in traditional extension methods. Making them to work in a computerized environment need a higher level of adjustment.

Need regular power and internet connection (73 %): To make the computer system work there is a need for uninterrupted power supply. However, many of our rural areas are still far away from electrification. Further, if we want to provide on-line information, phone connection is also a limiting factor.

Requires skilled personnel for development (50 %): The development of the software and updating needs computer professionals. Most of these professionals are from private sector and are paid high and works in a highly motivating environment. Making them work fora public sector organization at an entirely different environment is really a difficult task.

Depends highly on knowledge engineering skills (43 %): The success of an information system is highly dependent on the way technical information is synthesized. In most cases computer experts deduce the information needs for the extension personnel. And there comes the end of everything.

Opportunities

Opportunities are the possible ways of making improvement in the working of the system. By catching the opportunities considerable improvement in the performance can be made.

Can improve the effectiveness of distance learning (73 %): Distance learning is one of the best ways to educate the hitherto uncovered people on agriculture. To make the instructional learning process more effective there is the need for quality learning materials. The materials prepared for information and decision support system can be effectively molded to meet the learning requirements of various distant learning groups.

Can improve farmer-extension-research linkage (70 %): The gap between developed and used technology is some way around seventy per cent. This happens mainly because of poor research-extension-farmer linkage. Therefore, strengthening of this linkage is the best way to accelerate the technology flow process. By bringing all the actors of technology triangle together in system design this problem can be effectively addressed.

Can bring younger generation back to farming (63 %): One of the major challenges before extension is to bring the young blood back to agriculture. With development in computer and information technology there is sufficient scope of bringing the educated youth back to farming.

Can attempt for developing highly specific systems (47 %): Developing location and language specific information system is an area that can be looked into for future extension developments. By developing such systems the extension recommendations can be made more accurate. Further, it generates employment and also provides scope for value addition.

Can form rural information kiosks and search groups (40 %): There are a number of rural clubs, discussion form etc. working in rural areas. The popularization of information systems through these forums can make improvement in their working. Further, creation of different user groups where people interested in a particular technology or crop contribute their ideas is best way to harness local creativity.

Threats

Threats represent the hidden problems that may come out while using the system. The possible treats that should be effectively watched to prevent any type of damage to the system are:

Personnel touch in extension will be lost (73 %): Extension is meant for its service that will operate in a personalized environment. But when people start using computers, they may feel a highly rewarding environment. And during the process, the interaction between people, and also the personnel touch, get reduce.

Viruses damage file and increase maintenance cost (67 %): In extension organization there is every chance for the same computers to be used by more than one people and that itself for variety of purposes. This increases the susceptibility of computer to get attacked by virus. These can result in loss of files or even damage of the whole system and warrants the need for annual maintenance contract (AMC). Now a days most of the computer firms charge somewhere between 10 to 25 per cent of the cost of computers as AMC.

Loss of connectivity can stop the normal working (63 %): One of the basic problems associated with networking is the loss of connectivity. If the connectivity from server is lost due to a variety of reasons, the extension service will also be blocked. Further, people once get adapted to computer systems rarely try to go back to the manual mode. All these ultimately keep the operator at the loosing end.

Incorrect inferences can cause serious consequences (57 %): The ways users interpret the recommendation from the system ultimately results in their use of the information. Wrong interpretation can leads to wrong conclusion. Therefore, a number of users related variables also decide the acceptability of the system.

Possibility of hacking of the system cannot be ruled out (50 %): The development in computer technology is progressing in a very fast phase. At this level of development there is every chance for hacking of the system by wrested interest groups. And the hackers can even change the basic database of the system. The problem becomes severe when the change is made to price data or the data on chemical usage.

CONCLUSION

The major strengths identified in using the information and decision support system as a tool in transfer of technology was an improvement in the cover of extension. Besides, the system will also bring a multidisciplinary and logical approach in technology transfer. And among the weakness, the most prominent in the order include; the need of computers and other accessories, the basic knowledge on computers to operate, need of regular power and Internet connection, and the requirement of skilled personnel to manage, assumes significant.

The opportunities of the computer system include the improvement in the effectiveness of distance learning, farmer-extension-research linkage and the better coordination of various discussion groups. Besides, through these system extension can bring the new generation back to farming. Coming to the threats, the most important one is loss of personal touch to extension. There are chances where the system gets corrupted by various reasons and ends in high management cost. Another major treat is the loss in connectivity and the resultant stoppage of work.

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Research Note

Constraints Perceived by Beneficiaries in Adoption of Dairy and Livestock Enterprises of SGSY

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Unemployment and under employment Rural based employment generation programmes are the most important needs of the day. In this context the Indian Government has realized the magnitude of the unemployment problem and various efforts have been made through introduction of employment oriented programmes like, Integrated Rural Development Programme (IRDP), Training of Rural Youths for Self Employment (TRYSEM), Development of Women and Children in Rural Areas (DWCRA), Supply of Improved Toolkits to Rural Artisans (SITRA), Ganga Kalyan Yojana (GKY) and Million Wells Scheme (MWS). Due to many shortcomings in previous programmes the Government decided to restructure the self employment programmes. A new programme known as "Swarnajayanti Gram Swarozgar Yojana (SGSY)" was launched with effect from 1st April, 1999. The target group of SGSY included people living below poverty line. The expenditure of SGSY was to be shared by central and state governments on 75 : 25 basis. Dairy and livestock enterprises of the SGSY programme were selected for the study are one of the most important councerns in our contry they are the vital sectors of India's economy. Livestock production and dairy development have been viewed by planners and policy makers as effective instruments of social and economic change in the rural areas as they provide employment to the weaker sections and thereby help them in augmenting their income. The beneficiaries of SGSY faced various constraints in deriving benefits out of this programme. The present paper attempts to identify the constraints along with their severity. The results may help in strengthening the programme. Therefore, the present investigation was undertaken with the specific objective of identifying the major constraints faced by the beneficiaries in adoption of dairy and livestock enterprises of the SGSY.

METHODOLOGY

The present study was conducted in Girwa panchayat samiti of Udaipur district in Rajasthan. Seventeen villages were selected randomly from the Girwa panchayat samiti. Six beneficiaries from each identified villages were randomly selected. Thus, the total sample consisted of 102 beneficiaries from all seventeen villages. The data were collected with the help of structured schedule by personal interview method. To measure the intensity of constraints in the adoption of dairy and livestock enterprises of SGSY programme, three point continuum scale was used. These three points were most important, important and least important, with weightage of 3, 2 and 1, respectively. The recorded responses were counted and converted into mean per cent scores for each constraint and were accorded rank accordingly.

RESULTS AND DISCUSSION

An attempt was made to identify the constraints in various major aspects of the programme, like feeding, housing, milking, health care and hygiene, personal, socio-psychological, economic, general and overall problems.

It is evident from the Table 1 that "shortage of feed and fodder for animals", "scarcity of money for proper housing", "illiteracy as the hindrance in record keeping", "ignorance of the service and facilities available at animal health centres and hospitals", "lack of initiative", "lack of risk bearing capacity", "lack of capital

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Table 1. Constraints perceived by the beneficiaries of dairy and livestock enterprises of the SGSY in various aspects

S.No.	Constraints	MPS	Rank
A.	**Feeding constraints :**		
1.	Lack of knowledge about balanced ration	59.80	III
2.	Shortage of feed and fodder for animals	94.77	I
3.	Unavailability of concentrates and mineral mixtures in and around the villages	57.84	IV
4.	High prices of concentrates	87.25	II
5.	Non-availability of inputs needed for production of green fodder in the area of study	48.01	V
B.	**Housing constraints:**		
1.	Inadequate space for animals	68.62	II
2.	Lack of knowledge of cheap and scientific housing for animals	62.41	III
3.	Scarcity of money for proper housing	84.64	I
4.	Lack of time for managing sheds	37.25	V
5.	Lack of knowledge about weaning system	48.69	IV
C.	**Marketing constraints:**		
1.	Ignorance about the practice of "drying off"	69.93	III
2.	Lack of knowledge about scientific method of milking	53.26	IV
3.	Non-availability of scientific utensils for milking	44.77	V
4.	High cost of utensils	70.58	II
5.	Illiteracy is the hindrance in record keeping	93.46	I
D.	**Health care and hygiene constraints:**		
1.	Lack of knowledge of common contagious diseases, their causes and control	78.75	III
2.	Non-availability of veterinary services for treatment of sick animals	75.16	IV
3.	Vaccination facilities are not available regularly	81.37	II
4.	Ignorance of the service and facilities available at animal health centres and hospitals	89.86	I
5.	Cheap and timely medical care is not available in the area of study	61.76	V
E.	**Personal constraints:**		
1.	Lack of initiative	76.14	I
2.	Lack of foresight and vision	75.16	II
3.	Lack of decision making capabilities	65.03	IV
4.	Lack of enthusiasm to adopt a new programme	51.96	V
5.	Lack of ability to accept responsibility	74.50	III
F.	**Socio-psychological constraints:**		
1.	Lack of cooperation among the beneficiaries	76.47	II
2.	Lack of economic motivation	44.61	V
3.	Lack of risk bearing capacity	84.31	I
4.	Unfavourable attitude of credit institutions	64.70	III
5.	Lack of scientific orientation	52.88	IV
G.	**Economic constraints:**		
1.	Lack of capital for dairy and livestock enterprises	92.15	I
2.	Inadequate subsidy and loan by the government	78.10	IV
3.	Non-availability of credit in time	91.19	II
4.	Low rates of milk procurement	57.18	V
5.	Troubles involved in sanctioning the loan for dairy and livestock enterprises due to corruption of officials	82.02	III
H.	**General constraints :**		
1.	Inadequate contact with development functionaries	66.01	III
2.	Inadequate guidance and cooperation by line departments	86.92	II
3.	Lack of information about sources for loan and subsidy	90.19	I
4.	Lack of proper planning and coordination among concerned departments	48.03	V
5.	Small and uneconomic size of fodder production plots	56.20	IV

for dairy and livestock enterprises", "lack of information about sources for loan and subsidy" were the major constraints faced by the beneficiaries.

It can be seen from Table 2 that "feeding constraint" (MPS 80.13) was perceived as highest priority and was accorded first rank by the beneficiaries followed by "economic constraints" (MPS 77.38) and health care and hygiene constraints" (MPS 69.73).

Table 2. Overall constraints perceived by the beneficiaries of dairy and livestock

S.No.	Constraints	MPS	Rank
1.	Feeding constraints	80.13	I
2.	Housing constraints	60.32	VIII
3.	Milking constraints	66.40	VI
4.	Health care and hygiene constraints	69.73	III
5.	Personal constraints	68.56	V
6.	Socio-psychological constraints	64.37	VII
7.	Economic constraints	77.38	II
8.	General constraints	69.47	IV

Looking at the severity of major first three constraints viz., "feeding", "economic" and "health and hygiene" they were further the sub-constraints (severe) under these three major headings of constraints were as below :

Feeding constraints :

1. Shortage of feed and fodder for animals.
2. High prices of concentrates.
3. Lack of knowledge about balanced ration.

Economic constraints :

1. Lack of capital for dairy and livestock enterprises.
2. Non-availability of credit in time.
3. Troubles involved in sanctioning the loan for dairy and livestock enterprises due to corruption of officials.

Health and hygiene constraints:

1. Ignorance of the services and facilities available at animal health care centres and hospitals.
2. Vaccination facilities are not available regularly.
3. Lack of knowledge of common contagious diseases, their causes and control.

CONCLUSION

In line with the findings, it is concluded that most disturbing constraints in the success of dairy enterprises in the study area were three, which are, feeding, economic and health and hygiene. The areas of concern about the constraints were shortage of feed and fodder, inadequate space, lack of knowledge on the part of farmers about balanced ration, credit facilities and serious contagious diseases. Further, poverty among entrepreneurs, problems about loaning due to corruption and unavailability vaccination were the other constraints which need attention.

Based on the findings, it is strongly recommended that, if livestock enterprises have to be strengthened in the study area, the following line of actions by concern developmental agencies are required urgently:

i). Availability of feed and fodder by way of popularization of improved varieties thereof and their extensive cultivation. This is the job of universities and agriculture department.

ii). Rural banks and cooperatives be warned for the corruption involved in getting sanctioned the desired loan by the farmers and credits to the entrepreneurs without any deay.

iii). There is need to immediately look into the upgradation of knowledge of entrepreneurs about the balanced ration of animals, services of animal husbandry, credit and health and hygiene of animals and contagious and dangerous diseases. This task could be performed by the universities, agriculture and animal husbandry departments.

iii). Government should pay attention on decreasing corruption among officials in granting loans to the clienteles and frequently organizing vaccination camps for the benefits of dairy and livestock entrepreneurs.

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Research Note

Constraints in Adoption of Recommended Technologies for Composite Fish Culture

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Use of modern inputs and adoption of technology in aquaculture are undoubtedly more important in increasing farm productivity (Murshad, 1972). This is true particularly in the developing country like India where prosperity of country is mainly depended on agriculture. Empirical evidence shows that the adoption of recommended farming technologies gives high production and income to the farmers, yet many of them are reluctant to accept those technologies due to some limitations like-technical, economic, socio-psychological and infrastructural constraints. The extent of adoption of these recommended technologies by the fish farmers depends upon various factors as well as constraints faced by them. Constraints refers to the item of difficulties faced by fish farmers in the actual adoption of recommended technologies causing technological gap (Sen, 1987). It also plays an important role in adoption of recommended composite fish culture technologies. Therefore, the present study has been designed with the following objectives:

a. To analyse and study the constraints associated with technological gap in composite fish culture among the fish farmers.

b. Suggestions of fish farmers to overcome the constraints associated with technological gap.

METHODOLOGY

The present study was conducted in purposively selected three districts *viz.*, Gorakhpur, Faizabad and Varanasi of eastern Uttar Pradesh. In each district three blocks were selected which are categorized as high, medium and low on the basis of fish production level. In each block five to eight villages were selected randomly which were used for data collection and survey. There are nine blocks and fifty four village in which one hundred two fish farmers were interviewed for this study. The constraints faced by the respondents were measured by the open ended response technique. The responses of the respondents were measured in the form of 'Yes' or 'No' responses. The total numbers of frequency of the response were converted in percentage and then ranking was done.

RESULTS AND DISCUSSION

Constraints associated with technological gap among the fish farmers:

The respondents were asked to report the constraints they face in adoption of recommended technologies causing technological gap in their fish farming (Steffar 1992). During the time investigation the respondents expressed variety of constraints which are grouped into following three categories and presented in Table 1, 2 and 3.

The data presented in Tables (1,2,3) show that among technological constraints, "Lack of facilities for soil and water testing" and "undesirable fishes in the pond" were perceived main technological constraints by 83.33 and 73.83 per cent of the fish farmers respectively. While 91.67 per cent of fish farmers reports the "Lack of technical knowledge" was major constraints reported by 100 and 75 per cent of fish farmers respectively. This might be due to low educational level, poor economic conditions, unawareness about improved package of practices and use of traditional (Extensive) fish farming by the fish farmers (Thomas, 1987; Saharan *et al.*, 1992 and Rishi).

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Table 1: Technological constraints

(N=102)

S. No.	Constraints	frequ-ency	perce-ntage	Rank
1.	Lack of facility for soil and water testing	85	83.33	1st
2.	Undesirable fishes in pond	72	70.58	2nd
3.	Aquatic weed	63	61.76	3rd
4.	Algal blooms	49	48.03	4th
5.	Lack of assured water supply	40	39.21	5th
6.	Non availability of good quality and quantity of fish seed	27	26.47	6th
7.	Lack of balanced feed of fish (pellets)	10	9.80	8th
8.	Disease of fish	12	11.76	7th

Table 2: Information transfer constraints

(N=102)

S. No.	Constraints	Frequ-ency	perce-ntage	Rank
1.	Lack of knowledge about information center.	80	78.43	2st
2.	Lack of technical knowledge	91	89.21	1nd
3.	Lack of technical guidance	33	32.35	3rd

Table 3: Socio-economic constraints

(N=102)

S. No.	Constraints	Frequ-ency	perce-ntage	Rank
1.	Lack of inputs	79	77.45	2nd
2.	Low price of fish	102	100	1st
3.	Lack of fish insurance	36	35.29	4th
4.	Lack of transport facility	63	61.76	3rd
5.	Fish poaching	18	17.64	5th

Suggestion to overcome the constraints:

Respondents were asked to suggest possible solutions as they perceived to overcome the constraints associated with technological gap among them. The data in this respect are presented in Table-4.

It is clear that the data presented in Table 4, that more than 90 per cent of fish farmers had suggested arrangement for "easy availably of inputs" and "short term training programme at regular intervals" while "long term loan for management of fish pond" and "insurance facility" were suggested by 84.31 and 77.45 per cent of fish farmers respectively.

Table 4: Suggestion to overcome the constraints as perceived by the Fish Farmers

(N=102)

S. No.	Suggestions	Frequ-ency	perce-ntage	Rank
1.	Technical knowledge about composite fish culture provided	74	72.54	5th
2.	Easy availability of inputs provided	96	94.11	1st
3.	Easy way of fish insurance provided	79	77.45	4th
4.	Long term loan for management of fish pond	86	84.31	3rd
5.	Short term training programs at regular interval	92	90.19	2nd
6.	Time to time technical guidance for fish farming	69	67.64	6th
7.	Arrangement of fish market for getting high price	68	66.66	7th
8.	Arrangemet of fish feed in the form of pellets in which all protein, vitamins, fats and minerals are present in sufficient amount (Balanced feed).	62	60.78	8th

CONCLUSION

The main conclusion of this study are low price of fish, lack of technical knowledge, lack of facilities for soil and water testing, lack of inputs, undesirable fishes in the pond, lack of transportation facility were the major constraints associated with technological gap among the fish farmers. Majority of fish farmers suggested that easy availability of inputs, short term training programmes at regular interval and long term loan for management of fish pond will overcome the constraints associated with technological gap among the fish farmers.

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Research Note

Problems Perceived by the Potential Rural Entrepreneurs

Anita Jhamtani, J.P. Sharma, Rashmi Singh and Avinash Kumar Singh[1]

Developing entrepreneurship is crucial for overall development of the nation. Entrepreneurship development is essential for alleviating the problems of unemployment. There is need to make entrepreneurship development a mass movement. Experience as of last few decades both in India and abroad clearly show that it is possible to develop entrepreneurship through planned efforts.

The experiences have shown that two major factors play significant role in developing entrepreneurship. One of them is the development of human factor the entrepreneur himself. Another major factor is the development of environment where entrepreneurial activities can flourish and grow. The human factor refers to the attitude, desire and motivation of the individual, his capability to perceive the environmental changes and opportunities as well as high ability to solve problems which entrepreneurs are likely to face. The training is effective in developing all these aspects of human factor provided it is planned well with balanced emphasis on all aspects. Development of environment where entrepreneurial activities can flourish and grow is a long drawn process and can be hastened by committed efforts of the Government and the society at large.

The success rate in terms of setting up enterprises and running them successfully by those who attended Entrepreneurship Development Training Programme (EDPTs) has been quite varied ranging from anything between 8 to 60 per cent. Although success is not entirely dependent on training alone, since the support and services play an equally important role, yet the content and quality of EDPTs cannot be undervalued since it serves as the force to drive prospective entrepreneurs to entrepreneurial career. Training institutions do not seem to have much concern for objective identification and selection of entrepreneurs and the follow up after training, majority of them attribute it to low budgetary (contingencies) provision for the same. Those involved and concerned in the 'selection and follow up' activities have either limited manpower support and a near non existent linkage with other support agencies.

The present study was designed to gain an insight into the process of entrepreneurship development in rural youth specially focused on the problems perceived by potential entrepreneurs in entrepreneurial venture. An attempt was made to analyse the problems both personal and environmental in achievement of entrepreneurial goals.

METHODOLOGY

The study was conducted in agriculturally active rural Delhi and neighbouring villages in Haryana and Uttar Pradesh. On the basis of scope for entrepreneurship development in agriculture, six villages were identified two in Delhi namely Khatikara and Tatesar, one in Baghpat district namely Gauripur and three in Gurgaon district of Haryana namely Ghadolikalan, Ghadolikhurd and Kaadipur.

The sample for the study comprised educated unemployed rural youth from the six identified villages. The local panchayat leaders were approached to find out about the unemployed youth. Meetings with the youth of the villages were arranged at different locales numbering 2-4 in each village. A list of unemplolyed youth was prepared for each of the sites, viz., Baghpat, Gurgaon and Delhi. A sample of 45 youth from each locale was drawn on random basis from the sample of 225 educated unemployed rural youth (Ghadolikalan and

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Ghadoli khurd-45, Kaadipur-45, Khatikara-45. Tatesar-45, Baghpat-45). Ninety five were trained for entrepreneurship development under three training modules (Module I-27, Module II-18 and Module III-50). The training was provided to those who volunteered to be trained from amongst the 225 educated youth identified under the project. The data was collected with the help of pretested well structured schedule by conducting personal participatory interviews with the unemployed rural youth. Through the trainings youth were motivated to initiate entrepreneurial activity. They were continuously followed up after the training and provided necessary interventions to help initiate and establish entrepreneurial ventures.

RESULTS AND DISCUSSION

The perceived problems in starting entrepreneurial activity as revealed by the potential rural entrepreneurs can be broadly classified into two categories viz., personal problems related with self and individuals' immediate family and environmental, related with the community, market and credit institutions.

The personal problems perceived were : personal insecurity, lack of family support, lack of initiative, low risk taking ability, lack of motivation, lack of finance, unawareness regarding credit facilities, lack of awareness regarding potential enterprise, directions and know how. On the whole, large majority reported personal problems as blocking them from taking to entrepreneurship.

The environmental problems were reported by comparatively less number of respondents. These emanated from the existing value system of the society at large coupled with social norms and caste related restrictions on the individual to take up certain activities.

The family and community approval is one of the strong reasons that prevents youth from starting entrepreneurial ventures, which are not in line with the caste/religious norms. In an instance, in the village Jhatikara dominated by the Brahmins, youth were not allowed to start a fishery enterprise as the community objected to the activity being anti Brahmin pursuit.

An effort was made to identify the possible personal and environmental constraints in adoption of different enterprises as perceived by the rural entrepreneurs. The information collected through problems-cause-analysis with the enterpreneurs is presented in Table 1.

Table 1 reveals that majority, comprising nearly 81 per cent of potential entrepreneurs perceived lack of finance as the most important constraint ranked first, which prevented them from initiating entrepreneurial ventures. Financial constraints were perceived both at personal as well as at environmental levels. As per their own submission their own family elders did not have enough faith in their abilities to lend them some finances from the family kitty. In fact the family only instilled a fear of failure in the youth. The local banks too did not help as loans are given against collateral, which is usually a fixed deposit of some family member of the youth seeking loan or against land. Hence, youth invariably faced this problem of initial finance to start some entrepreneurial venture.

Directionlessness in terms of know how ranked second (72%). Majority of motivated entrepreneurial oriented youth did not have any know how for diversification or for taking up non-farm enterprises which include a range of products to suit the new demands and those of the market. Problem of marketing the produce was felt as the most crucial and common problem. To overcome this problem, marketing can be done collectively instead of single handedly. The budding entrepreneurs should be exposed to methods of analysing and surveying the market trends. They should in fact carry out market survey prior to making their decision on

Table 1. Problems perceived by the potential rural entrepreneurs (N=225)

S. No.	Problems	Number (f)	%	Rank
A.	**Socio-psychological (personal)**			
1.	Lack of family support	91	40.44	IV
2.	Problems in initiation	71	31.55	VIII
3.	Low risk taking ability	61	27.11	IX
4.	Lack of motivation	82	36.44	VII
5.	Lack of finance	182	80.88	I
6.	Unawareness regarding credit facilities	48	21.33	XI
7.	Lack of awareness regarding potential enterprise	106	47.11	III
8.	Poor technical know how	161	71.6	II
B.	**Environmental (external)**			
1.	Social norms and value	12	5.33	XIII
2.	The blocks due to caste and religion	14	6.22	XII
3.	Lackof credit facilities	51	22.66	X
4.	Poor institutional support and linkages	q84	37.33	V
4.	Lack of extension services	81	36.82	VI

the entrepreneurial venture. Also the correct pricing of the product must be taught to the entrepreneurs.

There were 47 per cent (rank-III) of rural youth who lacked any awareness regarding potential enterprise and plans for initiating entrepreneurial ventures. Forty per cent (rank-IV) felt blocked due to lack of family support, viz., moral and financial which created problems in achieving the entrepreneurial goal. They were besieged with fear of failure and had no support from the family. This was more of a psychological problem. It was observed that those rural youth who were encouraged by their own family members were more likely to be achievers as compared to others who were not provided any support especially moral. Personal and environmental blocks at the initial stage of starting an enterprise was reported by nearly one third of the youth while one fourth reported unawareness regarding credit facilities (21%).

The low risk bearing capacity (27%) of farm households was evident during the course of this study. More than one third of the rural youth (37%) who had started a small scale entrepreneurial activity had ventured only to a limited extent and into enterprises which assured them some income. In their exercise they were not much concerned about the quality and marketing strategies. With least input of effort they felt satisfied with minimum of returns. They did not find sufficient technical support through extension personnel and related sponsored institutes. So due to these problems, some times their own level of hope and motivation also decreased.

Over the period of three years during the research project it was observed that despite the fact that youth avoided going to the farm to lend a helping hand to their fathers, largely chose agriculture and allied activities for entrepreneurial venture. The main reason for zeroing in on agriculture and related work for entrepreneurial venture was their comfort level with it due to knowledge in the area as also the family support for such ventures was forthcoming as this did not pose much risk to them.

On the basis of the study it is recommended that some interventions be provided to the youth to take to entrepreneurial ventures within farm sector. The farm families having their roots in the village are very much tied to agriculture and having lived off it for generations found it difficult to change themselves according to changed circumstances. The economic needs of families have risen without any provision within agriculture to meet those needs. Hence they have no other choice but to seek new activities related to their known field, i.e., agriculture and allied areas.

By and large the family elders of the educated youth (target group for the present study) expected them to find a suitable job in the government or private sector. The over consuming fears of the senior family members for their failure had resulted in the youth too developing a fear of failure which over-weighed the hope of success. The values prevalent in the system too were found against entrepreneurial ventures outside of agricultural domain.

Interventions to achieve the entrepreneurial goals

Based on the findings of the study it is felt that the rural youth who are educated and unemployed need support and direction through institutionalized means to help them orient towards entrepreneurship and entrepreneurial ventures. The extension machinery in addition to the transfer of technology should include packages for the youth on entrepreneurial motivation, micro enterprise selection, launching management and marketing, etc.

The youth should be motivated to work in groups especially for marketing of the produce, which is often difficult at individual level. The self-help group organisation of the youth would be useful not only from marketing perspective but also give them power to obtain and get the benefits of government/banks credit support and push through the environmental blocks.

The role of agricultural universities and institutions is paramount especially to provide directions for agriculture based entrepreneurial ventures with which rural youth are more comfortable and can adopt with comparative ease.

CONCLUSION

Problems percieved by the potential rural entrepreneurs were more of socio-psychological than environmental. Major problem was lack of finance to start the entrepreneurial venture. The effective networking of institutions, self-help groups and government and non-governmet agencies coupled with well designed training programmes would go a long way in developing entrepreneurs.

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Research Note

Adoption of Modern Technologies through Institution Village Linkage Programme

Arunima Kumari[1], Kavita Kumari[2] and Meera Singh[2]

Indian economy is mainly an agrarian economy Since the advent of independence there has been spectacular progress in every area of human endeavours - science & Technology, Agriculture, Industry, Medicine, in Industry, Biotechnology and even in the area of Information Technology. Today India ranks 3rd in the number of technocrats, but all pleasure is diluted by the pain that still more than about 45 per cent of our population is below poverty line, per capita availability of food grain is only 75 kg. In such circumstances the challenge lies in front of us is how to push up our agricultural production with the increasing demand of huge population. The present rate of agriculture production can be increased to its double if the appropriate technology will be brought to fields. *In* the year of 1995 Govt. of India and ICAR started Institution Village Linkage programme in four villages only as pilot project with the main aim in its centre to introduce and integrate the appropriate technologies to increase the agricultural productivity,

After visualizing its performance IVLP was extended to 42 centres in different parts of the country. In Bihar it was launched in Ladaura and Pilkhi villages by RAU in 1998. In implementation of the project, it was mandatory to monitor the socio-economic impact or the technological intervention for different production system in adopted village. But how for these objectives have been fulfilled it is a matter to be rexammed Therefore this present study was conducted with the following objetives:

1. To assess the impact of 1VLP on adoption of modern technologies in crop production and animal husbandry.
2. To study the application pattern of agricultural chemicals before and after implementation of 1VLP.

METHODOLOGY

Pilkhi village of MuzatTarpur district was adopted under Institution Village Linkage Programme in the year 1999, various technologies ware introduced to farming community. Hente, this village was purptjsively selected for the study in order to assess the impact of adoption of modern technologic. Before and after research design was adopted from a list of IVLP beneficiaries group, 30 farmers were selected randomly. Age, education, caste, size of land holding, house type, occupation, household material possession, possession of agricultural implements, animal possession, family size, family type and social participation were taken as variables for the study.

RESULTS AND DISCUSSION

It can be seen from Table 1 that area under modern rice varieties increased from 17.07 ha in before situation to 24.34 ha in after situation area over before IVLP implementation. However, the increase was more pronounced or small farm size where area under modern nee varieties increased from 1.33 ha in before situation to 4.56 ha in after situation accounting for an increase of 242.86 percent after launching IVLP. Area under modern rice varieties has also increased from I. 04 ha in before situation to 3.30 ha in after situation on marginal farms showing on increase of 191.35 per cent after implementation of IVLP.

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Table I. Area under modern varieties of rice on beneficiary farms in before and after implementation of IVLP

(in ha)

Farm size Group	Before			After			% change in Area under Modern varieties
	Total area	Traditional	Modern	Total area	Traditional	Modern	
Marginal	5.35 (100.00)	4.31 (80.56)	1.04 (19.44)	5.04 (100.00)	2.46 (44.81)	3.03 (55.19)	+191.35
Small	6.33 (100.00)	5.00 (78.99)	1.33 (21.01)	7.05 (100.00)	2.49 (35.32)	4.56 (64.68)	+242.86
Medium	9.06 (100.00)	6.00 (66.23)	3.06 (33.77)	8.44 (100.00)	3.91 (46.33)	4.53 (53.67)	+48.03
Large	17.11 (100.00)	5.47 (31.97)	11.64 (68.03)	16.29 (100.00)	4.07 (24.98)	12.22 (75.01)	+4.98
Total	37.85 (100.00)	20.78 (54.90)	17.07 (45.10)	37.27 (100.00)	12.93 (34.69)	24.34 (65.31)	+42.58

Figures in parentheses indicate percentage to respective total area.

However the rate of increase in area under modern rice varieties was much less on medium and large forms where the increase was worked out to be 48.03 per cent and 4 98 per respectively. This may be due to comparatively higher proportion of area under modern rice varieties before implementation of IVLP. Hence it may be inferred that IVLP exerted significant influence on adoption of modern rice varieties on beneficiaries farm, particularly on smaller size of farms

Intercropping is an important agricultural technology which minimizes cost of production, reduces risks and give higher profit in agricultural production Before. IVLP farmers did not adopted suitable varieties of maize and potato which ultimately affected the crop yield. Hence after recommendation of IVP Lakshmi maize + Rajendra-2 aloo was adopted by the farmers From the Table 2 it can be inferred that impact was mainly observed on medium, small and marginal farms This higher

Table 2. Farm size coverage of area under maize & Potato in before and after introduction of IVLP

(in ha)

Farm size Group	Before			After			% change in area under Laxmi + Rajendra-2
	Maize + Potato	Laxmi + Rajendra-2 Alu	Other than Laxmi + Rajendra-2	Maize + Potato	Laxmi + Rajendra-2 Alu	Other than Laxmi + Rajendra-2	
Marginal	1.20 (100.00)	0.13 (10.83)	1.07 (89.17)	1.19 (100.00)	0.21 (17.65)	0.98 (82.35)	+61.54
Small	1.14 (100.00)	0.09 (7.89)	1.05 (92.11)	1.14 (100.00)	0.18 (15.79)	0.96 (84.21)	+100.00

Farm size Group	Before			After			% change in area under Laxmi + Rajendra-2
	Maize + Potato	Laxmi + Rajendra-2 Alu	Other than Laxmi + Rajendra-2	Maize + Potato	Laxmi + Rajendra-2 Alu	Other than Laxmi + Rajendra-2	
Medium	1.63 (100.00)	0.09 (5.52)	1.54 (94.48)	1.78 (100.00)	0.27 (15.17)	1.51 (84.83)	+200.00
Large	3.20 (100.00)	1.20 (37.50)	2.00 (62.50)	3.20 (100.00)	1.20 (37.60)	2.00 (62.50)	0
Total	7.17 (100.00)	1.51 (21.06)	5.66 (78.94)	7.312 (100.00)	1.86 (25.44)	5.45 (74.56)	+23.18

(Figures in parentheses indicate percentage to respective total area.)

level of adoption on medium and small farm was due to commercialized cultivation of these crops by the farmers.

The data given in Table 3 show that 50 per cent of the respondent fanners were using insecticides in before situation which increased to 56.67 per cent after the implementation of IVLP. Further it may be observed that adoption of weedicide and fungicide practices increased from 60.00 per cent and 66.67 per cent in before to 66.67 per cent and 70.00 per cent respectively after implementation of IVLP. Thus after the implementation of IVLP, adoption of insecticide, weedicide and fungicide increased by 13.33 per cent, 11.11 percent and 5.00 per cent.

Table 3. Application Pattern of chemical before and after implementation of IVLP

Type of chemicals	Before	After	% increase
Insecticide	15 (50.00)	17 (56.67)	13.33
Weedicide	18 (60.00)	20 (66.67)	11.11
Fungicide	20 (66.67)	21 (70.00)	5.00

Figures in parentheses indicate percentage to respective total member of farmers

The study also revealed (Table 4) that per milch animal milk production increased from 1671.13 litres to 1738.75 litres, 1474.72 litres to 1563.13 litres from 2137.85 litres to 2342.85 litres and from 3112.08 litres to 3243 50 litres on marginal, small medium and large farmers respectively. Again on an average per milch animal milk production also increased from 2238.65 litres to 2356.67 litres in after situation which accounted for 5.27 per cent rise in milk production.

Table 4. Farm/size wise, average milk production in a lactation period before & after the adoption or IVLP

(in litre)

Farm Size	Per Household		% increase
	Before	After	
Marginal	1114.08 (1671.13)	1159.17 (1738.75)	4.04
Small	2949.44 (1474.72)	3126.25 (1563.13)	5.99
Medium	2494.17 (2137.85)	2733.33 (2342.85)	9.58
Large	15560.38 (3112.08)	16217.5 (3243.5)	4.22
Total	3805.7 (2238.65)	4006.33 (2356.67)	5.27

(Figures in parentheses indicate per milch animal milk production in litre.)

CONCLUSION

The study has shown that there was an increase in crop productivity of paddy, wheat, maige + potato by 16.37, 11.08 and 0.83 per cent respectively due to IVLP. Per milch animal milk production increased by 4.04, 5.99, 9.58 and 4.22 per cent on marginal, small, medium and large farms respectively. Thus, it can be cancluded that the IVLP had a positive impact on adoption of modern technologies in crop production and animal hasbandry technologies.

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