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CONTENT

1. Assessing Adoption of Gross Margin Analysis Technique by Farmer Business School Lead Farmers in Mzuzu and Karonga Agriculture Development Divisions of Malawi — 1
   Beatrice Mbakaya, D. Kambewa and Isaac Mambo
2. Corporate Social Responsibility for Agricultural Development - A way forward — 13
   N. Balasubramani
3. A study on differential Adoption and Constraints of Dairy Farmers about Scientific Dairy Farming Practices in Amritsar district of Punjab — 29
   Sukhjinderjit Singh, Jagmohan Singh and Parvinder Singh
4. Use of Mobile Phone and its Apps in Extension Services — 37
   Pranav Kumar and Amandeep Singh
5. Rationality and Validity of ITKs on Plant Protection and Post-harvest Technology of Tribal Farmers in Telangana — 53
   N. Praveen and I. Sreenivasa Rao
6. Promotion of Entrepreneurship among Tribal Women under Tribal Sub Plan Scheme — 59
   E. Karuna Sree and R.V.S.K. Reddy
7. Empowerment of Rural Youth through Sericulture in Andhra Pradesh - present scenario and prospects ahead — 71
   S. Smitha, S.V. Seshagiri, A.K. Goel and P.J. Raju
8. Participation of Rural Youth in Agriculture — 89
   M.K. Rathod, G. Rakesh and S.S. Prasad
9. Impact of Technologies Assessed, Refined, Demonstrated and Disseminated to Paddy Farmers - A Case Study — 101
   N.Venkateshwar Rao, P.K. Jain, N. Kishor Kumar and M. Jagan Mohan Reddy

Views expressed in the articles are of the authors and not necessarily of the Institute.

-Editor

Assessing Adoption of Gross Margin Analysis Technique by Farmer Business School Lead Farmers in Mzuzu and Karonga Agriculture Development Divisions of Malawi

Beatrice Mbakaya[1], D. Kambewa[2] and Isaac Mambo[3]

Abstract

Gross margin analysis technique is among the tools that farmers are taught in farmer business schools to enable them to plan for profitable enterprises. This study was aimed at assessing the adoption of this technique being promoted among lead farmers.

It was observed that 60 per cent of the respondents did not prepare gross margins, indicating low adoption of this technique. Among the users of gross margin technique, this was used in selection of profitable enterprises only. Most of the respondents (60%) had an average knowledge on gross margin technique. Most respondents (82%) however indicated that it is easy to do gross margin analysis. Moreover, farmers complained that they do not sell their products at calculated sale prices. Use of gross margin technique was found to be associated with availability of farm records, extension follow-up visits on gross margin analysis and farmers` knowledge on gross margin analysis($p<0.05$).

Keywords: Adoption, Gross margin analysis technique.

Introduction

Malawi`s economy remains predominantly agro-based despite development of other economic sectors (GoM, 2012a). The agriculture sector is divided into two: the small-scale and the estate sub-sector (GoM, 2012a). The smallholder sub-sector contributes around 70 per cent of the total agricultural output (GoM, 2012c). Despite the fact that the smallholder sub-sector contributes a significant amount to Malawi`s GDP, farming by these smallholder farmers has in general not been approached as a profit making undertaking (GoM, 2012b). However,

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most capacity building programmes ear marked for the farmers in Malawi have been focusing on technical issues that include agronomic and production aspects. Little has been accomplished in imparting knowledge and skills in agribusiness and marketing, and more so in a structured format (GoM, 2012b). In an effort to provide technical back-up services, in 2008, the Ministry of Agriculture and Food Security initiated Farm Business Schools (FBSs) with the aim of strengthening the capacity of selected lead farmers to plan and orient their production activities towards the market to promote farm commercialization. Other countries where the FBS concept was piloted include Zambia, Pakistan and Ethiopia (Kahan, 2007).

The training of farmers in farm business management in Malawi dates back to 1969 when it was noted that it was not enough for farmers to produce good crops and animal products and leave the profit to look after itself (Tolani, 2002). However, these farm business management trainings among farmers were criticised for their unstructured format and little emphasis on marketing in an era of liberalised markets (GoM, 2012b). This necessitated putting in strategies to empower smallholder farmers to be conscious and aware of the challenges and opportunities that exist in a liberalised market economy and more so in a structured format. Farm business school is one strategy which the Government of Malawi piloted in eight districts in 2008, with assistance from Food and Agriculture Organisation (FAO). These districts are Karonga, Rumphi, Mchinji, Dedza, Salima, Mangochi, Mwanza and Nsanje.

A farm business school is a programme of business-oriented learning designed to help smallholder farmers who are getting involved in producing for the market and need help in making it work profitably (GoM, 2012a). Taking place at the village level, a FBS brings selected lead farmers together to carry out collective and collaborative enquiry with the purpose of motivating them to address business and marketing problems and opportunities (GoM, 2012a). According to GoM (2012a), an FBS has four distinctive characteristics: firstly, focus is on the content not training facility, secondly, participants learn by doing, it also promotes farmer to farmer learning where participants share experiences and lastly, the programme is organised to match the activities of the farm season with three terms *viz.,* pre-season, in-season and post-season (GoM, 2012a).

According to the Government of Malawi, (2011), the training of farmers in FBS can take one of the following models: in the first model, lead farmers are called

to a residential training centre where they undergo complete season training for 4-5 months for annual crops and eight months for livestock. On completion, graduates facilitate their own FBS in their local communities. The second model is an abridged residential training of lead farmers. Focusing on essential concepts, it approximately takes 30 days. On completion, graduates facilitate their own FBS in their local communities. As regards the third model, lead farmers are trained at residential training centres as well but at key times during the season. The fourth model is also an abridged residential training of lead farmers which takes 30 days but split into stages. The residential training centre in this case is closer to the field to test exercises in the field. The fifth model is a localized field school that takes place in the field. A Core Team of Trainers come down to the field level and work with extension workers in setting up schools directly on the ground.

Implementation of FBS under study took model number five. Apart from being cost effective (GoM, 2011), it is argued that field based training used in this model, is also more effective in building skills as it is done at the pace of the farmers with more time to explain issues and offer more technical support (GoM, 2009). Lead farmers selected to participate in these FBS, came from farmer groups who were already involved in income generating enterprises. Each FBS had fifteen lead farmers. On completion, the participants graduate as FBS lead farmers. By definition, a lead farmer is described as a farmer who has mastered a specific technology and is willing to support fellow farmers in the learning and implementation of that particular technology (GoM, 2012a). The essence of using lead farmers is to reach out to most farming population which is not reached due to inadequate front line agriculture extension staff. Using facts and figures, gross margin analysis is one of the instructional technologies FBS lead farmers learn and for those lead farmers who are not good at figures, symbols are used to represent figures in calculation of enterprise gross margins. The objective of capacity building programmes among farmers is to enable farmers to use the knowledge in decision making processes regarding their farm business. However, studies have shown that after going through trainings, farmers do not apply the knowledge in decision support services (Kahan, 2007). This was a follow-up study to assess adoption of Gross Margin Analysis (GMA) technique being promoted among lead farmers in farm business schools in Karonga and Mzuzu Agriculture Development Divisions (ADDs) of Malawi.

Objectives of the study

The overall objective was to assess whether lead farmers who were in farm business school had adopted gross margin technique. The specific objectives of the study were:

i. To assess the level of knowledge of FBS lead farmers on GMA.

ii. To assess the level of use of GMA technique by FBS lead farmers.

iii. To assess the FBS lead farmers` perceptions towards GMA technique.

Research Methodology

Description of the Study Areas

Eight FBS were piloted in Malawi in eight districts in 2008. These districts are Karonga, Rumphi, Mchinji, Dedza, Salima, Mangochi, Mwanza and Nsanje. Due to financial constraints, FBS in the northern part of Malawi were sampled. The study was conducted in Mhuju and Bolero Extension Planning Areas (EPA) in Rumphi district and Nyungwe Extension Planning Area in Karonga district. These Extension Planning Areas are among a number of Extension Planning Areas in the country where farmers were trained in gross margin technique under Farmer Business School (FBS).

Sampled Participants and Sampling Method

Through the District Agriculture offices in Karonga and Rumphi districts, names of Farmer Business Schools which were piloted were collected and this included a list of farmers who were recruited. It was found out that some farmers did not attend some lessons due to a number of reasons, *e.g.* attended funeral at the time; some were sick and some dropped out on the way. According to the selection criteria, farmers who did not attend gross margin lessons were left out. In total, 50 farmers were purposively sampled, with the aim of having lead farmers with information on gross margin analysis to allow for an in-depth case study.

Data Collection Methods and Tools

To document FBS lead farmer knowledge in gross margin analysis, an oral test was administered through face to face interviews which allowed for more in-depth assessment of farmers' knowledge. The test was developed based on the key recommendations on how to prepare enterprise gross margins outlined in the market oriented farm planning and management training manual for training staff

(GoM, 2012). To determine the farmers practice, farmer's record books were reviewed. Review of farmer`s record book offered evidence that lead farmers were using knowledge gained from the gross analysis lesson. Through face to face interviews using a checklist, farmer's perceptions towards gross margin analysis were captured.

Analysis of the Data

The initial steps of data analysis were achieved by computing frequencies, means and percentages of all variables of interest. Further, to determine relationship between categorical variables, cross tabulations were computed. To test whether the association between two categorical variables under consideration was significant, a chi-square test for association was examined where an observed frequency associated with a class is compared to an expected frequency. In order to test differences in mean knowledge scores between farmer groups, an independent 2- sample t-test was used. The F-test was performed to check for equality of variances as described by Armitage *et al.,* (2002). In an attempt to determine farmer knowledge of gross margin technique, a marking scheme was developed for scoring each farmer. The percentage scores were graded as follows to determine the knowledge levels of farmers in gross margin analysis: 70% - 100% (High), 40% - 69% (Average), 0% - 39% (Low), as adapted from Nekesa (2012).

Results and Discussion

Socio-economic Characteristics of the Study Population

The respondents comprised of 24 (48%) men and 26 (52%) women with a mean age of 42.24 years (SD 11.3). Majority of participants were within the productive age group (26-60) years old. The mean income was MK202,280.00/year, which is US$282 (@ 716.713 Malawian Kwacha=1 UD $) with farming as a major source. This is above the average annual income per household among smallholder farmers in Malawi which is reported to be MK50,000.00 (National Statistical Office, 2005). The type of farmers selected were not mere subsistence smallholder farmers; they were selected from farmer groups who were already involved in income generating enterprises hence the difference in income levels. Forty-four per cent, completed primary school education, furthermore, 56 per cent completed their secondary school education.

Farmers` Knowledge on GMA

The findings of the study revealed that most lead farmers (60%) were in the

category of an average knowledge level (40% - 69%). The mean knowledge score of participants was 43.52 per cent. This indicates that knowledge gaps in gross margin technique still exist among most FBS lead farmers. An analysis of the distribution of scores for each type of knowledge which comprise of awareness and how-to knowledge are displayed in Table 1.

Table 1. Percentage Score for each examined area on GMA

Type of knowledge	Possible Marks	Mean percentage score
Awareness knowledge		
Definition of gross margin	15	66.4
Definition of variable costs	10	56.0
Definition of gross income	10	60.0
Importance of gross margin analysis	10	83.0
How-to knowledge		
Procedure for gross margin preparation	55	27.0
Overall score	100	

Higher mean percentage scores were on awareness knowledge compared to how-to knowledge. This implies that respondents were more knowledgeable on awareness knowledge (what gross margin analysis is, what are variable costs, what are fixed costs and importance of gross margin analysis) compared to how-to knowledge (procedure for gross margin preparation). When it came to describing the procedure for gross margin preparation almost all farmers mentioned the need to establish value of production; however, some steps in establishing value of production were not mentioned. For example, need for establishing value of units of produce still possessed, eaten, given away, battered and that of any by-products. Despite attending lessons on GMA, it was noted that most lead farmers had an average knowledge on GMA technique hence this study assessed the relationship between farmers' associated characteristics of the study participants and how they relate to their knowledge level in GMA.

Influence of Farmers' associated Characteristics on Knowledge of GMA

Influence of Education on Knowledge of GMA

The mean knowledge score of lead farmers who attended primary education was 44.5 (SD 24.8) and that of lead farmers who attended secondary education was 46.1 (SD 24.2). An independent 2 sample t-test performed to test the relationship between knowledge scores of lead farmers and their education levels revealed that

there were no significant differences in the mean score of knowledge between participants who attended primary and secondary education with respect to gross margin analysis (t=-0.22, p=0.8). This is contrary to the belief that more years spent in formal education increases understanding of concepts. The training methodology used by FBS increased the chances of impacting knowledge on gross margin knowledge by lead farmers irrespective of their educational background *e.g.*, those who are not good at figures, symbols are used to represent figures to come up with gross margins.

Influence of Availability of Records on Knowledge of GMA

The mean knowledge score of lead farmers who kept farm records was 54.4 (SD25.7) and that of lead farmers without farm records was 27.9 (SD 25.7). An independent 2 sample t-test performed to the means of knowledge scores of farmers who kept records and those who did not keep records, revealed that there were significant differences in the mean score of knowledge of gross margin analysis between these two farmer groups (t=- 4.24, p=0.0001). This indicates that farmers who maintained records had a better understanding of gross margin analysis than those who did not. This finding is in line with Griffith (1984) who reported that in the teaching of farm management and record keeping, the most effective learning experience involves the use of each farmer's own records as a basis for discussion and the explanation of alternatives. He continues to say that the use of other hypothetical cases does not make as much impact on the learner as does the use of records the farmer keeps. The current results suggest that availability of farm records contributed to better understanding of gross margin analysis among those who kept records.

Use of GMA Technique by Lead Farmers

Only 34 per cent of the respondents adopted gross margin analysis technique. The results indicate that there is low adoption of gross margin technique among FBS lead farmers. All the farmers who adopted gross margin technique used it in assessing profitability of enterprises. Enterprises selected include: tobacco, maize, ground nuts, paprika, beans, onions, soya and green maize in Rumphi; rice, maize, tobacco in Karonga. Among the reasons farmers gave as regards their choice of these crops includes the fact that market for these crops is readily available. As reviewed in literature, use of GMA technique is also affected by a number of factors as discussed below.

Influence of Farmer Characteristics on Use of GMA Technique

Influence of Extension - Farmer Contact on Use of GMA Technique

A Pearson Chi-square test revealed a significant relationship between extension-farmer contact on GMA and use of GMA ($\chi 2=10.1901$, $p=0.001$). The results suggest that extension-farmer contact on gross margin analysis promotes use of gross margin analysis. Follow up visits to farmer business school participants are part of the farmer business school learning processes which help to individualize knowledge gained by farmers to different farm settings.

Influence of Availability of Records on Use of GMA

Maintenance of proper farm records as is done in all other commercial entities is key to monitoring and evaluating the financial viability of the farm enterprises (GOM 2008). Realizing the key role farm records play in farming business, this study analyzed the relationship between use of gross margin analysis technique and ability of lead farmers to keep records. A Pearson Chi–square test revealed a significant relationship between use of GMA and availability of records *($\chi 2=9.0749, p=0.003$).* Most lead farmers (94.1%) who used gross margin analysis technique, kept records. Gross margin analysis technique is data dependent and availability of records facilitates compilation of gross margin without which it is difficult to prepare gross margins.

Influence of Knowledge of GMA by use of GMA technique

The mean knowledge score of lead farmers who used gross margin analysis was 56.2 (SD 20.6) and that of lead farmers who did not use gross margin technique was 39.8 (SD 24.4). A Wilcoxon rank-sum (Mann-Whitney) test was performed to the means of knowledge scores of farmers who adopted gross margin technique and those who did not adopt gross margin technique. The mean score on knowledge on gross margin analysis among adopters and non-adopters was significantly different ($z=-2.25$, $p= 0.02$). This implies that adopters were more knowledgeable than non-adopters on gross margin analysis. The inadequacy of this knowledge may have affected adoption of this technique among non-adopters as noticed by their low mean knowledge scores on gross margin analysis. This is in line with International Labour Organization on World Agriculture in 1981 which reported that the degree of completeness or adequacy of knowledge will affect the manner in which a technology is applied.

Influence of Education level of Respondent on Use of GMA technique

A Pearson Chi–square test revealed no significant relationship between adoption of gross margin analysis and education level *($\chi 2 = 0.0006, p=0.981$)*. The finding suggests that there is no relationship between education level and adoption of gross margin analysis. This is contrary to the belief that more years spent in formal education makes one respond much faster to new information. The training methodology used by FBS increased the chances of impacting on adoption of gross margin technique among lead farmers irrespective of their educational background *e.g.,* for those who are not good at figures, symbols are used to represent figures to come up with gross margins.

Use of GMA Technique by Income of Respondent

An independent 2 sample t-test performed to the means of income of adopters and non-adopters revealed that the mean incomes were not significantly different *($t=-0.77, p=0.44$)*. This suggests that farmer income levels have no effect on adoption of gross margin analysis.

Farmers Perception towards GMA Technique

Lead farmers first learnt about gross margin analysis technique from the farmer business school. This suggests that gross margin analysis is a new concept to these graduates hence it was necessary to determine the farmers' perception towards the technique. In this study, lead farmers' perceptions towards the technique were captured in terms of the relevance and usability of gross margin analysis in their farm business.

On importance of gross margin analysis, all the farmers indicated that it was important as it helps one to know which enterprise is profitable. Fifteen FBS lead farmers mentioned that gross margin analysis helps one to know what inputs will be needed in a particular enterprise and twelve FBS lead farmers mentioned that gross margin analysis helps one to know what expenditure will be incurred.

On the ease of use of gross margin analysis, most farmers 82 per cent (n=50), reported that it is easy to use gross margin analysis. With most of farmers 82 per cent (n=50), reporting that it is easy to use gross margin analysis, one would expect that most graduates would be able to use gross margins but this was not the case as noticed by the low percentage of respondents who used gross margin analysis technique.

Farmers' Reasons for not using Gross Margins

The majority of farmers (69.7%) indicated that even if they prepare gross margins and venture into enterprises which seem to be profitable, when it comes to marketing the products, the prices of their products are not based on the prices they set. An example of tobacco and cotton prices was cited in Rumphi and Karonga districts respectively, and this demoralizes them. Among the reasons given by the farmers for not practicing gross margin analysis was that they had forgotten how to prepare gross margins (24.2%) and 3.0 per cent indicated that they did not have time to prepare gross margins because it required them to be keeping detailed records which is time consuming. This finding is in line with what Harding (1982) and Dorward (1991) reported that many of the conventional farm management techniques have been criticized as too complex, erudite and data- dependent and time consuming. Another 3 per cent indicated that they did not prepare gross margins because they did not have enough inputs which were required in viable enterprises. This is in line with a report by Malawi Government (2005) that lack of cash dominates the choices available to the typical Malawi farmer.

Conclusion and Recommendations

From this study it may be concluded that the adoption of gross margin analysis was associated with availability of farm records, knowledge in gross margin analysis and contact between extension workers and farmers on gross margin analysis. Apart from attending fortnightly training sessions where FBS lead farmers can be refreshed on the concept of gross margin analysis, this study proposes introduction of farmer awards on farm record keeping thereby promoting the culture of maintaining records which facilitate compilation of gross margins.

It was found that knowledge gaps among FBS lead farmers on gross margin analysis still exist. Higher knowledge scores on awareness knowledge on gross margin analysis technique were observed compared to how-to knowledge on gross margin analysis technique. This study proposes that FBS lead farmers must attend some Fortnightly Training Sessions (FTSs) with front line extension staff where lessons on how to prepare gross margin can be demonstrated in detail.

Among a number of uses of gross margin technique in farm business, findings of this study indicate that all lead farmers who adopted gross margin technique used it only in selection of profitable enterprises. This indicates low level of use of this technique among FBS lead farmers. This study recommends refresher courses on the other uses of gross margin technique among FBS lead farmers.

Farmers further indicated that they get demoralized because they do not sell their products at expected prices and are often price takers at the market. This study proposes that the setting of minimum produce support prices as practiced in several countries such as India must be done in a participatory manner.

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Corporate Social Responsibility for Agricultural Development - A way forward

N. Balasubramani[1]

Abstract

A huge investment is required to address the current challenges of agriculture. These challenges provide space for a pluralistic eco-system to involve various players. The Corporate sector is one of the important players in the current policy initiative to leverage Corporate Social Responsibility (CSR) funds for agricultural development. However, a very small amount of CSR fund has been spent in the agricultural sector by the companies though there is huge potential for investment in the sector. Agriculture is yet to attract the attention of India's CSR. Countries that had relatively high Agriculture growth, saw substantial reduction in poverty. Hence, if the Corporates allocate more fund under CSR in agriculture, many challenges of the farm sector can be addressed. Corporates who have invested in Agriculture as part of CSR activities have seen a significant improvement in terms of adoption of improved agriculture practices, conservation of natural resources, reduction in external inputs and cost of cultivation, etc., in their project areas. The emphasis of CSR in the Agriculture sector needs to be in the areas of environmental sustainability, natural resource management, innovation and technology led development, social development, entrepreneurship development, livestock development, market development, farm advisory services, etc. In order to promote CSR activities in Agriculture, it is suggested to have a Special Purpose Vehicle (SPV), steering committee having broad based representation of various stakeholders, proper monitoring system at various levels, etc.

Keywords: Corporate Social Responsibility, Agriculture

Introduction

Development of Agriculture continues to remain critical for India's economic growth, poverty reduction and ensuring food security of the country, as over 58 per cent of the rural households depend on agriculture as their principal means of livelihood. Green Revolution which brought food sufficiency to the country was due to a combination of technologies *viz.,* hybrids and high yielding varieties,

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fertilizers and improved agronomic practices and public policy. This revolution was made possible through an organized and committed Agricultural Extension system that ably supported and supplemented the input intensive production system.

In spite of significant growth in agriculture, Indian Agriculture continues to face serious challenges such as depletion of natural resources, occurrence of extreme events of climate change, exploitation by the intermediaries, inadequate credit support *etc.* A big investment in agriculture is required to address the current challenges and achieve 4 per cent technology led agricultural growth. These challenges cannot be addressed by any single agency either in public or private sector. These challenges provide a space for a pluralistic eco-system to involve various actors and service providers such as corporates, private agri-business companies, NGOs, producers' organizations with additional manpower, knowledge, skills, expertise and leveraging Corporate Social Responsibility (CSR) funds for overall development of agriculture and benefit of farmers.

The gradual transformation in CSR in India has gone beyond philanthropy to overall community development with more commitment. Similarly, the Government also started looking at corporates as partners and involving them in the process of development.

However, the data shows that, very meagre amount of CSR fund has been spent in the agricultural sector by the companies though there is huge potential for investment in the sector. Corporates cannot see agriculture in isolation. CSR may be seen in terms of "Creating Shared Value" wherein, business can help progress of agriculture and agriculture sector can help business to improve and flourish.

Overview of CSR Framework

As per the Section 135, sub section 1 of the Companies Act, 2013, every company having a net worth of rupees five hundred crore or more, or turnover of rupees one thousand crore or more or a net profit of rupees five crore or more has to spend 2 per cent of their profit on CSR activities. Such companies are mandated to constitute a Corporate Social Responsibility Committee of the Board. The role of the committee is to approve the CSR Policy of the company, disclose its contents in the Board's Report and place it on the company's website, ensure Implementation of CSR activities, ensure 2 per cent of the profit on CSR activities and Disclose reasons for not spending. The rule is effective from 1st April, 2014.

Activities Not Falling in the Ambit of CSR

- The CSR projects that benefit only the employees of the company and their families shall not be considered as CSR activities in accordance with section 135 of the Act.
- One-off events such as marathons / awards / charitable contribution / advertisement / sponsorships of TV programs *etc.* would not be qualified as part of CSR expenditure.
- Activities which are not taken up in project mode.
- Expenses incurred by companies for the fulfillment of any Act / Statute of regulations (such as Labour Laws, Land Acquisition Act *etc.*) would not count as CSR expenditure under the Companies Act.
- Contribution of any amount directly or indirectly to any political party shall not be considered as a CSR activity.
- Activities undertaken by the company in pursuance of its normal course of business.

Schedule VII of the Companies Act, 2013 about list of proposed CSR activities

As per the Schedule VII (Sections 135), the Activities which may be included by companies in their Corporate Social Responsibility Policies, relate to:-

I. Eradicating extreme hunger and poverty.

II. Promotion of education.

III. Promoting gender equality and empowering women.

IV. Reducing child mortality and improving maternal health.

V. Combating human immunodeficiency virus, acquired immune deficiency syndrome, malaria and other diseases.

VI. Ensuring environmental sustainability.

VII. Employment enhancing vocational skills.

VIII. Social business projects.

IX. Contribution to the Prime Minister's National Relief Fund or any other fund set up by the Central Government or the State Governments for socio-economic development and relief and funds for the welfare of the Scheduled Castes, the Scheduled Tribes, other backward classes, minorities and women; and

X. Such other matters as may be prescribed.

In Schedule - VII, the following items have been inserted with necessary amendment in the said Act.

XI. Slum area development.

XII. Contribution to the Swachh Bharat Kosh set up by the Central Government for the promotion of sanitation.

XIII. Contribution to the Clean Ganga Fund set up by the Central Government for rejuvenation of river Ganga.

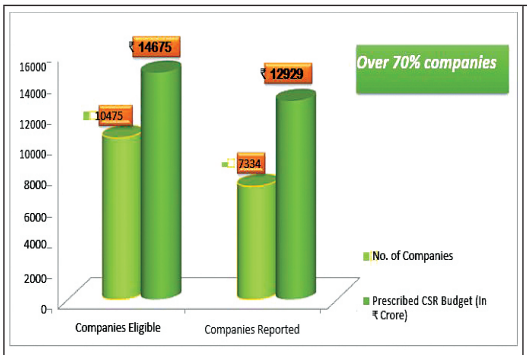
However, Agriculture is subsumed under 13 items of Schedule VII, and hence, agriculture is yet to attract the attention of India's CSR. Therefore, Agriculture should be added as a separate activity under priority sector among the activities enumerated in Schedule - VII of the Act like the Swachh Bharat Mission, Clean Ganga Mission, and Slum Area Development and get agriculture on the radar of CSR. A neutral and non – profitable organisation should facilitate to create a favourable ecosystem for stakeholders of CSR for agricultural development and CSR component should play a catalyst role for transforming agriculture, Thereby, partner companies may offer services to the agriculture sector through increased share of CSR fund in agriculture.

Why CSR in Agriculture?

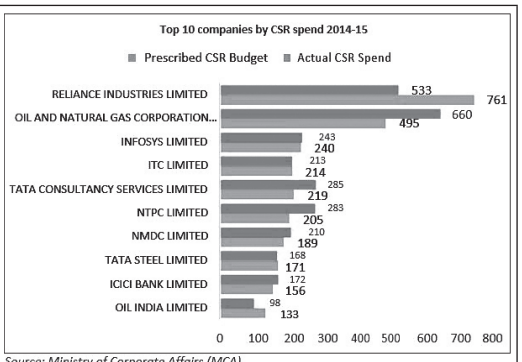
Seventy five percent of the world's poor live in rural areas and most of them depend on agriculture directly or indirectly as a source of their livelihood. Overall GDP growth originating in agriculture, is at least twice as effective in benefitting the poorest half of the population as growth generated in non - agricultural sectors. Countries that had relatively high agricultural growth, saw substantial reduction in poverty. China's rapid growth in agriculture was initially responsible for the rapid decline in rural poverty from 53 per cent in 1981 to eight per cent in 2001. Similarly, 24 percentage point reduction in rural poverty in Ghana over 15 years is mainly due to strong agricultural performance (World Development Report, 2008).

Though agriculture is a promising sector for reducing poverty, the expenditure under CSR component in India on agriculture is very meagre. If the Corporates allocate more fund under CSR, many challenges of the farm sector can be addressed. Government of India also envisages to double the income of the farmers by 2022 through productivity enhancement, resource use efficiency or reducing the cost of production, increase in cropping intensity, diversification of high value crops *etc.* In order to achieve this and considering the vast majority of the people depending on agriculture, a significant amount of investment is required from various sources.

CSR expenditure in India for the year 2014 -15



Source: Ministry of Corporate Affairs (MCA)



Source: Ministry of Corporate Affairs (MCA)

Development Sector wise break up of CSR expenditure FY 2014-15

Sr. No.	Sectors	Amount (in Crores)	Percentage
1.	PM Relief Fund	192	2.22
2.	Others	165	1.91
3.	Sports Promotion	160	1.85
4.	Art & Culture	157	1.82
5.	Slum Development	123	1.42
6.	Administrative Overheads	123	1.42
7.	Swachh Bharat Kosh	121	1.41
8.	Any Other Fund	36	0.42
9.	Clean Ganga Fund	19	0.22
10.	Contribution to Corpus	18	0.21
Source : Ministry of Corporate Affairs (MCA), Sharma, N.N.2017			

With the increase in percentage of companies who are spending on CSR, the trend analysis of CSR spending shows a positive response of corporates. However, most of the spending was observed in education and healthcare sectors which may be due to high visibility of the initiatives. Although most of the businesses are directly or indirectly linked with agriculture and nine out of 17 Sustainable Development Goals (SDGs) are related to agriculture, the analysis of overall CSR spending by corporates and spending in agriculture during the financial year 2014-15, shows that the expenditure in agriculture is negligible and there are only a few corporates who are spending a significant amount of their CSR budget on agriculture (Sharma. N.N, 2017). Hence, there is a need for leveraging CSR funds for the benefit of farmers and agricultural development.

Interventions of Corporates in Agriculture as CSR activities

There are some success stories, wherein, Corporates have invested in agriculture as part of CSR activities and made a significant improvement in the project areas in terms of adoption of improved agricultural practices, conservation of natural resources, reduction in external inputs and cost of cultivation, enhancing the collective bargaining capacities, strengthening value chain, empowerment of socio – economic status *etc.* A few success stories are given below.

Case - 1: Success story of ACC Limited in promoting LEISA as part of CSR

Issues: Farmers are heavily dependent on fertilizers and pesticides and agriculture is not seen as a profitable business venture.

Intervention: In order to reduce the cost of cultivation, use of traditional knowledge with modern agriculture techniques, help the farmers to increase income from their farm and provide customers with quality products, ACC Limited has initiated the promotion of LEISA as part of CSR in Bargarh in Odisha state. The interventions such as training to the farmers on preparation of Bio inputs for Integrated Pest Management, Integrated Nutrient Management, Formation of Farmers Interest groups and federating at higher level and developing local youth, linking them with Government schemes, Marketing support for Agri outputs *etc.,* were taken up by ACC Limited.

Outcome: ACC limited is working with 33 FIGs (Farmers Interest Groups) with membership of around 400 farmers and individual membership of 500 The vegetables are being sold in four prominent locations in Bargarh town with support from ATMA. The groups have been federated under the banner of Maa Samaleshwari Krishak Sangha. A total of 12 VLEs (Village Level Entrepreneurs) were trained for supporting farmers. The group has got an order of nearly Rs.3.0 lakhs from an FPO in U.P. Some more orders are expected from Chhattisgarh, Bihar and Jharkhand groups.

Future Plan: ACC Limited has proposed to undertake the following activities in the future:

- Proposed to link the group with SFAC (Small Farmers Agri Business Consortium Farmers Federation) or with NABARD.
- Introduce farm mechanization to reduce dependency on labour.
- Increase the number of VLEs in each village from 2 to 4 and increase the scope of their operation in purchase of agri inputs and output product marketing.

- Product Registration, Standardization and Certification of input and output products (Rama Krishna, 2017).

Case - 2: Sustainable Cotton Cultivation as CSR activity of Dalmia Cement

Issues: Soil testing is seldom practiced among the farmers; excess application of fertiliser and insecticides is a common practice; farmers are witnessing a declining trend of yield and increased cost of cultivation; a minimum of Rs. 20,000 per acre is incurred towards cultivation; yield per acre is about one tonne and they earn Rs. 45,000 per tonne but not on par with the global yield; there is no collective selling of the produce; lack of latest technology and holistic approach to end to end cultivation process.

Interventions: Handholding and supporting farmers to accelerate cultivation of cotton that will fetch better returns for the farmers and ensure production in coherence with the environment where it is grown through various approaches such as organising 1200 farmers into 37 learners groups consisting of 20 to 30 farmers each; identification of a lead farmer per learner group; capacitating of lead farmers; individual Farmer Cards, establishing ensuring linkage with KVK, Cotton Research Institute and Association; mapping of local supply chain and equipping them to meet the global requisites; conducting regular trainings and exposure visits as per project objectives in addition to the innovative extension interventions like a street play on soil and water conservation and indigenous technology; organising of farmers into Farmers' Club and federating them into producer organisation.

Outcome: Based on the individual farmer's field book, there is reduction in pesticide use by 10%; reduction in fertiliser use by 10%; reduction of water use by 10%; yield increase by 5 - 10%; Elimination of child labour; Influence of women; Profitability increase by 5 - 10%; Formed six producers organisations. (Bharathi, 2017).

Case - 3: Integrated Watershed Development Program by NABARD & Lupin Foundation

Issues: Buchkewadi and Muthalne villages of Junnar block, Pune, Maharashtra were selected for watershed development as the area was facing severe water scarcity, soil erosion; area is technically feasible for undertaking watershed, the area consists of more backward community population and the community is willing to participate in the program.

Interventions: The activities such as water absorption trench, continuous contour trench, gully plug, plantation; construction of farm bund, stone bund,

stone outlet, water ways and grass plantation, cement nala bund, loose boulder structures, Gabion; percolation tank desiltation, MI Tank, farm pond, Shivkalin Tank; plantation of horticultural crop and installation of drip irrigation *etc.* were introduced by NABARD and Lupin Foundation.

Impact: (i) Social Impact: promoted and capacitated village based Institutions for sustainable development of the village; Social Fencing (Ban on open grazing & tree cutting); ensured sustainability of work by collecting Rs. 5 lakhs contribution from the community for maintenance; significant changes in village family assets.

(ii) Environmental Impacts: 24 ha fallow land is brought under cultivation; ground water level has been increased with average 2 m height; defunct wells were reduced from 12 to 4; seasonal irrigated area was increased by 200.72 ha.

(iii) Other impacts: Net cropped area in *Kharif* season increased by 96 ha; Net crop area in *Rabi* season increased by 218 ha; Crops grown in the area shifted from Paddy to cash crops like potato, onion, floriculture and horticulture; drip irrigation was promoted on 46 ha & polythene mulching on 12 ha area with loan support from CANARA bank; a total of 281 tribal families have benefited; 33 ha area was brought under horticulture cultivation; fodder quantity increased by 317 tons; Milk production increased from 190 lit/day to 540 liters/day; 36.20 ha area was brought under perennial irrigation; Buchkewadi village got state level Sant Van Gram Puraskar award during the year 2016; first prize for "Model Agriculture Village" was awarded by Zilla Parishad, Pune. (Venkatesh, 2017)

Selection of Activities by the Corporates under CSR

Companies generally prefer to invest CSR fund to offset the negative impact of their activities/production unit. Ex. Packaged drinking water plant, cool drinks manufacturing company *etc.* are preferred to invest in water conservation. Similarly, Thermal power plant may be preferred to invest in plantation as these activities are in the bottom line of their company. Besides this, most of the companies may be interested to invest in the activities which give immediate and tangible results. Ex: construction of toilet is a one shot investment, and the end result is visible within a short time; it will also help the companies to project their achievement easily. On the other hand, in agriculture and allied sectors it takes a long time to show the achievements and companies have to work in the remote and risky areas. Many corporates may not have adequate knowledge on the issues of the farm sector and the nature of activities that can be undertaken as CSR interventions. Sometimes, as a Responsive CSR, the corporates may be interested in creating generic social impacts

through distribution of certain freebies in their working area, which will not create any economic value to the people and the development may not be sustainable. Instead, as a strategic CSR, if they transform the value chain activities to benefit society through creation of economic value by leveraging capabilities to improve the salient areas of competitive context, the development would be long lasting.

Hence, the department of agriculture and allied sectors have to sensitize the companies falling in the ambit of CSR rules on various agriculture related issues; and potential areas of activities which can be supported for agriculture development through CSR fund. The potential activities should address the challenges of agriculture and allied sectors such as deteriorating soil health; depleting water and other natural resources; decreasing size of farm holding; input use inefficiency; costly and scarce agriculture labour; drudgery in farming operations; information, knowledge and skill gaps; poor access to credit and investments; slow diffusion of relevant technologies; competiveness of quality and prices in export & domestic markets; inadequate focus on processing and value addition; Low profitability of agriculture; inadequate rural infrastructure; poor access to resources and services for women in agriculture; weak institutional linkages and convergence; occurrence of extreme events of climate change, low productivity of animals *etc.*

The real challenge remains in diffusion of the technologies generated by the research system to the farmers through an effective extension delivery system to address these challenges. Thus, extension is strategic to the growth of agriculture and allied sectors and enhancing the farmers' income. However, public extension services are criticized for poor performance with lack of accountability to clients, lack of relevance and quality of their programs. This is mainly due to various limitations faced by the extension system such as inadequate resources; inadequate competency and skills of extension workers towards market orientation, lack of value orientation and IT; limited Research-Extension-Farmer-Market linkages; lack of convergence between departments and schemes; inadequate budget; procedural delay in release of funds and lack of transparency; inadequate operational flexibilities; top down approach of schemes and programs; lack of farmer participation in extension planning and implementation *etc.*

Therefore, the proposed CSR projects in agriculture have to be Scalable, Replicable and Sustainable considering suitable ecosystems and human values; leveraging and convergence; inclusive growth; technology for empowerment; resilient supply chain *etc.*

Focus Areas for CSR in Agriculture for Sustainable Development

Environmental Sustainability: Environmental issues are most important to the agriculture sector, and the present agriculture sector is moving away from environmental sustainability for various reasons. Environment plays an important role in agricultural production. It has high influence on the growth, development and yield of crops, incidence of pests and diseases, water needs and fertilizer requirements. Any change in the environment may cause damage to crops, soils and affect the soil quality, air quality, water quality and bio-diversity of flora and fauna. Hence, there is a huge scope for investment through CSR fund on sustaining the environment.

Natural Resource Management: India has only 4 per cent of the fresh water resources and 17 per cent of the global population. Agriculture uses 70 per cent of the water resources. Population growth, extreme events of climate change, over exploitation, imbalanced external application of input, changing land use pattern, changing food habits, *etc.,* are increasing the pressure on fragile natural resources. Hence, conservation, optimum use and recycling of natural resources is very important for ensuring sustainable food and nutritional security.

Studies shows that watershed activities undertaken under CSR have made a significant impact in terms of increased crop productivity, increased cropping intensity, increased greenery coverage, reduced surface runoff and facilitated groundwater recharge, reduced soil erosion, increased fodder availability, helped to increase the milch animal population thereby doubling the farmers income within 4 to 5 years. Watershed activities have also helped the communities to address food security and livelihood issues without degrading natural resources. Therefore, there is a lot of scope for investment in natural resource conservation and management as CSR activities.

Innovation and Technology led Development: Some of the key areas that can revolutionize the profitability of agriculture are Information and Communication Technology, on-farm mechanization, precision farming, climate smart technologies, real time weather information, and dissemination of weather based advisory services through ICT platform, establishment of custom hiring centers, *etc.* Hence, there is a huge potential for investment under CSR in creating such infrastructure and support innovation and technology led growth.

Social Development: The important actors for development of society in the rural areas are Youth and Women. The success of agriculture is critical for the survival

of all rural communities (half the population), and to feed the whole population. Empowering women will make the largest difference to the whole family and avoid the most dramatic of human abuses. Malnutrition in rural areas needs to be tackled at the source - agriculture and rural communities. Engaging youth is critical for the long-term viability of agriculture. Therefore, there is a huge investment potential for social capital development through training, developing and nurturing them as producer's organizations *etc.*

Entrepreneurship Development: Agriculture all over the world is going through a phase of transition. In this changing scenario, agriculture is taking new shape and expanding its scope beyond the limits of mere crop cultivation and animal husbandry for livelihood of the rural population. Activities like diversification, value addition, precision farming, high-tech agriculture, agripreneurship, organic farming *etc.* are gradually getting due attention of people involved in redefining agriculture.

There is considerable complementarity between agriculture and industry and the growth of one is dependent upon the growth of the other. Hence, both are equally important for the economic development of the country. All round development of agriculture is possible only with effective exploitation of entrepreneurial behaviour skills as well as material resources. To create and maintain an environment that encourages profitable, market-oriented farm businesses, CSR fund can be utilized for creating the required infrastructure, enhance entrepreneurial skills, provide access to credit and finance, create training facilities, linking them to the market *etc.*

Livestock Development: Though Livestock is considered as a sunrise sector, the potential of this sector has not been fully explored due to limited public expenditure. Though India possesses huge livestock resources, the production and productivity is very less. The future growth of Indian agriculture lies in paying more attention to the livestock sector as returns on investment are higher in this sector. The contribution of the livestock sector to the overall agricultural sector is rising over the years. The sector shows high potential for contribution to GDP. Yet, the allocation of funds to this sector is incommensurate with its contribution to agricultural GDP. The potential interventions in Livestock would be breed improvement, nutritional support, health management, establishment of cattle development center, milk collection center, chilling center, milk processing center, promotion of Goat / Sheep and backyard poultry as an enterprise *etc.*

Market Development: Markets are core to economic growth. Working the whole agricultural value chain is needed for profitable and viable agriculture as an enterprise. This not only enables farmers to have access to required inputs but also bring their products to the market in an efficient and effective way. Building entrepreneurial skills and agribusiness are a key part of developing value chains. Untapped opportunities exist for creating the value chains for agri produce. There is a lot of scope for investment on market development and reducing the level of intermediaries.

Effective Farm Advisory Services: The potential investment areas for CSR activities in extension delivery are as follows:

- Development of competency of field extension functionaries of agriculture and allied sectors (over 1.25 lakhs) on various emerging areas is a huge task and requires adequate budget.
- Irrespective of any interventions in agriculture, capacity building component has to be inbuilt into the program design and behavioral change has to be brought about among farmers. Hence, capacity building of farmers through training, demonstration, exposure visits, technical back stopping/ hand holding is required on a large scale.
- CSR agencies may adopt villages which are agriculturally backward and develop as model villages by adopting good agricultural practices. The model villages can be used for demonstration and replication across the country. Area specific long term agriculture plan may be prepared and implemented under CSR project for addressing agriculture related problems.
- There is a lot of scope for investment on rural youth for promotion of agri-preneurship for self-employment as well as enhancing their employable skills for creating an opportunity for better employment through skill oriented training programs.
- So far, a total of 53,544 agripreneurs have been trained by MANAGE under ACABC scheme. Of these, 23,470 have established their ventures. One of the reasons for less establishment is inadequate financial support and credit from banks. Hence, there is a huge potential for investment for promotion of agri-start ups; in-turn the young agripreneurs will provide need based multiple services to the farmers.
- Formation and nurturing of Farmers groups / Community based organizations/ Cooperatives. Providing Working capital / Revolving fund for CIGs/

farmers groups to undertake activities like collective procurement of farm inputs, group processing, value addition, collective marketing and any other innovative activities.

- Investment for creating infrastructure for customized/personalized mobile and other ICT based integrated agro-advisory services to the farmers.
- For every two villages one Farmer Friend is working for extension under ATMA. Capacity building of about 3 lakh Farmer Friends at grass root level is a crucial link in extension and it requires huge investment.
- Establishment of a single point resource center for agriculture and allied sectors at village level similar to Raitha Samparka Kendra (RSK) in Karnataka state and routing all the activities through RSK. RSKs can also be used as training centers for the farmers.
- Production of Videos on improved and innovative agricultural technologies and dissemination of technologies through video to the farmers.
- Creating awareness about flagship programs of center and state government to involve the local community for better impact of such programs.
- Activities such as custom hiring centers, milk chilling units, fish fingerling production, etc can be taken up on PPP mode with the help of agripreneurs and rural youth to provide production support services to the farmers.
- MANAGE is implementing a one-year diploma course titled 'Diploma in Agricultural Extension Services for Input Dealers (DAESI)', spread over a period of 48 weeks, with 40 classroom sessions and 8 Field visits on Market holidays, which imparts relevant and location-specific agricultural education to equip the input dealers with sufficient knowledge to transform them into para-extension professionals so as to enable them to address the day-to-day problems being faced by the farmers at the field level. The course fee is Rs 20,000/- of which, 50% (*i.e,* Rs 10,000/- per input dealer) is subsidized by DAC, GoI. Agribusiness companies can also sponsor the candidates / input dealers for the program. Agribusiness companies' sponsorship can be considered for tax benefit under 35 CCC, subject to other conditions laid in the notification. So far, a total of 5246 candidates have been trained under DAESI. A large number of input dealers (about 2.82 lakh) are yet to be trained. CSR fund could be used to provide free health insurance to farmers and also cover crop insurance.

- A Group of companies can come together to address agriculture related issues through CSR project at block / district level.

Suggested Implementation Mechanism of CSR activities

- A Special Purpose Vehicle (SPV) for promoting CSR activities in agriculture and extension may be initiated at the national level with the support of an organization like the National Institute of Agricultural Extension Management (MANAGE), GoI, Hyderabad.
- The CSR fund for agriculture and allied sectors may be channelized through SPV in a Consortium approach with the involvement of various partners.
- Consortium approach may be supported and guided by the Steering Committee.
- The Steering Committee shall have a broad based representation and participation of various stakeholders such as representatives of donor agencies, agricultural and allied department officials, representatives of implementing partners and farmer representatives.
- The Steering committee shall evolve a Vision, Annual agenda and reach out to Business and Industry Associations and share experiences of existing projects.
- The Steering Committee shall receive the proposals from the implementing agencies across the country, scrutinize the proposals and approve the suitable proposal based on the relevance, importance and technical soundness of the proposal and release the fund accordingly.
- Funds from Donor agencies/companies/departments shall be received by Consortium.
- A proper Monitoring system shall be put in place at national, state and project level for effective monitoring of implementation of the project including the delivery of input and other services.
- The steering committee shall meet periodically to evolve and pursue the mandate of CSR for agricultural development, scrutinize and approve new proposals, review the progress of implementation of the sanctioned projects.
- A knowledge bank may be created to share experiments, learnings, best practices that will add value to the future CSR spend.
- Sharing of best CSR practices among various stakeholders by organising workshops and seminars at regular intervals.
- Identification of a common geographical area to undertake CSR projects in agriculture.

- All the members of the consortium shall provide their technical, financial and other inputs based on individual expertise and initiate a few high impact projects.
- An online platform (csrforagri) may be created, gaps in the field and potential needs of the farmers may be posted and updated regularly for the attention of corporates to facilitate CSR spent.

Good Practices for Effective Implementation of CSR Activities

- The projects should be in line with the company objectives and also address the issues of farmers.
- Awareness about the issues in the agriculture sector have to be created among corporates intensively on a mission mode.
- Engaging in regular consultation with the community and understanding of local needs by the implementation team.
- Implementation of the projects have to be preferably on the PPP mode to harness each other's strengths. Partners have to be selected based on strengths.
- Involvement of farmers has to be ensured and community mobilization has to be strengthened from planning till the completion of the project.
- Convergence of various flagship programs of both state and central government is essential to attain synergy.
- Transparency has to be ensured in utilization of funds.
- Mechanism for Documentation and Reporting has to be established.
- CSR activities should boost the confidence of the villagers through mutual cooperation and trust.

Conclusion

In order to achieve inclusive growth in agriculture, a huge investment for creation of infrastructure on production, processing, marketing, farm advisory services, developing social capital are essential. It is not possible to achieve inclusive growth by the public sector alone. There are a good number of success stories / models which benefit the farmers. These success stories are scalable and replicable with adequate funding support from CSR component of various players. Hence, it is high time for both public and private sectors to come together and join hands in the developmental process to double the farmer's income and make farming sustainable.

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A study on differential Adoption and Constraints of Dairy Farmers about Scientific Dairy Farming Practices in Amritsar district of Punjab

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Abstract

In the present study, practices adopted and constraints perceived in scientific dairy farming by KVK trained dairy farmers were compared with non-trained dairy farmers. Hundred trained and hundred non-trained dairy farmers were selected by random sampling technique from the villages of Amritsar district of Punjab. The data were collected through personal interview with the help of a structured interview schedule. The trained farmers were found to have better adoption than non-trained farmers. The respondents faced more constraints in breeding, feeding and health care. Some of the major constraints mentioned by the respondents were poor conception rate, lack of knowledge of common contagious diseases, their causes and control measures and non availability of mineral mixture in the study area. The present investigation concluded that the training programme on scientific dairy farming had a positive impact on adoption of technologies by dairy farmers despite many constraints.

Keywords: Dairy farming, Constraints, Artificial Insemination, Mineral mixture

With the advent of new technologies in the field of dairy science, a manifold increase in milk production has been achieved, however there is a need to follow improved technologies in order to meet the growing demand for milk and to minimize technological gaps. (Sharma and Bairathi, 1999). To bridge these gaps, extension functionaries are conducting suitable training programmes to impart technical know-how to the dairy farmers. This necessitates evaluating the level of adoption and the constraints faced by them in adopting these scientific technologies. It has been well documented that an overall development in the agricultural and dairy sector is only possible, if there is effective co-ordination among education, research, training and extension. Although serious efforts have been made to transfer the scientific dairy farming practices to the farmers, yet various studies have indicated that adoption of these technologies is up to 30 per cent, predominantly by resourceful farmers. This implies the need to transfer

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the developed technologies to the resource poor marginal and small farmers and landless labour who rear animals to augment their income through selling of surplus milk. It is emphasized that imparting suitable training in scientific dairy farming practices will enhance the adoption rate of technologies by resource poor farmers. India has the potential to meet the growing demand for milk for which there is a need to adopt and follow scientific dairy farming technologies. This is possible only if the dairy farmers are trained constantly so as to develop a desired level of knowledge and skills on scientific dairy farming. The present study was carried out with the specific objectives to study the differential level of adoption of scientific dairy farming practices and to identify the constraints faced by dairy farmers in adoption of those practices.

Methodology

The present study was carried out in Amritsar district, the operational area of Amritsar KVK of Punjab state. The respondents' sample constituted trainees of on-campus training programmes on scientific dairy farming as well as non-trained dairy farmers from the same area.

A sample of twenty five villages covering five blocks *viz*. Ajnala, Chogawan, Majitha, Harsha Chinna and Verka were selected purposively. For selection of respondents, four KVK trained dairy farmers were selected randomly from each village. From the same villages four non-trained dairy farmers with similar socioeconomic conditions were also selected randomly. Thus the total number of respondents were 200, consisting of 100 trained and 100 non-trained dairy farmers. The data were entered in a well structured schedule by personally interviewing the farmers. The data were then compiled, tabulated and analyzed using appropriate statistical methods. In the present study, adoption was operationalized as the actual use of innovation regarding dairy farming (Roger and Shoemaker, 1971). Adoption was measured by three point continuum scale, *viz*., 'continuous', 'occasional' and 'never tried' with respective scores 2, 1 and 0 (Sah, 1996). Constraints are the circumstances or the causes which prohibit the dairy farmers from adoption of improved management practices (Rathod *et al*., 2011). In this study, constraints were operationalized as certain obstacles or problems perceived and experienced by the dairy farmers in adoption of scientific dairy farming practices. A three point continuum scale *viz*., strongly agree, agree and disagree, with respective scores of 2, 1 and 0 was used to measure the constraints and these were ranked according to the total scores.

Results and Discussion

Adoption of Scientific Dairy Farming Practices

Association between knowledge and adoption of scientific dairy farming practices is well understood. Knowledge augmentation has been identified as the first step towards attaining higher adoption of scientific dairy farming practices. The adoption was considered appropriate to determine the extent to which the training imparted has been applied in the field, since the ultimate purpose of knowledge acquired by the farmers is its implementation at their field. The results given in Table 1 shows the practice wise adoption of scientific dairy farming practices. More than 85 per cent of the trainees adopted A.I and pregnancy diagnosis promptly. None of the trained farmers gave "Never" response to breeding practices. In the non-trained farmers' group, the adoption levels for A.I and pregnancy diagnosis were 65 and 62 per cent respectively. Four and ten per cent were "Never tried" responses which were given by the non-trained farmers for A.I and pregnancy diagnosis respectively. Similar responses with higher adoption from trained farmers were recorded in feeding, healthcare and management practices in comparison to non-trained group which is evident from Table 1.

Table 1. Adoption of Scientific Dairy Farming Practices by Dairy Farmers

Sr. No.	Practices	KVK trained dairy farmer			Non-trained dairy farmer		
		Continuous (2)	Occasional (1)	Never tried (0)	Continuous (2)	Occasional (1)	Never tried (0)
1.	A.I. in cows	86 (86.00%)	14	0	65	31	4
2.	Pregnancy diagnosis	88	12	0	62	28	10
3.	Vaccinating dairy animals against contagious diseases	98	2	0	90	8	2
4.	Feeding colostrum to calves within half an hour of its birth and continuing up to first 5 days	87	13	0	72	25	3
5.	Disinfecting cattle shed periodically	98	2	0	78	20	2

6.	Growing either Legume/Non-legume or mixed fodder crops	98	1	1	88	10	2
7.	Incorporating mineral mixture in the animal ration	87	13	0	60	25	15
8.	Practicing deworming in calves for prevention of internal parasites	60	25	15	57	27	16
9.	Dehorning of crossbreed calf	78	12	10	68	16	16

Adoption level of trained dairy farmers was significantly higher than those of non-trained dairy farmers (Table 2). The increased score of adoption in trained dairy farmers may be attributed to the knowledge enrichment of the dairy farmers from the training imparted by KVK. Sabapara *et al,* (2014) observed that education of dairy animal owners had highly significant and positive correlation with knowledge about improved dairy husbandry practices. The results of this study are also in line with the findings of Kumar *et al,* (2009), Sharma *et al,* (2009), Satyanarayan and Jagadeeswari (2010) and Shekhawat *et al, (*2013).

Table 2. Comparison between Adoption Level of ex-trainees and non-trainees

Groups	Mean score	Standard Deviation (S.D.)	Difference between two means	Calculated 't' value
Trained dairy farmers	16.49	2.93	1.79	3.17*
Non-trained dairy farmers	14.70	4.83		

*Significant at 1% level

Constraints faced by Trained Dairy Farmers in Adoption of Scientific Dairy Farming Practices

The constraints faced by trained dairy farmers in adopting scientific dairy farming are listed in Table 3. Poor conception rate was found to be the first major constraint in adoption of breeding practices whereas insufficient services at A.I centers and demanding money for A.I are the next constraints in the adoption of these practices. Singh *et al,* (2015) revealed that low economic gains and non-availability of adequate veterinary services were the major constraints in adoption of improved breeding practices. The results are in agreement with the findings of

Dabas *et al*, (2004) and Rathod *et al,* (2011). Non-availability of mineral mixture was ranked first, high cost of mineral mixture and high cost of compound feed were second and third constraints faced in adoption of scientific feeding practices. These results are in conformity with the findings of Rani *et al,* (2013) and Singh *et al,* (2015). Lack of knowledge on common contagious diseases, its causes and control measures was ranked first under health care constraints followed by ignorance of vaccine utility as prophylactic measures against contagious diseases and the distant medicine market. The first major constraint in adopting animal management practices was poor education about modern dairy husbandry practices. Lack of resources for housing and lack of knowledge on cheap and scientific housing were second and third constraints being experienced. Similar findings were reported by Dubey *et al,* (2012).

Table 3. Constraints faced by the Trained Farmers in Adoption of Scientific Dairy Farming Practices

Sr. No.	Constraints	Mean Percent Score (MPS)	Rank
A	**Breeding**		
i)	Poor conception rate of A.I.	88.5	I
ii)	Inefficient services at A.I. centres	62.0	II
iii)	Demanding money for doing A.I. in addition to prescribed fee	44.0	III
B	**Feeding**		
i)	Non-availability of mineral mixture	85.5	I
ii)	High cost of mineral mixture	81.5	II
iii)	High cost of compound feed	80.0	III
C	**Health care**		
i)	Lack of knowledge on common contagious diseases, its causes and control measures	86.5	I
ii)	Ignorance of vaccine utility as a prophylactic measure against contagious diseases	73.0	II
iii)	Medicines available at distance	56.0	III
D	**Management**		
i)	Poor education about modern dairy husbandry practices	74.0	I
ii)	Lack of resources for providing scientific housing	58.5	II
iii)	Lack of knowledge on cheap and scientific housing of animals	53.0	III

The major constraints in adoption of scientific dairy farming practices by non-trained dairy farmers are grouped in Table 4.

Table 4. Constraints faced by the Non-trained dairy farmers in adoption of scientific dairy farming practices

Sr. No.	Constraints	Mean Percent Score (MPS)	Rank
A	**Breeding**		
i)	Poor conception rate of A.I.	89	I
ii)	Inefficient services at A.I. centres	55	II
iii)	Preference to natural service than A.I.	42	III
B	**Feeding**		
i)	Non-availability of mineral mixture	85	I
ii)	High cost of mineral mixture	79.2	II
iii)	High cost of compound feed	75.5	III
C	**Health care**		
i)	Lack of knowledge on common contagious diseases, causes and control measures	87	I
ii)	Ignorance of vaccine utility as a prophylactic measure against contagious diseases	71.5	II
iii)	Medicines available at distance	62.5	III
D	**Management**		
i)	Poor education about modern dairy husbandry practices	72.5	I
ii)	Lack of resources for providing scientific housing	63.5	II
iii)	Lack of knowledge on cheap and scientific housing of animals	55.5	III

Similar to trained farmers, Poor conception rate of A.I. was ranked the first major constraint. Insufficient services at A.I centres and preference to natural service than A.I were the second and third constraints respectively. Regarding feeding practices, the major constraints observed were non-availability of mineral mixture followed by high cost of mineral mixture and high cost of compound feed. Narmatha *et al.,* (2010) also found high capital demand as a major constraint in adoption of scientific dairy practices. Similar ranks with respect to different constraints regarding health care and management practices were reported by the non-trained dairy farmers as revealed by trained dairy farmers. Singh *et al.,* (2015) reported that inadequate A.I facilities, high price of concentrate mixture, lack of resources for housing and inadequate veterinary services are the major block in adoption of dairy husbandry practices which corroborate our findings.

Conclusion

This study concludes that there was a statistically significant difference between trained and non-trained dairy farmers in adopting scientific dairy farming technologies. There are many technologies which are not yet tried by dairy farmers.

This could be considered as a great opportunity and wide scope for scientists to know reasons behind both active and passive adoption, as well as for extension workers to disseminate technologies. The constraints experienced by the trained farmers were the poor conception rate of A.I., non-availability of mineral mixture in the area, lack of knowledge on common contagious diseases, its causes and control in adoption of scientific dairy farming practices. The non-trained farmers also revealed that poor result of A.I., lack of knowledge on common contagious diseases, their causes and control measures and non-availability of mineral mixture were the major constraints. Thus, the constraints encountered in this study should be dealt by extension functionaries effectively so that the improved technologies could be disseminated among dairy farmers. Hence, suitable training programmes have to be conducted to impart technical knowledge and skills among the dairy farmers on scientific dairy farming practices.

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Use of Mobile Phone and its Apps in Extension Services

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Abstract

Information and Communication Technology (ICT) and its application have shown great prospects in remodeling extension services in both developed and developing countries. The present era is an era of science and technology and those related to these fields are showing a tremendous increase in their value and functionality. Linking extension services to emerging technologies should be focused upon for better results and efficient services, due to the fact that a majority of the people are now connected to one another through mobile phones. These devices and their apps can be used for better linkages and to provide farmers with latest information instead of creating new devices for extension activities.

Keywords: ICT, extension, mobile phones, application, technology

Introduction

The use of Information and Communication Technology (ICT) tools has potential to change the economy of livestock, agriculture, and rural artisans in India (Sasidhar and Sharma, 2006)). Tiwari *et al* (2010) argued that the livestock sector should come up with need based, location specific and local language content in the form of computer software and other electronic material with regard to livestock disease control, dairy herd management, livestock production and for marketing of livestock and livestock produce. With intensification of crop/ livestock production systems and increased market demand for animal based products, the importance of information is growing in many developing countries (Morton and Matthewman 1996). Among various ICT tools, mobile phone has emerged as one of the widely accepted and adopted instruments in most parts of the world to ease the information communication process among farming communities (Hayrol *et al*. 2009). Next to the radio and television the mobile phone users are increasing rapidly in India particularly in rural areas, creating a

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platform for information dissemination through value added services like Short Message Service (SMS).

The Government of India spent US$60 million on public agricultural extension programs in 2010, yet a series of surveys in 2009 and 2010 reveal variable success across regions, with as many as 51.2 per cent of farmers citing public agriculture extension staff as a main source of information in one region and as few as 7 per cent in another. In the absence of experts, farmers often rely on word of mouth, generic broadcast programming, or agricultural input dealers. As of 2015, around half of Indian farmers (120 million) were estimated to have a wireless subscription (Cole and Fernando, 2016) The mobile phone looks like today's most likely access device for information dissemination. Livestock related information such as vaccination alert can be delivered through the mobile service provider before the monsoon.

Status of Mobile Phone Technology in India

According to the latest report released by Telecom Regulatory Authority of India (TRAI, May 2016), the number of telephone subscribers in India increased from 1,051.88 million at the end of February 2016 to 1,058.86 million at the end of March 2016, thereby showing a monthly growth rate of 0.66 per cent. The urban subscription increased from 608.42 million at the end of February 2016 to 609.69 million at the end of March 2016 and rural subscription increased from 443.46 million to 449.17 million during the same period. The monthly growth rates of urban and rural subscription were 0.21 per cent and 1.29 per cent respectively during the month of March 2016. The overall Tele-density in India increased from 82.89 at the end of February 2016 to 83.36 at the end of March 2016. While Urban Tele-density increased from 153.93 at the end of February 2016 to 154.01 at the end of March 2016, Rural Tele-density increased from 50.76 to 51.37 during the same period. The share of urban subscribers and rural subscribers in total number of subscribers at the end of March 2016 was 57.58 per cent and 42.42 per cent respectively. As per the reports received from the service providers, the number of broadband subscribers increased from 144.87 million at the end of February 2016 to 149.75 million at the end of March 2016 with a monthly growth rate of 3.37 per cent.

Use of Mobile Phones in India for Extension Services

The agricultural extension system has been traditionally funded, managed and delivered by the public sector in India. However, it suffered a series of attacks beginning from 1980s when the government and economists began to express concern with the cost of public extension. Subsequently the expenditure on the

public extension system began to decline. Further, public sector extension is being criticized for not being relevant, ineffective, time consuming and expensive (Chauhan, 2006).

The social and economic benefits obtained from mobile phones by the livestock owners were useful for their endeavor. Majority of the livestock owners perceived medium level of satisfaction, among overall respondents. So, the service delivery may be improved furthermore to attain high level of satisfaction (Gensis, 2010). The farmers were spending money on mobile phone calls to veterinarians to seek information related to animal husbandry. This shows their willingness to pay for the service they received. Most of the livestock owners from rural areas perceived language and network coverage as main constraints than in peri-urban areas. Hence, providing mobile enabled services either by text messages or voice messages in the local language according to the literacy rate of that area may mitigate this constraint.

Mobile telephony is growing manifold when compared to other Information and Communication Technologies (ICTs) in rural areas. Mobile phones are the success story of bridging the rural digital divide bringing tangible economic benefits and acting as agents of social mobilization through improved communication. According to Waverman *et al*. (2005) of the London Business School, ten extra phones per hundred inhabitants can lead to 0.59 per cent extra annual growth in a typical low income country like India. Dissemination of information through mobile phones is a newly emerging concept in agriculture and allied sectors. Introduction of mobile phones to Kerala fishermen could decrease price dispersion and wastage by facilitating the spread of information which made the markets more efficient by decreasing risk and uncertainty (Jensen, 2007; Abraham 2007). An ICRIER study (Mittal and Tripathi, 2009) among farmers highlights the key role played by mobile phones in lowering transaction costs and raising the income-levels of farmers, by efficiently addressing their immediate agricultural information requirements. Farmers also emphasized that timing of precise information is central to minimizing wastage and therefore increasing efficiency. Mittal *et al.* (2010) conducted a study on impact of mobile phones on the crop sector and, in particular on small farmers in India. The key finding of this research was that mobile phones can act as a catalyst to rejuvenate the extension services in the country. A recent survey among farmers of Uttar Pradesh, Rajasthan and Maharashtra revealed that farmers were confident of the utility of the mobile phone in reducing costs and enhancing earnings. Farmers can bridge or alleviate the information gap by the use of mobile phones (Mittal and Tripathi, 2009). Mobile phones along with mobile

enabled services provide lot of hope to improve the extension system. Information through mobile phone has a major impact on the overall farm output in areas where biotic and abiotic conditions are not so favorable for cultivation. Timely intervention through the right kind of prescriptions can help increase yields by 10.00-25.00% (Gupta, 2009). There has been increasing evidence about the use of mobiles for dissemination of agricultural information among farmers.

Mittal and Tripathi (2009) reported the key role played by mobiles in lowering transaction costs and raising the income levels of farmers, by efficiently addressing agricultural information requirements, while Inigo *et al*. (2014) and Mittal *et al*. (2010) reported that mobile phones contribute greatly to agricultural and animal husbandry information dissemination. Mobile telephony is a new phenomenon in seeking dairy related information by opening up opportunities in accessing information about various aspects like disease, management, marketing *etc.* However, lack of customization of these services to serve the specific needs of farmers and lack of operational knowledge are some of the impediments in effectively leveraging the potential of mobile phones (Inigo *et al*. 2014). This leads to the fact that, role of mobile phones for dairy farmers in information access, is an area which has not received due attention. Though, mobile is considered as an emerging tool in Indian dairying (Rathod and Chander 2014), still there is a need to emphasize the initiatives of the public sector for information delivery through mobiles, and study the perception of multi-stakeholders *viz.* dairy farmers, scientists and extensionists towards use of mobile in Indian dairying.

In a similar study, Inigo *et al*. (2014) also reported that dairy farmers in Tamil Nadu used mobile phones for seeking information about animal husbandry and dairying from various sources. They also pointed out that farmers were ready to pay for mobile phone calls to seek information related to animal husbandry and dairying. Rathod *et al.* (2016) revealed that farmers had various problems with mobile use and hence, they demanded support from various stakeholders like research and extension institutes, government *etc.*

Mobile based Extension Services

mKisan

mKisan is a mobile based extension service aiming to provide information on crops, livestock, market prices and weather based advisories to resource poor farmers, strengthen linkages between experts and the farming community. The service is

made available to the farmer through a short code 556780 which is integrated with Mobile Network Operators. Information on livestock under various knowledge domains like General Care and Management, disease management, feeding, reproduction & breeding is delivered through regional Interactive Voice Response Systems (IVRS) supported with SMS, voice messages and a Call Centre. The service is user friendly and is available 24x7 and can be accessed from any basic low cost handset. It also overcomes literacy barriers by providing information through Interactive Voice Response System. This suite of agriculture and livestock advisory services on mobile is providing information in the most cost effective and efficient manner. Farmers can easily access any information related to crop and livestock in the regional language of the state. The initiative of providing a knowledge platform helps to empower the smallholder farmers having 1-3 livestock by improving the livestock productivity, improved livelihoods, better income and decision making ability. At present there are 1,70,000 unique users (farmers) accessing the service.

The project was conceptualized, designed and developed in-house within the Department of Agriculture & Cooperation and has widened the outreach of scientists, experts and Government officers down to the Block level to disseminate information, give advisories and to provide advisories to farmers through their mobile telephones. SMS Portal was inaugurated by the Hon'ble President of India on July 16, 2013 and since its inception nearly 327 crore messages or more than 1044 crore SMSs have been sent to farmers throughout the length and breadth of the country. These figures are rising ever since (http://mkisan.gov.in/aboutmkisan.aspx).

Use of Mobile Apps in India for Extension Services

1. Kisan Suvidha

Kisan Suvidha mobile app has been developed to help farmers by providing relevant information on current weather and over the next 5 days, information on dealers, market prices, agro advisories, plant protection, IPM Practices *etc.*

2. Pusa Krishi

Pusa Krishi app helps farmers know about the various types of crops and information about those.

3. Shetkari Masik Android App

The app can be used to download Shetkari Masik magazine and can be read without internet connectivity. "Shetkari Masik" is one of the most popular monthly magazines in the Agriculture sector, published since 1965. It is published by Department of Agriculture, Maharashtra.

4. Farm-o-pedia App

The app is targeted for rural Gujarat and is useful for farmers and anyone involved in agriculture business. The app can be used to get information on suitable crops as per soil and season, crop wise information, check weather in your area and manage your cattle.

5. Crop Insurance Android App

Crop insurance mobile app can be downloaded and used to calculate the Insurance Premium for notified crops based on area, coverage amount and loan amount in case of loanee farmer. The app can also be used to get details of normal sum insured, extended sum insured, premium details and subsidy information of any notified crop in any notified area.

6. AgriMarket

Agri Market mobile app can be used to get the market price of crops in the markets within 50 km of the device's location capture by GPS. There is another option to get price of any market and any crop in case a person does not want to use GPS location (http://www.sarkariyojna.co.in/7-android-apps-farmers-launched-narendra-modi-government/).

7. Miscellaneous Mobile Apps

a. SmartAgri: Dr. Vijayaragavan Viswanathan, is a scientist with the European Organization for Nuclear Research. Growing up in southern India, Dr. Viswanathan saw how limited access to education and basic crop information kept many farmers locked in a cycle of low productivity and poverty. To combat this situation-and capitalize on the fact that India has almost a billion mobile subscribers-he developed SmartAgri, an app that communicates with underground sensors to deliver easy-to-understand data, such as soil moisture and mineral levels, to farmers' mobile devices. "In India today, more people have access to mobiles than to running water," says Viswanathan. "These new apps present an opportunity like no other to revolutionize life for farmers there."

b. Jayalaxmi Agro Tech created an app to equip illiterate farmers with crop-specific information using audiovisual tools.

c. Mandi Trades lists government crop price updates, important information for farmers in remote villages.

d. Rainbow Agri connects local buyers and sellers.

e. mPower Social offers simple veterinary advice for cattle owners (http://modernfarmer.com/2016/01/agriculture-apps-india/).

f. Life Tools was created by Nokia in 2009 and consists of basic information pertaining to agriculture, weather and farm machinery.

g. A similar app called M Krishi was created by Tata in 2009.

Integrating Mobile Phone-Based Learning and Credit for Women Livestock Producers

VIDIYAL, an Indian NGO, uses L3 (Life Long Learning) to promote community banking among 5,000 women organized into self-help groups (SHGs). During 2008, nearly 300 women from the SHGs became partners and decided to build their capacity through open and distance learning related to various aspects of sheep and goat production. As poor labourers, most of the women felt that attending classes or watching multimedia materials restricted their ability to work and attend to household chores. They asked VIDIYAL and COL (Commonwealth of Learning, Canada) to explore the use of mobile phone as a learning tool, because they would not need to be confined to any particular place or time during the learning process.

COL and VIDIYAL developed a business proposal in which each member would obtain credit for buying nine female goats, one buck, and one mobile phone. The local bank agreed to the proposal and sanctioned a loan of US$ 270,000. The credit and the legal ownership of the assets are in the names of the participating women. The 300 women bought simple mobile phones, and VIDIYAL entered into an agreement with IKSL (IFFCO Kisan Sanchar Limited), one of India's major mobile network operators, to send audio messages to the women's phones free of charge and enable free calls among group members. The company felt that this strategy would enhance its mobile service in the long run. VIDIYAL and some of the participating women were trained in developing audio content for mobile phone-based learning. Learning materials are prepared within the broad principles of open and distance learning to meet the learners' time and geographical constraints. VIDIYAL developed the materials in consultation with the Tamil Nadu Veterinary and Animal Sciences

University and contextualized them to the local culture and dialects (http://www.vidiyalngdo.in/ict.htm, http://www.vidiyalngdo.in/lifelong.htm).

Use of Mobile Phones for Extension Services in other Countries

Santos (2002) reported that, the National FMD Task Force of Philippines uses an information system in managing data regarding disease situation, vaccination, and animal movement, which give accurate information on the animal disease situation of an area in the quickest possible time.

In Italy, to control the blue tongue disease in cattle effectively, a surveillance system was established that included clinical, entomological and serological surveillance elements. The National Reference Centre for Veterinary Epidemiology developed a Web-based National Information System (NIS) and a Geographical Information System (GIS) to collect and manage data from Veterinary Services across Italy. Surveillance data are displayed to the user in different ways: reports, tables and interactive maps.

Garner and Beckett (2005) reported that Department of Agriculture, Fisheries and Forestry, Australia, developed a sophisticated spatial model (AusSpread) for foot-and-mouth disease control that operates within a geographic information system framework. The model allows for interactions between herds or flocks of different animal species and production type, and considers the role that such interactions are likely to play in the epidemiology of a regional outbreak of foot-and-mouth disease.

There are several initiatives in Africa that employ ICTs in offering extension services and training to small-scale farmers. Munyua (2008) cites several examples of such initiatives that have employed ICTs to restructure extension services in Africa which include; the Machobane Farming System (MFS) in Lesotho, the Agricultural Technology and Information Response Initiative (ATIRI), and the Linking Local Learners (LLL) initiative in Kenya, the Virtual Extension Research and Communication Network (VERCON) in Egypt, the National Agricultural Advisory Services Programme (NAADS) in Uganda, the Agricultural Research and Extension Network (ARENET) in Uganda and the District Agricultural Training and Information Centers (DATICS) in Uganda. The use of SMS is an example of solutions that should find more use as they offer easy accessibility. However, SMS carries only a limited amount of information and requires a basic level of literacy. Angello (2015) reported that different types of ICTs in Tanzania were used by urban livestock keepers to learn and disseminate livestock information though

some ICTs *e.g.* mobile phones were used more (92.1%) than other ICTs *e.g.* radio (21.7%) and television (24.6%). Internet was used by very few livestock keepers (2.4%) due to computer illiteracy.

Colombia's Ministry of Agriculture and Rural Development, in collaboration with partners, facilitates AGRONET, the National Agricultural Information and Communication Network of Colombia (www.agronet.gov.co). Through SMS, producers receive updates on AGRONET's platform, including changes in its databases and other news and events pertinent to agriculture. The Ministry plans to expand the service to reach more producers with context-specific information on agricultural markets, inputs and supplies, weather alerts, and other subjects. Over the medium term, AGRONET plans to provide content and information services to producers by adding capacity in digital television. In Uganda, ARENET (Agricultural Research Extension Network) is a web portal (www.arenet.or.ug/index) created to strengthen the links between the National Agricultural Research System and the National Agricultural Advisory Services program and its related extension service providers. The portal provides access to practical and technical agricultural information from national and international sources.

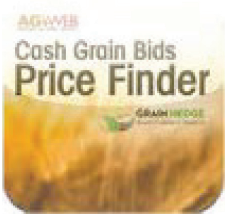
'iCow' is a trust worthy SMS based information and education platform. The service aims at helping small scale farmers increase their productivity by giving them access to pivotal information. iCow is very simple to use and is not reliant on smart phones. 'M-Farm', a real time group buying and selling market for farmers was launched in 2011 in Kenya along with iCow. 'Kilimo Salama' enables small holder farmers to insure their agricultural inputs against adverse weather conditions. 'Kuza Doctor' 'a farmer's mobile toolkit from farm to fork' provides knowledge to farmers using SMS. SALI (Sustainable Agricultural Livelihood Innovation) by Christian Aid provides farmers with weather updates. All the above listed apps are used in Kenya.

In Cameroon, 'Agro-Hub' uses mobile technology to drive demand for farmers' products, attract better prices, and increase farmer's income. In East Africa, 'SAGONeT' is involved with an application that helps the farmers to record the daily milk production from their cows. In Ghana, 'Esoko' service allows the farmers to access the market prices and allows them to place orders, buy or sell. 'CocoaLink' launched by Ghana Cocoa Board and World Cocoa Foundation, connects cocoa farmers with information about Good Farming Practices. The free service uses SMS and IVRS. In Senegal and Mali, 'E-TIC' portal and a series of training sessions

are destined for youth, women and community journalists that aims at sharing knowledge for better farm management. In Zambia, South Africa Tele centre Network (SATNET) aims to give rural training for effective use of communication and information services (www.oafrica.com/list-of-mobile-agriculture-services-and-applications/). National Livestock Market Information System (NLMIS) was developed to provide a timely price and volume information on livestock markets in Ethiopia, Kenya and Tanzania. The objective was to improve and expand the analytical, reporting, and geographical relevance of livestock price and volume information to wider stakeholders in Ethiopia. The NLMIS allows data entry into the system via short messaging service (SMS) by mobile phones. Coding system allows data collectors to send livestock price and volume information by SMS. The data is stored in a central server in headquarters. The stakeholders can request the price and volume information for specific markets using SMS. The data are also made available through the Internet via a market information portal (www.lmiset.net).

Use of Mobile Apps for Extension Services in USA

Table 1. Examples of some applications used by Farmers in United States of America

Sr. No.	Logo	Name	Use
1.		**Commodity Prices**	Track corn, soybeans, wheat, cotton, lean hogs, live cattle, feeder cattle and more. The app has a clean interface and is simple to operate.
2.		**Cash Grain Bids**	One can input their ZIP code to find out cash bids and base levels in their area and get bids from the five closest elevators.

3.		**Weather Undear-ground**	This weather app provides information regarding temperature, visibility and humidity. One can view hourly and seven-day forecasts, too.
4.		**USDA News Reader**	One can create own news feeds, learn about recovery plans and programs, and easily navigate the USDA website in a mobile-friendly environment.
5.		**Virtual Farm Manager**	This subscription-based service helps one to store, view and log information about their fields. This app was developed by farmers Jacob Fannik of Max, N.D., and Ryan Raguse of Wheaton, Minn.
6.		**SoilWeb**	USDA-National Resources Conservation Service soil survey information at the touch of a button. The app works with the phone's GPS receiver to identify soil properties anywhere in the lower 48 states where there is cell phone coverage.
7.		**Livestock Manager**	A number of mobile apps are targeted to livestock producers. This app allows users to track information about their animals, including parentage, transport information, medicine administration *etc.*
8.		**Agrian Mobile**	One can view product labels and material safety data sheets for more than 8,000 crop protection products. One can browse usage rates, pre-harvest and re-entry intervals, worker safety information and more.
9.		**Nutrient Removal**	This app provides growers and retailers with valuable nutrient removal data in support of higher yields. The app also allows users to test potential yields, generating results that are crop- and region-specific. *(iPhone, iPad, Droid)*

10.		**JD Link**	This equipment management app from John Deere is a telematics system designed to remotely connect owners and managers to their equipment, providing alerts and machine information including location, utilization, performance and maintenance data to manage where and how equipment is being used. *(iPhone, iPad)*
11.		**iHerd**	From iApps. iHerd, provides the user with lifetime traceability of the herd such as treatment and location movements and is a more simplistic approach than other software which requires information to be recorded in the paddock and then entered manually into the computer.

(Adapted from 'Apps for Agriculture' by National Institute of Food and Agriculture, USDA; Texas A&M Agrilife Extension; Southern Risk Management Education Centre, USA)

Mobile Phones as Tools for Farmer Surveys and Feedback

Voice of Farmer (VoF) or Farmer's Voice is a pilot project testing a structured approach to obtain broad-based, low-cost, and frequent feedback from farmers in Kenya, Tanzania, and Uganda, using mobile phone technology. The pilot was conducted between January 2010 and March 2011 by Synovate Panafrica, with funding from the Bill and Melinda Gates Foundation. The approach was designed to help organizations collect a steady supply of empirical, actionable data more rapidly and cost-effectively. Feedback from target constituencies enables organizations to assess whether they need to change their activities and approach to better meet their constituents' needs. Findings are available to participating organizations through an online portal in the shortest possible time (www.eeas.europa.eu/Uganda/projects/list_of_projects/improving_food_security_en.htm).

Mobile Geospatial Applications for Extension

Mobile applications that incorporate geospatial technologies, including both GPS (Global Positioning System) and GIS (Geographic Information Systems), are undergoing rapid development and widespread adoption, and have the potential to help Extension professionals in a wide variety of tasks and educational settings.

These tools are now available to smart phone and GPS-enabled tablet users through a number of mobile geospatial applications ("apps"). In 2013, 56 per cent of adult Americans owned a smart phone (Smith, 2013), and 35 per cent of adult Americans owned a tablet computer. Extension professionals working in a variety of fields - from natural resources, to agriculture and education can enhance the

effectiveness of their programs by leveraging the use of these hand-held devices along with the use of geospatial applications.

Conclusion

The extension personnel have been disseminating technological messages to the farmers manually. This approach has not been able to reach a majority of the farmers who are spread across the whole country, due to scarcity of expert human resource, especially in terms of manpower. This gap remains a challenge for the extension system even today. To reach over 110 million farmers, across the country is an uphill task. The diversity of agro-ecological situations adds to this challenge further. The studies conclude that researchers and extension experts need to be familiarized about use of mobiles to disseminate information and improve productivity in the agriculture sector. In one of the studies by Mittal and Mehar, 2012, it is evident that 87.2 per cent farmers got better connected to markets, 71.7 per cent got better market prices, and 34.6 per cent witnessed increase in their yields after using mobile based information. This implies that one can increase the output and productivity of the farmers by the use of mobile telephony. Further, the scientists have to generate and transfer field relevant, profitable and sustainable tools and techniques with the involvement of farmers as partners of research and extension for effective generation and transfer of technological innovations. With the effective use of mobile phone technology, one can provide technology in every farmer's hand and pave his way to a bright and profitable future.

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Rationality and Validity of ITKs on Plant Protection and Post-harvest Technology of Tribal Farmers in Telangana

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Abstract

This study was conducted in Adilabad, Khammam and Warangal districts of Telangana. Ex post-facto research design was followed in this study, since different variables chosen for the study had already occurred. An effort was made to document the indigenous technology of tribal farmers. A questionnaire containing lists of ITKs was prepared and exposed to the scientists for judging the rationality and validity of ITKs on a three point scale wherein, 3 is rational, 2 undecided and 1 is irrational. The mean score was calculated by summing the scores overall and divided by the number of judges for a given item and if it was more than two then the item was considered as rational and less than two was considered as irrational. For validity, the scientists were asked to find out the valid ITKs among rational ITKs which were validated, tested and verified on the basis of research. Out of 41 ITKs on plant protection and post-harvest technology, only 32 ITKs (78.04%) were found rational and the remaining 9 ITKs (21.96%) were found irrational, while, 30 ITKs were found valid.

Keywords: Post-harvest Technology, Tribal Farmers

Introduction

Tribals in course of their close interactions with nature and natural resources have to make certain decisions to solve the problems they encounter in their day to day life while managing the land and environmental resources for survival. Compelling situations motivate them to generate knowledge out of necessity. Therefore, indigenous knowledge so developed is based on necessities, curiosity and observations of ethnic groups to mitigate the immediate situations. Tribals in the districts are mostly below poverty line and alienated from development and basically survive on subsistence agriculture which is primitive in nature. Tribals are generally steeped in a number of superstitious and primitive beliefs related

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to crop production and protection practices. Some of the beliefs play a vital role in deciding the sustainability of a technology to reduce the cost of cultivation and to propagate eco-friendly agriculture (Sundaramari and Ranganathan, 2003). According to Haverkort (1995) ITK is the actual knowledge of a given population that reflects the experiences based on tradition and includes more recent experiences with modern techniques. ITKs are broad based, ecologically sound, environmentally safe, socially acceptable and economically resilient. Identifying, documenting and incorporating the indigenous knowledge systems into agriculture extension organizations is essential to achieve sustainable agriculture development (Rajasekharan,1993). Hence, an attempt has been made in this study with the following specific objectives.

1. To identify and document the indigenous agricultural practices of tribal farmers in Telangana.
2. To ascertain the scientific rationality and validity of ITKs on plant protection and post harvest technology of Tribal Farmers in Telangana.

This can create favourable attitude towards rational ITKs for quick dissemination of technology and increase the area under cultivation.

Methodology

The study was conducted by adopting an *ex-post facto* research design method to study the rationality and validity of ITKs towards indigenous agricultural practices. The study was conducted in Adilabad, Khammam and Warangal districts of Telangana. From each district four mandals were selected, and from each mandal three villages were selected and from each village six farmers were selected for this study by following random sampling method. Thus the study represents 3 districts, 12 mandals, 36 villages and 216 respondents. For testing the rationality of the ITKs, questionnaires containing different lists of ITKs pertaining to Plant Protection and Post harvest technology were prepared and exposed to the scientists for judging their rationality and validity on a three point scale *viz.,* a score of 3 for rational, 2 for undecided and 1 for not rational. The mean score was calculated by summing the overall scores and divided by the number of judges for a given item and if it was more than two then the item was considered as rational and less than two was considered as irrational. For validity, the scientist respondents were asked to find out the valid ITKs among rational ITKs which were validated, tested and verified on the basis of research in the

State.

Results and Discussion

It can be observed from Table 1 that out of 41 ITKs on plant protection and post harvest technology, only 32 ITKs (78.04%) were found rational and the remaining 9 ITKs (21.96%) were found irrational while 30 ITKs were found valid.

Table 1. Rationality and Validity of ITKs on Plant Protection and Post Harvest Technology

ITK No.	Indigenous Technical Knowledge (ITKs)	Mean score	Ratio-nality	Validity
1	Burning the dry stalks in the field and spraying cattle urine for control of pests and diseases.	1.29	IR	-
2	Beating empty tins with a stick to scare away wild animals, birds that destroy crops.	2.13	R	V
3	Placing of ash at the base of the stem to protect from termites.	1.23	IR	-
4	Bamboo sticks with bird feathers are erected in the field to avoid bird damage.	2.13	R	V
5	Polythene sheets tied to the bamboos sticks generate sound due to blowing air which scare away the rats.	2.03	R	NV
6	Wood is burnt at the field boundaries to protect the crop from wild animals.	1.13	R	V
7	*Odesella* is a rope made with a pouch tied with a string thus releasing the stone to greater distances chasing away the birds.	109	R	V
8	Grains are stored in the gunny bags and kept on big wooden beams to avoid damage from rats.	2.34	R	V
9	Dehusking and crushing cereals, millets and pulses is done by use of indigenously made stone crusher called *Thiragali* (vernacular name).	2.41	R	V
10	The liquid extracted from the *Kodishaku* has insecticidal properties when sprayed on infested paddy fields, to control the pests.	1.23	IR	NV
11	Sorghum seeds are stored in the *gummis* by mixing with ash and neem leaves and sealed with cow dung to avoid insect attack.	2.03	R	V
12	Seeds are stored in the gunny bags mixed with *Seethaphal* (Custard apple) leaves + cow dung ash to prevent storage pest attack.	2.13	R	V
13	The seeds *challaginjalu* and *mustiginjalu* available from the forest are crushed and the liquid extracted is used as a pesticide	1.23	IR	-
14	Yerrathega + cow dung ash + neem leaf are mixed and used for storing green gram, blackgram and cowpea, millets in *gadelu (Cow dung coated bamboo stick baskets)* to avoid pest attack.	2.03	R	V
15	Maize cobs are kept for a long period without husk and tassel to avoid stored pests and for prolonged viability.	2.23	R	V

ITK No.	Indigenous Technical Knowledge (ITKs)	Mean score	Ratio-nality	Validity
16	Manual beating on wooden tables and crushing the paddy straw with the help of animals to separate the paddy and straw practiced.	2.62	R	V
17	Storing *sesamum* seeds with ash is practiced to increase its keeping quality.	0.91	R	V
18	Pulses are stored in bamboo baskets mixed with ash which acts as insect repellent for a longer period to avoid pest attack.	1.09	R	V
19	Neem seed extract solution is prepared and sprayed to control bollworm and pod borer of pigeon pea and chick pea.	2.13	R	V
20	The latex of *calatrophis is* diluted with 15 parts of water for control of caterpillars in cotton.	2.03	R	NV
21	Burning the stalks is practiced by the farmers to reduce scale and *aphid* attack in red gram.	1.34	IR	-
22	Pods which are not infested with any pest and disease are selected for seed purpose for next year.	1.13	R	V
23	To control the pod borer in red gram, farmers spray neem seed kernel extract on the crop.	1.29	R	V
24	Leaf blotch disease can be controlled by planting dried *Palmyra* leaves in the turmeric field	1.23	IR	-
25	Ash along with FYM improves the quality of turmeric and reduces the rhizome rot.	0.91	IR	-
26	Farmers grow jatropa plants around the groundnut field, which acts as catch crop against red hairy caterpillar.	2.52	R	V
27	Farmers burn trash adjacent to the groundnut fields during nights to attract nymphs and adults of insects.	2.34	R	V
28	Farmers move the rope in the paddy field to reduce the leaf folder.	2.13	R	V
29	*Calotrophis* leaves are spread in the safflower field to attract Bihar hairy caterpillar.	1.09	R	V
30	Yellow stick traps are installed in the cotton field to attract whitefly and *jassid*.	2.03	R	V
31	Stem borer is managed by tribals by pouring neem kernel extract in the whorls.	1.51	IR	-
32	Terminal clipping in bengal gram is practiced by tribals to avoid *Heliothis* egg laying.	1.54	R	V
33	Wood is burnt in the boundaries to protect the crop from wild animals.	2.13	R	V
34	Maize cobs were covered by polythene cover to protect from bird damage.	2.12	R	V
35	Maize cobs are hung to the roof without removing leaf sheath to avoid rat and insect damage.	2.34	R	V
36	Digging trenches around the field to ward off wild boar.	1.71	R	V

ITK No.	Indigenous Technical Knowledge (ITKs)	Mean score	Ratio-nality	Validity
37	Beating empty drum is practiced by tribals to ward off wild animals and birds.	2.21	R	V
38	There will be no incidence of pest and disease if neem leaves are applied as basal manure.	1.72	IR	-
39	Tribals now and then beats cardboards with a stick to scare away the animals and birds which destroy the crop.	2.71	R	V
40	Stones are used by the tribals to kill wild animals which destroy crops like Maize, Sorghum.	1.91	R	V
41	Indigenous arrows *(Banalu)* are used to ward off wild animals which damage food crops.	1.51	R	V

ITK Nos. 2, 4, 5, 16, 39, 40 and 41 suggest bird scaring practices which were found rational and valid except for ITK No. 5 which is not valid. This might be because coloured polythene carry bags and empty tins scare away the birds and the rats. The uncertain appearance and the sound was the reason behind that. Tribal also use stones and arrows to scare away animals and birds from the field.

The ITK Nos. 8, 11, 12,14 and 17 indicating storage of cereals and pulses mixed with ash and neem leaves were found rational and valid. The reasons behind the rationality of the ITKs might be because the ash acts as a physical barrier against insect pests and neem leaves contain insecticidal properties which helps in reducing stored grain pests and diseases.

ITK No. 7 was found rational which might be because birds are scared by release of the string. ITK No. 9 was found rational and valid because it is a traditional practice performed by tribal farmers and home makers in many villages in the plains.

ITK No 13 (the seeds *challaginjalu* and *mustiginjallu* available from the forest are crushed and the extract is used as a pesticide) were judged irrational and not valid ITKs because they do not have insecticidal properties to control pests.

ITK No. 18 Pulses are stored in bamboo baskets mixed with ash which acts as an inset repellent for a larger period to avoid pest attack was judged rational and valid because of the insecticidal properties.

ITK No. 22 was judged rational and valid because the seed material of the previous *kharif* season is used for the succeeding *kharif* season because they cannot afford to buy seed material from outside. They utilize their own pest free seed for sowing in the next season feeling that their seeds are viable and have tolerance to pests and diseases.

ITK No. 23 was judged as rational and valid because the pest control properties of neem seed kernel extract might be the possible reason behind the rationality of this ITK. ITK Nos. 26, 27, 28 and 33 were judged rational and valid because *jatropa* acts as a trap crop in the groundnut field to attract red hairy caterpillar. Burning of trash adjacent to the field and moving the rope in the paddy field ward away sucking pests and leaf folders.

ITK Nos. 34 and 35 were judged rational and valid ITKs because maize cobs covered by polythene cover and hung to the roof without removing leaf sheath acts as a barrier to protect from birds, rats and insect damage.

ITK No. 29 (*calotrophis* leafs are spread in the safflower field to attract *Bihar hairy caterpillar*) and ITK No. 32 (Terminal clipping in bengal gram is practiced by tribals to avoid *heliothis* egg laying) were judged rational and valid ITKs because the milk extracted from *calotrophis* leaf attracts Bihar hairy caterpillar. The terminal clipping in Bengal gram prevents *heliothis* egg laying.

Conclusion

Indigenous technologies have strong roots in tribal culture. The study reveals that there were nearly 297 ITKs on various crops cultivated in the study area. These ITKs may be documented, tested, verified, standardized for the possibility of blending with modern technologies for profitable and environmental friendly agriculture. The extension personnel while encouraging the continuous use of rational ITKs may suitably educate their clientele to discontinue the irrational ITKs. Farmers were found to have more favourable attitude towards ITKs, hence these can be effectively utilized by the extension personnel in dissemination of information on ITKs. The efforts of different agencies in promotion of ITKs can be effectively utilized in sustainable agriculture.

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Promotion of Entrepreneurship among Tribal Women under Tribal Sub Plan Scheme

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Abstract

Krishi Vigyan Kendra, Venkataramannagudem is working in 25 upland mandals of west Godavari district including seven tribal mandals, to conduct location specific technology demonstrations and vocational training for the farming community. During the preliminary visits and information collected through secondary sources regarding the livelihood activities of tribal women, "processing and value addition to millets" was identified as a suitable vocation for tribal women. The activity was taken up under tribal sub plan programme of the KVK during the year 2015-16. Thirty tribal SHG women attended this training. After the training these women were divided into two Common Interest Groups (CIGs) i.e. Girivanitha and Giriposhana and they started preparation of millet based products. Both the groups are supplying their products to 28 tribal welfare schools. Every month each group is getting an amount of Rs.2 lakh under supplementary nutrition programme of the tribal welfare schools.

Keywords: KVK, millet processing, tribal women, tribal sub plan

Introduction

Tribal farmers form a significant proportion of the population and the role of tribal women in the development of family, their economy and social system is highly important. Adequate investment in developing the capabilities of women and encouraging the empowerment of women is needed. The Human Development Reports of UNDP indicate that the Human Development Index (HDI) is extremely gender sensitive. It is also stated that "investing in women's capabilities and empowering them to exercise their choice is not only valuable in itself but is also the surest way to contribute to economic growth and development. National as well as state plans and programmes have given due importance to bring tribal women into the main stream.

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Krishi Vigyan Kendra, being a transfer of technology centre at the district level to cater to the needs of the farming community in rural and tribal areas is instrumental in conducting programmes related to agriculture and allied sectors through technology assessment, demonstration and training its clientele in effective use of these technologies. Vocational training being the important mandate "Processing and value addition to millets" was identified as a suitable vocation for tribal women. (Hariprasanna K and Dayakar Rao B. 2016). The activity was taken up under tribal sub plan programme of KVK during the year 2015-16.

Tribal Sub Plan

The basic objective of the Tribal Sub-Plan (TSP) is to allocate government resources equally between the overall population and tribal population. (Planning Commission, GoI 2006). Majority of the tribal population is less vocal, has been traditionally disadvantaged, live in remote places, and for these reasons do not get their due share of the resources in terms of the percentage of their population to the population of the Country or in a State.

The strategy of Tribal Sub Plan (TSP) has been in force since 1974 to ensure adequate flow of plan resources for bridging the gap in the socio-economic development of Scheduled Tribes and ensuring their faster, sustainable and more inclusive growth. Funds from the plan are allocated under TSP in proportion to the tribal population of the country which is 8.2 per cent as per 2001 Census. Guidelines on formulation, implementation and monitoring of TSP have been issued by the Planning Commission from time to time to the 62 central ministries/ departments implementing TSP.

Objectives of TSP

The primary objective of TSP is to bridge the gap between ST population and others by accelerating development. The objectives are:

- Enhanced access to education and health.
- Providing basic amenities including housing.
- Reducing poverty and unemployment through creation of productive assets and income generating opportunities.
- Enhanced capacity to avail opportunities, gain rights and entitlements and improved facilities at par with other areas.
- Protection against exploitation and oppression.

Modus Operandi of TSP

1. Identification and demarcation of tribal areas.
2. Conducting a bench mark survey or PRA to understand the socio-economic status of the selected areas, benefits already drawn from earlier programs, occupational category *etc.*
3. Assessing potentialities, social problems and felt needs of the areas.
4. Assessment of resources and technologies available.
5. Formulation of suitable programs in convergence with other agencies to avoid duplicity and to benefit more people.
6. Implementing the programs in a participatory mode and in tune with the cultural milieu of the local people.
7. Assessment of impact in terms of socio-economic upliftment after successful completion of the TSP schemes.

Indicative activities that can be undertaken by KVKs under TSP in various thematic areas (General/Capital).

1. KVK acting as an Agro-service center

- Assessment (OFTs) of crop/livestock/fisheries and allied technologies.
- Demonstration (FLDs) of crop/livestock/fisheries/health, sanitation and nutrition /watershed management/micro-irrigation and allied technologies.
- Supply of seed/planting material/livestock strains/fish fingerlings/nutrition supplements/ fodder slips/bio-products / pesticides / micro-nutrients *etc.*
- Training programmes for farmers/rural youth / extension functionaries/ farm women on crop/livestock / fisheries / health, sanitation and nutrition, watershed management / micro-irrigation and allied technologies.
- Extension activities like kisan melas, technology weeks, extension literature, radio talks, TV shows *etc.*
- Soil/ water analysis and issue of soil health cards.
- Issue of Mobile Agro-advisory.
- Diagnostic visits to the operational area.
- Exposure visits organized for farmers / tribal youth / women.
- Creation of awareness on inputs, credit, insurance and markets for the produce from tribal areas.

2. Creation of Productive Assets (Micro-enterprises)

This is done with an aim to substantially reduce poverty and unemployment among STs and to provide livelihood security

- Creation of farming systems (IFS models) – including backyard poultry, apiary, mushroom, sericulture, dairy, goatery, fishery units and value addition of farm and forest produce and other agri-based income generating units integrated into farming.
- Establishment of hatcheries for fisheries.
- Establishment of spawn units for mushroom cultivation.
- Supply of supporting machinery.
- Supply of farm implements.
- Fishing units *etc.*
- Temporary storage units for seed, feed, fodder (silage bags) and machinery (implement sheds).
- Primary processing units of millets, dal mills, bakery equipment *etc.*
- Installation of kiosks for dissemination of information for creating awareness.
- Minor analytical equipment required at the farm site (could be for soil testing, weather data recording *etc.*).
- Small pump sets (solar) for lifting water from farm ponds and micro-irrigation equipment like sprinkler / drip/ rain jets *etc.*
- Small tractors with accessories, tube wells in electrified villages and pump sets in non-electrified villages could be given to a group of 5-10 ST farmers who have been given skill development training. This group can also be given quality seeds, pesticides and fertilizers too.
- Assets could be created on KVK premises in the form of functional demonstration units for the purpose of skill development training under capital head.
- Facilitate setting up of organic farming units and obtaining organic registration.
- Multiple skill development in basket making, mat, garment making and rural crafts.

- Creation of Implement Banks (rotavator, power tiller, chaff cutter, sprayers, ridger, portable GPS, portable soil testing kits, pruning equipment *etc.*).

The assets could be created in areas where the land is under SHGs or Village / Gram Panchayat as a group activity with common ownership.

3. Skill Development Training Programmes

Various thematic areas on which skill can be imparted are as follows

1. Seed / Seedling production.
2. Raising and value addition of horticultural crops.
3. Protected cultivation / precision farming.
4. Vegetable cultivation / high value floriculture.
5. Raising vegetable / fruit nurseries in shade net / green house.
6. Value addition of locally available millets.
7. Location specific back yard poultry /goatery /dairy / fisheries.
8. Bee-keeping/sericulture/ mushroom/vermicomposting.
9. Medicinal plants/ aromatic plants (Collection/growing/grading/value addition).
10. Multiple skill development in basket making, mat, garment making and rural crafts.
11. Training rural youth on how to install, use and maintain micro-irrigation equipment like drip and sprinkler systems.
12. Training the rural youth on plant protection techniques.
13. Training rural youth to become eco and adventure tourism guides.

West Godavari District: West Godavari District is having the distinction of being the "Rice Granary" of Andhra Pradesh on par with East Godavari and Krishna Districts. The District is bounded by river Godavari in the East, Krishna district in the West, Khammam district in the North and Bay of Bengal, Krishna District in the South.

The major agricultural crops grown in the district are paddy and other coarse grains (2,31,478 ha), pulses (6144 ha.), oil seeds (1029 ha.) and other crops (16780 ha.). The major horticultural crops include mango, cashew, oil palm, acid lime and vegetables. The average rainfall received in the district is 1153.3 mm,

in which a major part of 792.0 mm. is through the South West monsoon (June to September) and the remaining 239.4 mm. from the North East monsoon (October to December).

The district occupies an area of 7,742 square kms and consists of 901 revenue villages. As per the 2011 census the total population of the district is 39,94,410 in which the tribal population is 1,33,997 of which 65439 are male and 68558 are female. The percentage of tribal population in the district is reported as 3.35. There are seven major mandals *viz;* Buttaigudem, Jeelugumilli, Polavaram, Velerupadu, Kukkunur, T. Narsapuram and Chintalapudi in the district. Among the mandals, the maximum ST population is found in Buttaigudem followed by Velerupadu, Kukkunur, Polavaram, Chintalapudi, Jeelugumilli and T. Narsapuram. The Integrated Tribal Development Agency (ITDA), Kota Ramachandrapuram, is functioning to cater to the social, cultural and economic development of the tribal population.

Krishi Vigyan Kendra, Venkataramannagudem is working in 25 upland mandals of the district including seven tribal mandals to conduct location specific technology demonstrations and training to augment productivity enhancement in major crops and crop based enterprises. Under tribal sub plan programme, during the year 2015-16, funds were provided by ATARI, Zone-V, Hyderabad to a tune of Rs. 15.00 lakhs with which the following activities were taken up to introduce new and improved technologies.

Table 1. Mandal wise tribal population details where TSP is being implemented by KVK, Venkataramannagudem

Sr. No.	Name of the Mandal / block	Total population	Population of tribal people	% tribal population	Names of major tribes
1	Jeelugumilli	28,501	8,217	29%	Koyas & Konda Reddy
2	Polavaram	43,710	11,819	27%	Koyas & Konda Reddy
3	Buttaigudem	51,878	32,768	63%	Koyas & Konda Reddy
4	Lingapalem	54,844	325	0.59%	Koyas & Konda Reddy
5	T. Narasapuram	51,881	3,714	7.1%	Koyas & Konda Reddy
6	Velerupadu	21,474	13,703	64%	Koyas & Konda Reddy
7	Kukkunuru	25,758	7,407	29%	Koyas & Konda Reddy

Table 2. Details of Programmes Conducted by KVK, Venkataramannagudem

Sr. No.	Programme	Activity	No. of Farmers	Villages covered
1.	Integrated crop management in cotton	Frontline demonstration	20	Kamaiahkunta
2.	Improved cultivation practices of tomato	Frontline demonstration	10	Lankalapalli & Pandugudem
3.	Micro nutrient management in cucurbits for increased productivity	Demonstration	10	Bandarlagudem & Kamaiahkunta
4.	INM in cashew	On farm trial/ Front line demonstration	20	Kamaiahkunta, Bandarlagudem & Pandugudem
5.	Control of Tea mosquito bug in cashew	Front line demonstration	200	14 villages in Jeelugumilli & Buttaigudem mandals
6.	Introduction of millet processing and value addition	Vocational training & entrepreneurship development	30	Rajanagaram & Bandarlagudem
7.	Introduction of Apiary	Vocational training	15	Pandugudem & Bandarlagudem
8.	Improved back yard poultry breeds for nutritional security	Demonstration	100	Villages of Jeelugumilli & Buttaigudem Mandals
9.	Nutritional gardens in backyard	Demonstration	100	Kamaiahkunta, Pandugudem, Bandarlagudem & Lankapalli
10	Integrated pest management in brinjal	Demonstration	20	Datlavarigudem & Gangannagudem

Methodology

During the preliminary visits and information collected through secondary sources regarding the livelihood activities of tribal women in agency villages of Buttaigudem mandal under Integrated Tribal Development Agency (ITDA), Kota Ramachandrapuram of West Godavari district, it was found that the main occupation of the women in these areas is agriculture and it is mostly rain fed. The women in these villages are mostly dependent on agriculture labour available based on the seasonal conditions, backyard poultry rearing and collection of cashew nuts and other minor forest produce. The situation was discussed with the ITDA

officials and it was proposed to have a vocational training on millet processing and value addition and to provide millet processing units under Tribal Sub Plan funds of KVK, Venkataramannagudem during the year 2015-16. Accordingly the Project Officer, ITDA accepted the proposal and sanctioned an amount of Rs. 35,000/- towards the three days training programme on millet processing and value addition at KVK, Venkataramannagudem. Thirty tribal women who are interested to take up this vocational activity from Bandarlagudem and Rajanagaram villages of Buttaigudem mandal were selected in coordination with ITDA to undergo training at the KVK.

Training on millet processing and value addition under vocational training at Krishi Vigyan Kendra, Venkataramannagudem was conducted from 05th - 08th December, 2016 and 30 tribal SHG women attended the training. During the training period they acquired knowledge relating to the nutritional importance of millets, methods of millet processing, preparation of millet based products and use of machinery in millet processing (Chavan *et al.,* 2016). Special emphasis was given on product development by using multi grain mix, nutritional analysis of the product prepared, branding and packing (Shankaran, 1994).

Two millet processing units purchased by KVK, Venkataramannagudem under tribal sub plan funds for the year 2015-16 which included one multiple pulverizer and LPG based oven were provided to these two groups by Sri. Magantti Venkatesvar Rao, Hon'ble Member of Parliament, Eluru during the Kisan Sammelan organized by the KVK.

These units were kept at the infrastructure provided in ITDA, KR Puram premises. These women were motivated to form two Common Interest Groups (CIGs) and they were named "Girivanitha" and "Giriposhana" groups. The Girivanitha group is led by Smt. Pattodi Bullemma from Bandarlagudem village and Giriposhana group is working under the leadership of Smt. Madakam Lakshmi Devi from Rajanagaram village.

A preliminary group meeting was conducted in the presence of PO, ITDA and a detailed plan of action was designed for the next six months to take up this activity as a commercial activity. The ITDA provided an amount of Rs. 30,000/- as revolving fund to each group and the KVK facilitated in procurement of all the required material and equipment to take up the activity.

Registration of brand name in the name of "Sri Foods" was completed under Food Safety and Standards Authority of India during January, 2016 and the two groups

started preparation of millet based malt and biscuits at the centers. After checking the product quality and nutritional supplementation as discussed with the KVK Home Scientist, the ITDA authorities decided to supply these products to 26 tribal welfare schools in this agency area.

Accordingly Girivanitha group is supplying the snacks for the tribal welfare schools in the villages *viz.* Kamaiahkunta, Nuti ramannapalem, Koya Rajahmundry, Lankalapalli, Puliramannagudem, Reddikopalli, Tellam varigudem, Doramamidi, Madakamvarigudem, Marrigudem, Velerupadu, Koyyada, Kunkala and ITDA AR School, Jeelugumilli (Table 3).

Table 3. Details of Millet Processed Products supplied by "Girivanitha" Group

Sr. No.	Month	Supply details							
		Tribal welfare Schools				Outside marketing			
		Biscuits		Malt		Biscuits		Malt	
		Qty. (kg)	Value (Rs.)	Qty. (kg)	Value (Rs.)	Qty. (kg)	Value (Rs.)	Qty. (kg)	Value (Rs.)
1	February,2016	18	5,400	32	6,400	2	600	5	1,000
2	March, 2016	380	1,14,000	639	1,27,800	60	18,000	25	5,000
3	April, 2016	97	29,100	117	23,400	20	6,000	16	3,200
4	May, 2016	-	-	-	-	10	2,500	-	-
5	June, 2016	-	-	-	-	165	49,500	46	9,600
6	July, 2016	465	1,39,500	120	24,000	106	26,500	40	8,000
7	August, 2016	492	1,47,600	80	16,000	180	54,000	28	5,600
8	September, 2016	393	1,17,900	120	2,400	199	59,700	53	10,600
9	October up to 20.10.2016	251	75,300	90	18,000	120	36,000	39	7,800
	Total	**2,096**	**6,28,800**	**1198**	**2,18,000**	**862**	**2,52,800**	**252**	**50,800**

Giri Poshana group is supplying snacks for the tribal welfare schools in the villages *viz.,* Itikalakota, Bodigudem, Chegondapalli, Rajanagaram, Barrinkalapadu, Palakunta, Andirivadi, Ankannagudem, Barrinkalapadu, Jeelugumilli, Kukunuru, Madhavaram, Vankavarigudem and Chintalapudi (Table 4).

Table 4. Details of Millet Processed Products supplied by "Giri Poshana" Group

Sr. No.	Month	Supply details							
		Tribal welfare Schools				Outside marketing			
		Biscuits		Malt		Biscuits		Malt	
		Qty. (kg)	Value (Rs.)	Qty. (kg)	Value (Rs.)	Qty. (kg)	Value (Rs.)	Qty. (kg)	Value (Rs.)
1	February, 2016	14	4,200	25	5,000	1	300	4	800
2	March, 2016	304	91,200	511	1,02,200	48	14,400	20	4,000
3	April, 2016	78	23,400	94	18,800	16	4,800	13	2,600
4	May, 2016	-	-	-	-	8	2,400	-	-
5	June, 2016	-	-	-	-	132	39,600	37	7,400
6	July, 2016	372	1,11,600	96	19,200	85	25,500	32	6,400
7	August, 2016	393	1,17,900	64	12,800	144	43,200	22	4,400
8	September, 2016	314	94,200	96	19,200	159	47,700	42	8,400
9	October up to 20.10.2016	201	60,300	72	14,400	96	28,800	31	6,200
	Total	**1,676**	**5,02,800**	**958**	**1,91,600**	**689**	**2,06,700**	**201**	**40,200**

Both the groups are supplying their products *viz*., Ragi, Jowar, Multigrain biscuits and malt powder to 28 schools. Every week both the groups supply about 800 kg (400 kg each) approximately of the products to schools. Every month each group is getting an amount of Rs. 2,00,000 under supplementary nutrition programme of the tribal welfare schools. After deducting their expenses, the remaining amount is shared among the group members by way of working wages @ Rs. 150/- per day and the remaining amount is being utilized as share capital to prepare the products for further marketing. The outside marketing is also being taken by the group members to nearby super markets in Eluru, Koyyalagudem, Rajahmundry and local shandies in the villages. ITDA is encouraging by giving orders as per their requirement for official meetings and functions. Recently an outlet in Eluru Rythu Bazar was also started and the sales are encouraging with a turnover of about Rs. 30,000/- to 50,000/- per month.

Further refinement in packing was done by going for box packing which is attracting the consumers and has created more demand for the product in the open market. These two groups participated in the "Millet Fest" organized by the College of Home Science, ANGRAU, Guntur, Exhibitions at Vijayawada, Eluru, and Pattiseema and could raise demand for their products.

The division of work among the members of the group was done *viz.* product preparation, marketing, record keeping *etc.* which was constantly reviewed by the KVK and ITDA officials to motivate them and provide further guidance. Now these groups are ready to procure further required machinery like Atta Kneader, Solar Drier *etc.,* to make a quality product with an intention to go for online marketing. The CST registration was also completed and they got the TIN number and Amazon.in: Online Shopping India was contacted for online marketing of the product. Product diversification by way of providing further training is planned for these women groups during the year.

Spread of the Technology

Seeing the success of the activity and potential market demand created by these value added products, the activity horizontally spread to two other villages namely Muddappagudem and Kota Ramachandrapuram of Buttaigudem mandal. Eighteen tribal women from these two villages were trained in preparation of millet based products for three days by the KVK at ITDA and two additional millet processing units have been established during 2016-17. Vertical spread of the technology has also taken place, as a similar programme is being conducted at Krishi Vigyan Kendra, Pandirimamidi for 30 tribal women from two villages of Rampachodavaram, East Godavari with the technical support of KVK Venkataramannagudem. The millet processing units are being run successfully with effective linkages created with ICDS, GCC and ITDA in the respective district.

Conclusion

Six millet processing units are being established *i.e.* four in West Godavari District and two in East Godavari district by both the KVKs working under Dr. YSR Horticultural University under tribal sub plan funds allotted to both the KVKs by ATARI, Zone V during the year 2015-16. The tribal women are successfully running the enterprises and earning an amount of Rs. 5000/- to Rs. 6000/- per month and the economic empowerment has direct impact on the standard of living and change in the life style of the tribal families. Now, further product diversification by using other locally available food grains and palmyrah neera, candy, jaggery *etc.,* are being proposed during the year 2016-17.

Product prepared, packed and ready for marketing

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Empowerment of Rural Youth through Sericulture in Andhra Pradesh - present scenario and prospects ahead

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Abstract

The youth are considered as the backbone and cream of the nation. Youth are the primary productive human resource of socio-economic development. It is therefore, essential to locate the role of youth in mainstream development. Youth are the important asset of a nation but they are being exploited by different agencies and their capabilities and competencies are not fully utilized by the nation. Rural youth are not only the future of food security but also for the growth of agriculture and development of allied enterprises. Rural youth face many hurdles while trying to earn a livelihood. While most of the world's food is produced by (ageing) smallholder farmers in developing countries, older farmers are less likely to adopt the new technologies needed for sustainable increase in agricultural productivity and ultimately feed the growing world population. The focus should be on how to make agriculture and allied enterprises such as Sericulture, Animal husbandry etc., more attractive and rewarding to the younger generation. Being a rural agro-based labour intensive industry, the sericulture sector plays a vital role for checking the migration from rural to urban areas. The very nature of this industry with its rural based on-farm and off-farm activities and enormous employment generation potential attracted the attention of policy makers to recognize the industry as one of the most appropriate avenues for socio-economic development of a largely agrarian economy like India. Hence, we need to engage youth in agriculture and allied enterprises like sericulture.

Keywords: Rural youth, Agriculture, Sericulture, Enterprise, Prospects, Empowerment.

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Introduction

Global population is expected to increase to 9 billion by 2050, with youth accounting for about 14 percent of this total. The age of an individual youth makes him mentally mature and able to take rational decisions. The youth are considered as the backbone and cream of the nation. Ours is a land of youth and this happens to be our greatest asset. Young minds are creative minds and youth are capable of achieving seemingly impossible tasks. Youth are the primary productive human resource of socio-economic development. It is therefore, essential to locate their role in mainstream development. The youth of India is diverse in ethnicity, religion, and socioeconomic backgrounds. Such diversity necessitates customized initiatives to meet needs and activate their untapped potential.

Majority of Indians live in villages and real progress is not possible, unless rural development takes place at a rapid pace. The population of youth in India in the age group of 15 - 35 years is around one third of the total population. Out of this total youth population, 20 per cent of them constitute the urban sector while the remaining 80 per cent are from the rural sector. There is evidence from various studies that more than 70 per cent of the poor people live in rural areas and the reduction of rural poverty continues to be a primary goal of developing countries like India. The socio-economic development and prosperity of the country depends to a considerable extent on the type of youth the country possesses.

Present Scenario

For healthy rural development, directional utilization of youth energy is very essential as the Indian social system is having bulk of educated but untrained and unskilled youth. They are conscious of their social responsibility and willing to render dedicated service to the community. Thus they can play a pivotal role in rural development. However, majority of the rural youth are living in an environment confronted with many problems including the sluggishness of village life, economic and social insecurity, village factions, lack of skills and limited work opportunity.

Youth and agriculture are the twin pillars of sustainable growth in developing countries. The primary aim for youth to engage in a meaningful occupation is to have sufficient regular income. Hence, if agriculture and allied enterprises are enabled by policy and practice to be a respectful, meaningful and profitable engagement, youth will definitely be attracted to it. Agriculture is the backbone of India and the best agricultural practices, a combination of traditional agricultural

methods reinforced by modern technology and innovations can play a leading role in rural development.

Rural development has been a major factor of sustainable livelihood by using available resources, manpower and technology. The Father of the Nation, Mahatma Gandhi said that the "Real progress in India can be achieved only through village development programs". The women and unemployed youth are to be taken as the driving force of any sustainable development in rural India. Strong rural urban linkages will not only help farmers stay back in villages pursuing profitable enterprises, but also improve access to quality produce by urban consumers. It is noteworthy to mention the views of late Dr. A.P.J. Abdul Kalam, who has advocated his concept of PURA (Providing Urban facilities in Rural Areas). So far, various policies have been pursued to address this concern and among the major ones is rural employment creation.

To meet this objective, the focus should be on how to make agriculture and allied enterprises such as Sericulture, Animal husbandry *etc.,* more attractive and rewarding to the younger generation. In India, agriculture continues to be at the mercy of the monsoon and the markets. In such circumstances, it will therefore be useful if the State Government launches a special programme for enabling youth to remain in villages and take to scientific agriculture. In order to ensure food security, agriculture and allied occupations need to be made intellectually and economically attractive and more consistent for the younger generation to take it up. With this in mind, farming and allied professions must be promoted aiming at involvement of youth. We need the growth of a strong services sector in rural India for ensuring regular and stable livelihood in the villages. Agri-business centers with allied enterprises and agri-clinics are needed on a big scale to promote agriculture and allied enterprises. Farm schools will have to be established in the fields of young farmers, in order to promote farmer to farmer learning. Value addition will have to be done to primary products in order to increase income.

A good crop of certain agriculture and horticulture products *viz.,* tomato, onion, mangoes, grapes *etc*. results in drastic fall in rates and wastage of such items. Establishment of infrastructure like cold storage, warehouses, food processing units, training and basic knowledge of food processing would make agriculture and horticulture more consistent, viable and a profitable occupation with stable and regular income. Similarly, the cocoon rates in India are greatly influenced by legal and illegal import of silk from China.

Objectives

Unlike earlier, when the average yield per unit was hardly 30 kg and crop uncertainty was higher than agricultural crops, Sericulture is now more attractive and rewarding with a consistency in cocoon yield and better income. There is a problem of growing unemployment and most of the youth today want to join a white collar job, even though the salaries offered are meager. There is lack of awareness among them. They do not know the type of avenues and opportunities available in the field. The present article is an attempt to create awareness among youth and motivate them to take up any of 21 various activities in the field of sericulture, as an occupation. Such awareness and motivation would ultimately help in promotion of sericulture and earning foreign exchange for the country.

Status of Sericulture and Constraints of Entrepreneurs in the State

Andhra Pradesh has the unique distinction of producing three varieties of silks *i.e.* Mulberry, Tasar and Eri silks out of the four silk varieties available in India. The state possesses a very strong and traditional weaving base with more than a lakh hand looms. Andhra Pradesh occupies the 1st position in unit productivity and 2nd position in the country next to Karnataka in production of Silk. As a rural agro based industry, Sericulture has now expanded to almost all districts in the state. Ever since its introduction, it is playing a pivotal role in the development of the rural economy of the state (Seshagiri *et al*., 2003). In the last decade a number of cotton weavers have taken to silk weaving in centers like Rayadurg and Proddatur because of better income in silk weaving. In Andhra Pradesh, Anantapur district ranks on top for having the largest mulberry acreage and high cocoon production. Presently sericulture is the main occupation of the farming community in the Rayalaseema region particularly in Anantapur and Chittoor districts absorbing the rural labor, giving direct and indirect employment to the other communities through silk reeling, twisting, dyeing, weaving and block printing, sericulture industrial equipment and input manufacture (Seshagiri and Ganapathi Rao, 2002). The Government of Andhra Pradesh has a separate department to promote Sericulture industry both in on-farm and non-farm sectors. The present status of sericulture in Andhra Pradesh (2016-17) is presented in Table 1.

Table 1. Present Status of Sericulture in Andhra Pradesh (2016-17)*

Sr. No.	Component	Unit	Present Status
1	Mulberry acreage (cumulative)	Acres	82889
2	No. of sericulture farmers	Nos	67871
3	Employment generation	Lakhs	4.97
4 a	Bivoltine cocoon production	M.Ts	6603
4 b	CB cocoon production	M.Ts	35625
4	**Total cocoon production**	**M.Ts**	**42228**
5 a	Bivoltine raw silk production	M.Ts	1056
5 b	CB raw silk production	M.Ts	4914
5	**Total raw silk production**	**M.Ts**	**5970**
6	Productivity per 100 dfls	Kg	70
7	Multi end reeling units	Basins in Nos.	1620 (240 units)
8	Automatic Reeling Machines (ARM)	Basins in Nos.	120 (1200 ends)

** Source: Department of Sericulture, Andhra Pradesh*

Sericulture is not only a tradition but also a living culture in India in general and Andhra Pradesh in particular. It is both an art and science of raising silkworms for silk production and ensuring livelihood. However, the entrepreneurs are facing various challenges for their sustainability in the industry. Fair prices and timely availability of quality seeds and other inputs are the major constraints of the farmers. Their knowledge base is influenced by the R & D support/Technical guidance by different agencies. Low rainfall and depleting ground water table is a major challenge not only for cultivating mulberry but also all agricultural crops in many states of India. The prevailing environmental factors *viz.,* high temperature-low humidity or high temperature-high humidity in coastal areas of the state and socio-economic status also influences the success of the crops. All these factors are the reasons for low productivity per unit, when compared with China. At present, availability of skilled labour has become a thrust among the farming community in continuing with the sericulture enterprise. Various other factors such as finance and support of other line departments also play a major role in the continuity of the entrepreneur in the industry. Considering the needs and constraints of the entrepreneurs, Govt. of Andhra Pradesh supports them financially for various activities.

Opportunities in Sericulture - Regular income with minimum gestation period

Sericulture is an agro-based labour intensive industry which provides gainful employment to the rural and unemployed youth and helps to uplift the socio-economic status of small and marginal farmers. It could be an attractive regular income oriented enterprise for rural youth as the silk and silk products are intermingled with the

country's culture and civilization. No ritual of any community is complete without silk as a wear in one form or the other. India has the unique distinction of producing all the four known commercial varieties of silk. The silk industry has emerged as one of the major employment providers in the state of Andhra Pradesh which leads to poverty alleviation and inclusive development. Being a rural agro-based labour intensive industry, the sericulture sector also plays a vital role for checking the migration from rural to urban areas. The very nature of this industry with its rural based on-farm and off-farm activities and enormous employment generation potential has attracted the attention of policy makers to recognize the industry as one of the most appropriate avenues for socio-economic development of a largely agrarian economy like India. The various activities in the field of sericulture are listed below and one can choose an area of his/her interest depending upon the finance and infrastructure requirement and availability (Table 2).

Table 2. Opportunities in the field of Sericulture

Sr. No.	Mulberry Cultivation, Seed Production and Silkworm Rearing	Post Cocoon Sector	Allied activities
1	Kissan Nursery - mulberry saplings	Reeling units (Charkha, Multi-end and Automatic Reeling Unit)	Production of disinfectant chemicals
2	Production of bio-fertilisers and/or vermi-compost	Twisting Unit	Production of bio-control agents
3	Silkworm egg production	Dyeing Unit	Production of rearing equipments-mountages *etc.*
4	Chawki Rearing Centre	Printing on silk	Computer Aided Textile Designing (CATD)
5	Commercial Silkworm Rearing	Weaving Units (Handloom/powerloom)	Placements at corporate sericulture offices
6	Compost from silkworm rearing waste	Preparation of garlands, flowers *etc.* from waste cocoons	Job in Department of Sericulture, Laboratory Assistant
7	--	Waste pupae trading/ Pupal oil and powder extraction	Marketing of sericulture products *etc.,* (Disinfectants, mountages, heaters, humidifiers, micro-nutrients *etc.*)
8	--	--	Placements in graineures, sales counters, reelers, weavers and quality assessment centers

Mulberry sericulture is a land based activity, which is labour intensive and provides good returns to the farmers. It has special significance for young women as silkworm rearing, an indoor activity, is not physically laborious and can be

simultaneously taken up by the women and unemployed youth along with other household activities. Mulberry sericulture has both agricultural components relating to mulberry plantation as well as industrial components relating to reeling, twisting and weaving. Because of its multifarious advantages such as high employment potential, rural base, relatively low capital requirement, minimum gestation period, very small crop duration, regular income, checking migration to urban areas, meeting raw material needs of the silk weaving industry sericulture has been attempted in several countries but it could sustain only in a few countries and India is one of the successful countries. Considering the merits of the sericulture industry for inclusive growth and the activities aligning with the Millennium Development Goals, the Government of India and the State Governments have taken up various developmental programmes for the development of sericulture and silk industry in India (Table 3A & 3B).

Table 3A. Financial Assistance provided by the Government for Sericulture Farmers

Sr. No.	Item / Activity	Cost (Rs.)	Subsidy/ Incentive (Rs.)
	Mulberry Propagation		
1	V1 saplings/ acre	14,000	10,500
2	Tree mulberry plantation/ acre	45,000	22,500
3	Soil enrichment (Organic fertilizer like Neem Cake)	10,000	5,000
4	Micronutrients (growth promoter)	1500	750
5	Drip Irrigation/ one acre (APMIP)	1,50,000	1,35,000
Rearing Shed, Veranda, Equipment, Disinfectants *etc.*			
6	Model-1: Rearing Shed (50 x 20 x 12-15 feet)	2,75,000	82,500
7	Model-2: Rearing Shed (30 x 20 x 12-15 feet)	1,75,000	87,500
8	Model-2: Rearing Shed (for SC farmers)	1,75,000	1,57,000
9	Model-2: Rearing Shed (for ST farmers)	2,00,000	1,80,000
10	Low cost shed including shoot stand	2,75,000	1,37,500
11	Construction of *Veranda* to a Rearing Shed	--	22,500
12	Rearing Equipment	70,000	35,000
13	Rearing Equipment (SC and ST farmers)	70,000	63,000
14	Brush Cutter (Farm Mechanization)	24,090	10,000
15	Secatures (1 big and 1 small)	1,400	700
16	Disinfectants	5,000	3,750
17	**Establishment of Chawki Rearing Centre & Equipment**	6,00,000	4,20,000
18	Incentive on Chawki silkworms (Bivoltine)/100 Dfls	--	750

19	Plastic mountages (300 Nos.)	20,720	19,330
20	Plastic Trays (10 Nos.)	6,000	4,500
21	Production incentive for CB cocoons (per Kg)		10 (20)
22	Production incentive for Bivoltine cocoons (per Kg)		50

Table 3B. Financial assistance provided by the Government for post cocoon sector (Reeling, Twisting, Weaving, Pupae Processing)

Sr. No.	Item / Activity	Cost (Rs.)	Subsidy/ Incentive (Rs.)
Reeling Units			
1	Multi-end reeling machine -6 basin	11,88,500	8,91,000
2	Multi-end reeling machine - 10 basin	14,86,000	11,14,750
3	Construction of Multi-end reeling shed (6 basin)	5,40,000	2,70,000
4	Construction of Multi-end reeling shed (10 basin)	7,20,000	3,60,000
5	Multi-end reeling machine -6 basin (SC & ST)	11,00000	9,90,000
6	Construction of Multi-end reeling shed- 6 basin (SC/ ST)	5,40,000	4,86,000
7	Construction of Multi-end reeling shed- 10 basin (SC/ ST)	8,00,000	7,20,000
8	Improved Cottage Basin Reeling	3,88,200	2,91,000
9	Automatic Reeling Machine (ARM) - 400 ends	1,28,20,000	96,15,000
10	Automatic Reeling Machine (ARM) - 200 ends	72,57,000	54,42,000
11	Additional equipment (ARM)	3,63,000	2,72,250
Twisting Unit/ Pupae Processing Unit			
1	Twisting Unit (480 spindles)	7,78,000	5,83,000
2	Pupae Processing and Drying Unit	13,60,000	10,20,000
Production Incentives - Reeling and weaving			
1	Production of Charkha Reeling silk (per kg)		35
2	Production incentive for crossbreed silk (per kg)		80
3	Production incentive for Bivoltine silk (per kg)		130
4	Handloom Weavers @Rs. 250/kg (Max. 4 kg/month)		1000

**Source: Department of Sericulture, Andhra Pradesh*

Employment potential through Sericulture with low investment

Sericulture generates employment @11 man days per kg of raw silk production (in on-farm and off-farm activities) throughout the year. This potential is par-excellence and no other industry generates this kind of employment, especially in rural areas, hence, sericulture is used as a tool for rural reconstruction. It is obvious that mulberry sericulture can be an effective tool in solving the problems of unemployment and poverty alleviation in the rural areas. The labour force participation rate in silk industry is the highest in comparison to any other avocation

in the country. Sericulture consists of two phases, one is mulberry cultivation which is basically agriculture in nature through which mulberry leaf, the food of the silkworm is produced and the other one is rearing of silkworms for cocoon production. Mulberry garden requires a low gestation period of six months and continues to yield for 15-16 years with little expenditure on maintenance. The sericulture crop is harvested in 22-28 days unlike other crops which take about four months to harvest. More interestingly, if planned properly, a farmer can get regular handsome monthly income from sericulture. By adopting stipulated package of practices, a farmer can attain net income level up to Rs. 1,00,000 or more per acre per annum. Thus the industry plays a major role in empowerment of youth and employment generation. The economics of sericulture is presented in Table 4.

Table 4. Sericulture Economics (One Acre Plantation under irrigated conditions)

Sr. No.	Particulars	Rate (Rs.)	Amount (Rs.)
A. Expenditure			
1.	Cost of leaf production for 28 MT. of leaf per kg	Rs. 2.28	63840.00
2.	Cost of dfls (Multi x Bi.) 1250 dfls	Rs. 400 per 100 dfls	5000.00
3.	250 Man days for rearing [@ 20 man days per 100 dfls per 1250 dfls]	200/-	50,000.00
4.	Non recurring expenditure (approx.)		57,387.00
5.	Recurring expenditure (approx.)		6520.00
	Total Expenditure		**182747.00**
B. **Return**			
6.	Returns by selling 750 kgs cocoons @ 60 kg cocoons / 100 dfls (1250 Dfls/ year)	400/- per kg	3,00,000.00
		Net Return in Rs. : (B-A)	**1,17,253.00**
Cost Benefit Ratio is 1 : 1.64			

Assumptions	
Mulberry variety	V1
Silkworm Hybrid	Multi x Bi
Average leaf yield / acre @70 MT/ha/yr	28 MT / acre
No. of Dfls brushed / acre/year	1250 dfls
Average cocoon yield / 100 dfls	60 kg
Average rate of cocoon / kg	400.00

The new innovations of mulberry cultivation, silkworm rearing and improved hybrid silkworm seeds have brought an unparalleled revolution in the silk industry. They do not call for any special heavy investment as the same are developed to suit the existing socio-economic conditions of the farm households. The simplicity in adoption of these technologies and attractive income thereof have great appeal to the farmers with the result that sericulture is spreading fast in new areas covering practically almost all the districts. It is also helping in rapid transformation of the poor sericulture villages into reasonably prosperous rural areas. The new sericulture technologies are very much farmer oriented and have, in fact, transformed sericulture which used to be a subsidiary rural occupation in the past, into a full time highly remunerative agricultural activity better than any other cash crops. Due to these advantages sericulture is a priority and gets major attention in rural development programmes. Keeping in view the advantages of silk in promoting inclusive development, promotion of sericulture will continue to be an important factor in the coming days. Sericulture is also recognized for its transfer of income from richer to poorer classes, use of marginal land without affecting food grains production and high export potential (Seshagiri and Ganapathi Rao, 2002).

Challenges of Youth in Sericulture

In general, rural youth continue to face challenges related to unemployment, underemployment and poverty. Despite having ample potential to provide income-generating opportunities for rural youth, challenges related specifically to participation of youth in agriculture and allied enterprises are detailed here.

1. Insufficient access to information and skills: Access to information and skills is often worse in rural areas than in urban areas, and this discrepancy is observable as early as in primary school. Among the farming community, agricultural knowledge and farming know-how are passed on by tradition from parents to children. To ensure successful participation of youth in the agricultural sector and allied enterprises, access to both information and skills is crucial. In addition to knowledge of agricultural production and processing techniques and the relative know-how, the young farmers need access to information about finance, land, market rates and latest technologies in the field of water conservation and utilisation, food processing and preservation of harvested crop.

2. Limited access to land: Due to growth in population and division of land among growing family members, access to agriculture land has come down drastically making agriculture a non-viable occupation. Land is the basic and

primary requirement around which the rural economy revolves. In rural areas, land not only contributes to household food security but is a means to employment creation and income generation. A good crop in rural areas also provides business in the urban markets and industries.

3. Inadequate access to financial services: Access to financial services such as crop loan is much more difficult for farmers than the loan to industrialists. Interest rates on tractor are much higher than on cars. Defaulter farmers commit suicide due to pressure and reminders from the bank and also in case of crop failure. On the other hand, the industrialists easily escape by declaring themselves bankrupt. If youth have access to land, minimum finance is needed to cover the initial costs to start sericulture activities. In order to meet these needs, Financial Service Providers (FSPs) have to play a crucial role. While financial services have become increasingly available to poor farmers, there is still much to be achieved to improve the availability of finance at low interest rate to young people in agricultural and rural enterprises.

4. Difficulties accessing green jobs: There is enormous potential for growth in the creation of new green jobs and for upgrading existing jobs contributing to sustainable development, poverty reduction and better inclusion of young people in society. Mere academic qualification without technical knowledge and skills is not enough to generate employment to youth passing out every year from various institutions. Even agriculture/sericulture graduates and post graduates wish to go for jobs instead of taking up agriculture or sericulture as an occupation. It is increasingly clear that investments must be made in technical training and skill development so that the youth can go for self-employment and also create jobs for others. Such training would also be useful in upgrading their skills.

5. Limited access to markets: Market access for farmers means the ability to acquire farm inputs and farm services and the capability to deliver agricultural produce to buyers. Easy access to markets is vital for boosting productivity and increasing incomes. Limited access to market paves the way for middlemen, who due to their financial strength enjoy the maximum benefit and the small and marginal farmers, reelers, dyers, weavers *etc.* get the minimum out of their produce.

6. Limited involvement in policy dialogue: Participation of youth has an important role in decision-making and policy dialogue. At times, the policy-

makers unilaterally frame policies without understanding the field realities and requirements. Since, the policies are usually framed at the top most level; there is lot of pilferage till it reaches the grass root level. Due to these reasons the policies and schemes do not yield desirable success. However, there is still a long way to go to ensure the active participation of youth in policy processes and too often their participation remains token or passive.

Inspire youth for better prospects in sericulture

Globally, most young people (around 85%) live in developing countries, where agriculture provides the main source of income and therefore, it is vital that young people are brought to the mainstream of agriculture and allied enterprises. However, in the recent past, retaining youth in agriculture has been identified as one of the major problems. Today's agriculture reflects a poor social image and hence, rural youth are moving towards the urban sector for alternative and better opportunities. The future challenges are complex in nature and magnitude especially due to shrinking natural resources, declining profitability and adversaries of climate change. Obviously, these challenges are not only posing a threat to agriculture and food and nutrition security but also creating wider socio-economic gaps within the society. Overall, the current agricultural policies do not provide attractive and sufficient avenues for engaging youth in agriculture.

Youth have the capability and capacity to make significant changes in agriculture but need right policies and proper grooming. The past glory of "Green Revolution" was achieved due to policy support and infrastructure as well as human resource development of youth. There is an urgent need to involve youth in decision-making processes at all levels to reorient agricultural research for development. Each country needs to develop long-term, consensus-based and integrated youth policy, for which there is a great need to share experiences at national, regional and global level. There is a high potential for cooperation among agri-stakeholders, particularly through networking of youth at different levels. The future of agriculture warrants impact oriented efforts at scale by involving youth to play a catalytic role in establishing 'Plough to Plate' chain. This depends on greater involvement of youth through effective networking for knowledge sharing and out scaling of innovations. It is through their active involvement that we can move forward to make agriculture an agri-business oriented profession which is very crucial for the prosperity of our farming communities.

It is our responsibility to get young people energized about the challenge of

feeding the world and then provide the opportunities to become the leaders of the next generation in the field of agriculture, sericulture and allied enterprises. For the future of agriculture, the responsibility of preparing today's youth for tomorrow is not an option but a must for the older generation. Likewise to ensure participation of rural youth in sericulture, focus should be on motivating the rural youth. Special programmes need to be framed on priority basis for attracting rural youth to Sericulture for better prospects and upliftment of their financial status.

I. Study of market trends and identification of rural youth: Within the greater framework of policy making, the study of market trends and requirements has to be considered. The rural youth are to be identified and trained in sericulture for their long sustenance with the enterprise.

II. Capacity Building of youth in Sericulture activities: Sericulture is considered as a skill oriented activity. There is a need for training and skill-building opportunities for young people that can mould them for active participation in sericulture. Youth platforms (Rural youth and young farmer's platforms and councils) have been created to determine training and capacity building needs. Need based innovations such as shoot rearing, plastic mountages, tree plantation & drip irrigation, rearing of bivoltine silkworm, use of foggers for disinfection, humidity and temperature maintenance, sprinklers on roof-top for temperature maintenance have been made to meet the challenges *viz.,* labour shortage, water shortage, to maintain optimal rearing conditions *etc.* The Technical staff of Department of Sericulture and scientists of Central Silk Board and APSSRDI are shouldering the responsibility of capacity building through transfer of technology to sericulture farmers in the field.

Andhra Pradesh State Sericulture Research and Development Institute (APSSRDI), in its pursuit for Human Resource Development (HRD) in Sericulture has ambitiously established a study centre for "*Certificate course in Sericulture*" under the ambit of Indira Gandhi National Open University (IGNOU), New Delhi. The Institute is continuously training an enthusiastic array of Graduates, Post Graduates, Entrepreneurs and a few farmers, with a view to convert the pass outs into Registered Silkworm Seed rearers and Licensed Chawki Rearers. This effort would result in the development of skilled manpower in Sericulture.

III. Professional farming approach in Sericulture: After youth are engaged in sericulture, special programmes need to be designed to inculcate professional farming approach among the sericulture farmers. Agricultural universities and

research institutes should conduct mobile camps in rural areas to teach professional techniques to make the farming and sericulture in particular, more viable and profitable. Frequent youth-participatory realistic feedback is to be collected for monitoring and evaluation on the above aspects to ensure timely reforms and updates of the knowledge-systems and structures. National policies should be youth friendly to promote small scale farming and protect young farmers from the adverse effects of corporate farming and illegal dumping of silk from China.

IV. Access to rural finance and market: Most of the time, accessing credit remains difficult for young people. Financial institutions often have the perception that youth form a risky client category as they cannot give collateral guarantee and as a consequence, youth frequently find access to private finance at unusually higher interest rates, which they find very difficult to repay later. All this leads to the failure of their newly established enterprise. In such circumstances, loans should be provided, without many formalities, to youth as working capital in sericulture enterprise which would give confidence to entrepreneurs in the sericulture industry. With reference to sericulture in non-traditional areas, to encourage the farming community, marketing facility for cocoons needs to be arranged on priority basis. Information on market rates and climatic conditions would help farmers in harvesting a good crop and higher returns.

V. Sericulture crop insurance: Keeping in view the constraints of the large number of farmers across the country, the Central Government and various state governments have introduced crop insurance to safeguard their interests and lives. Silkworm being a very sensitive insect, silkworm rearing is highly prone to diseases leading to crop loss and failure. Sericulture may also be brought under crop insurance to protect the interests of sericulture farmers.

VI. R & D Support: R&D support is the back bone of any industry for quality improvement and higher returns with the help of new technologies. It is also important to stimulate agricultural R&D for youth for which the 'Young Professionals Platform for Sericulture Research ('YPPSR') has to be organized. Such a network may focus on exchange of knowledge among young professionals and contribute their inputs during policy debates; to promote sericulture among young people. Further, the use of information and communication technologies (ICTs), agricultural education systems and new technologies by research institutions should be developed to respond to the needs of young entrepreneurs in the field of sericulture.

VII. Seri Poly Clinics: Input supply at farmers' door steps through establishment of Seri Poly Clinics (One Stop Shops) may be established and popularised amongst rural youth to provide all the required material at reasonable rates.

VIII. Chawki Rearing Centres (CRCs): Production of Chawki worms is an important and latest concept in bivoltine cocoon production, which has been successfully adopted in the field. The rural youth with small land holding may establish CRCs. They can play a vital role in production of good quality Chawki worms leading to a successful commercial crop.

IX. Recruitment / Outsourcing of well qualified rural youth as extension workers, support schemes to youth farmers for Chawki silkworm production, commercial silkworm rearing, Reeling, Weaving and access to markets, engagement in value chain activities like garment making, fashion accessories and marketing of value added products through a chain of Silk Mark outlets will further enhance the participation of rural youth in the Sericulture sector. Awards are to be given to sericulture youth to gain confidence of youth to share their experiences and replicate the successes.

The role of youth in transforming the face of Indian sericulture is very crucial. They are the vectors of new ideas and imbibe the necessary impatience and excitement needed to spur all round development. The youth are more receptive to new ideas, ready to spend on ideas and take risk. Hence there is a need to kindle their energies for fruitful purposes and develop them in the desired direction. Sericulture involves various aspects and farm youth are actively involved in all these aspects. They participate in most of the sericulture operations like field preparation, application of manure and fertilizers; inter cultivation, disinfection, feeding the silkworms *etc.* Indian silk industry has registered a phenomenal growth over the years and presently accounts for more than 18 per cent of the global silk production. Such spectacular growth could be attributed to the involvement of youth in sericulture. India has emerged today as the second largest producer of mulberry raw silk besides producing all the varieties of commercially exploited silks of the world.

The Indian silk industry is suffering from two major constraints *i.e.*, low productivity and high production cost. In these circumstances, if youth are brought into this sector, productivity could be increased by adoption of new technologies as the youth are ready to accept any new technology. Further the production cost could be brought down by effective utilization of resources which could happen with the involvement of rural youth. Bottlenecks in the field of cocoon production

have been identified and addressed to a great extent. Needless to mention that, there is still more to be done in achieving the target of enlarging the production base of bivoltine in the larger interest of the sericulture industry in the country and also to compete in the international market.

Conclusion

Most rural youth do not foresee a prosperous future for themselves in the agriculture or sericulture sector mostly because of uncertainty of weather, lack of stability and profitability and lack of infrastructure in rural areas. At the same time, rural youth is very aware of this situation and full of hope and energy to turn the tide and create a 'new rural reality'. Rural youth are trying to mitigate the low profitability of agriculture. They aspire to become agri-preneurs / seri-preneurs who are involved in all links of the value chain from production to transformation and marketing. Conscious of the effects of climate change on the environment and depletion of natural resources, rural youth are excellent environmental stewards who promote sustainable agriculture. Many of them are farming in the agricultural high-season but migrate to the cities during the low season, keeping close ties with their relatives in rural areas and thus enhancing rural-urban linkages. Rural youth are willing to become modern farmers and are taking advantage of new ICTs to learn about new agricultural techniques and to facilitate the marketing of their produce.

It can be concluded that youth are the important asset of a nation but they are being exploited by different agencies and their capabilities and competencies are not fully utilized by the nation. Rural youth are not only the future of food security but also for the growth of agriculture and allied enterprises development. Rural youth face many hurdles while trying to earn a livelihood. Youth often also lack access to credit, and many other productive resources necessary for agriculture. While most of the world's food is produced by (ageing) smallholder farmers in developing countries, older farmers are less likely to adopt the new technologies needed for sustainable increase in agricultural productivity, and ultimately feed the growing world population and protect the environment at the same time. Hence, we need to engage youth in agriculture and allied enterprise like sericulture.

Future Prospects

There is a strong demand for silk in the country, which is expected to continue for another two decades and the country is fast becoming the largest consumer

of silk in the world. Hence, there is a strong prospect for horizontal and vertical expansion to meet the increased domestic and export demand for silk products. The onus now lies with the policy makers and industry stakeholders to introduce and steer the industry into uncharted areas. In these circumstances if youth are brought into the main stream of agriculture and to the allied enterprises there is scope for much more betterment in agriculture based enterprise as the youth are ready to accept new technologies and implement them successfully.

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Participation of Rural Youth in Agriculture

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Abstract

This study was conducted in Chandrapur district of Maharashtra State in 2016. The main objective was to study the extent of participation of rural youth in Agriculture. The responses were collected with the help of a pretested schedule by contacting rural youth personally. Hence ex-post facto design of social research was used in the present investigation. Majority of the respondents participating in agricultural activities expressed that they take decisions by consulting elders. With regard to participation in farm operations majority of the respondents had medium level of participation. More than half of the respondents (68.33 per cent) expressed that they participate in maintaining record of milk. With reference to participation of rural youth in management of animal activities like milking of animals and in getting fodder from the farm to the cattle shed 55.83 per cent and 49.17 per cent of the respondents expressed that they only do this work. In economic activities like purchase of farm implements/ machines 58.33 per cent expressed that they do the work with others. In case of borrowing/repaying loan 93.33 per cent expressed that they never do this work.

Keywords: Rural youth, Participation, Agriculture

In India, it is well known that youth are the backbone of the rural economy. The youth of today are the future citizens of the country. They are the hope of tomorrow. Youth reflect the national potential and represent the life blood of a nation. Development of youth determines the development of the community and the country as a whole. The socio-economic development and prosperity of the rural areas depend upon the kind of youth in the country, because, rural youth have the ability to orient themselves to go along with the mainstream development process. Youth are the precious human assets who can play an important role in nation building activities, if opportunities are provided. If a country can harness a creative and pervasive force like youth, it can substantially and quickly advance

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towards modernization in agriculture.

Agriculture generally involves five stages *viz.,* production, consumption, processing, storage and marketing. In most of these stages rural youth can be actively involved. They are participating in most of the agriculture operations like ploughing, harrowing, sowing, transplanting, weeding, harvesting, post- harvest activities and so on. Rural youth participate in marketing where the trade or enterprise is highly/commercialized. Rural youth play a key role in performing various tasks related to dairy and goatery enterprises activities like maintenance of cattle/ goat shed, feeding of animals, collection of fodder for animals *etc.* The participation of rural youth in farming gains more importance because it solves the problem of unemployment; secondly the young farmers are innovative and accept new farm technology earlier than the older ones. Hence, this study was focused on the objective to study the participation of rural youth in Agriculture.

Methodology

The study was undertaken in Chandrapur district of Maharashtra State with a sample size of 120 youth respondents from 12 villages. The data from respondents were collected with the help of a pretested schedule by contacting them personally. Hence, ex-post facto design of social research was used in the present investigation. An interview schedule was prepared in view of the objective of the study and data were collected by personal interview from selected respondents, regarding their participation in agriculture. For measurement of participation teacher made test was used in which four major indicators were identified. A Schedule was developed to measure all these indicators with the help of suitable continuum. The score of all these indicators was converted into an index. Further, overall participation index (PI) was estimated with the help of the formula given below.

$$PI = \frac{\text{Obtained participation score}}{\text{Obtainable participation score}} \times 100$$

Results and Discussion

The data in Table 1 indicates distribution of respondents according to their participation.

1. a Participation of Rural Youth in Farm Decision Making

Table 1. Distribution of the Respondents according to Participation in Farm Decision Making

Sr. No.	Farm Decisions	Respondents (n=120)				
		A	B	C	D	E
1	Selecting hybrid varieties	22 (18.33)	52 (43.34)	12 (10.00)	19 (15.83)	15 (12.50)
2	Using disease/weed preventive spray	25 (20.83)	65 (54.17)	20 (16.67)	04 (03.33)	06 (05.00)
3	Using chemical fertilizers	00 (00.00)	52 (43.34)	28 (23.33)	24 (20.00)	16 (13.33)
4	Using labour on temporary basis	15 (12.50)	10 (08.33)	20 (16.67)	44 (36.67)	31 (25.83)
5	Maintaining record book of farm	17 (14.17)	23 (19.17)	73 (60.83)	07 (05.83)	00 (00.00)
6	Buying the farm implements	20 (16.17)	16 (13.33)	63 (52.50)	12 (10.00)	09 (07.50)
7	Building the farm implements	24 (20.00)	23 (19.17)	56 (46.67)	04 (03.33)	13 (10.83)
8	Taking opinion of Govt/ Non-Govt institutes about farm business	12 (10.00)	23 (19.17)	51 (42.50)	04 (03.33)	30 (25.00)
9	Taking credit for farming	09 (07.50)	24 (20.00)	61 (50.83)	17 (14.17)	09 (07.50)
10	Doing subsidiary activities like poultry farming and others	17 (14.17)	42 (35.00)	34 (28.33)	15 (12.50)	12 (10.00)

A – Exclusively I take the decision, B - I take the decision by consulting my father/ elders, C - We take decision together, D – Father/elders take decision by consulting me, E – Only Father/elders take decision

The data furnished in Table 1 indicate the results of participation of rural youth in farm decision making. Near about fifty per cent of respondents (43.34%) expressed that the decision of selecting hybrid varieties was taken by them by consulting their father/ elders followed by 18.33 per cent respondents who expressed that they exclusively take the decision of selecting hybrid varieties. The respondents were distributed according to their farm decision making in farm operations like using disease/ weed preventive spray. Over half the respondents (54.17%) were taking decisions by consulting their father or elders followed by 20.83 per cent of respondents who were taking their own decision and 16.67 per cent of respondents who take decisions together with their father/elders. The proportion of respondents

who expressed that only father/elders take decisions and by consulting them was 5.00 and 3.33 per cent, respectively. Regarding use of chemical fertilizers, majority of the respondents (43.34%) were taking the decision by consulting their father/elders followed by 23.33 per cent respondents who take this decision together, 20.00 per cent respondents also expressed that their father/elders take the decision by consulting them. Decision on use of labour on temporary basis was always taken by father/elders in consultation with respondents (36.67%) and in case of one fourth of the respondents (25.83%) only their father/elders are taking this decision. Majority of the respondents are taking decisions together with their father/elders regarding maintaining of record book of farm (60.83%), buying the farm implements (52.50%), taking credit for farming (50.83%), building the farm implements (46.67%) and taking opinion of Government or Non Government institutes about farm business. For doing subsidiary activities like poultry farming and others, more than one third of the respondents (35.00%) took their decision by consulting their father or elders and nearly 28.33 per cent of them are taking decisions together with their father/elders.

From the above findings it can be concluded that majority of the respondents are taking decisions together with their father or elders regarding farming activities like maintenance of farm records, buying and building farm implements, taking credit for farming and institutional opinion about farm business. Majority of the respondents are also taking decisions by consulting their father or elders, regarding use of disease or weed spray, chemicals and fertilizers and selection of improved hybrid varieties.

Table 2. Distribution of the Respondents according to their Level of Participation in Farm Decision Making

Sr. No.	Farm decision making Index	Respondents (n=120)	
		Frequency	Percentage
1	Low (Up to 33)	34	28.33
2	Medium (34 to 66)	60	50.00
3	High (Above 66)	26	21.67
	Total	**120**	**100**

It is revealed from Table 2 that half of the respondents (50.00%) were concentrated in medium category of farm decision making followed by 28.33 per cent respondents who come under the category of low level of farm decision making, while 21.67 per cent respondents had high farm decision making.

This clearly indicates that rural youth were participating in the farm decisions, but

not on their own; they used to take decisions in consultation with their father and elders, hence the extent of farm decision making was medium.

1.b Participation of Rural Youth in Farm Operations

Table 3. Distribution of the Respondents according to Participation in Farm Operations

Sr. No.	Farm Operations	Respondents (n=120)			
		A	B	C	D
1	Are you participating in land preparation for crop?	16 (13.33)	05 (04.16)	32 (26.67)	67 (55.84)
2	Are you participating in sowing of seed?	10 (08.33)	45 (37.50)	16 (13.33)	49 (40.84)
3	Are you participating in irrigating the field?	68 (56.67)	08 (06.66)	30 (25.00)	14 (11.67)
4	Are you participating in intercultural operations on the farm?	13 (10.83)	67 (55.84)	25 (20.83)	15 (12.50)
5	Are you participating in fertilizer application?	15 (12.50)	40 (33.33)	35 (29.17)	30 (25.00)
6	Are you participating in spraying of insecticides/ fungicides/herbicides?	00 (00.00)	32 (26.67)	57 (47.50)	31 (25.83)
7	Are you participating in harvesting of crop?	00 (00.00)	69 (57.50)	21 (17.50)	30 (25.00)
8	Are you participating in operating of farm implements?	21 (17.50)	31 (25.83)	45 (37.50)	23 (19.17)
9	Are you participating in threshing and drying of farm produce?	00 (00.00)	43 (35.83)	42 (35.00)	35 (29.17)

A - Only I do this work, B - Get done through labour, C - I do with others, D - I never do this work

The data in Table 3 indicates the results of participation of rural youth in farm operations. More than fifty per cent of the respondents expressed that they never do the work of land preparation for crops (55.84%) and about one fourth of the respondents get it done with others (26.67%). In the operation of seed sowing 40.84 per cent of the respondents never participate, while 37.50 per cent of the respondents get it done through labour. More than half of the respondents (56.67%) were found to participate in irrigating the field on their own and 25.00 per cent were doing it with others. Regarding intercultural operations, 55.84 per cent of the respondents get it done through labour, while 20.83 per cent were doing it with others. In the fertilizer application, 33.33 per cent of the respondents get it done through labour, 29.17 per cent do it with others and 25.00 per cent of the rural youth have never done this operation. For the spraying of insecticide, fungicides or herbicides, nearly 47.50 per cent of the respondents are doing this

work with others or through labour (26.67%). Harvesting of crop was always done through labour, as expressed by 57.50 per cent of the respondents. Majority of the respondents were operating farm implements with others (37.50%) or get it done through labour (25.83%). In threshing and drying of farm produce, 35.83 per cent of the respondents get it done through labour, while 35 per cent of them are doing with others. On the same line Ahire *et al.* (2001) reported that participation of rural youth in farm activities was varying.

It is concluded from the findings that except in irrigation, no farm activities were done by most of the rural youth on their own.

Table 4. Distribution of the Respondents according to their Level of Participation in Farm Operations

Sr. No.	Farm Operations Index	Respondents (n=120)	
		Frequency	Percentage
1	Low (Up to 33)	26	21.67
2	Medium (34 to 66)	61	50.83
3	High (Above 66)	33	27.50
	Total	**120**	**100**

It is revealed from Table 4 that, in case of level of participation in farm operations, majority of the respondents *i.e.* 50.83 per cent had medium level of participation in farm operations, 27.50 per cent of the respondents had high level of participation in farm operations, while, 21.67 per cent of the respondents had low level of participation in farm operations. These findings corroborate with the findings of Nale (2003).

1.c Participation of Rural Youth in Animal Husbandry

Table 5. Distribution of the Respondents according to participation in Animal Husbandry

Sr. No.	Animal Husbandry Activities	Respondents (n=120)			
		A	B	C	D
1	Are you participating in cleaning animals?	32 (26.67)	08 (06.66)	54 (45.00)	26 (21.67)
2	Are you participating in feeding of animals?	56 (46.67)	00 (00.00)	36 (30.00)	28 (23.33)
3	Are you participating in getting fodder from farm to cattle shed?	59 (49.17)	04 (03.33)	25 (20.83)	32 (26.67)

4	Are you participating in vaccination of animals?	26 (26.66)	00 (00.00)	38 (31.67)	56 (46.67)
5	Are you participating in taking animals for artificial insemination?	24 (20.00)	00 (00.00)	28 (23.33)	68 (56.67)
6	Are you participating in milking of animals?	67 (55.83)	00 (00.00)	23 (19.17)	30 (25.00)
7	Are you participating in maintaining record of milk?	82 (68.33)	00 (00.00)	21 (17.50)	17 (14.17)
8	Are you participating in rearing of hybrid animals?	03 (02.50)	00 (00.00)	12 (10.00)	105 (87.50)
9	Are you participating in poultry farming?	21 (17.50)	00 (00.00)	00 (00.00)	99 (82.50)
10	Are you participating in cleaning of animal shed?	54 (45.00)	02 (01.67)	34 (28.33)	30 (25.00)

A - Only I do this work, B - Get done through labour, C - I do with others, D - I never do this work

The data furnished in Table 5 indicates the results of participation of rural youth in Animal Husbandry activities. Among the management practices, cleaning of animals was done by majority of the respondents (45.00%) with others, followed by 26.67 per cent of the respondents who do this work on their own; however 21.67 per cent of them have never done the cleaning of animals. Nearly half of the respondents (46.67%) participated in feeding of animals and nearly one third of rural youth (30%) did it with others, while nearly one fourth of the respondents (23.33%) have never done this activity. Almost half of the young respondents (49.17%) were getting fodder from farm to cattle shed and 20.83 per cent were doing this with others. Regarding vaccination of animals 46.67 per cent rural youth respondents never participated in vaccination of animals, while 31.67 per cent did it with others and 26.67 per cent were doing this work on their own. More than half of the respondents (56.67%) never take their animals for artificial insemination, 23.33 per cent respondents send their animals with others and 20.00 per cent have taken their animals for artificial insemination.

Regarding milking of animals, 55.83 per cent of the respondents themselves are doing milking, 19.17 per cent of the respondents are doing it with others and one fourth of the respondents have never done this activity (25%). Majority of the youth respondents (68.33%) had maintained milk record on their own. A great majority of the respondents (87.50%) never participated in rearing hybrid animals and near about similar per cent of respondents (82.50%) have never done poultry

farming. Majority of the respondents (45%) are participating in cleaning of the animal shed on their own, while 28.33 per cent are doing it with others.

Table 6. Distribution of the Respondents according to Level of Participation in Animal Husbandry

Sr. No.	Animal Husbandry activities Index	Respondents (n=120)	
		Frequency	Percentage
1	Low (Up to 33)	19	15.83
2	Medium (34 to 66)	82	68.34
3	High (Above 66)	19	15.83
	Total	**120**	**100**

It is observed from Table 6 that a majority of the respondents (68.34%) were having medium participation in animal husbandry activities followed by 15.83 per cent of the respondents who had low participation and 15.83 per cent of the respondents who had high participation in management of animals.

1. d Participation of Rural Youth in Economic Activities

Table 7. Distribution of the Respondents according to Participation in Economic Activities

Sr. No.	Economic Activities level	Respondents (n=120)		
		A	B	C
1	Are you participating in storage of farm produce?	10 (08.33)	70 (58.34)	40 (33.33)
2	Are you participating in selling of farm produce?	12 (10.00)	32 (26.67)	76 (63.33)
3	Are you participating in maintaining farm records?	15 (12.50)	67 (55.83)	38 (31.67)
4	Are you participating in selling/buying of bullocks or other farm animals?	12 (10.00)	25 (20.83)	83 (69.17)
5	Are you participating in purchase of farm implements/ machines?	12 (10.00)	70 (58.33)	38 (31.67)
6	Are you participating in purchase of insecticide/fungicide/ herbicide required for spraying?	15 (12.50)	55 (45.83)	50 (41.67)
7	Are you participating in purchase of animal fodder?	14 (11.67)	35 (29.16)	71 (59.17)
8	Are you participating in selling of milk?	23 (19.17)	52 (43.33)	45 (37.50)
9	Are you participating in borrowing/repaying loan?	00 (00.00)	08 (06.67)	112 (93.33)

A - Only I do this work, B - I do with others, C - I never do this work

The data in Table 7 indicate the results of participation of rural youth in economic activities. Regarding storage of farm produce over half of the respondents (58.34%) said that, they do with others, 33.33 per cent of the respondents expressed that, they never do this work and 8.33 per cent of the respondents expressed that they exclusively do this work. Regarding participation of youth in selling of farm produce, majority of the respondents (63.33%) said that, they never do this work. 26.67 per cent of the respondents said that they do with others followed by 10.00 per cent of respondents who expressed that they exclusively do this work. Over half the respondents (55.83%) said that, they participate with others in maintaining farm records, 31.67 per cent of the respondents said that they never do this work while 12.50 per cent of respondents expressed that they exclusively do this work. With reference to activities like, selling/buying of bullocks or other farm animals 69.17 per cent expressed that they never do this work, 20.83 per cent do with others followed by 10 per cent who exclusively do this work. In activities like, purchase of farm implements/machines and purchase of insecticides/fungicides/ herbicides required for spraying, the distribution of respondents is as follows with three statements, "I do with others (58.33 per cent) and (45.83 per cent), "I never do this work" (20.83 per cent and 22.50 per cent) followed by (10.00% and 12.50%) "I exclusively do this work". in activities like, purchase of animal fodder and selling of milk, 59.17 per cent and 37.50 per cent of the respondents never do this work, 29.16 per cent and 43.33 per cent do with others followed by 11.67 per cent and 19.17 per cent who exclusively do this work. Regarding participation of youth in borrowing/repaying loan, majority of the respondents (93.33 per cent) said that, they never do this work. 6.67 per cent of the respondents said that they do with others.

Hence, it is concluded that majority of rural youth never participated in some of the economic activities like borrowing or repaying of loan, buying and selling of farm produce and farm animals, their artificial insemination and purchase of fodder. They were participating with others in some of the activities like storage of farm produce, maintaining farm records, purchase of implements, machinery, insecticides/ fungicides/ herbicides and selling of milk.

Table 8. Distribution of the Respondents according to their Economic Activities Level

Sr. No.	Farm Economic Index	Respondents (n=120)	
		Frequency	Percentage
1	Low (Up to 33)	48	40.00
2	Medium (34 to 66)	52	43.33
3	High (Above 66)	20	16.67
	Total	**120**	**100**

It is observed from Table 8 that, majority of the respondents (43.33%) were having medium level of participation in economic activities, followed by 40.00 per cent of the respondents who were having low level of participation in economic activities and only 16.67 per cent of the respondents had high level participation in economic activities.

Overall Participation of Rural Youth in Agriculture

Table 9. Distribution of the Respondents according to overall Extent of Participation

Sr. No.	Extent of participation Index	Respondents (n=120)	
		Frequency	Percentage
1	Low (Up to 33)	17	14.17
2	Medium (34 to 66)	81	67.50
3	High (Above 66)	22	18.33
	Total	**120**	**100**

It is observed from Table 9 that a great majority of the respondents (67.50%) were having medium extent of participation followed by 18.33 per cent of the respondents who had high extent of participation and 14.17 per cent of the respondents were found to have low extent of participation.

Most of the respondents were not participating fully in all the agricultural activities. The reason might be that youth are losing interest in agriculture or due to insufficient knowledge about different agricultural operations. Hence there is a need to train the youth on certain issues of agriculture and help them to acquire more knowledge and create interest. It is clear from the findings that, majority of the rural youth indicated that training is needed in selection of seed material, identification of pests and diseases and selection of hybrid verities. The administrators and policy makers should organize training programmes in these

areas to increase the knowledge and skill of rural youth. A similar finding was reported by Hiremath (2000) and Shinde (2001).

Conclusion

Rural youth are very attracted towards urbanisation and the need to earn assured income which they could not find in agriculture or in rural areas. Due to the present scenario of agriculture in Vidarbha region, the farming community has developed pessimism towards agriculture, hence they are not encouraging their children towards agriculture. The suggestions given by rural youth are all concerned with the generation of assured income from agriculture and the need for formal education from childhood that can help them to change their perception and increase participation and decision making in agriculture.

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Impact of Technologies Assessed, Refined, Demonstrated and Disseminated to Paddy Farmers - A Case Study

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Abstract

The present paper highlights the level of knowledge and extent of adoption of paddy production technologies and the impact on productivity and profitability of farmers in Karimnagar district of Telangana State. Ex post facto research design was adopted and ninety farmers were selected for the study. A high level of knowledge, high extent of adoption and a minimum of ten percent increased productivity and profitability were observed among the farmers adopting the technologies as compared to the non-adopter farmers. A positive and significant correlation was observed with most of the profile characteristics of farmers adopting the technologies when compared to non-adopter farmers.

Keywords: Knowledge, Adoption, Productivity, Profitability, Paddy, Production technologies

The Krishi Vigyan Kendra (KVK), Karimnagar is working to pioneer suitable location specific technologies for its mandatory crops such as paddy, cotton, maize, groundnut, redgram, *etc.* This paper is mainly focused on paddy crop which is one of the prominent crops of the region. Technologies are continuously assessed, refined, demonstrated and disseminated for the benefit of the farming community. Important technologies of paddy which are disseminated include soil test based fertilizer application, growing of green manuring crop preceding paddy, seed treatment, nursery management, introduction of improved varieties, weed management, fertilizer management, water management, pest and disease management, System of Rice Intensification (SRI), modified SRI, direct seeding with drum seeder, aerobic rice management of zinc deficiency, Integrated Pest Management (IPM), Integrated Nutrient Management (INM), hybrid seed production and usage of post emergence herbicides.

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KVK, Karimnagar conducted "Farmer Field Schools" (FFS), in the 15 adopted villages, on paddy crop to improve the production and productivity through Integrated Crop Management (ICM), direct seeding and hybrid seed production *etc.* The FFS was expected to enhance the knowledge and adoption of recommended package of practices in paddy crop. The KVK is also acting as a resource and knowledge centre for technologies in the district.

This paper examines the performance of the KVK in terms of the paddy technologies percolated among the farmers of Karimnagar district.

The objectives are (a) to study the personal, psychological, socio-economic and situational characteristics of farmers adopted by the KVK, (b) to compare the level of knowledge and extent of adoption of paddy technologies by these farmers; and (c) also study the impact of technology adoption on productivity and profitability of paddy crop.

Methodology

Ex-post facto research design combined with exploratory type of research design was adopted. Prakasam KVK was selected purposively as it was recognized as the best KVK for the year 2006-07 by the Indian Council of Agricultural Research (ICAR) at the National level. It has been serving the farming community for over two decades.

Fifteen villages where KVK worked during the period 1993-2008 constituted the study area. The sample consisted of two categories i.e. farmers adopting KVK technologies and farmers not adopting KVK technologies. This paper presents the result drawn from the survey of a total of 60 farmers adopting technologies and 30 non-adopter farmers, growing paddy crop. From each village, four farmers who are adopting the technologies and two farmers who are not adopting the KVK technologies were randomly selected and served as respondents.

Findings

Profile of the Paddy Farmers

Most of the farmers adopting KVK technologies belonged to middle age, with high level of mass media exposure, extension contact, innovativeness, scientific orientation and economic orientation. Non-adopters belonged to middle age group and had medium to low level of mass media exposure, extension contact, innovativeness, scientific orientation and economic orientation. It can be understood

that high level of social participation, mass media exposure shall drive the individuals to have high level of extension contacts. Under normal circumstances the young and middle aged individuals are attracted easily to experiment with new technology due to their innovativeness and risk orientation.

Level of Knowledge of Farmers on Technologies Imparted through KVK

The levels of knowledge of the farmers adopting the paddy technologies and farmers not adopting the paddy technologies disseminated by the KVK are presented in Table 1. It is observed that the farmers adopting the technologies possessed more knowledge than the non-adopter farmers. It could also be concluded that there exists a significant difference between the knowledge of both groups of farmers.

Table 1. Knowledge Level of Paddy Farmers

Sr. No.	Respondent category	Size of the sample (n)	Mean score	S.D.	'Z' value
1.	Farmers adopting the technologies	60	56.58	3.02	3.53*
2.	Farmers not adopting the technologies	30	34.73	3.16	

*Significant at 0.01 level of significance.

It is observed that the majority of the farmers adopting the technologies had high level of knowledge (43.34% farmers) followed by medium level of knowledge (31.66% farmers) and low level of knowledge (25.00% farmers) whereas, majority of the farmers not adopting the technologies had medium level of knowledge (40.00% farmers) followed by low (33.34% farmers) and high level of knowledge (26.66% farmers) (Table 2). The findings are in line with the findings of Rao *et al.,* (2012).

Table 2. Distribution of Respondents according to their Knowledge Level of Paddy Crop

Category	Farmers adopting technologies (n=60)			Farmers not adopting technologies (n=30)		
	Low (29-38)	Medium (39-48)	High (49-58)	Low (29-38)	Medium (39-48)	High (49-58)
Frequency	15	19	26	10	12	8
Percentage	25.00	31.66	43.34	33.34	40.00	26.66

It is concluded that majority of the farmers who adopted the technologies had high level of knowledge whereas non-adopter farmers had medium level of knowledge (Table 2).

Item analysis was done to identify the extent of knowledge of farmers on various paddy technologies and ranks were assigned to all technologies based on the total score obtained on each technology. The farmers who adopted the technologies had high level of knowledge on hybrid paddy and varietal seed production which ranked 1st followed by weed management with recommended herbicides (2nd) (Table 3). The reasons for high level of knowledge on these technologies could be continuous organization of farmers field school, farmer – scientist interactions, field days and focused group discussions by the KVK scientists.

Item wise Analysis of the Level of Knowledge of Paddy Production Technologies by the Farmers of Karimnagar District.

Table 3. Item wise Analysis of Farmers adopting Technologies on Level of Knowledge of Paddy Production Technologies in Karimnagar District N=60

Sr. No.	Paddy Production Technologies	Level of Knowledge				Total score	Mean score	Rank
		Yes		No				
		F	%	F	%			
1	Soil samples collected up to 15-20cm depth in V shape for soil testing	54	90.0	06	10.0	114	1.90	V
2	Soil test based fertilizer application is economical	53	88.3	07	11.7	113	1.88	VI
3	Growing of green manure crop preceding rice and incorporating into the soil improves the soil fertility	56	93.3	04	6.7	116	1.93	III
4	Seed treatment with fungicide reduces the disease incidence in the initial stages of plant growth	52	86.7	08	13.3	112	1.86	
5	Spraying of herbicide cyhalofop butyl 10% solution @ 2 ml /lt of water reduces the weeds of echinocloa in nursery	50	83.3	10	16.7	110	1.83	
6	Stem borer and Gall midge incidence at early growth stage will be effectively controlled by application of 1 kg carbofuron granules in 1 acre nursery one week before transplantation	56	93.3	04	6.7	116	1.93	III
7	Transplantation of lesser seedlings(2-3) per hill and shallow transplantation facilitates more tillers leads to higher yields	50	83.3	10	16.7	110	1.83	
8	Application of complex fertilizers at basal and straight fertilizers in split up with recommended doses reduces the pest and disease incidence	50	83.3	10	16.7	110	1.83	
9	Creation of alley ways help to control BPH	56	93.3	04	6.7	116	1.93	III

Sr. No.	Paddy Production Technologies	Level of Knowledge				Total score	Mean score	Rank
		Yes		No				
		F	%	F	%			
10	Weeds can be effectively controlled by using recommended herbicides at 3-5 days after transplanting by keeping a thin film of water in the field	58	96.7	2	3.3	118	1.96	II
11	Mid season drainage is important for obtaining higher yields	52	86.7	08	13.3	112	1.86	
12	Timely management of zinc deficiency with foliar spray increases the yields	54	90.0	06	10.0	114	1.90	V
13	Application of recommended dose of fertilizers before panicle initiation stage reduces pest and disease incidence	50	83.3	10	16.7	110	1.83	
14	Application of urea with neem cake or neem oil reduces the nitrogen loss	48	80.0	12	20.0	108	1.80	
15	Harvesting of paddy needs to be done close to the ground level to prevent pest incidence	56	93.3	04	6.7	116	1.93	III
16	Aerobic rice does not require wet land preparation and reduces the time for land preparation with lesser labour and lesser seed rate	30	50.0	30	50.0	90	1.50	
17	Direct seeding in rice with drum seeder reduces the labour requirement, seed rate and facilitates timely sowing	53	88.3	07	11.7	113	1.88	VI
18	Direct seeding in rice with drum seeder reduces the crop period for 7-10 days and also reduces one irrigation	53	88.3	07	11.7	113	1.88	VI
19	In direct seeding in rice with drum seeder yields will be on par with the normal transplantation with lesser cost of cultivation	53	88.3	07	11.7	113	1.88	VI
20	In SRI higher yields will be obtained with lesser cost of cultivation and with lesser water	50	83.3	10	16.7	110	1.83	
21	Post emergence herbicide cyalofop butyl @ 400 ml/acre and ethoxy sulfuron @ 50 gm/ acre spraying at 2-3 leaf stage of weeds will effectively control all the weeds	45	75.0	15	25.0	105	1.75	
22	Post emergence herbicide bispyribac sodium @ 120 ml/ acre will effectively control both the monocots and broad leaved weeds	45	75.0	15	25.0	105	1.75	
23	WGL -32100 (Warangal Sannalu) a fine grain variety has good cooking quality will come to harvest 15 days earlier and gives higher yield than BPT 5204	55	91.7	05	8.3	115	1.91	IV

Sr. No.	Paddy Production Technologies	Level of Knowledge				Total score	Mean score	Rank
		Yes		No				
		F	%	F	%			
24	NLR 34449 a fine grain variety has good cooking quality will have blast tolerance and gives higher yield than BPT 5204	50	83.3	10	16.7	110	1.83	
25	Usage of lesser seed rate 10 Kg per acre also gives yields on par with the normal seed rate 30 kg per acre and reduces seed cost	50	83.3	10	16.7	110	1.83	
26	Grain discolouration will be effectively controlled by spraying with profenophos @ 400 ml and propiconazole@ 200 ml per acre before panicle emergence	50	83.3	10	16.7	110	1.83	
27	Hybrid seed production in rice gives higher net returns compared to normal rice cultivation	60	100.0	0	0.0	120	2.00	I
28	Stem borer will be effectively controlled with auto confusion technology by using YSB exosect tablets @ 80 /ha	40	66.7	20	33.3	100	1.66	
29	Seed production in rice gives higher net returns compared to normal rice cultivation	60	100.0	0	0.0	120	2.00	I

The farmers who adopted the technologies had the lowest level of knowledge on aerobic paddy and auto confusion technology for stem borer management. In case of non adopter farmers, the practices like hybrid paddy and varietal seed production ranked 1st followed by green manuring to improve the soil fertility (2nd) (Table 4). The latter had low level of knowledge on direct seeding and SRI cultivation. The non-adopter farmers are seldom inspired and motivated and influenced by the actions and deeds of their fellow adopted farmers. These farmers not adopting technologies want to replicate the successful practices carried out by the farmers who have adopted the technologies. Hence, the same level of knowledge of adopter farmers on these technologies is reflected in case of non-adopter farmers also.

The reasons for high level of knowledge on these technologies could be suitability of the agro ecosystem of Karimnagar district, for hybrid and varietal seed production, as this was clearly envisaged by the KVK Scientists to the paddy farmers. Realizing the ill effects of continuous application of inorganic fertilizers, the farmers resorted to the application of green manure to improve the soil fertility. The continuous organization of farmers field school, farmer – scientist interactions, field days and focused group discussions by the KVK scientists resulted in formation of alleys in paddy crop to control the brown plant hopper (BPH).

Table 4. Item wise Analysis of Farmers not adopting technologies on Level of Knowledge of Paddy Production Technologies in Karimnagar District N=30

S. No.	Paddy Production Technologies	Level of Knowledge				Total score	Mean score	Rank
		Yes		No				
		F	%	F	%			
1	Soil samples collected up to 15-20cm depth in V shape for soil testing	15	50.0	15	50.0	45	1.50	V
2	Soil test based fertilizer application is economical	15	50.0	15	50.0	45	1.50	V
3	Growing of green manure crop preceding rice and incorporating into the soil improves the soil fertility	22	73.3	08	26.7	52	1.73	II
4	Seed treatment with fungicide reduces the disease incidence in the initial stages of plant growth	18	60.0	12	40.0	48	1.60	IV
5	Spraying of herbicide cyhalofop butyl 10% solution @ 2 ml /lt of water reduces the weeds of echinocloa in nursery	15	50.0	15	50.0	45	1.50	V
6	Stem borer and Gall midge incidence at early growth stage will be effectively controlled by application of 1 kg carbofuron granules in 1 acre nursery one week before transplantation	15	50.0	15	50.0	45	1.50	V
7	Transplantation of lesser seedlings(2-3) per hill and shallow transplantation facilitates more tillers leads to higher yields	18	60.0	12	40.0	48	1.60	IV
8	Application of complex fertilizers at basal and straight fertilizers in split up with recommended doses reduces the pest and disease incidence	20	66.7	10	33.3	50	1.66	III
9	Creation of alley ways help to control BPH	20	66.7	10	33.3	50	1.66	III
10	Weeds can be effectively controlled by using recommended herbicides at 3-5 days after transplanting by keeping a thin film of water in the field	20	66.7	10	33.3	50	1.66	III
11	Mid season drainage is important for obtaining higher yields	20	66.7	10	33.3	50	1.66	III

S. No.	Paddy Production Technologies	Level of Knowledge				Total score	Mean score	Rank
		Yes		No				
		F	%	F	%			
12	Timely management of zinc deficiency with foliar spray increases the yields	20	66.7	10	33.3	50	1.66	III
13	Application of recommended dose of fertilizers before panicle initiation stage reduces pest and disease incidence	18	60.0	12	40.0	48	1.60	IV
14	Application of urea with neem cake or neem oil reduces the nitrogen loss	15	50.0	15	50.0	45	1.50	V
15	Harvesting of paddy needs to be done close to the ground level to prevent pest incidence	20	66.7	10	33.3	50	1.66	III
16	Aerobic rice does not require wet land preparation and reduces the time for land preparation with lesser labour and lesser seed rate	10	33.4	20	66.6	40	1.33	VI
17	Direct seeding in rice with drum seeder reduces the labour requirement, seed rate and facilitates timely sowing	10	33.4	20	66.6	40	1.33	VI
18	Direct seeding in rice with drum seeder reduces the crop period for 7-10 days and also reduces one irrigation	10	33.4	20	66.6	40	1.33	VI
19	In direct seeding in rice with drum seeder, yields will be on par with the normal transplantation with lesser cost of cultivation	10	33.4	20	66.6	40	1.33	VI
20	In SRI higher yields will be obtained with lesser cost of cultivation and with lesser water	10	33.4	20	66.6	40	1.33	VI
21	Post emergence herbicide cyalofop butyl @ 400 ml/acre and ethoxy sulfuron @ 50 gm/ acre spraying at 2-3 leaf stage of weeds will effectively control all the weeds	15	50.0	15	50.0	45	1.50	V
22	Post emergence herbicide bispyribac sodium @ 120 ml/ acre will effectively control both the monocots and broad leaved weeds	15	50.0	15	50.0	45	1.50	V
23	WGL -32100 (Warangal Sannalu) a fine grain variety has good cooking quality will come to harvest 15 days earlier and gives higher yield than BPT 5204	20	66.7	10	33.3	50	1.66	III

S. No.	Paddy Production Technologies	Level of Knowledge				Total score	Mean score	Rank
		Yes		No				
		F	%	F	%			
24	NLR 34449 a fine grain variety has good cooking quality will have blast tolerance and gives higher yield than BPT 5204	20	66.7	10	33.3	50	1.66	III
25	Usage of lesser seed rate 10 Kg per acre also gives yields on par with the normal seed rate 30 kg per acre and reduces seed cost	20	66.7	10	33.3	50	1.66	III
26	Grain discolouration will be effectively controlled by spraying with profenophos @ 400 ml and propiconazole@ 200 ml per acre before panicle emergence	15	50.0	15	50.0	45	1.50	V
27	Hybrid seed production in rice gives higher net returns compared to normal rice cultivation	25	83.3	5	16.7	55	1.83	I
28	Stem borer will be effectively controlled with auto confusion technology by using YSB exosect tablets @ 80 /ha	15	50.0	15	50.0	45	1.50	V
29	Seed production in rice gives higher net returns compared to normal rice cultivation	25	83.3	5	16.7	45	1.83	I

The farmers experienced methods of collecting the soil samples for testing, through a series of method demonstrations conducted by KVK Scientists. The farmers were empowered and enriched on necessary competencies to apply need based fertilizers based on the results generated from soil testing as it gives more economic returns. The farmers who adopted paddy technologies had the lowest level of knowledge on aerobic paddy due to non availability of tractor drawn seed cum fertilizer drill. The farmers not adopting the technologies are not aware of these types of technologies adopted by KVK adopted village farmers because of their low level of knowledge in paddy cultivation.

Extent of Adoption of Technologies Imparted through KVK

The extent of adoption of paddy technologies by the farmers adopting the technologies and non-adopters is presented in Table 5. It is observed that with reference to the extent of adoption of paddy technologies the difference is significant between the two groups.

Table 5. Extent of Adoption of Paddy Technologies

Respondent category	Size of the sample (n)	Mean score	S.D.	'Z' value
Farmers adopting technologies	60	63.55	8.85	2.45*
Farmers not adopting technologies	30	33.70	3.29	

*Significant at 0.01 level of probability

The majority of the farmers who adopted technologies had high level of adoption (36.67% farmers) followed by medium level of adoption (33.33% farmers) and low level of adoption (30.00% farmers). Among non-adopter farmers, majority had low level of adoption (43.33% farmers) followed by medium (33.34% farmers) and high level of adoption (23.33% farmers) (Table 6). These findings are in agreement with the findings from earlier studies of Krishnamurthy *et al* (1998), Ramesh and Govind, (2000) and Rao *et al.,* (2012).

Table 6. Distribution of Respondents according to Extent of Adoption of Paddy Technologies

Category	Adopter farmers (n=60)			Non adopter farmers (n=30)		
	Low (33-55)	Medium (56-78)	High (79-100)	Low (33-55)	Medium (56-78)	High (79-100)
Frequency	18	20	22	13	10	7
Percentage	30.00	33.33	36.67	43.33	33.34	23.33

Item analysis was done to identify the extent of adoption of various paddy technologies by both categories of farmers. The ranks were assigned to all the technologies based on the total score obtained on each technology. The farmers adopting the technologies had higher adoption of hybrid/variety seed production, weed management with recommended herbicides and mid season drainage. These technologies are ranked 1st followed by management of zinc deficiency (2nd) (Table 7). The low level of adoption by these farmers was found on aerobic paddy and auto confusion technology for stem borer management. In case of farmers not adopting technologies, hybrid seed production, varietal seed production, weed management with herbicides and mid season drainage are ranked 1st followed by usage of WGL 32100 variety (2nd) (Table 8).

Item wise Analysis of the Extent of Adoption of Paddy Production Technologies by the Farmers of Karimnagar district.

Table 7. Item wise Analysis of Farmers adopting Technologies on Extent of Adoption of Paddy Production Technologies in Karimnagar district N=60

Sr. No.	Paddy Production Technologies	Extent of Adoption						Total score	Mean score	Rank
		Fully adopted		Partially adopted		Not adopted				
		F	%	F	%	F	%			
1.	Soil samples collected up to 15-20cm depth in V shape for soil testing	39	65.0	11	18.3	10	16.7	149	2.48	
2.	Soil test based fertilizer application is economical	42	70.0	9	15.0	9	15.0	153	2.55	
3.	Growing of green manure crop preceding rice and incorporating into the soil improves the soil fertility	48	80.0	0	0.0	12	20.0	156	2.40	
4.	Seed treatment with fungicide reduces the disease incidence in the initial stages of plant growth	55	91.6	0	0.0	5	8.4	170	2.80	IV
5.	Spraying of herbicide cyhalofop butyl 10% solution @ 2 ml /lt of water reduces the weeds of echinocloa in nursery	50	83.4	0	0.0	10	16.6	160	2.60	
6.	Stem borer and Gall midge incidence at early growth stage will be effectively controlled by application of 1 kg carbofuron granules in 1 acre nursery one week before transplantation	52	86.6	0	0.0	8	13.4	164	2.74	VI
7.	Transplantation of lesser seedlings(2-3) per hill and shallow transplantation facilitates more tillers leads to higher yields	53	88.3	0	0.0	7	11.7	166	2.76	V
8.	Application of complex fertilizers at basal and straight fertilizers in split up with recommended doses reduces the pest and disease incidence	42	70.0	18	30.0	0	0.0	162	2.70	
9.	Creation of alley ways help to control BPH	50	83.4	10	16.6	0	0.0	170	2.83	III

Sr. No.	Paddy Production Technologies	Extent of Adoption						Total score	Mean score	Rank
		Fully adopted		Partially adopted		Not adopted				
		F	%	F	%	F	%			
10.	Weeds can be effectively controlled by using recommended herbicides at 3-5 days after transplanting by keeping a thin film of water in the field	60	100.0	0	0.0	0	0.0	180	3.00	I
11.	Mid season drainage is important for obtaining higher yields	60	100.0	0	0.0	0	0.0	180	3.00	I
12.	Timely management of zinc deficiency with foliar spray increases the yields	51	85.0	9	15.0	0	0.0	171	2.85	II
13.	Application of recommended dose of fertilizers before panicle initiation stage reduces pest and disease incidence	48	80.0	11	18.3	1	1.7	167	2.78	V
14.	Application of urea with neem cake or neem oil reduces the nitrogen loss	35	58.3	20	33.3	5	8.4	150	2.50	
15.	Harvesting of paddy needs to be done close to the ground level to prevent pest incidence	50	83.4	10	16.6	0	0.0	160	2.60	
16.	Aerobic rice does not require wet land preparation and reduces the time for land preparation with lesser labour and lesser seed rate	25	41.6	0	0.0	35	58.4	110	1.80	
17.	Direct seeding in rice with drum seeder reduces the labour requirement, seed rate and facilitates timely sowing	50	83.4	0	0.0	10	16.6	160	2.60	
18.	Direct seeding in rice with drum seeder reduces the crop period for 7-10 days and also reduces one irrigation	50	83.4	0	0.0	10	16.6	160	2.60	
19.	In direct seeding in rice with drum seeder yields will get on par with the normal transplantation with lesser cost of cultivation	50	83.4	0	0.0	10	16.6	160	2.60	
20.	In SRI higher yields will be obtained with lesser cost of cultivation and with lesser water	30	50.0	15	25.0	15	25.0	135	2.25	

Sr. No.	Paddy Production Technologies	Extent of Adoption						Total score	Mean score	Rank
		Fully adopted		Partially adopted		Not adopted				
		F	%	F	%	F	%			
21.	Post emergence herbicide cyalofop butyl @ 400 ml/acre and ethoxy sulfuron @ 50 gm/acre spraying at 2-3 leaf stage of weeds will effectively control all the weeds	40	83.3	15	25.0	5	8.3	155	2.58	
22.	Post emergence herbicide bispyribac sodium @ 120 ml/ acre will effectively control both the monocots and broad leaved weeds	40	66.6	15	25.0	5	8.4	155	2.58	
23.	WGL -32100(Warangal Sannalu) a fine grain variety has good cooking quality will come to harvest 15 days lesser and gives higher yield than BPT 5204	55	91.6	5	8.4	0	0.0	170	2.83	III
24.	NLR 34449 a fine grain variety has good cooking quality will have blast tolerance and gives a higher yield than BPT 5204	40	67.0	20	33.0	0	0.0	160	2.66	
25.	Usage of lesser seed rate 10 Kg per acre also gives yields on par with the normal seed rate 30 kg per acre reduces seed cost	50	83.4	10	16.6	0	0.0	170	2.83	III
26.	Grain discolouration will be effectively controlled by spraying with profenophos @ 400 ml and propiconazole@ 200 ml per acre before panicle emergence	55	91.6	5	8.4	0	0.0	170	2.83	III
27.	Hybrid seed production in rice gives higher net returns compared to normal rice cultivation	60	100.0	0	0.0	0	0.0	180	3.00	I
28.	Stem borer will be effectively controlled with auto confusion technology by using YSB exosect tablets @ 80 /ha	30	50.0	0	0.0	30	50.0	120	2.00	
29.	Seed production in rice gives higher net returns compared to normal rice cultivation	60	100.0	0	0.0	0	0.0	180	3.00	I

Table 8. Item wise Analysis of non-adopter Farmers on Extent of Adoption of Paddy Production Technologies in Karimnagar district N=30

Sr. No.	Paddy Production Technologies	Extent of Adoption						Total score	Mean score	Rank
		Fully adopted		Partially adopted		Not adopted				
		F	%	F	%	F	%			
1	Soil samples collected up to 15-20cm depth in V shape for soil testing	0	0.0	0	0.0	30	100.0	30	1.00	
2	Soil test based fertilizer application is economical	0	0.0	0	0.0	30	100.0	30	1.00	
3	Growing of green manure crop preceding rice and incorporating into the soil improves the soil fertility	2	6.7	8	26.7	20	66.6	42	1.40	III
4	Seed treatment with fungicide reduces the disease incidence in the initial stages of plant growth	0	0.0	5	16.7	25	83.3	30	1.00	
5	Spraying of herbicide cyhalofop butyl 10% solution @ 2 ml / lt of water reduces the weeds of echinocloa in nursery	0	0.0	0	0.0	30	100.0	30	1.00	
6	Stem borer and Gall midge incidence at early growth stage will be effectively controlled by application of 1 kg carbofuron granules in 1 acre nursery one week before transplantation	0	0.0	10	33.3	20	66.7	40	1.33	IV
7	Transplantation of lesser seedlings(2-3) per hill and shallow transplantation facilitates more tillers leads to higher yields	0	0.0	0	0.0	30	100.0	30	1.00	
8	Application of complex fertilizers at basal and straight fertilizers in split up with recommended doses reduces the pest and disease incidence	0	0.0	10	33.4	20	66.6	40	1.33	II
9	Creation of alley ways help to control BPH	4		0	0.0	26	86.6	34	1.13	VI
10	Weeds can be effectively controlled by using recommended herbicides at 3-5 days after transplanting by keeping a thin film of water in the field	10		10	33.3	10	33.4	60	2.00	I

Sr. No.	Paddy Production Technologies	Extent of Adoption						Total score	Mean score	Rank
		Fully adopted		Partially adopted		Not adopted				
		F	%	F	%	F	%			
11	Mid season drainage is important for obtaining higher yields	10		10	33.3	10	33.4	60	2.00	I
12	Timely management of zinc deficiency with foliar spray increases the yields	5		10	33.3	15	50.0	40	1.33	IV
13	Application of recommended dose of fertilizers before panicle initiation stage reduces pest and disease incidence	0		5	16.7	25	83.3	35	1.16	V
14	Application of urea with neem cake or neem oil reduces the nitrogen loss	0		0	0.0	30	100.0	30	1.00	
15	Harvesting of paddy needs to be done close to the ground level to prevent pest incidence	0		10	33.3	20	76.7	40	1.33	IV
16	Aerobic rice does not require wet land preparation and reduces the time for land preparation with lesser labour and lesser seed rate	0		0	0.0	30	100.0	30	1.00	
17	Direct seeding in rice with drum seeder reduces the labour requirement, seed rate and facilitates timely sowing	0		0	0.0	30	100.0	30	1.00	
18	Direct seeding in rice with drum seeder reduces the crop period for 7-10 days and also reduces one irrigation	0		0	0.0	30	100.0	30	1.00	
19	In direct seeding in rice with drum seeder yields will get on par with the normal transplantation with lesser cost of cultivation	0		0	0.0	30	100.0	30	1.00	
20	In SRI higher yields will be obtained with lesser cost of cultivation and with lesser water	0		0	0.0	30	100.0	30	1.00	
21	Post emergence herbicide cyalofop butyl @ 400 ml/acre and ethoxy sulfuron @ 50 gm/acre spraying at 2-3 leaf stage of weeds will effectively control all the weeds	0		0	0.0	30	100.0	30	1.00	

Sr. No.	Paddy Production Technologies	Extent of Adoption						Total score	Mean score	Rank
		Fully adopted		Partially adopted		Not adopted				
		F	%	F	%	F	%			
22	Post emergence herbicide bispyribac sodium @ 120 ml/ acre will effectively control both the monocots and broad leaved weeds	0		0	0.0	30	100.0	30	1.00	
23	WGL -32100(Warangal Sannalu) a fine grain variety has good cooking quality will come to harvest 15 days earlier and gives higher yield than BPT 5204	5		10	33.3	15	50.0	50	1.66	II
24	NLR 34449 a fine grain variety has good cooking quality will have blast tolerance and gives higher yield than BPT 5204	5		0	0.0	25	83.3	40	1.33	IV
25	Usage of lesser seed rate 10 Kg per acre also gives yields on par with the normal seed rate 30 kg per acre reduces seed cost	0		5	16.7	25	83.3	35	1.16	V
26	Grain discolouration will effectively controlled by spraying with profenophos @ 400 ml and propiconazole@ 200 ml per acre before panicle emergence	0		5	16.7	25	83.3	35	1.16	V
27	Hybrid seed production in rice gives higher net returns compared to normal rice cultivation	15		0	0.0	15	50.0	60	2.00	I
28	Stem borer will be effectively controlled with auto confusion technology by using YSB exosect tablets @ 80 /ha	0		0	0.0	30	100.0	30	1.00	
29	Seed production in rice gives higher net returns compared to normal rice cultivation	15		0	0.0	15	50.0	60	2.00	I

Majority of the farmers adopted hybrid seed and varietal seed production technology. The reason could be that the KVK scientists conducted more demonstrations on seed production keeping in view the suitability of agro-climatic conditions of adopted villages. The farmers who adopted technologies learnt practically, following the principle of learning by doing. KVK works on the philosophy that farmers cannot adopt the technology unless the source of availability of the concerned technology is well known. The adopter farmers had lower adoption

on auto confusion technology for stem borer management probably due to non availability of YSB pellets in the local market. The non-adopter paddy farmers also had high extent of adoption on hybrid and varietal seed production, weed management with herbicides and mid season drainage. The reason could be that these farmers were influenced by the demonstrations or farmers who participated in end field schools. The performances of the demonstrated technologies had a visible impact on non-adopter farmers.

Productivity and Profitability of Paddy Crop

Difference in productivity of paddy crop was observed at the fields of farmers adopting KVK technologies and farmers not adopting KVK technologies. The paddy yield was 6429 kg/ha and 5827 kg/ha at the field of farmers adopting KVK technologies and not adopting KVK technologies, respectively. The farmers who are adopting the KVK technologies got approximately 10 per cent (602 Kg/ha) more yield than the KVK non-adopter farmers. This may be called an impact of KVK technologies on crop productivity. This result is in conformity with the result of Vichare (2007), Razack (2000). Considerable amount of difference was also observed in net return between these two categories of farmers. The profitability of paddy was found to be INR 39,164 per hectare for farmers adopting the technologies. It was INR 32,962 per hectare in case of non-adopter farmers. Approximately 19 per cent (INR 6202 per hectare) more net return was obtained by the KVK farmers who adopted technologies than the non-adopter farmers. This is an impact of the KVK activities on the farmers' economy.

Relationship between Knowledge, Adoption, Profitability and Profile Characteristics of Farmers

Correlation coefficients were calculated between level of knowledge, extent of adoption of technologies, profitability and profile characteristics of farmers such as age, education, mass media exposure, extension contact, innovativeness, social participation, scientific orientation, risk preference and economic orientation for both the categories of the farmers. Correlation coefficient (r) between level of knowledge of KVK adopted paddy farmers with their profile characteristics show that there is a positive and significant relationship between education, mass media exposure, extension contact, social participation and scientific orientation and level of knowledge of farmers who adopted the technologies in paddy crop. In case of paddy farmers who had not adopted the technologies it was found that there is positive and significant relationship between education, social participation and

mass media exposure and level of knowledge.

A positive and significant relationship was observed between education, extension contact, scientific orientation and risk preference and extent of adoption in case of paddy farmers adopting technologies. In case of non-adopter paddy farmers, a positive and significant relationship was found between education, scientific orientation and social participation and extent of adoption of technologies.

A positive and significant relationship was observed between extension contact, mass media exposure, risk preference and profitability of KVK adopter farmers. In case of non-adopter paddy farmers, a positive and significant relationship was observed between mass media exposure, social participation and profitability.

It is evident from the data in Table 9 that education, mass media exposure, extension contact, social participation and scientific orientation are positively and significantly related with level of knowledge with KVK adopter paddy farmers. The degree of formal education possessed by individuals enhances their intellectual base of observing the external knowledge. Mass media exposure, extension contact and social participation supplement the farmers in getting technical knowledge. Scientific orientation inculcates the spirit of inquisitiveness, analytical abilities and comprehension skills to know the happenings in the society, related to the given profession. The positive and significant relationship of the variables education and mass media exposure with the level of knowledge of KVK non-adopter farmers in paddy crop indicate that education acts as a platform to enhance the knowledge base of an individual. The exposure to various kinds of media like print, electronic and other mass media reinforces the learning / knowledge through various sources.

Table 9. Correlation Coefficient between Level of Knowledge, Extent of Adoption and Profitability with Profile Characteristics

Sr. No.	Characteristics	Level of knowledge		Extent of adoption		Profitability	
		Adopter	Non adopter	Adopter	Non adopter	Adopter	Non adopter
1.	Age	0.109^{NS}	0.106^{NS}	0.120^{NS}	0.126^{NS}	0.130^{NS}	0.232^{NS}
2.	Education	0.212*	0.192*	0.211*	0.162*	0.210^{NS}	0.160^{NS}
3.	Mass media exposure	0.245*	0.201*	0.176^{NS}	0.216^{NS}	0.190*	0.216*

4.	Extension contact	0.209*	0.192NS	0.201*	0.186NS	0.211*	0.179NS
5.	Innovativeness	0.685NS	0.562NS	0.675 NS	0.625NS	0.654NS	0.625NS
6.	Social participation	0.345**	0.234*	0.312NS	0.292*	0.304**	0.291*
7.	Scientific orientation	0.321*	0.221NS	0.311*	0.215*	0.221NS	0.216NS
8.	Risk preference	0.248NS	0.628NS	0.263*	0.218NS	0.210*	0.625NS
9.	Economic orientation	0.256NS	0.562NS	0.209NS	0.461NS	0.200*	0.391NS

* Significant at 0.05 level of probability

** Significant at 0.01 level of probability NS –Non Significant

With regard to the extent of adoption of technologies by farmers adopting technologies, positive and significant correlation was observed with education, extension contact, scientific orientation and risk preference. The more the contact with various line departments the more were the chances of getting aware about new ideas and clarification of prejudices. More scientific orientation leads to understanding the rationale behind the application of technology. The risk preference increases the individual acceptance of hurdles in implementation of new ideas and also the levels of preparedness. The variables such as education, social participation and scientific orientation were positively and significantly correlated with the extent of adoption of KVK non-adopter paddy farmers. Education paves the way to quench the need for information for adoption. Social participation and scientific orientation also act as supporting psychological variables to verify and clarify the misconception in adoption of technologies.

The profile characteristics like mass media exposure, extension contact, social participation, risk preference and economic orientation were positively and significantly correlated with profitability achieved by adopted paddy farmers. Mass media exposure, extension contact and social participation facilitate quick acquisition of knowledge and better adoption thereby helping in reaping higher profitability. It is possible for an individual who has risk preference and income orientation to work towards higher profits.

Conclusions

KVKs are grass root district level agricultural science centres meant for application of technology through assessment, refinement and demonstration of proven technologies under different 'micro farming' situations.

The study has shown that the farmers of KVK Karimnagar who had adopted technologies had better profile characteristics compared to farmers who had

not adopted the technologies. The former had a higher level of knowledge and adoption of paddy technologies, whereas the latter had medium to low level of knowledge and adoption. The differences could be attributed to on-farm testing, demonstrations, farmer field schools and farmer-scientist interactions conducted by the KVK in the adopted villages. Adoption quotient, productivity and profitability also exhibited a similar trend. Correlation analysis indicated that education, mass media exposure, extension contact, social participation and scientific orientation were positively and significantly associated with level of knowledge of farmers adopting the technologies. With regard to the extent of adoption by the adopter farmers, positive and significant correlation was observed with education, extension contact, scientific orientation and risk preference. The profile characteristics like mass media exposure, extension contact, social participation, risk preference and economic orientation were positively and significantly correlated with profitability of farmers adopting the technologies.

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