Economic Affairs: 59(1): 63-74 March, 2014 **DOI Number 10.5958/J.0976-4666.59.1.007**

Role of ICT Institutions in Enhancing Productivity, Knowledge and Innovativeness of Farmers: A Case Study of ISRO Village Resource Centers

C.S. Shaijumon

Department of Humanities, Indian Institute of Space Science and Technology (IIST)
Government of India, Valiamala, Kerala – 695 547, India

Email: shaiju@iist.ac.in shaijumon@gmail.com

Paper no: 118 **Received:** 08 October, 2013 **Revised:** 07 February, 2014 **Accepted:** 02 March, 2014

Abstract

Space technology and Information communication technologies are state of the art technologies of modern civilization. Indian Space Research Organization (ISRO), with the intention of disseminating knowledge of any kind to rural masses using advances of information communication technologies in space research, has envisaged the Village Resource Centre (VRC) concept in the year 2004. ISRO's VRC conduct interactive programmes on a regular basis in the areas of, agriculture, water resources, tele - health care, awareness programmes, skill development/vocational training for livelihood support etc. , are connected to knowledge producing institutions like Universities, development institutes, hospitals and other institutions in association with NGOs/Trusts and state/central agencies. The purpose of this study is to empirically analyze the role of VRCs in enhancing productivity, level of knowledge and innovation performances of farmer community. The specific objectives of present study was: 1) to understand the level productivity of VRC attending farmers 2) to understand the level of knowledge of VRC attending farmers and 3) to understand the innovativeness of VRC attending farmers. The study has conducted in Meppadi Panchayath (11°33'38.24"N, 76° 8'31.32"E) in Kerala State. Findings of the study show that the impact of new developmental intervention through Village Resource Centers are significant in the level of knowledge diffusion, innovativeness, and productivity of farming communities, and are quantitatively measured. There is a significant reduction of information inequality among the people and noticed the emergence of a new socio-economic relationship. It is understood from the study that the farmers are keenly interested in increasing their knowledge day by day and as a result of trying to increase their income from farming. VRC's plays a vital role in improving the quality of life in villages by providing new knowledge to the farmer community. The VRCs are connecting the knowledge between the experts and the village community and making it to reach the doorsteps of common man, in local language.

Keywords: Village resource center, technology, productivity, knowledge, innovation, absorption, information

Information Communication Technologies (ICTs) play an important role in agricultural value chains, with different types of ICT having different strengths and weaknesses when applied to particular

interventions. The impacts of ICT are diverse, and they influence market competitiveness in different ways. ICT presents unprecedented opportunities to empower smallholder farmers by strengthening their capabilities in marketing their products. Despite these opportunities, it is worthwhile reinforcing the fact that there is no single, best ICT solution for all circumstances. The potential benefits of technologies are, actualized only when it is successfully diffused to a large number of end-users. The benefits technology brings are normally accessed by the few affordable with relatively high absorptive capacity[1]. Hence the ultimate measure of benefits of a new technology can contribute to economic growth and development only when it is correctly and successfully transferred and applied by a large number of the intended end-users. The efficient functioning of technology at the rural agricultural setting requires institution / institutions to disseminate proper information and enforce it to the larger masses. However it is much more difficult to identify exactly which institution matter and how it matters for the regional economic development. Indian Space Research Organization (ISRO), with the intention of disseminating knowledge to rural masses by using advances of information communication technology in space research, has envisaged the Village Resource Centre (VRC) concept. The VRC is a totally interactive Very Small Aperture Terminal (VSAT) based network. These nodes can be further extended using other technologies like Wi-Fi, Wireless and Optical Fibre. The extensions may serve as the local clusters around the areas where the VRC is located.

The organization of the VRC is the joint responsibility of ISRO / NGO / Partner Agency / Community. The NGO / partner agency at VRC level is expected to setup the VRC with the necessary infrastructure and ISRO will provide the equipment, hardware and software as per the required specifications. The NGO / partner agency is also expected to collect the necessary information by conducting Participatory Rural Appraisal, Rapid Rural Appraisal, Focused Group Discussions and from other sources (Recent Census) to arrive at suitable agriculture / land / water resources issues as well as health / education needs. Thus VRC is an institution which intermediates between the people and the knowledge producing institutions like, universities, climate prediction centers, market etc. This study argue that VRC is a non-market institution and is the major source of new external knowledge to local community, and the significant actor in the local innovation system responsible for transition of the local economy.

Present study was an attempt to analyse productivity and level of knowledge of VRC attending coffee planters in Wayand district of Kerala, and comparing and contrasting it with that of non- attendees. The specific objectives of present study was: 1) to understand the level productivity of VRC attending farmers 2) to understand the level of knowledge of VRC attending farmers and 3) to understand the innovativeness of VRC attending farmers.

Literature Survey

The fundamental argument set forth by Schultz (1964) is that peasant farmers behave as rational economic agents, in the neoclassical sense, and evaluate the costs and benefits associated with different production techniques. Productivity growth can be decomposed into technological change and technical efficiency (Nishimizu and Page, 1982), where technological change can be defined as "…changes in the production process that comes about from the application of scientific knowledge" (Antle and

[1]Ability to recognize the value of new information, assimilates it, and applies it to commercial ends. Cohen and Levinthal (1990)

Capalbo 1988, p. 33). Agricultural productivity is often held back by lack of information relating to the financing of actors, supply of inputs, difficulty of access to appropriate technology and adequate services and by the incapacity of farmers to be covered against various risks and hazards. Agriculture growth is not merely introduction and adoption of knowledge, it requires co-evolution of institutions. Lack of information can cause vulnerability. However, institutional systems can act to reduce risk and protect livelihood assets (Jock Anderson, John Dillion and Brian Hardaker 1977). Information and Communication technology advances in space research can play a tremendous role in socio-economic development. It can be instrumental in disseminating knowledge of any kind to the rural masses and thereby act as a catalyst to development.

In agriculture, extension activities are necessary to transfer information from global knowledge base and from local research to farmers, enabling them to clarify their own goals and possibilities, educating them on how to make better decision, and stimulating desirable agricultural development (Van der Ban and Hawkins 1996). To warrant this transition the capabilities for innovation have to be strengthened. Effective extension involves adequate and timely access by farmers to relevant advice with appropriate incentives to adopt the new technology if it suits their socio-economic and agrological circumstances. Evaluating the impacts of extension involves measuring the relations between extensions and farmers' knowledge, adoption of better practices, and use of inputs; farm productivity and profitability; and related improvements in farmers' welfare (Anderson and Feder 2004). The capacity to evaluate new external knowledge, assimilate it, and put it into commercial ends is a must for innovative economic agents. This is known as absorptive capacity and is largely a function of prior related knowledge of economic agents or system (Cohen and Levinthal, 1990).

Experience shows that the creation of a value chain for each agricultural product deemed strategic will make it possible to considerably reduce malfunctions and make it possible for actors at all links of the chain to draw greater benefit from their work and therefore contribute to the reduction of poverty and the economic growth of the country. To achieve the full potential of gains in productivity needed in developing countries, it is imperative for the public sector not only to design and implement a research strategy that would generate technologies that are usable and appealing to farmers but also to provide an environment conducive to the private sector's active involvement in this effort (Boris E. Bravo-Ureta, 2002). Information and communications technology (ICT) positively affect economic growth and productivity of production inputs. (Seyed Abdolmajid Jalaee1, Sina Zeynali, 2013). Lack of information can cause vulnerability. However, institutional systems can act to reduce risk and protect livelihood assets (Jock Anderson, John Dillion and Brian Hardaker 1977).

Institutions generally interface with resource allocation, formal government laws and stakeholders. Usually, institutions will help translate growth into development and thereby help the upward shift of production possibility curve. Unlike technology, institution will have no influence on the physical quality of resources. Thus appropriate institutions are important for improving the value chain of agriculture. A good knowledge on the exact production techniques enables farmers to increase productivity. In this sense the services of knowledge provision by village resource centres should have a positive impact on crop production and productivity.

Print ISSN: 0424-2513 Online ISSN: 0976-4666

The Field of Study

The field of study is Meppadi Gram Panchayat, located in Kalpetta block Panchayat of Wayanad district. Wayanad, a mountainous district bordering Tamil Nadu and Karnataka with a population of about 8 lakhs has 25 Gram Panchayats as per the 2001 Popultion Census. Meppadi has a population of 56530, (out of which males constitute 28345 and females 28185) with a population density of 285 and sex ratio of 994. Meppadi has an average literacy rate of 82.32 percent. VRC in Meppadi has been organized by ISRO in collaboration with Kerala State Planning Board since 2006 to serve as a primary delivery system in rural areas. In meppadi, VRC conducts both online and offline classes for farmers. In addition to the teleconferencing programmes, additional features such as offline programmes, soil testing and dissemination of weekly weather advisories have been done for the benefits of the farmer community. VRC enables each expert node to multicast the advisory, and enables each of the participating VRCs to raise questions. Expert node software enables a video return link for each VRC in such a way that all participating nodes can listen to the expert and also the questioner, along with viewing them.

During the period 2006-07 to 2010-11, 75 percent of Meppadi VRC attendees are males and the remaining 25 percent is female. Eighty six percent of VRC attending households are above the official poverty line and More than 90 percent depends on agriculture for their income. More than 80 percent of total agricultural land used for the coffee cultivation.

Methodology

Both primary and secondary data are used for the study. The principal modes of data collection are field surveys, with (i) different sections of VRC attending coffee planters in Meppadi (ii) VRC Non attending coffee planters from the same village (iii) VRC Non attending coffee planters from neighbouring villages (as control group). A detailed survey has been conducted at Meppadi Panchayath[2] (11°33’38.24"N, 76° 8’31.32"E) of Wayanad district in Kerala state during the months of September and October of 2011. In order to collect information regarding agriculture production practices, productivity and knowledge level, innovation performance, we collected primary data from 170 VRC attending (VRC A) Meppadi coffee planters, 170 VRC no- attending (VRC NA) Meppadi coffee planters and 170 VRC non-attending (VRC NAN) coffee planters as Control Group from a neighbouring panchayats such as, Ambalavayal (11°37’9.44"N, 76°12’37.72"E), Mooppanadu (11°32’7.45"N, 76°10’16.40"E) and Vaithiri (11°32’54.66"N, 76° 2’28.09"E). The geographic, climatic and demographic features of these neighboring panchayats are almost similar and comparable with that of Meppadi. The Control Group is selected to distinguish between the effects of VRC from other related institutions like, Village Office, Panchayath Office, Agricultural Office etc. in the region. Coffee based farming system is a notable feature of Wayanad. Coffee in Wayanad (66,999 ha.) shares 33.65 per cent of the total cropped area in the district and 78 per cent of the coffee area in the Kerala state.

Two interview schedules are used for gathering data:-

Schedule I: Mainly to collect information on agriculture productivity and knowledge - For this, a

[2]Gram panchayats are local self-governments at the village or small town level in India. As of 2002 there were about 265,000 gram panchayats in India. The gram panchayat is the foundation of the Panchayat System.

survey covering 170 VRC attending Meppadi coffee planters, 170 non-VRC attending Meppadi coffee planters and 170 non-VRC attending coffee planters from a neighbouring panchayats was conducted.

Schedule II: Gathered information on the innovative performance of Planters- surveyed 170 VRC attending Meppadi planters (rubber, coffee, arecanut, pepper, cardamom etc), 170 VRC non-attending Meppadi planters and 170 VRC non attending planters from neighbouring panchayats, Ambalavayal, Mooppanadu and Vaithiri.

Results and Discussion

1. Productivity

The average productivity of the coffee plantation sector is shown in figure 1. Productivity is calculated in terms of production in kg per hector. The average productivity of VRC attendees was 1086 kg/ha during 2005- 06 and fluctuated in the succeeding years and increased to 1146.1 kg/ha in 2010-11. It was 1094 kg/ha in 2005-06 in case of non attendees of Meppadi and declined to 1057 kg/ha in 2010-11. The productivity of non attendees of neighbouring villages, continuously declined from 1261 kg/ha during 2005-06 to 1008 kg/ha in the current year. It is also noticed that the productivity of VRC attendees are higher than that of non attendees since 2007-08. From the field, it is observed that in these periods the interventions of VRC was active in this region. Eighty three percent of VRC attendees reported that knowledge from VRC was significant for productivity improvement. It indicates positive impact of VRC in terms of productivity.

There are many factors which can affect the productivity of coffee; the size of holding is an important factor among them. The relation between farm size and productivity is a debating issue. The productivity per acre declines with an increase in farm size (Bharadwaj, 1974). The plot size has a significant effect on changes in crop pattern and productivity (Shrestha, 2009). It is found that VRC attending planters

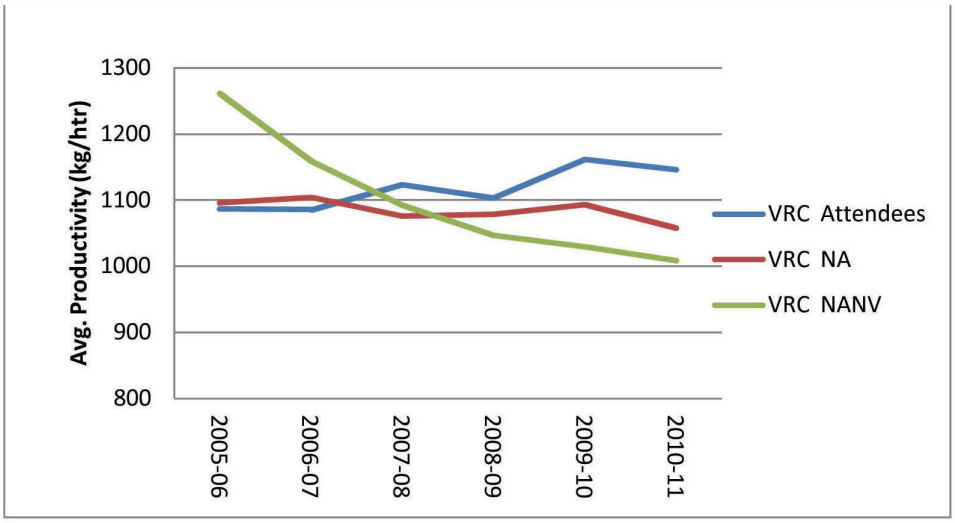

Fig. 1: Trends in Average Productivity of Coffee for Three Groups
Source: Primary survey

Print ISSN: 0424-2513 Online ISSN: 0976-4666

have gained productivity improvements irrespective of their size of holdings. The inter group disparity in productivity gain with respect to holding is quite marginal and hence insignificant.

Apart from size of holdings there are several other factors which determine productivity of coffee which are mentioned in Table 1. The main purpose the pursuit is to understand how far each group has been become innovative and market oriented and relieved from their dependency on weather.

Table 1: Factors Influencing Productivity

Factors	VRC Attendees	VRC Non- Attendees	VRC Non- Attendees of Neighbouring Villages
No response	12.1 %	5.5 %	4.8 %
1.Weather	49.1 %	61.9 %	92.2 %
2.Improved Access to Knowledge	6.4 %	1.9 %	-
3.Market Price	16.2 %	12.5 %	2.4 %
4.Labour	5.8 %	12.5 %	-
5.Other	0.6 %	0.6 %	0.6
1 & 2	3.5 %	1.3 %	-
1 & 3	4.6 %	1.3 %	-
1 & 4	1.7 %	2.5 %	-
Total	100 %	100 %	100 %

Source: Primary survey

Table 1 reveals that the majority of farmers are weather dependent. However, we can identify three distinguishing features of VRC attendees that makes them innovative; (i) survey data indicates VRC planters are relatively less weather dependent while comparing with other two groups, (ii) VRC planters recognizes knowledge as an important factor that determine productivity, and (iii) VRC planters are more market oriented as they conceive price as a dependent variable. Moreover, it is reported that decline in productivity is comparatively lower among VRC attendees than the other two non-attendees' groups. This is primarily because during the preceding five years the VRC intervention and support was strong in the form of new knowledge inputs and subsequent changes in farming techniques. There are several reasons for the decline in productivity since 2000-01. From the table 2, it is understood that climatic factors are the most important reason for the decline in coffee productivity.

Table 2: Reasons for decline in Productivity of coffee in last 10 years

Reasons	VRC Attendees	VRC Non- Attendees	VRC Non- Attendees of Neighbouring Villages
1. Pest & Diseases	27.1 %	25.8 %	11.7 %
2. Reduction in use of Fertilizers /Pesticides	1 %	6.5 %	0.6 %
3. Reduction in Labour	9.4 %	10.8 %	2.9 %
4. Climatic Factors	52.1 %	47.3 %	81.9 %
5. Mixed Cropping	5.2 %	3.2 %	2.9 %
1 & 4	5.2 %	6.4 %	-
Total	100 %	100 %	100 %

Source: Primary survey

More than 80 percent of VRC non attendees of neighbouring villages, 47.3 percent of VRC non attendees in Meppadi and 52.1 percent of VRC attendees in Meppadi reported that climate change is the main factor for the decline in productivity. The other important reason is the pests and diseases, 27 percent of VRC attendees, 26 percent of non attendees in Meppadi and 12 percent of neighbouring villagers reported about pest and diseases. The other reasons are labour shortage, mixed cropping and reduction in the use of fertilizers.

2. Level of Knowledge

Agricultural innovation literature suggests that awareness and knowledge of a new technology is the first step in the adoption process (Rogers, 1995). Usually farmers plan agricultural production with the instruments of their knowledge. A good knowledge about the exact production techniques will enables farmers to increase their production and productivity of the crops. In this perspective the services of knowledge provided by the Village Resource Centres and other institutions is expected to a have positive impact on the farmers' productivity. In order to understand the level of knowledge of farmers we are taking a case of pest management. Pest management is embarked upon for the promotion of yields of crops (Ofuoku et al 2009). As mentioned earlier, one of the main reasons for decline in coffee productivity is pest diseases. It is also noted that there had been many VRC classes regarding pest management in Meppadi, Wayanad.

Berry borer and mealy bugs are the two major pests found in Meppadi that had adversely affected coffee productivity. Accordingly, in order to understand the knowledge on pest management specifically, in case of berry borer and mealy bugs, we framed different set of questions that test respondents' degree of understanding or knowledge on the corresponding facets. The field investigators were also trained on the concept of pest management and on evaluating farmers' response to each set of questions. Four degree or scales such as 'perfect knowledge', 'incomplete knowledge', 'not sure' and 'ignorant' were prepared to classify respondents according to their knowledge on certain facets of pest management. The evaluation is done by trained field investigators on the basis of their in depth interview with the respondents. Sets of questions were framed to test eight facets of knowledge, its management, and benefit.

It is observed that perfect knowledge about pests that affect more frequently[3] is high among the VRC attendees (Table 3); around 75 percent of them have perfect knowledge on pests which affects their plantation. 24.5 percent of them have an incomplete knowledge about them.

Table 3: Knowledge on Pests that affect more Frequently

	VRC Attendees	VRC Non-Attendees	VRC Non-Attendees of Neighbouring Villages
Perfect Knowledge	74.9 %	37.5 %	4.8 %
Incomplete Knowledge	24.5 %	42.5 %	62 %
Not Sure	0	15.6 %	21.1 %
Ignorant	0.6 %	4.4 %	12.1 %
Total	100 %	100 %	100 %

Source: Primary survey

[3]Berry borer and mealy bugs.

Print ISSN: 0424-2513 Online ISSN: 0976-4666

As shown the Table 4, 68.4 percent of the VRC attending population have perfect knowledge about the symptoms of pest and where it affects, 30.4 percent have incomplete knowledge and only 0.6 percent is ignorant in these matters. In case of VRC non attendees in Meppadi, 34.4 percent have perfect knowledge, 45 percent have incomplete knowledge but 5.6 percent are ignorant. Among the neighbouring villagers only 5.4 percent have perfect knowledge, 62 percent have incomplete knowledge, 18.7 percent in 'not sure' category, and 13.9 percent are ignorant in these subject.

Table 4: Knowledge on Symptoms & where it affects the Plants

	VRC Attendees	VRC Non-Attendees	VRC Non-Attendees of Neighbouring Villages
Perfect Knowledge	68.4 %	34.4 %	5.4 %
Incomplete Knowledge	30.4 %	45.0 %	62.0 %
Not Sure	0.6 %	5.6 %	18.7 %
Ignorant	0.6 %	0	13.9 %
Total	100 %	100 %	100 %

Source: Primary survey

Table 5 depicts the knowledge on the methods to be adopted for controlling pests. In this case also VRC attendees have good knowledge than others. 61.9 percent of them have perfect knowledge regarding this. 34.5 percent have incomplete knowledge, 3 percent are not sure about this and only 0.6 percent is ignorant. In case of VRC non attendees in Meppadi, 20.1 percent have perfect knowledge, 46 percent have incomplete knowledge and 23.4 percent are not sure about and 10.4 percent are ignorant. Only 1.2 percent of VRC non attendees of neighbouring villages have the perfect knowledge regarding the methods for control pests. 68.3 percent have just incomplete knowledge and 17.1 percent are not sure about it.

Table 5: Knowledge on Pest Control Methods

	VRC Attendees	VRC Non-Attendees	VRC Non-Attendees of Neighbouring Villages
Perfect Knowledge	61.9 %	20.1 %	1.2 %
Incomplete Knowledge	34.5 %	46.1 %	68.3 %
Not Sure	3.0 %	23.4 %	17.1 %
Ignorant	0.6 %	10.4 %	13.4 %
Total	100 %	100 %	100 %

Source: Primary survey

It is also reported that about 79 percent of VRC attendees are aware of bio control methods and its advantages. 65.3 percent of VRC attendees have adopted right prescribed pesticides and observed improvement in productivity after using pesticides (table 6). However, only 4.4 percent VRC non attendees in Meppadi and 5.8 percent of neighbouring villagers reported adoption and positive impact in productivity.

Table 6: Adopted Right Pesticides and Observed Impact on Productivity

Yes/No	VRC Attendees	VRC Non-Attendees	VRC Non-Attendees of Neighbouring Villages
Yes	65.3 %	4.4 %	5.8 %
No	34.7 %	95.6 %	94.2 %
Total	100 %	100 %	100 %

Source: Primary survey

3. Level of Innovation

With the use of space technology tools, the Village Resource Centres can act as a critical link between knowledge production institutions and society. This study argues that VRC is a primary source of new external knowledge to local community, and are the significant actor in the local innovation system responsible for transition of the local economy. Nonetheless, the impact of this institution on the innovation performance of community is largely a function of the absorptive capacity of community, and how effectively these institutions are linked with the local actors and the activities in the system.

The innovative changes are captured in terms of changes in farming and hiring practices; subsequently changes in farming practices is discussed in terms of changes in existing farming practices and adoption of entirely new process or varieties. In the field we could observe that innovative changes in farming practices as a result of new knowledge and learning is followed by naturally subsequent changes in labour hiring practices. It is evident from the figure 2 that whilst around 55 percent of Meppadi VRC planters have undertaken changes in farming practices, only 25 percent of non VRC Meppadi planters and 13.6 percent of non VRC planters in neighbouring villages have undertaken changes during 2006-07 to 2010-11.

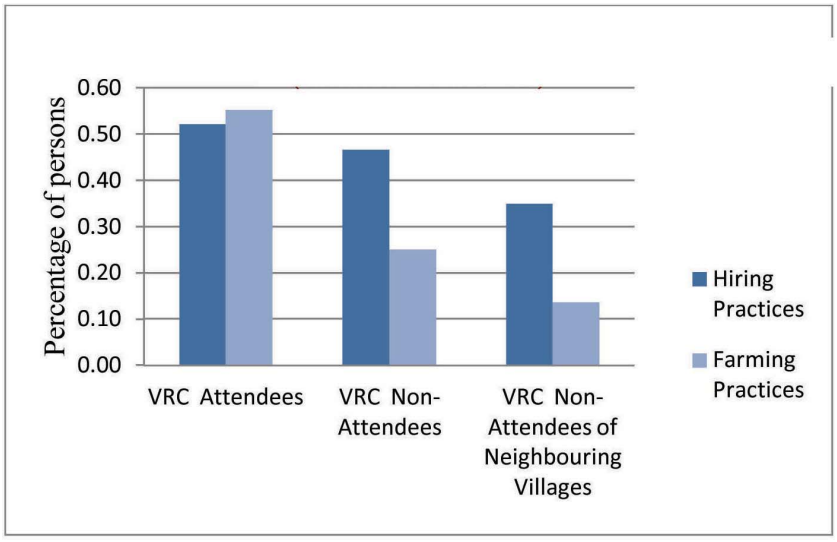

Fig. 2: Changes in farming practices in Mepadi (2006-07 to 2010-11)

Print ISSN: 0424-2513 Online ISSN: 0976-4666

Major changes in the farming practices are in pruning, weeding, irrigation, bio-farming, application of pesticides and insecticides, adoption of new plants/varieties, and crop switching.

These changes can be of two types; (i) changes in existing farming practices and (ii) adoption of new varieties and farming practices. We identify that the major changes in existing practices are in weeding, fertiliser application, irrigation, pest management, harvesting and in post harvesting techniques. Table 7 shows major changes adopted in existing farming techniques by each group during 2006-07 to 2010-11. The changes are reported under each major category for three different groups. It is evident that most of the changes are in weeding, fertilizer, and irrigation techniques.

Table 7: Changes in Existing Farming Practices in Meppadi (2006-07 to 2010-11)

Farming Practices	VRC Attendees	VRC Non-Attendees	VRC Non-Attendees of Neighbouring Villages
Weeding	46.1 %	19.8 %	2.1 %
Fertiliser Application	45.1 %	20.61 %	7.4 %
Irrigation	39.9 %	16 %	1.1 %
Pest Management	30.3 %	13.7 %	0.5 %
Harvesting	21.4 %	9.2 %	1.1 %
Post Harvesting	11.2 %	4.6 %	1.1 %
Others	3.9 %	2.3 %	6.4 %

Source: Primary survey

More than 45 per cent of Mepadi VRC attending planters made changes in weeding and fertilizer application during 2006-07 to 2010-11. About 40 percent of VRC attendees changed their practices in irrigation 30.3 percent changes pest management, 21.4 percent changes their harvesting practices and 11.2 percent made changes in their post harvesting techniques. This is clearly much better performance than the other two groups. An important question that follows the above reflection is that what motivated for those innovations? 83 percent of total VRC attending population has reported that the acquisition of new knowledge is the main reason for adopting changes in their farming process (Table 8).

Table 8: Reasons for Introducing Changes in Farming Practices

Major Reasons	VRC Attendees	VRC Non-Attendees	VRC Non-Attendees of Neighbouring Villages
1. New Knowledge	83 %	53 %	33 %
2. Less Remuneration	2.3 %	7 %	5.3 %
3. Pests & Diseases	5 %	20 %	22.3 %
4. Financial Difficulties	1.2 %	-	5.3 %
5. Labour Shortage	4.8 %	7 %	11.7 %
6. Others	0	0	10.6 %
7. Both New Knowledge & Less Remuneration	3.7 %	13 %	11.7 %
Total	100 %	100 %	100 %

Source: Primary survey

It is important to note that almost 55 percent of VRC attendees point out that traditional knowledge and VRC are the main sources of information. With regard to hiring practices, almost 53 percent of VRC attendees in Meppadi changed their hiring practices. It is 46.6 percent and 35 percent in case of VRC non attendees in Meppadi and neighbouring panchayats. It indicates that changes made in hiring practices are comparatively higher in case of VRC attendees. The shortage of labour led them to adoption of new methods in hiring practices especially in wage payment. Recently there have been changes in their wage rates also.

Conclusion

The present study has examined the role of VRC in enhancing rural livelihood and ensuring higher income and better standard of living. Two key factors that determine economic progress and well being have analysed here; (i) level of knowledge, and (ii) productivity. Five years before the study, productivity level of the VRC attendees was much lower than that of non attendees. However, VRC attending farmers could increase their productivity in the consecutive years, whilst the rest experienced a declining trend in productivity. VRC planters could cross the higher productivity levels of VRC non-attending planters with in a period of two years. This was particularly with the help of VRC support specifically in the field of pest management, special techniques in pruning, shading etc. Most of the VRC attendees have perfect knowledge regarding what kind of pests affect their plantation, its symptoms, where its affects and what sort of methods to be adopted to control pests. They can also identify the pests in the early stage. In case of knowledge of bio chemical controls, usage of pesticides, its dosage and time of application, the VRC non-attendees are far behind the VRC attendees. Around 83 percent of VRC attendees reported that interactions through VRC were beneficial to them to increase productivity. In the field we could observe that innovative changes in farming practices as a result of new knowledge and learning, is followed by subsequent changes in labour hiring practices. Developmental interventions through VRC for about six years have made the planters to get in acquaintance with new knowledge, learn them and innovate. However, it is worth to note that the primary beneficiary of VRC system is a section of population with larger absorption capacities, capital/ land resources and capabilities.

References

Allen T, 1984. Managing the flow of technology. Cambridge, MA, MIT Press.

A.W. Van der Ban, H.S. Hawkins, 1996. Agricultural Extension. Blackwell Science Ltd., London

Anderson, J.R, G. Feder, 2004. Agricultural Extension: Good Intentions and Hard Realities. *World Bank Research Observer* **19**(1): 41-60.

Anderson, Jock R, John L. Dillon, J. Brian Hardaker, 1977. Agricultural Decision Analysis. Ames, Iowa: Iowa State University Press.

Antle J, S. Capalbo, 1988. Agricultural Productivity: Measurement and Explanation. Washington, D. C, John Hopkins University Press.

Antonelli C, 1998. The dynamics of localized technological changes: The interaction between factor costs inducement, demand pull and Schumpeterian rivalry. *Economics of Innovation and New Technology* **6**: 97-120.

Bharadwaj Krishna, 1974. Production Conditions in Indian Agriculture – A study based on Farm Management Surveys. Cambridge University Press.

Boris E. Bravo-Ureta, 2002. Research, Extension, and Information: Key Inputs in Agricultural Productivity Growth, The *Pakistan Development Review* **41** (4): 443-473

Burns Tom, Stalker G. M 1961. The management of innovation. London: Tavistock.

 Print ISSN: 0424-2513 Online ISSN: 0976-4666

Chandrashekar S, Basvarajappa K. P, 2001. Technological innovation and economic development: Choices and Challenges for India. *Economic and Political Weekly* **36**(34) : 3238-3245

Chandrashekar S, 1995. Technology priorities for India's development - need for restructuring. *Economic and Political Weekly* **30**(43): 2739-48.

Cohen and Levinthal, 1990. Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly* **35** (1): 128-152.

Johnston B.F, Mellor J.W, 1961. The role of agriculture in economic development, *American economic review* **51**: 566-593.

Kareemulla, 2012. Role of ICT in dissemination of knowledge in agriculture sector- its scope and efficancy. *Indian Journal of Agricultural Economics* **67***(*1):

Nishimizu, M, J. Page, 1982. Total Factor Productivity Growth, Technological Progress and Technical Efficiency Change: Dimensions of Productivity Change in Yugoslavia, 1965–79. *The Economic Journal* **92**: 920–936.

Ofuoku A.U, Egho E.O, Enujeke, E.C, 2009. Integrated pest management (IPM) adoption among farmers in central agro-ecological zone of delta state: Nigeria. *Advances in Biological Research* **3** (1-2*):* 29-33.

Rogers, E, 1995. Diffusion of innovations. The Free Press, New York.

Schultz, T. W, 1964. Transforming Traditional Agriculture. Yale University Press, New Haven.

Seyed Abdolmajid Jalaee, Sina Zeynali, 2013. Impact of Information And Communications Technology on Growth of Agriculture Sector. *Asian Journal of Management Sciences and Education* **2**(2):

Shrestha, A. B, 2009. Climate Change in the Hindu Kush-Himalayas and its Impacts on Water and Hazards. *Asia Pacific Mountain Network Bulletin* **9**: 1–5

Waghmare M N, Rahane R K, 2011. Role of ICT in the Agriculture Sector of India. *Indian Journal of Agricultural Economics*.