# Space Technology and Knowledge Management in Agriculture

Dr. C S Shaijumon,
Reader in Economics,
Dept. of Humanities,
Indian Institute of Space Science and Technology (IIST)

## Introduction

Knowledge Management comprises of a range of strategies and practices used in an organization to identify, create, represent, distribute, and enable adoption of insights and experiences. Such insights and experiences comprise knowledge, either embodied in individuals or embedded in organizational processes or practice (National Institute of Extension Management; Govt. of India). The asymmetry and poor communication of knowledge among and between farmers, and those who produce of farm related knowledge, has often considered as big hindrance to the proper development of agriculture in developing countries. Knowledge management can play a pivotal role in enhancing agricultural productivity and addressing the problem of knowledge asymmetry. It will facilitate appropriate knowledge and information to reach farmers in a timely manner. Such delivery of knowledge and information undoubtedly minimizes the risk and uncertainty among farmers who face multiple levels of problems from production to marketing of their produce.

The attainment of effective knowledge management in the agriculture sector requires the systematic and continuous interaction of stakeholders that include farmers, farmer organizations, research scientists, policy makers, extension agents and the private sector among others (ASARECA, 2010). Appropriate institutions are required for generating, capturing, and disseminating knowledge and information. Information and Communication technology (ICT) based institutions can play a critical role in facilitating rapid, efficient, and cost effective knowledge management. The information and communication technology advances in space research can play a tremendous role in socioeconomic development of a nation. It can be instrumental in disseminating knowledge of any kind to the rural masses and thereby can act as a catalyst to development. The Indian Space Research Organization (ISRO), with the aim of disseminating knowledge to the rural masses, envisaged the concept of Village Resource Centre (VRC) in 2004. The VRCs programme of ISRO is in association with non-governmental

organizations (NGOs)/Trusts and state/central government agencies, and is connected to the knowledge-generating institutions like universities, public research institutes, healthcare centres, etc. The VRC is a totally interactive 'Very Small Aperture Terminal; (VSAT) based network.

The objective of the study is to understand the effectiveness of Village Resource Centers in Knowledge management among farmers. The specific objectives of the study are i) to analyse the changes in knowledge capability of farmers' ii) to understand the changes in innovative capacity of farmers and iii) to understand the skill capacity of farmers.

**Review of Literature**

Knowledge management primarily includes sharing, exchanging and dissemination of knowledge. The central purpose of knowledge management is to transform information and ideas into valuable output (Metcalfe, 2005). The important distinction in knowledge management is between explicit knowledge (which can formally communicate through a structured language) and tacit knowledge (gain through personal experience and involvement) (Polanyi, 1966). A large part of knowledge is not explicit but tacit (Schreiber et al., 1999). Fostering a dynamic interaction between tacit and explicit knowledge, therefore, generates new forms of knowledge vital for improved knowledge utilization (Nonanka and Takeuchi, 1995). An effective strategy for knowledge management in agriculture should bring the knowledge creators, innovators, extension experts and farmers together in all the knowledge management phases from knowledge creation to utilization. Any attempt at bridging the knowledge divide between the different stakeholders must be rooted in a knowledge management model that recognizes the significance and complementary roles of both tacit and explicit knowledge in decision-making (Boateng, 2006). Effective knowledge management can increase the profitability of any organization (Probst, Raub and Romhardt, 1999). The emergence of Information and Communication Technologies (ICT) in the last few decades has opened new avenues in knowledge management that could play important roles in meeting the prevailing challenges related to sharing, exchanging and disseminating knowledge and technologies

Agriculture is an important sector of Indian economy. More than 70 per cent of the population depends upon agriculture and it contributes about 17 per cent of national income. Transfer of relevant knowledge to small and marginal farmers can help them to improve their yields and get better market prices. ICT can play a crucial role in benefiting the resource-

strapped farmers with up-to-date knowledge and information on agricultural technologies, best practices, markets, price trends, and weather conditions. The experiences of most countries indicate that rapid development of ICT, which facilitates the flow of data and information, has tremendously enhanced the knowledge management practice in agriculture. 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). 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).

The Indian Space Research Organization (ISRO), with the aim of disseminating knowledge to the rural masses, envisaged the concept of Village Resource Centre (VRC) in 2004. These centres aim to accelerate farmers' education, facilitate technology transfer and technological development, develop skills of agricultural labour, and enhance continuously the learning process of all farmers, and thus help in increasing their earnings and professional capacities. Village Resource Centers are a peculiar type of institutions clubbed with technology and can be called 'Technology institution' where, they can influence the production possibility curve as well as the physical quality of resources. VRC's are the centers of knowledge management, where they manage the raw information from different agencies and stakeholders, synthesize and add value before they deliver it to the end users. ISRO's VRCs programme is in association with Non Governmental Organizations (NGOs)/Trusts and state/central government agencies, and is connected to knowledge producing institutions like Universities, government research institutes, hospitals, etc. 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.

**Methodology**

The study is based on both primary and secondary data. The field of study for collecting primary data is Meppadi (11°33'38.24"N, 76° 8'31.32"E) in Wayanad district of Kerala. VRC in Kerala has been organised by ISRO in collaboration with Kerala State Planning Board since 2006 and generally known as the ISRO-KSPB Network. In Meppadi, VRC has equipped with

internet powered computer, powerful camera, speaker, tele-medicine related equipments etc and conducts both online and offline classes for farmers. Through internet, the local people are able to get class from the experts from the various points like universities, hospitals, agriculture offices etc. 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. 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.

A detailed survey has been conducted at Meppadi during the months of September and October of 2011 and primary data collected from 170 VRC attending (VRC A) Meppadi coffee planters, 170 VRC non-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, Mooppanadu and Vaithiri. 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.

**Descriptive Analysis**

There are several factors which can influence the agricultural production and productivity of an economy. A good knowledge on the exact production techniques enables the farmers to increase productivity. In this sense, the services of knowledge provision by village resource centers should have a positive impact on crop production and productivity. Space technology and information communication technologies (ICTs) are the state-of the-art technologies of modern civilization. The potential benefits of knowledge are actualized only when these are successfully disseminated to a large number of end-users. Generally the benefits that right knowledge brings-in are normally accessed by the few rich with relatively high absorptive capacity. Hence, the ultimate benefits of a new knowledge can contribute to economic growth and development only when it is correctly and successfully transferred and applied by a large number of end-users.

The economic development involves the mastering of new ways of doing things and breaking away from the circular flow of economic activities. The mastering new ways of doing things implies transition of an economy from low value-addition to high value-addition

activities. Farmers can also improve and enrich their existing indigenous (tacit) knowledge not only through the interaction with modern knowledge, but also by sharing experience with other farmers. However, in order to scale up knowledge to other farmers, the knowledge and information needs to be codified, made explicit, and upgraded or modernized with research-based evidence. Because of the sharing of experiences at local level by farmers, dissemination of information / knowledge through VRCs is also leading to the creation of new knowledge.

**Knowledge capability of farmers**

Indian agricultural sector has been characterised by low productivity growth despite periods of strong growth in the past. Serious challenges must be addressed in order to achieve faster productivity growth. These include infrastructure constraints, supply chain inefficiencies and significant problems in the diffusion of and access to information (Mittal et al., 2010). From the field it is observed that, the shortage of the labourers and the high wages have forced the farmers to employ new technological equipments. In this context, the scope of the knowledge of farmers, their effort to assimilate the new knowledge and application of such knowledge is important. It is also understood from the study area that the farmers are keenly interested in increasing their knowledge day by day and in many cases they gain new knowledge as a result of trying to increase their income from farming.

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. VRC is essentially a knowledge provider to rural population. Knowledge needs of the farmers and other stakeholders fell broadly under the areas like weather forecasts, harvest and post harvest technologies, marketing information, government schemes including subsidies, issues relating to the package of practices etc (Kareemulla, 2012). In the examination of VRC's relative role and capabilities as an institution that enter in partnerships and linkages with other regional institutions to promote innovation, it is essential to have a basic idea on peoples' accessibility to modern ICTs and conventional information sources. Knowledge/technology transfer approach is given thrust to "trickle down" flows of information from experts to farmers. The project also emphasizes the importance of interactive, mutual learning between formal and informal knowledge/technology sources and stresses their linkages with farmers so that they actively participate in rural

(agricultural) development. The survey data from Meppadi (Table 1) shows that the VRC attendees have relatively good access to both modern ICTs and conventional information sources such as news papers and agricultural magazines.

**Table 1. Access to Information**

| Sources | VRC Attendees | VRC Non Attendees | VRC Non- Attendees of Neighbouring Villages |
|---|---|---|---|
| Telephone | 82 % | 76 % | 68 % |
| Mobile Phone | 96 % | 93 % | 78 % |
| Internet Connection | 8 % | 3 % | 4 % |
| Newspaper | 63 % | 48 % | 38 % |
| Agriculture Magazine | 32 % | 14 % | 3% |

Source: Primary Survey

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. It implies the ability of a local economy to adapt to the new market and technological opportunities through innovation. Development 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). The following table shows that VRC attendees have improved awareness about factors affecting productivity of Coffee in Meppadi.

**Table 2 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

The above table reveals that, even though majority of farmers are still weather dependent, VRC attendees are less dependent because of their awareness about alternate sources of irrigation. However, we can identify three distinguishing features of VRC attendees that make them innovative; (i) survey data indicates VRC planters are relatively less weather dependent while comparing with other two groups, (ii) VRC planters recognises knowledge as an important factor that determine productivity, and (iii) VRC planters are more market oriented as they conceive price as a dependent variable.

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). The uniqueness of VRCs is the knowledge connectivity between experts at Universities, research institutes and medical colleges with village community. An important actor in the concept of VRC is (agricultural) University, for which space technology serves as a platform for linkage and dissemination of knowledge from their research to the local community. Accordingly, VRCs support universities in discharging their third role- i.e. (regional) economic development. 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.

**Table 3. Total Programmes on Pest Management by Various Agencies / Institutions in Meppadi between 2007 & 2011**

| Agents \ institution | Total programmes |
|---|---|
| Regional Coffee Research Station (RCRS) | 18 |
| Indian Institute of Spices Research (IISR) | 17 |
| Kerala Agriculture University (KAU) | 11 |
| Krishi Vigyan Kendra (KVK) | 5 |
| Regional Agriculture Research Station (RARS) | 5 |
| State Planning Board (SPB) | 1 |
| **Total** | **57** |

Source: Primary survey

Berry borer and mealy bugs are the two major pests found in Meppadi that had adversely affected coffee productivity. 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. It is observed that perfect knowledge about pests that affect more frequently is high among the VRC attendees (Table 4); 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. In case of VRC non-attendees in Meppadi, 37.5 percent have perfect knowledge but 42.5 percent have an incomplete knowledge and 4.4 percent are ignorant.

**Table 4. 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

From the table it can be said that VRC attendees have comparatively better knowledge regarding what kind of pests affect their plantation frequently. It is also observed that VRC attendees (Table 5) have better knowledge on the symptoms and where pests affect the plants.

**Table 5. 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

The survey has also observed that 62% of VRC attending farmers in Meppadi have perfect knowledge about pest control methods (Table 6). 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, incomplete knowledge - 46.1 percent, not sure - 23.4 percent and 10.4 percent are ignorant.

**Table. 6 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

65.3 percent of VRC attendees have adopted right prescribed pesticides and observed improvement in productivity after using pesticides (Table 7). 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 .7 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

In short, 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. However, only less percentage of VRC non-attendees posses this knowledge.

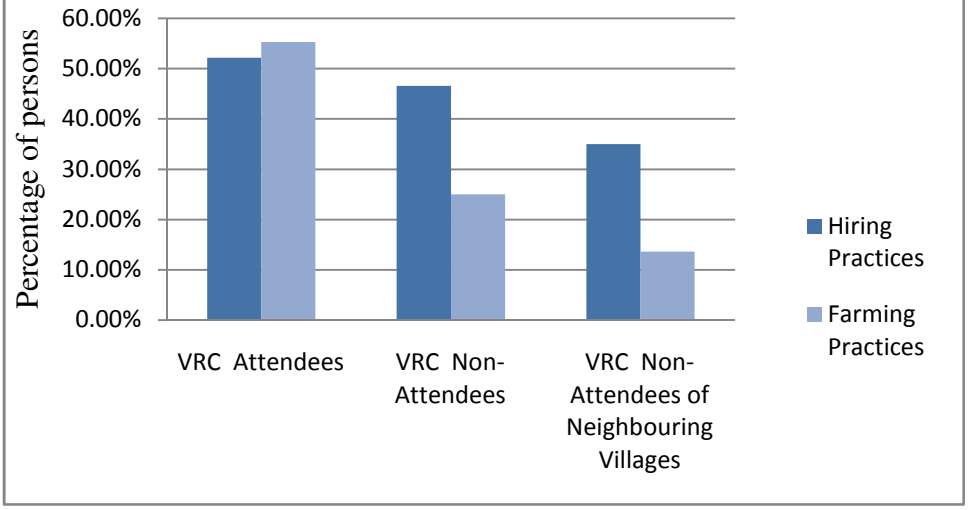
**Changes in Innovative capacity of farmers**

An innovation system may be defined as comprising the organizations, enterprises, and individuals that together demand and supply knowledge and technology, and the rules and mechanisms by which these different agents interact (*World Bank,* 2006:5). It extends beyond the creation of knowledge to encompass the factors affecting demand for and use of new and existing knowledge in novel and useful ways. Therefore, Innovation depends upon dynamic interactions among actors such as firms, government agencies, universities, and research institutions that result in systemic learning and capacity building. With the use of space technology tools, the Village Resource Centres can act as a critical link between knowledge production institutions and society.

The innovative changes are discussed in terms of changes in farming and hiring practices; subsequently changes in farming practices are discussed in terms of changes in existing farming practices and adoption of entirely new process or varieties. In the field, the study 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. The changes in farming practices include both changes in existing farming practices and adoption of new farming practices. Figure 1 exemplifies the innovative changes adopted by the VRC attending and non-

attending planters in Meppadi and neighbouring villages during last five years. It is evident 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 last five years.

**Figure 1. Changes during 2006-07 to 2010-11**




Source: Data from Primary Survey

Fifty five percent of VRC attendees and twenty five percent of VRC non attendees in Meppadi have made innovative changes in farming practices. These changes can be of two types; (i) changes in existing farming practices and (ii) adoption of new varieties and farming practices. Table 8 depicts the major changes adopted in existing farming techniques by each group during the last five years. 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. However, the intensity of changes varies extremely across three different groups of planters.

**Table. 8 Changes in Existing Farming Practices (from 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

The main incentives or motivations for these kinds of changes of both VRC attendees and non attendees are showed in the following table:

**Table 9. Reasons for Introducing Changes in Farming Practices**

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

Source: Primary survey

Out of the total VRC attending planters, 83 percent reported acquisition of new knowledge is the main reason for adopting changes in their farming process. The innovative changes in farming practices can be of two types; (i) changes in existing farming practices and (ii) adoption of new varieties and farming practices. Table 10 reports frequencies of adoption of new varieties and/or plants, and new processes by the three different groups during 2008-09 to 2010-11.

**Table 10. Innovative methods adopted (from 2008-09 to 2010-11)**

| Frequency of Changes | VRC Attendees | VRC Non-Attendees | VRC Non- Attendees of Neighbouring Villages |
|---|---|---|---|
| **New Variety / New Plants** | | | |
| **1** | 43 | 20 | 7 |
| **2** | 29 | 7 | 0 |
| **3** | 16 | 4 | 0 |
| **4** | 14 | 5 | 0 |
| **5** | 12 | 5 | 1 |
| **Total** | **265** | **91** | **12** |
| **New Process** | | | |
| **1** | 19 | 2 | 7 |
| **2** | 8 | 3 | 3 |

| | | | |
|---|---|---|---|
| **3** | 5 | 0 | 5 |
| **4** | 4 | 3 | 0 |
| **5** | 21 | 7 | 0 |
| **Total** | **171** | **55** | **28** |

Source: Primary survey

The first section of Table 10 reports the frequencies of varieties or plants, and the numbers of adoptions under each frequency. It can be read from the table that 43 VRC attendees have adopted of one variety, but 20 and 7 persons in case of non attendees in Meppadi and neighbouring panchayats respectively. Among the VRC attendees 29 persons adopted 2 varieties, 16 persons adopted 3 varieties and number of persons adopted 4 and 5 varieties are 14 and 12 respectively. The innovative methods are consisting of two types: - one is new to the farmer but practised in locality, and the other is new to both the farmer and locality. The innovation that is both new to the farmer and region is considered to be more radical, whilst the innovation that is new to the farmer but that already exists in the region is relatively more with imitation features. The study has also observed that VRC attendees spent 18.5 percent of total agricultural expenditure for the innovative methods. Of which, 14.4 percent for introducing a method, which is new to the farmer but practised in that region and remaining expenditure used for the method, which is new to both farmer and region. The VRC non-attendees in Meppadi and Neighbouring villages spent 9.3 percent and 11.9[1] percent of total agricultural expenditure for new innovative methods. In short, as expected VRC attendees are devoting relatively higher percentage of their total outlay towards innovative activities, and this substantiates our earlier findings.

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. It is also noted that the demand supply gap is higher among the VRC attendees than others. The study observed that the supply gap in plantation labourers has a significant negative effect on innovation activities of planters. It is evident that those farmers who have adopted large number of innovations in terms of new processes and varieties have faced higher shortage in labour supply. Those planters are primarily VRC attendees. This labour shortage naturally has increased local wage rate and hence labour

[1] However, the average total expenditure per hectare is relatively much lower for VRC non attendees particularly for planters in neighboring villages. Without this 'base effect' the percentage of expenditure on innovative practices would be higher than the figures in table.

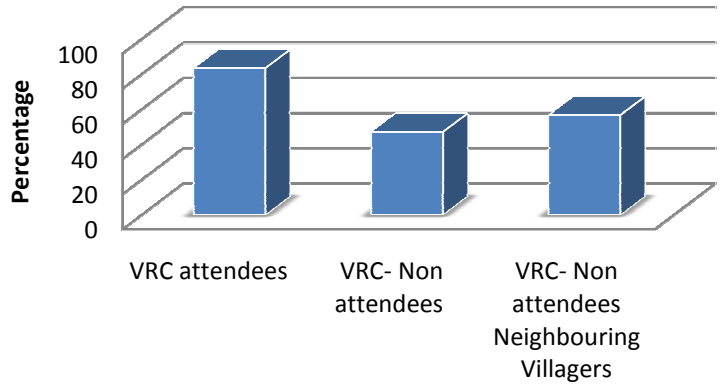
productivity, which naturally squeeze the profitability of innovation and thus hamper incentives for innovation.

**Changes in Skill Capacity of farmers.**

For the rural people, technological inclusion is enhancing of absorptive capacity and thereby increasing their capacity to participate in more economic activities. Technology allows the rural people to get more access to knowledge and resources and thereby helps them to get more economic benefits. Located close to the rural community, these VRCs bring together national and local government organizations, and local people. These centres aim to accelerate farmers' education, facilitate technology transfer and technological development, develop skills of agricultural labour, and enhance continuously the learning process of all farmers, and thus help in increasing their earnings and professional capacities.

The most striking result is 83.6 percent of VRC attendees in Meppadi have improved their skills after participating in organisations. Among the VRC non attendees in Meppadi 47.4 percent have improvements in their skills and the corresponding percentage was 56.9 among the non attendees of neighbouring villagers.

**Figure 2. Capabilities/skills Enhancement in Meppadi**




In Meppadi, 83.6 percent of VRC attendees reported improvements in skills, the main one being that of training and leadership quality. 42.9 percent of VRC attendees got training, 16.5 percent improved leadership quality and 7.1 percent gained both training and leadership quality. 6 percent could convey their needs, 2.1 percent got ability to oppose social evils and 2.5 percent got specific skills in agriculture as a result of participation in organisations.

| Table 11. Improvements in Skills | | | |
|---|---|---|---|
| | Meppadi | | |
| | VRC | Non-VRC | Neighbouring Villagers |
| 1.Training | 42.9 % | 15.1 % | 13.8 % |
| 2.Leadership Building | 16.5 % | 17.1 % | 36.5 % |
| 3. Ability to Articulate needs | 6 % | 4.4 % | 1.8 % |
| 4. Fight against Social Evils | 2.1 % | - | 4.8 % |
| 5. Agricultural Production | 2.5 % | 1.8 % | - |
| 1 & 2 | 7.1 % | 2.2 % | - |
| 1 & 3 | 3.6 % | 3.4 % | - |
| 2 & 4 | 2.9 % | 3.4 % | - |
| Total | 83.6 % | 47.4 % | 56.9 % |

Source: Primary Survey

In the case of VRC non attendees in Meppadi, 15.1 percent got training, 17.1 percent have improvement in leadership quality and 2.2 percent got both training and leadership quality. 4.4 percent got ability to convey their needs and 3.4 percent both training and ability to convey their needs. And another 3.4 percent informed both improvements in leadership quality and ability to oppose social evils. 5.1 percent reported both improvements in leadership quality and got information regarding agriculture production. Among the neighbouring villagers, 36.5 percent reported improvement in their leadership quality, which is primarily because of their association with NGO's. The study has observed that 19.5% of VRC Non- attending neighbouring villagers have membership in Self Help Groups of NGO's and only 7.5% of VRC attendees have VRC attendees have membership in NGO's. A lion share of VRC attendees as well as non attendees is also affiliated to other local organisations, whilst this phenomenon is quite prominent in Meppadi, owing to the sociological peculiarities of Kerala society. It is also evident that the primary motive to join a social network or organisation is social as well as economic benefit, and eventually people have experienced enhancement of skills and capabilities.

**Conclusion and Policy implications**

This study began with a goal to understand the outcome of new developmental intervention; i.e. Village Resource Centres with their linkages with a set of regional research institutions on one hand, and local farmers on the other hand. The economic development involves mastering of new ways of doing things and breaking away from the circular flow of economic activities. The mastering new ways of doing things implies transition of an economy from low value-addition to high value-addition activities. Development is not merely introduction and adoption of knowledge; it also requires co-evolution of institutions. Improving productivity and quality requires a functioning system of technology generation and transfer and a means to implement these technologies. The study clearly found that VRC attending farmers have better knowledge, innovative capacity and enhanced skill capabilities than VRC non - attending farmers. The effect of VRC in Meppadi region has been isolated by using a control group of VRC non-attending population from neighbouring villages. The study results reveal that, even though there were plenty of development institutions like Village Panchayath, Krishibhavan etc, VRC has played a vital role in enhancing the level of knowledge, innovativeness and skill among farmers in Meppadi region. To enhance the positive effects of VRCs as highlighted by this study, it is proposed that a specific body is to be established so as to bring any local specific problem to the notice of resource centers on time, and instant transfer of solutions to such problems. The study has also taken into note that interaction between farmers particularly VRC attendees and non-attendees is a requisite for the success at community level. Therefore, one should identify the centre of the social network under each VRC and efforts should be given to make centre more active and form linkages with maximum number of nodes (farmers). The study asserts this initiation will result in a Public Private People Participation model. Moreover, such PPPP model should also plan on delivering information at door step.

**References**

Anderson, J.R.,. Dillon, J. L & Hardaker, J. B. (1977). *Agricultural decision analysis*. Ames, Iowa: Iowa State University Press.

Association for Strengthening Agricultural Research in Eastern and Central Africa (2010), *Annual Report* 2010: *Technologies without borders: Sharing regional innovations for food security*, ASARECA: Entebbe, Uganda; 2011

Boateng. (2006). Knowledge management working tool for agricultural extension:the case of Ghana. *Knowledge Management for Development Journal*.2 (3): 19-29

Kareemulla.(2012). Role of ICT in dissemination of knowledge in agriculture sector - its scope and efficacy. Indian Journal of Agricultural Economics, Vol. 67, No.1, Jan - March 2012.

Metcalfe, A.S. (ed). 2005. *Knowledge management and higher education: A critical analysis*. Retrieved from http://site.ebrary.com/lib/aucairo/Doc?id=10084481&ppg=14 . Inform. Sci. Publ.

Mittal, Surabhi and Kumar Praduman (2000). Literacy, technology adoption, factor demand and productivity: An econometric analysis. *Indian Journal of Agricultural Economic s*, Vol. 55 No. 3, Pp 490 - 499

Nonaka, I & Takeuchi, H. (1995). *The Knowledge-creating Company*. New York: Oxford University Press W.

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.

Polanyi, Michael (1966), *The Tacit Dimension*, University of Chicago Press: Chicago

Probst, G., S.Raub, and K.Romhardt. (1999). *Managing Knowledge Building Blocks for Success*, John Willey & Sons Ltd, England.

Rogers, Evert M (1995), *Diffusion of Innovations*, The Free Press, MC Millan Publishing Co. Inc., New York.

Schreiber, G., Akkermans, H., Anjewierden, A., de Hoog, R., Shadbolt, N., de Velde, W.V. and Wielinga, B. (1999), *Knowledge Engineering and Management: The Common KADS Methodology*, MIT Press, Massachusetts.

Van Den Ban, A. W., & Hawkins, H.S. (1996). *Agricultural extension* (2nd ed.). Oxford: Blackwell.

World Bank. 2006. “Enhancing Agricultural Innovation: How to Go Beyond the Strengthening of Research Systems.” Washington, D.C.: Agricultural and Rural Development Department, the World Bank