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Space Technology Institution for Technology Diffusion and Development in Agriculture: A Case Study

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Abstract

To disseminate knowledge to the rural masses using advances in information and communication technologies, The Indian Space Research Organization (ISRO) envisaged the concept of 'Village Resource Centre' (VRC) in the year 2004. A VRC conducts interactive programmes on a regular basis in the areas of agriculture, water resources management, tele-health care, awareness generation, skill development/ vocational training for livelihood support, etc. These VRCs are connected with knowledge producing institutions like universities, development institutes, hospitals and other institutions and have association with NGOs/Trusts and state/central agencies. This study has examined the functioning of a VRC as a knowledge provider and capability builder at the rural level. For study, two VRCs were selected – one at Meppadi in Wayanad district of Kerala and the other at Thiruvaiyaru in Tanjore district of Tamil Nadu. These regions are predominantly agrarian but specialize in different crops — coffee in Meppadi and paddy in Thiruvaiyaru. The study has revealed that the VRCs have been successful in providing knowledge and building skills among the farmers in the study area. It has also been observed that association with a VRC has motivated the farmers towards adoption of new varieties, crops and processes vis-à-vis preferring improvements in the existing varieties, crops and processes.

Key words: ICT, knowledge dissemination, skill development, Village Resource Center, agricultural development, Kerala, Tamil Nadu

JEL Classification: Q16, Q13, Q10

Introduction

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 centres should have a positive impact on crop production and productivity. Apart from knowledge, there are other factors such as income, farm size, input costs, labour, weather, market prices, etc. that also influence the production and productivity in agriculture. Space technology and information communication technologies (ICTs) are the state-of-the-art technologies of modern civilization. The potential benefits of these technologies are, however, actualized only when these are successfully disseminated to a large number of end-users. In developing countries, the benefits that a technology brings-in are normally accessed by the few rich with relatively high absorptive capacity[1]. Hence, the ultimate 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 end-users. 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.

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The successful technology/knowledge transfers from lab to land improve the efficiency of production, and make the economy more productive. The capacity to evaluate new knowledge, assimilate it, and put it into commercial uses is a must for innovative economic agents. This is known as absorptive capacity[2] and is largely a function of prior knowledge of the economic agents or system (Cohen and Levinthal, 1990). The information and communication technology advances in space research can play a tremendous role in socio-economic 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. In the 1970s, multilateral organizations like Food and Agriculture Organization (FAO) initiated implementation of two-way knowledge flows and information exchange between rural communities and technocrats, rather than one-way transfer of knowledge. This recognition that development comprises of more than just increased productivity, led to alternative development approaches, such as the Sustainable Livelihoods (SL) approach in the 1990s. The approach is centred on people and their livelihoods. It prioritizes people's tangible and intangible assets, and their ability to withstand shocks in the vulnerability context. It also prioritizes policies and institutions that reflect priorities of the poor, rather than of the elite (Chambers and Conway, 1991).

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 present study aims to understand the specific role of Village Resource Centres as a knowledge provider[3] and capability builder so as to produce innovations at the rural level.

Technology, Institutions and Economic Development

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. The lack of information can cause vulnerability. However, institutional systems can act to reduce risks and protect livelihood assets (Anderson *et al*., 1977).

In the issue at our hand, the VRC is a non-market institution that assists the local community by means of creation and dissemination of knowledge. In India, this institution is the major source of new external knowledge to the local community, and the significant actor in the local innovation system responsible for transition of the local economy. In this entire framework, the institutions intervene exactly like technological parameters in shifting the production function upwards, but unlike a technological change, institutions do not alter the physical quality of resources. The Village Resource Centers are a peculiar type of institutions clubbed with technology and can be called 'Technology Institution', and can influence the production possibility curve as well as the physical quality of resources. The VRCs are the centres of knowledge management, and manage raw information from different agencies and stakeholders, synthesize it and do value addition before delivering it to the end users.

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

[2] Absorption capacity refers to the ability to identify and assimilate new external knowledge, and it is largely a function to prior related knowledge. For instance, this reflection is true for such earlier development interventions. However in case of VRC, we could observe from the field that people with relatively less capabilities attend VRCs and benefit out of new knowledge subsequently. We would like to call it as 'subsequent wave', and it was very much evident in Thiruvaiyaru.

[3] The knowledge needs of 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).

The evolutionary point of view on economic development argues that successful development involves co-evolution of knowledge and technologies, firms and economic structures, and a variety of non-market institutions (Nelson, 2006). Therefore, the basic challenge in the process of development for a region is to learn new ways of achieving things. Improving productivity and quality requires a functioning system of technology generation and transfer and a means to implement these technologies. The extension services can provide the proper institutional system to deliver these trainings to the farmers. An effective extension resource involves adequate and timely access by the farmers to relevant advice with appropriate incentives to adopt the new technology, if it suits their socio-economic and agrological circumstances (Anderson and Feder, 2004). The farmers get information from many sources including public, private and corporate sectors. Extension service delivery has a greater impact during the early stages of new technology dissemination. As more farmers become aware of new technology, the impact of extension services diminishes (Byerlee, 1998). The evaluation of impact of extension service 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).

It is obvious that local institutions play a big role in economic development of the region. However, it is very difficult to identify exactly which institution matters and how it matters for the regional economic development. Therefore, it is important to understand the specific role that is being played by innovative institutions like Village Resource Centres in the development of rural areas. The advances of information and Communication technology in space research can play a tremendous role in the socio-economic development. 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. These nodes can be further extended using other technologies like Wi-Fi, wireless and optical fibre, etc. The extensions may serve as the local clusters around the areas where the VRC is located. The overall implementation of the project will be 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 agricultural / land / water resources issues as well as health care / educational needs.

Data and Methodology

For study, both primary and secondary data were used. The areas selected for the study were Meppadi in the Wayanad district of Kerala and Thiruvayyaru in the Tanjore district of Tamil Nadu. The rationale behind selecting these two VRCs was: (i) These are run by two different partner agencies — NGO (MS Swaminathan Research Foundation) and the respective state government in Thiruvayyaru and Meppadi, (ii) These regions are predominantly agrarian but specialize in different crops — coffee in Meppadi and paddy in Thiruvaiyaru. The socio-economic settings of these two regions are also different and therefore may have some lessons to learn from each other. The principal modes of data collection were field surveys (with three interview schedules) with (a) different sections of the VRC attending coffee planters in Meppadi, (b) VRC non-attending coffee planters from the same village, and (c) VRC non-attending coffee planters from the neighbouring villages (as control group). A detailed survey was conducted at Meppadi panchayath[4] of Wayanad district in Kerala state and Thiruvaiyaru panchayat in Thanjavur district of Tamil Nadu. The information regarding agricultural production practices, productivity, knowledge level, and innovation performance, was collected as primary data from 170 VRC attending (VRC-A) Meppadi coffee planters, 170 VRC-non-attending (VRC-NA) Meppadi coffee planters, and 170 VRC non-attending (VRC-

[4] A gram panchayat is the local self-government 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.

Table 1. Reasons for attending VRC classes

(% of VRC attendees)

Reasons	Meppadi	Thiruvaiyaru
Knowledge	73.6	59.7
Discussion/Debate	1.6	10
Informative	15.2	23
Compulsion of others	1.6	1.3
Others	8	6

Source: Primary survey

NAN) coffee planters (as control group) from the neighbouring panchayats, viz. Ambalavayal, Mooppanadu and Vaithiri. The geographic, climatic and demographic features of these neighbouring panchayats are almost similar to those of Meppadi. The control group was selected to distinguish between the effects of VRC from other related institutions like, Village Office, Panchayath Office, Agricultural Office, etc. in the region.

Results and Discussion

VRC as Knowledge Provider

The study has found that the VRCs at Meppadi and Thiruvaiyaru are acting as knowledge providers. The primary survey has revealed that 73.6 per cent of Meppadi VRC attendees and 59.7 per cent of Thiruvaiyaru VRC attendees were visiting the centre for gaining knowledge, (Table 1). A considerable number of farmers (15.2% of Meppadi VRC and 23% of Thiruvaiyaru VRC) reported the VRC classes as 'informative'.

The innovative changes in farming practices can be of two types: (i) changes in the existing farming practices, and (ii) adoption of new varieties and farming practices.

Adoption of New Varieties, Crops and Processes

The percentages of farmers who adopted new varieties, crops, and processes during 2008-09 to 2010-11 are given in Table 2. The first section of Table 2 reports the percentages of VRC attendees and non-attendees in Thiruvaiyaru and neighbouring villages who adopted new varieties of paddy during the period. The overall percentage of farmers adopting new varieties was very high for VRC attendees (89.3%), followed by non-VRC attendees (48.8%) of Thiruvaiyaru, and VRC non-attendees of neighbouring villages (40.2%). It was also found that across VRC attendees, 12.7 per cent adopted one variety, but it was 3.3 per cent each in the case of non-attendees in

Table 2. Adoption of new varieties, crops and processes in paddy cultivation in Thiruvaiyaru, 2008-11

(in per cent)

Frequency	VRC attendees in Thiruvaiyaru	VRC non-attendees in Thiruvaiyaru	VRC non-attendees in neighbouring villages
		New varieties (%)	
1	12.7	3.3	3.3
2	32	24.6	9.5
3	39.3	19.1	20
4	5.3	1.8	7.4
Total	89.3	48.8	40.2
		New crops (%)	
1	17.7	15.8	16.8
2	6.7	5.4	3.8
3	4.3	-	-
Total	28.7	21.2	21.6
		New process (%)	
1	39.3	18.2	26
2	12	0.8	0.8
3	3.3	0.8	0.8
Total	55.2	19.8	27.6

Source: Primary survey

Thiruvaiyaru and neighbouring villages. About 32.0 per cent adopted two varieties, 39.3 per cent adopted three varieties and only 5.3 per cent adopted four variables. The pattern of adoption of number of varieties across non-VRC attendees in Thiruvaiyaru and in the neighbouring village was almost same. However, there were huge differences in the adoption of varieties across the groups. The variety adoption of VRC attendees was nearly two-fold than that of VRC non-attendees in the two regions.

In Thiruvaiyaru, the farmers were using the paddy variety IR 36. Because of its low resistance power and incidence of pest diseases, coupled with the influence of VRC, most of the farmers shifted to the variety IR 43, which has good resistance power to pests and climatic changes. However, some farmers still cultivate the old variety, which according to them provides more straw than the new variety. They also opined that despite not getting irrigation facilities properly, they could acquire reasonably good output from the old variety.

The second section of Table 2 reports the percentages of farmers from all the three groups who had adopted new crops during 2008-09 to 2010-11. The ratios are reported for three frequency classes, viz, adoption of one, two or three new crops, and finally the overall new crop adoption. Whist 28.7 per cent of Thiruvaiyaru VRC attendees adopted new crops, 21.2 per cent, and 21.6 per cent of VRC non-attendees in Thiruvaiyaru and neighbouring villages, respectively adopted new crops during the period. The disparity in attitude towards innovation is also evident from the adoption of new processes. While 55.2 per cent of VRC attendees could make innovative changes in the farming process during 2008-09 to 2010-11, it was only 19.8 per cent and 27.6 per cent in the case of VRC non-attendees in the Thiruvaiyaru and in neighbouring villages. This highlights the importance of VRC that serves as a platform which links the rural farmers with universities/research institutions, and also helps in establishing subsequent linkages among farmers. Accordingly sixty six per cent of the VRC attendees in Thiruvaiyaru reported that their association with the VRC helped them to introduce innovations. Moreover, VRC attendees, as a group, influence other farmers to learn or imitate, innovations in farming

Improvements in Existing Variety and Processes

The changes in farming practices include changes in the existing farming practices and adoption of new varieties and farming practices. Table 3 shows the changes adopted by three groups in existing farming practices during the past three years. The changes were further classified into (i) new to the farmers, and (ii) new to the region, in which, innovations new to the region were considered as primary incremental innovations rather than mere imitations. The data showed that only a small percentage of sample farmers had undertaken innovative changes during the period. However, one perturbing fact is that the percentage of changes from VRC attendees is relatively lower than VRC non-attendees. This is true for all the three frequency classes.

VRC as a Skill Provider

Improvement in Farmers' Skills

In Meppadi, 83.6 per cent of VRC attendees reported improvements in their skills, the main one

Table 3. Improvements in existing variety or process

(in per cent)

Frequency	VRC attendees in Thiruvaiyaru	VRC non-attendees in Thiruvaiyaru	VRC non-attendees in neighbouring villages
		New to planter	
1	4	4.6	4.9
2	2	2.3	-
3	2	4.5	2.4
		New to region	
1	1.2	-	0.8
2	-	0.8	-

Source: Primary survey

Table 4. Improvement in framers' skills in Meppadi and Thiruvaiyaru districts

(in per cent)

S. No.	Skill	Meppadi			Thiruvaiyaru		
		VRC attendees	VRC non-attendees	Neighbouring villagers	VRC attendees	VRC non-attendees	Neighbouring villagers
1.	Training	42.9	15.1	13.8	16.6	6.9	15.4
2.	Leadership building	16.5	17.1	36.5	13.7	3.9	3.2
3.	bility to articulate needs	6	4.4	1.8	5.4		3.2
4.	Fight against social Evils	2.1	-	4.8	2.1		0.8
5.	Agricultural production	2.5	1.8	-			
	1 & 2 together	7.1	2.2	-	1.4	0.8	0.8
	1 & 3 together	3.6	3.4	-			
	2 & 4 together	2.9	3.4	-			
	Total	83.6	47.4	56.9	39.2	11.6	23.4

Source: Primary survey

being of training and leadership quality. About 42.9 per cent of VRC attendees got training, 16.5 per cent improved leadership quality and 7.1 per cent gained through both training and leadership quality. About 6 per cent could convey their needs, 2.1 per cent got ability to oppose social evils and 2.5 per cent got specific skills in agriculture as a result of association with VRC.

In the case of VRC non-attendees in Meppadi, 15.1 per cent got training, 17.1 per cent reported improvement in leadership quality, 2.2 per cent got both training and leadership quality, 4.4 per cent got ability to convey their needs, 3.4 per cent had both training and ability to convey their needs, 3.4 per cent informed improvements in both leadership quality and ability to oppose social evils, 5.1 per cent reported improvements in leadership quality as well as got information regarding agricultural production. Among the farmers from neighbouring villages, 36.5 per cent reported improvement in their leadership quality, 13.8 per cent got training, 4.8 per cent got ability to oppose social evils and only 1.8 per cent could convey their needs.

In Thiruvaiyaru, among the different facets of skill improvement, the main one was training and leadership quality. About 16.6 per cent of VRC attendees got training, 13.7 per cent improved leadership quality and 1.4 per cent gained through both training and leadership quality, 5.4 per cent gained ability to articulate their needs, and 2.1 per cent acquired ability to fight against social evils.

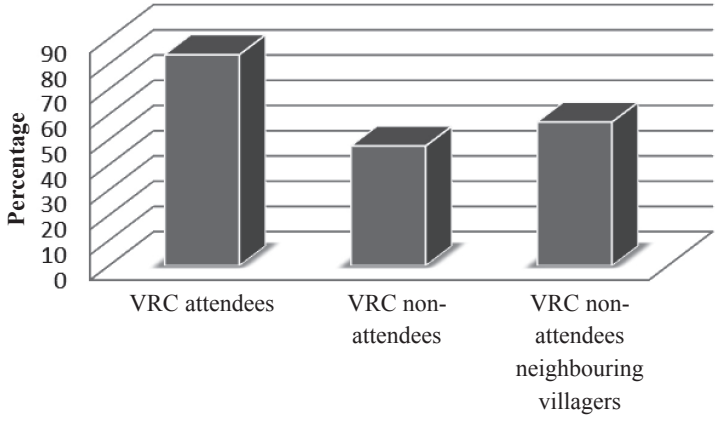

Figure 1. Capabilities/skills enhancement in Meppadi, 2008-09 to 2010-11
Source: Primary survey

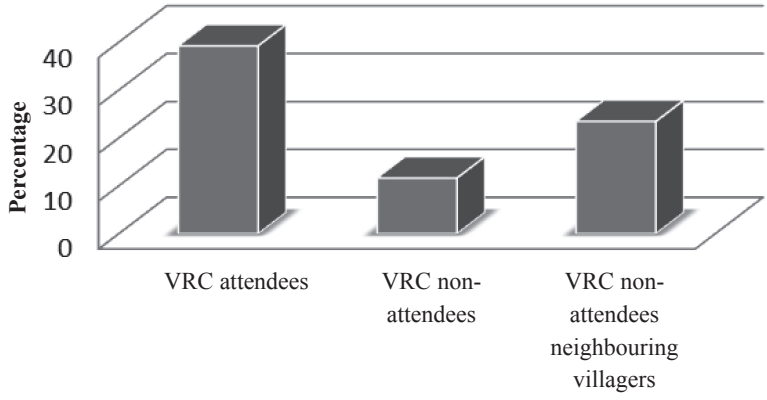

Figure 2. Capabilities/skills enhancement in Thiruvaiyaru 2008-09 to 2010-11
Source: Primary survey

In the case of VRC non-attendees in Thiruvaiyaru, 6.9 per cent got training, 3.9 per cent improved leadership quality and 0.8 per cent gained through both training and leadership quality. Among the farmers from neighbouring villages, 15.4 per cent got training, 3.2 per cent reported improvement in their leadership quality, 3.2 per cent gained the ability to articulate their needs. 0.8 per cent reported improvements in both leadership quality and training, and 0.8 per cent got ability to oppose social evils. The overall improvements in capability/skill enhancement among VRC-attendees, VRC non-attendees and farmers from neighbouring villages are depicted in Figure 1 for Meppadi and in Figure 2 for Thiruvaiyaru.

Conclusions

This study has examined the role of a Village Resource Centre as a knowledge provider and capability builder so as to adopt innovations at the rural level. For study, two VRCs were selected, one at Meppadi and the other at Thiruvaiyaru. The Thiruvaiyaru VRC is run by an NGO (MSSRF) in association with ISRO, and is the first VRC in the country. Here, paddy was selected for the study. During the survey, about 66 per cent of VRC attendees reported a VRC to be the principal source for knowledge and supporting institution for innovation, whether it was radical or incremental. The VRC non-attendees who did not have any other institutional support were found dependent primarily on indigenous knowledge to bring about any improvement or change in farming practices. On the other hand, VRC-attendees were relatively less dependent on indigenous knowledge. The study has shown that adoption of innovative changes in the existing farming practices was very small across all the three categories of farmers and the adoption was still lower in VRC non-attendees. It showed that the association of farmers with VRC was moving them to adoption new varieties, crops and techniques rather than trying to improve the existing techniques. This signifies that Thiruvaiyaru VRC has enabled the farmers to produce new (even radical) innovations rather than incremental innovations. This study has also found that VRC attendees spend almost one-third of their outlay for new processes. All these findings highlight the importance of VRC, which serves as a platform that links the rural farmers with universities/ research institutions, and also helps to establish subsequent linkages among the farmers.

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