Chapter 10

Technology Application, Refinement and Transfer through Farm Science Centres in India

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Introduction

India has made considerable progress in improving its food security. The agricultural development strategy pursued in the country, particularly since the mid-sixties, is recognized and appreciated world over. The integration of agricultural research with quality education and a properly planned extension education system has been one of the fundamental foundations of this developmental strategy, which also led to revolutions in many other sectors of agriculture and allied enterprises. As a part of this strategy, several programmes of transfer of technology from research stations to farmers' fields were launched in the country. These included National Demonstration Project, Lab to Land Programme, Operational Research Project and Krishi Vigyan Kendras (Farm Science Centers). The programmes were continuously reviewed from time to time and reformulated for their effectiveness. Presently the Krishi Vigyan Kendras (KVKs) have been recognized as an effective link between agricultural research and extension system in the country (Venkatasubramanian*et. al.*, 2009).

Krishi Vigyan Kendras (Farm Science Centers), an innovative science-based institution, were established in India mainly to impart vocational skill training to the farmers and field-level extension workers. The concept of vocational training in agriculture through KVK grew substantially due to greater demand for improved/agricultural technology by the farmers. The farmers require not only knowledge and understanding of the intricacy of technologies, but also progressively more and more skills in various complex agricultural operations for adoption on their farms. The effectiveness of the KVK was further enhanced by adding the activities related to on-farm testing and front-line demonstrations on major agricultural technologies.

With the consolidation of other front-line extension projects of the Council during the Eighth Five Year Plan, such as National Demonstration Project (NDP), Operational Research Project (ORP), Lab to Land Programme (LLP) and All India Coordinated Project on Scheduled Caste/Tribe, the mandate was enlarged and revised to take up on-farm testing, long term vocational training, in service training for grass root extension workers and front-line demonstrations on major cereal, oilseed and pulse crops and other enterprises. The application of technology in the farmers' field is achieved through conducting of On-farm trial which include technology assessment and refinement. The proven and recommended technologies are then introduced in the system through conducting of frontline demonstrations followed by training programmes to empower the farmers, field extension personnel and rural youths for its adoption. The extension activities such as field day, exhibitions etc are conducted to disseminate the technologies across the system.

The KVKs have witnessed several changes in their functions over the years. Accordingly their functional definition also has radically got refined so as to meet the new challenges in agriculture."KVKs are grass root level organizations meant for application of technology through assessment, refinement and demonstration of proven technologies under different 'micro farming' situations in a district" (Das, 2007).As of January, 2020, 716 Krishi Vigyan Kendras were operating in 732 districts of India (ICAR, 2020).

It should be clearly understood that transfer of technology is not a primary function of KVKs and the same is the responsibility of State departments. The KVKs on the other hand will assess (and if needed refine also) the newly released technologies, demonstrate the proven ones and train farmers and extension workers of the district on the same.

Role of KVKs in the context of Agricultural/Fisheries Extension in India Extension in India is largely deployed by government, implemented mainly through government institutions and to some extent through non-government agencies. Krishi Vigyan Kendras (KVKs) or Farm Science Centres as institutes of inducing behavioural change, are being managed by both government and non-government organizations. Literally, Krishi Vigyan Kendras have to serve as repository of scientific knowledge that is useful to the entire district, which is its jurisdiction. In India, agricultural/fisheries extension and extension education are interchangeably used with the same connotation as used in American tradition, meaning "Extending Information" as a means of educating people to solve their problems. As a result, agricultural/fisheries extension in India is more of "Informative Extension" than "Emancipatory Extension".

In India, the extension efforts, particularly transfer of technology efforts, have largely been taken up by the state departments of agriculture and other disciplines as a state subject. The Indian Council of Agricultural Research (ICAR) as the apex body to provide new technologies in agriculture and allied aspects has its own transfer of technology activities too. The extension efforts of ICAR have evolved through National Demonstration Projects, Operation Research Projects, Lab to Land Programmes, and integrating of these approaches to Krishi Vigyan Kendras (KVKs) since 1974.

Technology and farm technology

Technology is any systematic knowledge and action applicable to any recurrent activity. Technology involves application of science and knowledge to practical use, which enable man to live more comfortably. The Merriam-Webster dictionary offers a definition of the term: "the practical application of knowledge especially in a particular area" and "a capability given by the practical application of knowledge".

Technology can be most broadly defined as the entities, both material and immaterial, created by the application of mental and physical effort in order to achieve some value. In agriculture/fisheries, the term technology often confuses practitioners. This is because farm technology is a complex blend of materials, processes and knowledge. Swanson (1997) has classified farm technologies into two major categories:1) Material technology, where knowledge is embodied into a technological product; and2) Knowledge based technology, such as the technical knowledge, management skills and other processes that farmers need for better farm management and livelihood support.

KVK scientists need to have clarity over the technologies which they are assessing and refining in response to a specific problem in a specific micro-location. For example, a KVK Subject Matter Specialist may be assessing the efficacy of a particular management practice on a crop/fish's yield or growth in the KVK district. Such management practices can be broadly classified as Knowledge based technology. Alternatively, all technological products tested and demonstrated under OFT and FLD fall under material technology. Ex: Seeds/fish seeds, pesticides, fertilizer, farm machinery, irrigation systems etc.

Agricultural/ Fishery Technology Development

Technology Development (also called technology innovation) in agriculture/fisheryis a process consisting of all the decision and activities which a scientist does from recognition of a need/ problem with planning, testing, conducting research, verification, testing and dissemination for adoption. During the same time, some problems on the technology might get back to the scientist for solution thus resulting in refinement of the same. Thus, technology development is a continuous process. The KVK scientists have to equip themselves for 'technology application' - a process which includes the above mentioned processes; thus contributing their part in the overall process of agricultural/fisherytechnology development.

Agricultural/Fishery Technology Management

Technology management can be defined as the integrated planning, design, optimization, operation and control of technological products, processes and services. A better definition would be "the management of the use of any technology for farmer advantage." The KVK role under fishery technology management is very huge where-in it selects latest fisheries technologies, tests them for suitability in different micro-locations of the district and demonstrates the proven ones to farmers and extension system.

Technology fatigue in agriculture/fishery

Linkages between the laboratory and farmer fields have weakened and extension services often have little to extend by way of specific information and advice on the basis of location, time and farming system. Good quality seeds at affordable prices are in short supply and spurious pesticides and bio-fertilizers are being sold in the absence of effective quality control systems. Farmers have no way of getting proactive advice on land use, based on meteorological and marketing factors. No wonder the prevailing gap between potential and actual yields, even with technologies currently available, is very wide (National Commission on Farmers, 2007). In case of KVKs, it was found utilizing old and obsolete technologies for OFTs, FLDs and training programmes thus resulting in poor feed-forward to the extension system. A knowledge deficit as mentioned above coupled with the usage of obsolete technologies and package of practices together leads to a situation called 'technology fatigue'. Indian agriculture, particularly agriculture/fishery by resource poor farmers in rural areas is now bearing the brunt of technology fatigue. The KVK role lies in providing timely supply of proven technologies specific to various micro-locations of the district thus alleviating the technology fatigue existing in the district.

Technology Gap

Technology Gap is the gap between the level of recommendation and the extent of adoption (against recommendations). Technology gaps are a major source of concern for extension system. The successes of traditional transfer of technology (TOT) models were mainly evaluated on the basis of the extent of narrowing down in technology gaps achieved by them. KVK system being primarily focused on assessment, refinement and demonstration of new technologies, its role lies in feeding proven technologies to the main extension system. Thus, the primary focus of KVK should not be mistaken as reduction of existing technology gaps. Rather, they are meant at alleviating "technology fatigue" by providing timely supply of proven technologies specific to various micro-locations of the district. Alleviation of technology fatigue is accomplished through processes of technology and methodology backstopping.

Agricultural/Fishery Technology backstopping

Backstopping refers to any precaution taken against an emergency condition. Accordingly, agricultural technology backstopping can be defined as any technology precaution taken to combat technology fatigue in agriculture. In simple terms agricultural technology backstopping is the process of making available ready to use technologies for farm families through assessment, refinement and demonstration processes in order to combat the existing/forecasted technology fatigue.

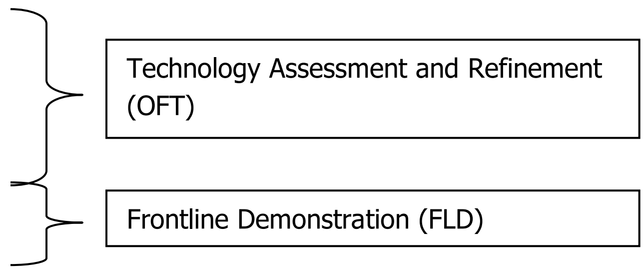
Agricultural Methodology backstopping

This is a process almost similar to agricultural technology backstopping but differs with respect to the kind of technology solution offered. Instead of material technology, methodology backstopping aims at assessment, refinement and demonstration of knowledge based technologies often referred to as methodologies/package of practices. It provides detailed procedures to carry out the technology application functions by the extension personnel in the field. It includes methodologies for conducting OFT, which includes TAR, demonstrations, training, conducting surveys, impact assessment and evaluation etc.

Conceptual paradigm of Agricultural/Fishery Technology Development

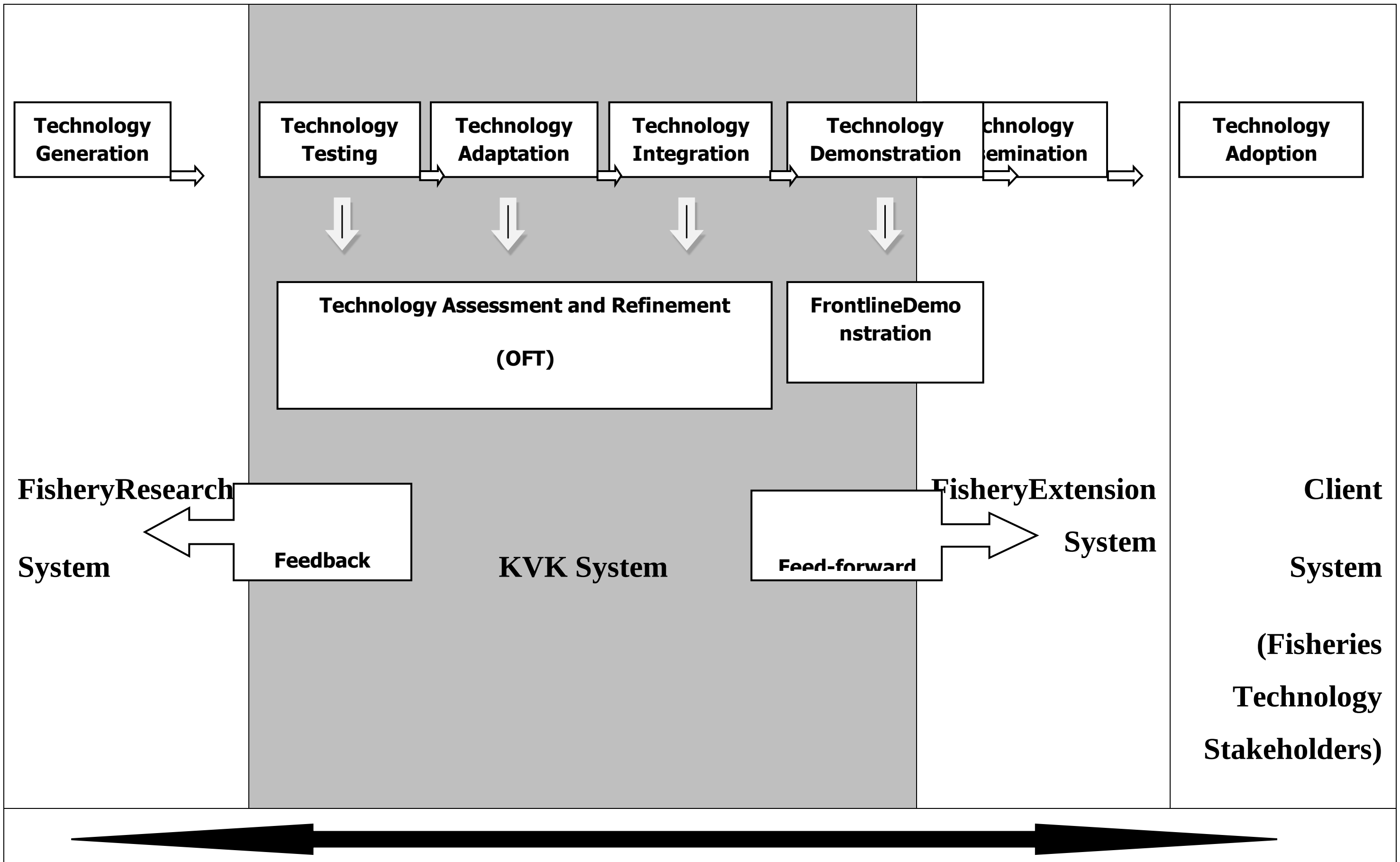
Understanding technology development process in agriculture/fishery and its components is vital for success of KVK scientists. Farm technology development basically constitutes seven processes. They are:

1. Technology generation
2. Technology testing
3. Technology adaptation
4. Technology integration
5. Technology demonstration
6. Technology dissemination
7. Technology adoption



Technology generation, the starting point of technology development process is mainly a function of agricultural research system. Testing, adaptation and integration processes constitute technology assessment and refinement which KVK system executes through OFTs. The feedback is passed over to research system. KVK system also involves in technology demonstration through FLDs. Feed-forward from successful OFTs and FLDs is communicated to the extension system for mass popularization in the district. Technology adoption; the final act, occurs among the members of client system i.e. farmers.

We are presenting a new conceptual model of fishery technology development process depicting the various components and actors involved for the benefit of fisheries technology stakeholders. The role of KVK system between research system and extension system with respect to technology application is identified and highlighted here.Research system generates new technologies. In India, research system comprises of ICAR institutes, SAUs, Fishery Universities, departments like DBT, DST, other Science and Technology Institutions and Commodity boards. NGOs, Corporate and farmer innovators also contribute to technology generation.Extension system comprises of State departments of agriculture, animal husbandry and veterinary, fisheries, sericulture etc. SAUs, ICAR institutes, commodity boards, NGOs and Corporate sector also contribute to extension system.Earlier, due to the primary focus on vocational training, KVKs were categorized under extension system itself. But today, with mandates being focused on assessment, refinement and demonstration of frontier technologies, the KVK system positions itself clearly between the research and extension systems thus acting both as a feedback and feed-forward mechanism. In this paradigm, it is necessary to understand the pathways or passage of technology through KVK system.



A Conceptual model for Fisheries Technology Development Process *(Sajeev, 2020)*

Typology of technology passage through KVK system

KVK system has successfully established itself between the research and extension systems. Technology development process as explained earlier, invariably has assessment, refinement and demonstration components. Hence, there is a passage of technologies through various stages in a KVK system. We found that this passage doesn't follow a uniform pattern. For example, a technology may go through assessment stage and demonstration stage but not through refinement stage. Based on analysis of OFTs and FLDs conducted by KVKs, we identified five different typologies of technology passage through KVK system. A proper understanding of these typologies will help KVK personnel in deciding whether a particular technology has to go for OFT and FLDs or both. The typologies are:

1. **Source - Demonstration**

In this type the technology from any source/provider directly goes to demonstration by KVK. This happens when the KVK is completely sure that the technology is fully suited for the district and can go directly for FLD. Here, the technology doesn't pass through assessment and refinement stages.

2. **Source - Assessment**

In this type the technology from any source/provider goes for assessment by KVK. This happens when the KVK is not sure that the technology is fully suited for different micro-locations of the district. Here the technology fails at assessment stage itself and hence doesn't move to refinement or demonstration stages.

3. **Source - Assessment - Refinement**

This type is a variation of type 2. Here, the KVK is not sure that the technology is fully suited for different micro-locations of the district. The technology goes for and succeeds in assessment but needs refinement and hence moves to refinement stage. Here, the technology fails in refinement stage and hence doesn't move to demonstration stage.

4. **Source - Assessment - Demonstration**

This type follows type 3. This happens when the KVK becomes sure that the technology is fully suited for different micro-locations of the district. The technology fully succeeds in assessment and hence moves to demonstration stage. Here, the technology doesn't require refinement and hence move to demonstration stage.

5. **Source - Assessment - Refinement - Demonstration**

This type also follows type 3. This happens when the KVK becomes sure that the technology is fully suited for different micro-locations of the district. The technology succeeds in assessment and refinement and moves to demonstration stage. Here, the technology is successfully refined by KVK and taken to demonstration stage i.e. FLD.

FLDs are supposed to be taken up on proven technologies only. Hence, it makes obvious that once demonstrated it will go to the extension system and client system. Rarely FLDs may fail thus preventing the technology passage. But KVKs are not supposed to demonstrate such technologies which are not fully proven. The failure of FLD can be due to some extraneous factors rather than technological factors.

Client system comprises of the ultimate end-user i.e. the fish farmer/fishery technology stakeholder. Although KVK system does assessment, refinement and demonstration of new technologies as part of technology development process, some technologies get refined or rejected even in the last stage at farm/user level. Hence, client system even though being the final actor in technology development process, plays the ultimate decisive role.

Conceptual paradigm for Technology Assessment and Refinement in agriculture/fisheries

Technology Assessment and Refinement (TAR)in agriculture refers to a set of procedures whose purpose is to develop recommendations for a particular agro-climatic situation/ location through assessment and refinement of recently released technology through farmer participatory approach. It refers to the process or a set of activities before taking up new scientific information for its dissemination in a new production system. *OFTs conducted by KVKs are based on this concept and thus distinguish it from agronomic and research trials*. The process of TAR has three components. They are technology testing, technology adaptation and technology integration. TAR should be site specific, holistic, farmer participatory, providing technical solution to existing problems, inter-disciplinary and Interactive.

This process involves Scientist-Farmer linkage in terms of sufficient understanding of the farming situations, adequate perception of farmers' circumstances and their needs, the variability of conditions on the research status as compared to farmers' fields and problem orientation instead of disciplinary approach.Thus, Technology assessment in agriculture by KVKs should be understood as the study and evaluation of new technologies under different micro locations. It is based on the conviction that new discoveries by the researchers are relevant for the farming systems at large, and that technological progress can never be free of implications. Also, technology assessment recognizes the fact that scientists at research stations normally are not trained field level workers themselves and accordingly ought to be very careful while passing positive judgments on the field level implications of their own, or their organization's new findings or technologies. Considering the above factors, the ICAR has envisaged On Farm Trials (OFTs) through its vast network of KVKs covering almost the entire geographical area of the country (Anon, 1999).

On Farm Trials (OFTs)

An On-Farm Trial aims at testing a new technology or an idea in farmer's fields, under farmers' conditions and management, by using farmer's own practice as control. It should help to develop innovations consistent with farmer's circumstances, compatible with the actual farming system and corresponding to farmer's goals and preferences.On-farm-trial is not identical to a demonstration plot, which aims at showing farmers a technology of which researchers and extension agents are sure that it works in the area. *It should be noted that OFTs are strictly to be conducted in collaborating farmer fields and not in KVK land.*

Stakeholders of On-farm trials

There are various stakeholders in an on-farm trial. Understanding them and their roles can help KVKs to develop better OFTs. The stakeholders are:

1. The farmers who are the clients for the out-coming results,
2. The SMS who should help the farmers to overcome their problems and improve their economical situation. On farm trials can give them valuable information in this respect.
3. The Scientist who needs to apply promising on-station results under farmers' conditions before releasing the technology to the extension service,

4. The extension system and government itself, who is interested in seeing an efficient and participatory technology development model evolving, since most top-down approaches have failed miserably.

Typology of On Farm Trials

We can distinguish three types of OFTs in India according to the stakeholder who is going to take the lead role:

- **Type 1, Research driven:** Research system designed and managed (with the assistance of extension)

- **Type 2, Extension driven:** Extension System or KVK system designed and managed by farmers

- **Type 3, Farmer/User driven:** Farmers/user designed and managed, with the assistance of Extension system/KVK system.

Type 1. Research driven

Rationale:

Research has shown promising results in on station trials. Now the concerned researcher wants to evaluate the new technology in multi location as the on station trial does not represent the wide range of conditions (e.g. soil fertility, weed flora, altitude, rainfall, farmers' conditions).

Objective:

Assess the performance of the new technology under various conditions and test the acceptability by farmers.

Particular characteristics:

The trial is usually planned in advance and included in the annual work-plan of either research or extension. Objective and layout of the trial is thoroughly discussed by the researcher with the Institute/Division head and the respective Extension agency. Here,

a. Extension agency involved helps to locate suitable fields
b. Usually plots are of small size
c. Researchers design and manage the trials with the help of extension agencies
d. If necessary, researchers furnish inputs and may exceptionally hire labour
e. Trails are used for the purpose of field day

Outputs:

Information on the performance of new technology under various conditions; information on the acceptability by farmers and interesting positive results are published in various journals.

Type 2. Extension driven

Extension driven OFTs should not be confused as to only extension system managed. The OFTs by KVKs also fall under this type since the whole purpose of OFTs by KVKs is to give feed-forward to the extension system.

Rationale:

Type 1 trials have confirmed that the new technology will work in farmers' conditions; therefore SMS plan to implement the trial on a wider scale with active involvement of the farmers. Researchers are interested in getting the information on both biophysical and farmers assessment of the technology. KVK and SMS have developed their own ideas how to improve aspects of the new technology. They want to try it out in real farm situation.

Objectives:

a. Assess the biophysical performance of a new technology in a wide range of micro-locations within the district,
b. Obtain the farmers viewpoint about the technology,
c. Assess cost/benefit ratio.

Particular Characteristics:

a. Interest of farmer having the trial on his land must be ascertained. Objective must be very well understood by farmers,
b. SMS discuss their ideas with PC and researchers
c. SMS determines on the design and provides instruction
d. Plots are often larger than in type 1
e. Farmers' assessment of the result is essential
f. Scope for refinement after assessment
g. Feed back of the results to research and
h. Feedforward of successful technologies to extension system

Outputs:

a. Farmers' reaction on technology, on management requirement and economical sustainability of the technology.
b. Feedback for the design of new future trials and
c. Compilation of a large number of similar trials will give fairly reliable data on performance over a broad range of farm types and circumstances.

Type 3. Farmer/user driven

Toughest of all types, yet the most sought after one. It involves Participatory Technology Development thus contributing to sustainability of results. The KVKs are also expected to bring their OFTs to this level from being an extension driven one at present.

Rationale:

a. Farmers are aware of a given technology, they like what they see and would like to experiment it by themselves.
b. Farmers are aware of a problem and would try some methods to solve them and
c. Researchers want to know to which extent and how a technology is adapted by farmers

Objectives:

a. To study how farmers adapt and adopt technologies,
b. To investigate what factors affect the performance of technology,
c. Provide on station researchers with feed back on problems at farm level and provide new research issues and
d. Participatory technology development

Particular Characteristics:

a. Farmers identify problems and choose from menu of technologies.
b. Farmers decide to choose the technologies and modify them to fit their particular farming system. Control plots are not really necessary unless the farmer decides to have one
c. High level of participation and self mobilization
d. Feed back of the results to research and other interested entities
e. Feed-forward to other farmers.

Outputs:

a. SMS document the farmers' decisions, preference and the management strategies.
b. Information is collected on the uptake of the new technology by fellow farmers.
c. Feedback to researchers on technology performance and on further research needs

Points to consider:

a. It is not wise to force collection of the biophysical data (yield, climate, and soil fertility) in type 3 because of too many confusing factors.
b. Constant monitoring, recording of farmers' comments is necessary.
c. Encourage farmer to take some notes himself (inputs, yield etc.)
d. Self-diffusion of the technology needs to be monitored (e.g. seed distributed to neighbours, area expansion etc) and
e. Socio-economic data should be collected.

KVKs have to spend considerable time and efforts in planning and implementing OFTs. The basic principles of conducting successful OFTs are to be followed in this process. The principles are:

1. *Define a clear question you would like to have an answer for:*

Narrow the trial down to its simplest form; define a clear simple question to which the OFT should give an answer.

2. *Keep it simple:*
   Limit the trial to a comparison of two (or maximum three) treatments.

3. *Go step by step:*
   Farmers usually do not adopt entire new systems of production; they go step-by-step adapting components of the technology. Therefore the OFT should not include too many new steps/practices at once.

4. *Seek help:*
   When the problem is clear and the idea on how to go about the trial has evolved, the SMS should contact a competent researcher to discuss the plan of the OFT. He/Shecan also take help from other SMS and PC of the KVK.

5. *Replicate and randomize*
   Plan on enough field space (in farmers' field) to do more than one strip of each treatment being tested. Mix treatments within blocks.

6. *Stay uniform:*
   Treat all the plots exactly the same except for the differing treatments. If possible, locate the experiment in a field of uniform soil type (slope, fertility etc.).

7. *Harvest individual plots:*
   Record data from each individual plot separately. Do not lump all treatment types together or the value of replication will be lost.

8. *Remain objective:*
   The results may not turn out as expected or planned. Be prepared to accept and learn from negative results. Negative results show that the technology under testing is not suitable in the present form for the specific micro-location of the district. Such results are equally valuable for the benefit of farming systems at large.

9. *Manage time wisely:*
   Expect to devote extra time to OFT during busy seasons. Make sure to can carry out the trial even though busy, or get extra help from other SMS.

The success of an OFT should not be confused with success of the technology tested. A negative result of a technology tested shows that the technology is not suited for the specific micro-location of the district. This finding also refers to the success of the trial. Some technologies may not need refinement thus qualifying directly for frontline demonstrations. Some may successfully undergo refinement and reach the demonstration stage while some technologies fail to get refined in the farmer field. The technologies which successfully come out of On Farm Trials are then recommended for Frontline Demonstrations (FLDs).

A study conducted by National Institute of Labour Economics Research and Development during 2015 on impact of KVKs on dissemination of improved practices and technologies revealed that KVKs are having an edge over other organizations in providing technology services by virtue of their having better technical expertise and demonstration units. At national level, on an average each KVK covers 43 villages and 4,300 farmers, and it organize more field level activities than on campus activities. About 25% of the persons trained by KVKs onagri-preneurship had started self-employment venture.

Krishi Vigyan Kendra Knowledge Network Portal

Krishi Vigyan Kendra Knowledge Network Portal facilitates KVKs to update and upload all types of information so that the related information and knowledge can reach to the farming community in time. A KVK Mobile App for farmers has also been developed for Android users and is available in Google Play Store. Farmers need to register and select concerned KVK in the App for accessing information. Farmers can ask any farm related query to the experts of KVKs for solution.

Conclusion

With current reforms and policies, the public extension system would continue to play a prominent role in technology dissemination. The large scale of small and marginal farmers and landless labourers are benefited by the public extension system. The other players involved in extension/transfer of technologies such as NGOs, Farmers organisations, Private sector (both corporate and informal), para-workers etc. would actively complement/ supplement the effort of the public extension agency. Extension mechanism will have to be driven by farmer's needs, location specific and address diversified demands. There is room for both the public and private sectors in the development of a demand based and feedback driven system. Technologies required to address total farming systems are knowledge intensive. Public extension system will need to be redefined with focus on knowledge-based technologies to upgrade and improve the skills of the farmers.

Farmers' capacity building is often seen within the limited perspective of giving them the knowledge and skills required to practice crop and animal husbandry in a better way. Though, knowledge and skills are fundamental to efficiency in any enterprise, the Indian farmers need more than that because of the limitations and complexities under which they operate. The KVKs which have been mandated to work with farmers, farm workers and rural youth directly as well as through field extension functionaries have the greatest challenge to make their clients more efficient, specialized and to be economically active. The fact that the need for agricultural/fisheries and rural information and advisory services is to intensify in the immediate future exerts more pressure on KVK performance. This articlehas attempted to assist the extension practitioners in equipping themselves for the future challenges by providing a conceptual paradigm regarding technology assessment and refinement, the most important mandated activity assigned to them.

References

Anonymous, (1999). Krishi Vigyan Kendra: A Guide for the KVK Managers, Division of Agricultural Extension, ICAR, New Delhi – 12.

Anonymous,(2007). Report of National Commission on Farmers, retrieved from: http://krishakayog.gov.in/tor.pdf

Das, P., (2007). As quoted from: '*Proceedings of the Meeting of DDG (AE), ICAR, with Officials of State Departments, ICAR Institutes and Agricultural Universities, NRC Mithun, Jharnapani on 5th October 2007*,' Zonal Coordinating Unit, Zone – III, Barapani, Meghalaya, India.

ICAR (2020) Retrieved from: https://icar.org.in/content/krishi-vigyan-kendra

Swanson, B.E. (1997). Changing Paradigms in Technology Assessment and Transfer; Unpublished paper. Urbana, IL: University of Illinois, INTERPAKS.

Venkatasubramanian, V., Sajeev, M.V., & Singha, A.K. (2009). Concepts, Approaches and Methodologies for Technology Application and Transfer - A Resource Book for KVKs. ICAR-Zonal Project Directorate, Zone – III, Umiam, Meghalaya.

Sajeev.M.V. & V. Venkatasubramanian (2010). Technology Application through Krishi Vigyan Kendras: Conceptual Paradigm, International Journal of Extension Education, INSEE, Nagpur.Vol.6:45-54.