

Technology Transfer Modules of Punjab Agricultural University used for Agricultural Development in Punjab

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ABSTRACT

Since the foundation of the Punjab Agricultural University (PAU), practical extension work in agriculture has been undertaken besides education and research at university. Remarkable features of PAU extension system are direct assessment of farmers' needs, need-oriented research, quality training for state personnel, and a strong linkage between academic education and field practice. It has its own multidisciplinary extension team in each district in FASS and KVKs, who are engaged in adaptive research, on farm research, training, and consultancy. These extension workers are working like transmitters and receivers of experiences from researchers, farmers, and state extension workers. Regular workshops are held which unite university and department staff from research and extension together with outstanding farmers. Strength of PAU extension system is its literature where apart from regular monthly magazine, all the latest research findings are published as a "Package of Practices" for all the crops recommended for the zone in local language every year before the commencement of cropping season. Considering person-to-person communication has traditionally been the most important form of information transfer. Thus PAU has registered many commodity based clubs and training youth in large numbers, for the formidable task of disseminating useful and practical information from the research base to the rural farm families. Similarly the latest modes of communication are being exploited by providing advisory through SMS on phone and emails. Such experiences have been documented in this paper.

Key words : Technology transfer, Package of Practices, KVK, FASS, Kisan Clubs.

INTRODUCTION

Agriculture has two ways to increase its production, expanding the land area under cultivation and improving the yields on cultivated land. In early 60s, Punjab state became a harbinger of green revolution by adoption of high yielding varieties of wheat and rice. As a result the productivity increased discernibly. Better inputs coupled with development of irrigation facilities, farm mechanization, infrastructure development and policies implemented in state acted as catalyst in revolutionizing the state agriculture. Alongside, the agricultural technology development and transfer by Punjab Agricultural University (PAU) had been driving force for this development.

As an outcome of this revolution, the Punjab which represents only 1.5 per cent geographical

area of country is contributing 30-40 per cent rice and 40-50 per cent wheat to the central food grain pool. At the country level, it is producing 22 per cent wheat, 11 per cent rice, 10 per cent cotton, 37 per cent honey and 40 per cent mushroom clearly enumerating the extensive agricultural growth. The cropping intensity and irrigated area is 189 per cent and 98 per cent, respectively. Rice-wheat is the major cropping system occupying about 60 per cent of the cultivated area and producing on an average yield of 6.0 t/ha paddy and 5.1 t/ha of wheat.

Mode of Technology Dissemination Followed

The following activities were identified and implemented for efficient and effective transfer of agricultural technologies to farmers for the rapid development of agriculture in Punjab state.

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Establishment of Farm Advisory Service Scheme

Apart from development of agricultural technology, PAU has played a significant role in the dissemination of the technologies through the Farm Advisory Service Scheme (FASS) at each district head quarter . The main objective of the scheme was to acquaint the farmers about the new technologies by organizing training camps, farmers' group discussion, imparting technical know-how to the farmers by organizing the frontline demonstrations, field days, campaigns, exhibitions and to refine and assess the technologies at the cultivators' fields in the form of adaptive research trials. The multi-disciplinary teams of subject matter specialists at each FASS provided the technical support to the State Development Departments as resource persons in their training programmes.

Kisan Mela

PAU is the pioneer Institute in the country which started Kisan Melas (Farmer Fairs). The first Kisan Mela was organized at PAU campus, Ludhiana during 1967. After observing the overwhelming response of the farmers, a regional Kisan Mela was started at Regional Research Station (RRS), Gurdaspur in 1975. Later on, more number of regional kisan melas were started keeping in view the success achieved during earlier years e.g. at Regional Research Station (RRS), Ballawal Saunkhri (1983), RRS, Bathinda (1985) and KVK, Patiala (1995). Recently, two more Kisan Melas have been started, one at RRS, Faridkot (2011) and another at KVK, Amritsar (2012). These kisan melas are organized twice a year during the months of March and September. Thus, a total of 14 Kisan Melas are conducted for maximum outreach and benefit of the farmers. The kisan Mela at PAU is of two days whereas the regional melas are of one day. The demonstration plots of the crops, vegetables, fruits, farm power and machinery, improved methods of irrigation are shown on mela route along with the exhibition of latest technology generated in the different disciplines of agriculture. An impressive agro-exhibition stall is arranged comprising of machinery, tube well pumps, pesticides, fertilizers, kitchen garden appliances, Krishi Vigyan Kendras (KVKs) activities, self-help groups, banking

services, health services, legal services which attract the farmers in large number. In addition to the exhibition there is sale of quality seed, saplings, bio-fertilizers, literature in these melas. The attractive feature of the mela is question-answer session for the queries of the visiting farmers besides special technical sessions where all experts from the university pass on information regarding the improved agro-technologies to the farmers. It is worth to mention that these fairs acquaint and equip participating farmers and farmwomen with latest farm innovations, technical know-how of scientific farming and need-based agricultural-technologies. Over the years these Kisan Melas have become platform for 'knowledge sharing' where not only farmers gain new knowledge from scientists, but scientists also get valuable feedback from farmers.

Farmers' committees and clubs

It was well understood by the scientists of PAU that linking the farmers to the process of technology development by taking their feedback is vital for transfer and adoption of these technologies. Thus various committees/ farmers' clubs/associations involving progressive farmers of the state have been formulated and registered and are now functioning well.

Kisan Club:

PAU Kisan club which was registered during 1966, now has more than 3000 members from the entire State. An annual function is organized at PAU, Ludhiana and the innovative farmers are honored for their excellence in different fields.

Farmers' committee:

PAU farmers' committee was started in 1970 whereas PAU fruits and vegetables growers association came into existence during 1989. These committees registered by PAU have organized structure and meet at scheduled time. To make their meetings effective and more fruitful, the Director of Extension Education, PAU presides over such meetings.

The members of these committees meet once in a year. The member-farmers help a lot to disseminate the knowledge in the rural masses. They also provide the feedback about the success of recommended technologies, their shortcomings if noticed for further improvement.

Agricultural Equipment Manufacturers' Committee:

This committee started functioning in 1995 and meets once in every month. All the issues relating to the development and promotion of newly evolved machinery are discussed at length. These meetings serve as both "bottom up" and "top down" platform where the entrepreneurs/manufacturers take cue and guidance from university leadership and fellow farmers. Thus they have been able to develop machinery specific to farming situation and as a result, Ludhiana has become a hub of agricultural machinery catering to entire country.

Punjab Naujwan Kisan Sansthas:

Mobilizing youth for agricultural and overall community development is another phenomenon adopted by PAU for under which the Punjab Naujwan Kisan Sansthas have been established at each district head quarter. The ultimate aim of these organizations is to develop robust relationship between university and youth. The proper legislation of such clubs and associations has assured facilities and assistance to youth so that they can catalyze agriculture development.

Bee- Keepers' Association :

Commodity based farmer associations are platform where the farmers share knowledge on use of appropriate and affordable technologies for increasing their production. In this series, PAU set up a bee- keepers' association in 1991 with the aim of furthering the craft of bee-keeping and to advance education in field of bee-keeping. The Punjab state has made mark in honey production due to concerted efforts of university and KVKs in rendering training in bee-keeping. At present, there is 33,000 bee-keepers in the State and produce about 14,000 tonnes of honey which is 37 per cent of the total honey produced in the country.

Tree Grower Association:

The tree grower association came in existence during 2007. The farmers who grow timber trees either in blocks or as agro-forestry are the member of this association. Their meeting is organized once in three months. Various issues relating to forest trees are discussed in detail. The PAU

experts apprise them about the latest developments in production and protection technologies of timber trees.

Seed and Nursery Producers' Association:

The quality seed are in short supply and the PAU has taken an initiative to form the seed and nursery producers' association in 2011. The University shall supply the foundation seed to them for producing certified seed. The response of the fellow members is highly encouraging.

These associations work hand in glove with extension officers helping in establishment of strong working relation between farmers and university and make the delivery of services to rural people more channelized.

Training Programme

The effective technology transfer cannot be separated from human resource development and empowerment of farmer community is corner stone of the extension approach of university. Thus over the years university has paid attention to training component. Trainings were earlier conducted at PAU campus alone but now the transfer of skill to grass root level is carried out by KVKs. There are 20 Krishi Vigyan Kendras (KVKs) in Punjab state imparting trainings, conducting frontline demonstrations and on-farm research trials. These KVKs also organize campaigns, exhibitions, field days and celebrate technology week and special days on different occasions.

Since the inception of first KVK in 1982 at Gurdaspur, the KVKs have come long way in capacity building of farmers. The short term trainings provide improvement of knowledge and skill which helps the farmers to execute farm operations effectively while the vocational trainings aim at teaching new skills, knowledge and attitude in context of entry into new vocation. The vocational trainings are given to the farmers/farm women in different agri-based enterprises (dairy, poultry, piggery, fishery, bee-keeping, rabbitry, hybrid seed production, mushroom, kitchen gardening, tie-dye, preparation of pickle, jam, chattrni, tomato ketchup, sevian, warrian, baking, sprouting, cooking of normal and therapeutic diet, fruit and vegetable preservation,

infant feeding, recycling of old cloth, paper & kitchen wastes, stitching and embroidery, nutrition and home decoration).

At PAU, the refresher and advance training courses are organized in the field of precision farming, protected cultivation, improved methods of irrigation, queen rearing in bee-keeping, spawn production for mushroom, integrated farming system, organic farming, agro-forestry, cultivation of aromatic and medicinal plants, agro-processing, crop residue management, soil and water testing, conservation agriculture, fruit and vegetable processing, value addition, marketing intelligence, custom-hiring systems for cooperative societies, post harvest management for the quality control etc.

As networking is the key in developing agri-entrepreneurship, the university encourages and facilitates the interaction with the officials from line departments, licensing officers, credit providers by inviting them as experts in these trainings.

Frontline Demonstration

The frontline demonstrations (FLDs) are conducted by KVKs based on principle that “seeing is believing” with the purpose of creation of local proof of both the applicability and profitability of the recommended technology. This is done with the cooperation and participation of the farmers and under the personal guidance of the scientists and extension personnel. Each KVK conducts around 100 demonstrations to promote oilseeds, pulses, cotton, vegetables, integrated pest management, integrated nutrient management concepts etc. The target audience of frontline demonstrations is both farmers and the extension officers. The purpose is to convince extension functionaries and farmers together about the potentialities of technologies for further wide scale diffusion and FLDs are used as a source of generating data on factors contributing higher crop yields and constraints of production under various farming situations.

The FLDs not only help to get first hand feedback on the contributory or limiting factors for achieving the productive potential of the new technology but also prepares technical leadership in the village as the training of farmers associated with FLDs is pre-requisite of this programme.

Field Day

The field days are conducted at the demonstration plots during the different growing stages of the crop and farmers are acquainted about the technology demonstrated and discussion is made at the site. During technical sessions, the experts deliver the lectures about the improved technologies and reply to the queries of the farmers. Similarly, progressive farmer who is conducting FLD share his experience about the technology used under the FLD as well as at his own level and gave his free and frank comments to the other fellow farmers as well as to the extension workers of line departments. The field days and farmers’ group discussions are organized at FLDs sites to show the worth of the technology to the farmers.

On-Farm Trial (OFT) and Adaptive Research Trial (ART)

Linking the technology development process/research to extension and farmer has the potentials to promote agricultural production, and adoption of agricultural technologies. This concept has been well taken care of in technology transfer modules of PAU through OFTs and ARTs.

On-farm trials are conducted by the KVKs, to solve the location specific problems. This kind of research in real field conditions helps farmers to decide that what would work best for their fields. Each Subject Matter Specialist conducts two on-farm research trials in each season. These trials help to solve the problems being noticed at the cultivators’ field. On the basis of the results, the feedback is given in the research system for further improvement, if need be.

Similarly there is another testing tool used by university for testing its new technology which is through adaptive research trials (ARTs). Despite three year of testing at university, prior to bringing recommendation of technology in the state, university conducts one year trial (ARTs) at farmer fields. The objective of an adaptive trial is to predict how different varieties/management options will perform compared to each other under different environment and cropping system. This process of testing and using the information gained in a cooperative, systematic manner has been highly successful in providing viable technological options for state farmers.

Farmers' Service centre

PAU is the pioneer Institute which conceived the idea of providing all services to the farmers at single window and that too at the entrance of the University. With this in mind, the plant health clinic was established during 1993 at one of the entrances of the university where the multi-disciplinary team of experts provides diagnostic and advisory service to the farmers. Flash message/press release about the out - breaks of pests and diseases are given as an alert signal to the farmers. The blow-up depicting information about the insect-pests and diseases of different crops, vegetables, fruits, disorders on account of excessive use of chemicals, micro-nutrient deficiency, new weed biotypes emerging over time, new farm mechanization aspects also displayed so that the visiting farmers is able to relate it to the problems at his farm. Furthermore, the disease or insect samples are preserved to educate the visitors about various problems.

Additionally, the availability of improved seed, sapling, vegetable nursery, rhizobium culture, leaf colour chart, tensiometer, mushroom spawn, water testing kit, farm literature has been ensured under a single roof. The visiting farmers need not to visit the different departments for getting the reply of the problem. On the basis of the queries/plant sample diagnosed at Plant health clinic enable to give need based feed back to the research scientists to find out the solution. The final year B.Sc. Agriculture students are given practical training at Plant health clinic. The students interact with the farmers and get knowledge about the field problems.

Keeping in view the utility of this concept, this service has been started at the Krishi Vigyan Kendras with the same objective. The KVKs have been lased with all kind of basic infrastructure required for identifying the problems of visiting farmers and providing instant solutions.

Farm Literature

The production and distribution of printed material helps farmers in the transfer of new information and technologies at a faster rate than personal contacts. Printing helps in preserving the technologies in the shape of books/booklets, magazines, newspapers and brochures. According to a many studies conducted, majority of the

farmers consulted pamphlets, magazines, and newspapers for getting the information regarding crop production technologies. Farm publications have proved to be effective means for dissemination of information, especially to introduce new technologies.

Package of Practices For *Kharif* And *Rabi* Crops

PAU has fully explored this tool of technology dissemination and wide array of literature is printed by it. The farm literature in the form of package of practices for *kharif* and *rabi* crops, vegetables and fruits are published regularly. These include the entire package from sowing to harvesting covering all aspects of production, protection, improved cultivars, farm mechanization, high density planting and post harvest management. These also include the information on integrated nutrient and pest management, organic farming, use of poor quality water, rat control and complete package about bee-keeping, spraying techniques etc. In addition, the farm literature of field problems, individual agri-based enterprise bulletin/ pamphlets on protected cultivations, C.Ds of agri-based enterprise have also been developed. The farmers are showing keen interest towards farm literature. During 2002-03, the total sale was of Rs.46.1 lakhs which doubled in 2010 (Rs. 98.5 lakhs) and three time in 2011-12 (Rs. 138.4 lakhs) which clearly indicates the increase in sale asserting the faith of Punjab farmers towards the findings of PAU in documented form.

Changi kheti and Progressive farming:

Monthly magazines namely *Changi kheti* and *Progressive farming* are published regularly. The total circulation of these magazines is more than one lakh. It bears the latest knowledge for adoption to the farmers. Apart from improved technologies, the articles on the new emerging issues in agriculture like appearance of new bio-types, resistance in pests, decline in biodiversity, climate change, disappearance of farmer friendly birds/small animals, decline in water table, appearance of multi-nutrient deficiency are duly published along with their possible remedial measures for the benefit of the farmers. Another remarkable feature of these monthly magazines is calendar of farm operations for the current month and

training schedule of 20 KVKs and PAU. For the easy outreach to the farmers, farm literature is available at the office of all FASS and KVKs.

Mobile Diagnostic and Exhibition Van

The Directorate of Extension Education has taken new initiatives such as Mobile Diagnostic and exhibition van fully equipped with the literature, blow-ups and audio-visual aids. The information about the new innovations, subsidiary occupations, techniques to reduce the cost of production, crop diversification, conservation of natural resources, secondary agriculture etc. is shown through videos to the farmers and the experts accompanying the van attending queries raised by the farmers on the spot.

PAU Doots

To improve technology transfer and gather farmers' feedback, PAU has started an innovative way of deputing volunteer '*PAU Doots*' (agricultural ambassadors) in Punjab villages, which use internet for this purpose and act as bridge between farmers and experts. PAU *doot* are supplied technical know-how, information about new varieties, production and protection technology, steps to counteract the climate change on their e-mail which they convey in their

respective villages through announcements or meetings and also bring back feedback. Any farmer query conveyed to experts through *PAU Doots* is replied back within 24 hours. So far 6000 *doots* have been deputed and others are being identified. Similarly 8500 farmers have been registered at 17 KVKs and Kisan Mobile Advisory Service is being provided to them.

CONCLUSION

The technology transfer approaches described above have achieved remarkable results in terms of improvement in agriculture and impact on livelihood. Common requirement for success of these approaches is continued community development at grass root level. The PAU is constantly tuning its technology transfer modules in context of more participatory, consumer-led and market oriented reforms. As mentioned in beginning of the paper that there are two ways to increase the agriculture production; increasing area and/or productivity but as both are reaching stagnation, so PAU is now looking at a third way, i.e. shifting the product composition to higher value product through crop diversification. Through the effective technology transfer tools University will be able to replicate its first green revolution success on this front.