CHAPTER 19

Entrepreneurship Through Market-Linked Extension

THE ROLE OF INSTITUTIONAL INNOVATIONS

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Introduction

Indian agriculture has seen tremendous growth since its independence in 1947, although producing sufficient food to feed the growing population is always a challenge. Agricultural extension has played a key role in enhancing production through various services to disseminate knowledge, skills, and technologies to farmers and other stakeholders. Public and private institutions contributed immensely through innovative approaches. Their continuous support and contributions through various services to the farmers and entrepreneurs helped farmers' products compete for better prices. On the other hand, increased expenditure capacities of individuals with food purchasing power, economic growth, and increased income will further expand demands. The various challenges agriculture faces must be addressed to achieve further agricultural success.

Innovations have the potential to offer solutions as per the local needs and capacities of farming communities (Gatzweiler & von Braun, 2016). Institutions can play an important role in producing innovation-oriented, yet practical, solutions to local agricultural challenges (Payumo et al., 2017). The role of institutions and partnership has also been identified by Ganguly,

Gulati, and von Braun (2017) in their working paper on innovations spearheading the next transformations in Indian agriculture. Technological innovations can no longer be pursued separately from organizational and institutional innovations as each depends on the other. Institutional innovations are not only necessary to ensure the access and use of technological innovations but also to create an enabling environment that rewards grassroots innovators for being creative and sharing their knowledge (Gatzweiler & von Braun, 2016).

Taking into consideration the importance of institutional innovations in not only helping establish an innovator as an entrepreneur but also in enhancing the access of technology and service to a large number of end users, this chapter is an attempt to compile some of the institutional innovations to enhance the reach of technology and services. This will supplement the extension efforts of various departments. The compilation is based on the information shared and discussion held during the Joint International Conference organized by Michigan State University (MSU) Extension and National Institute of Agriculture Extension Management (MANAGE) on "Agricultural Extension and Advisory Services: Innovation to Impact" that took place February 12–14, 2019, at MANAGE, Hyderabad. India.

MSU Product Center

The MSU Product Center Food-Ag-Bio (Product Center) was established in 2003 and served its first client entrepreneurs in 2004. It is an outreach center, housed in MSU Extension, the mission of which is to support entrepreneurship in the food, agriculture, and natural resource sectors of the Michigan economy. The Product Center addresses the skill requirements of aspiring entrepreneurs by providing them with training, coaching, and technical assistance as per their needs at various stages of their own and their business' development.

The Product Center strives to build and maintain an ecosystem of support for its client entrepreneurs. At the field level, appropriately trained, certified *innovation counselors* work with the entrepreneurs. These are MSU Extension educators, who dedicate a percentage of their time to the work of the Product Center. Approximately ten innovation counselors are geographically dispersed across Michigan. Each innovation counselor works with entrepreneurs located in the Extension district they serve, but they also help entrepreneurs anywhere in the state who need their particular expertise virtually via technology. These entrepreneurs tend to be in the early stages of developing their businesses, mostly pre-venture or Stage 1. They help these clients to understand all that is involved in launching a new business, review business plans, and assist them in connecting to local and state entrepreneurship support organizations that can provide additional aid.

When the innovation counselors are unable to help a client with technical challenges, they refer the entrepreneurs to the Product Center's campus staff. This group includes individuals with expertise in nutrition, food safety, marketing, and various types of economic analysis. When the clients' needs go beyond the capability of the campus staff, they are referred to other experts available at MSU, including the many experts throughout the MSU Extension system.

The Product Center facilitates clients in having access to university resources such as specialists in the Department of Food Science and Human Nutrition; the School of Packaging; the Department of Agricultural, Food and Resource Economics; the Eli Broad College of Business; the College of Communication Arts and Sciences; the College of Law; and the Center for Regional Food Systems, among others. The Product Center and its partners have expertise on a wide range of subjects enabling it to extend support to clients all along the process of business development (see Table 19-1).

Table 19-1. Expertise and support available from the Michigan State University Product Center.

Expertise Available	Type of Support Offered
▪ Agricultural economics ▪ Market research ▪ Policy analysis ▪ Food science/food safety ▪ Nutrition ▪ Food processing ▪ Packaging ▪ Agri-food supply chain ▪ Entrepreneur/business development ▪ Economic development	▪ Business concept development ▪ Business planning ▪ Entrepreneur coaching ▪ Marketing and market research ▪ New product development and testing ▪ Packaging ▪ Labeling (nutrition facts and package design) ▪ Food safety ▪ Making connections with retailers and distributors ▪ Feasibility assessments ▪ Cooperative development services ▪ Impact assessment

An important service of the Product Center is helping food and natural resource product entrepreneurs gain access to retailers and distributors. For this purpose, the Product Center established an annual conference and marketplace tradeshow called Making It in Michigan. This one-day event offers a morning educational conference for entrepreneurs and an afternoon trade show, where they can vend their products. Retailers and distributors attend anonymously, sampling the items offered and, ultimately, entering into agreements to buy some of these to sell on grocery store shelves. The show typically attracts 150 to 200 vendors and many other entrepreneurs, prospective entrepreneurs, and members of the public.

The Product Center has also developed a facility, called the Food Processing and Innovation Center (FPIC), with equipment, infrastructure, and food safety licenses to help entrepreneurs develop and validate products and obtain consumers' feedback before making business decisions and investments. The FPIC is intended for Stage 2 and Stage 3 entrepreneurs; the former are just starting to grow via the development of new product lines, while the latter are larger companies seeking a place to work on potential products that have been stuck in the queue at their research and development facilities.

Through this process, a comprehensive system has evolved with provisions for integrating information and knowledge available from various departments and organizations and for serving entrepreneurs at all stages of the business life cycle, thereby making the entire initiative work for both emerging and growing companies. In this way, the Product Center offers a complete end-to-end solution to help new ideas to develop into full-fledged commercially sustainable enterprises.

MSU Extension's Role With Private Sector Business Incubators & Accelerators

MSU Extension, as a long-standing partner with local governments, has developed a relationship with the agriculture business incubator ACRE AgTech, an organization founded on the idea that it would develop local, marketable innovations, find investors, and ultimately, create thriving businesses. The incubator was established with funding from a local government with the intent to drive job creation while functioning as a private entity. Since the incubator's inception, MSU Extension has worked with it as an established partner, representing higher education and research-based programming. The partnership model emphasized a two-pronged approach. The first step is to conduct outreach to the agricultural community. When a local innovation is identified, MSU Extension would refer clients to ACRE AgTech. MSU Extension is uniquely poised to play this role due to the historical relationship and reputation that Extension educators have with the agriculture community. The second prong in this process is to vet the agriculture products that come into the incubator as a third party, nonbiased entity with zero vested interest in the product or innovation itself.

Successes & Challenges of the Incubator Model

The incubator model helped in identification, validation, and commercial multiplication of the technologies. The most successful aspect of the incubator model is increased visibility by the business community and county governments. The process, however, met many challenges along the way such as scarcity of local innovations, difficulty in bringing different organizations and agencies together, inconsequential differentiations of small innovations, and inconsistent funding.

For example, in Ottawa County, Michigan, a local farmer designed a small anaerobic digester. The patentable idea was digestion of any organic material in three to four days as opposed to the average 21 days. The challenge of this particular innovation was that there were no data to verify the farmer's claim of digestion in a shortened time period. The MSU Extension educator developed a lab procedure to test the project and sought $8,000 to $10,000 to duplicate the process in the lab. ACRE AgTech was not able to find an investor that was willing to pay for the lab work to be done, and therefore, the project could not move forward.

Moving to an Accelerator Model

At the end of 2018, ACRE AgTech, having learned from their challenges, shifted directions from their incubator model to an accelerator model. The basic idea of the accelerator model is to maintain a database of challenges and "wishes" that have been identified by commodity groups, processors, and farmers or growers. ACRE AgTech would then publicize those needs to the innovator community to seek potential solutions. Applicants would then

be reviewed by the business sector partners and then accepted into the accelerator program.

With the change in business model, the role of MSU Extension has also changed. An MSU Extension educator is taking on an educational role in helping ACRE AgTech clients understand Michigan agriculture. Included in this role is scheduling tours of farms and agribusinesses, providing educational programming, and providing feedback on how Michigan agriculture and ACRE AgTech clientele can work together. In August 2019, they launched their first cohort of entrepreneurs. MSU Extension plays a coaching role in ACRE AgTech's business cohort meetings. ACRE AgTech goals for this cohort are to help enrolled companies develop lasting business relationships that can lead to customer access in Michigan, position them to secure investment capital, and support the Michigan agricultural community (www.acreagtech.com/).

In summary, due to its long-standing relationship with the agriculture community in Michigan, as well as its history of delivering and supporting reputable research in support of agriculture, MSU Extension is a vital partner to include for business development and entrepreneurial support in serving this community. The relationship with ACRE AgTech is still under development and consistently changing and adapting based on new needs and lessons learned; however, it's clear moving forward that MSU Extension's voice in the business model is essential to the process.

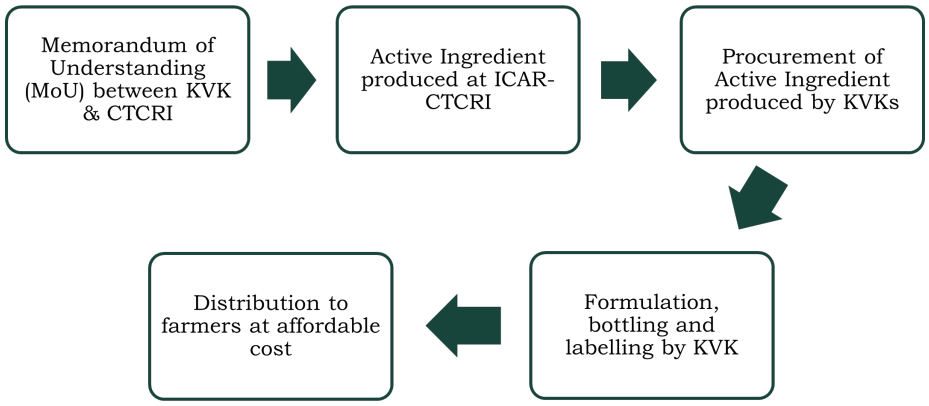
ICAR–Central Tuber Crops Research Institute

The Indian Council of Agricultural Research (ICAR) Central Tuber Crops Research Institute (CTCRI) (or ICAR–CTCRI) has adopted different institutional arrangements for the commercialization of technology in agriculture. The models are being implemented by the Intellectual Property and Technology Management Unit of CTCRI. The unit's committee, the Intellectual Property and Technology Management Committee, is responsible for making decisions related to intellectual property management as well as transfer and commercialization of technology. The first model adopted by the CTCRI addresses the challenge of developing cost-effective production and distribution networks of technology. Under the initiatives, Krishi Vigyan Kendra (KVK), an extension agency operating at the district level, is being used for manufacturing and distributing bio-inputs to farmers. Research and training are the responsibility of ICAR–CTCRI, while its multiplication and distribution at affordable prices is the responsibility of KVK (see Figure 19-1).

Some of the basic conditions for the association between ICAR–CTCRI (responsible for research and product development) and KVK (responsible for production and distribution) are:

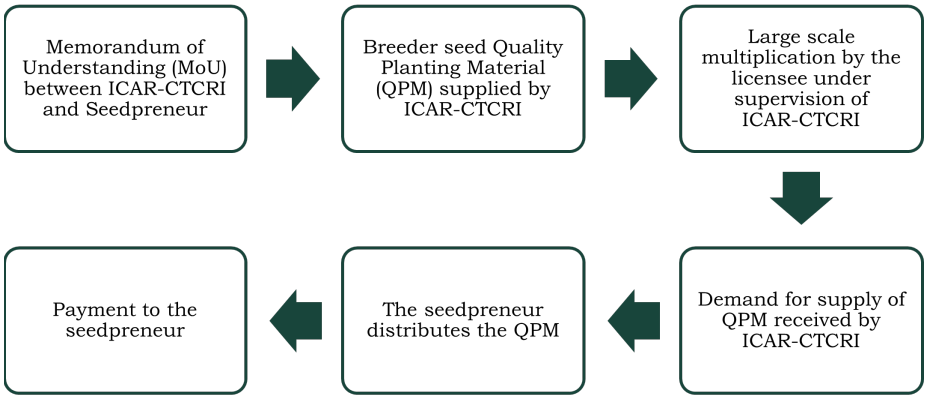
- License fee: Rs 25000 (USD $354)
- Period: five years
- Technology know-how: formulation of active ingredient

Figure 19-1. Taking biopesticides to farmers through KVK's contract manufacturing system.



Another model involves developing entrepreneurs for multiplication and distribution of the already developed and tested technology by the research institute. Most of the time, the research institutes are set up with a focus primarily on research and have a weak link for commercialization of technology. ICAR–CTCRI has successfully experimented with this model for developing a *seedpreneur* for multiplication and distribution of quality planting material developed by the research institute (see Figure 19-2).

Figure 19-2. Creating sustainable seedpreneurship for production and distribution of quality planting material through Public Private Partnership (PPP) Mode.



The terms and conditions laid down for such association are defined as under:

- License fee: Rs 25000 (USD $354)
- Period: three years
- Supply of seed materials by ICAR–CTCRI at current prices
- Field supervision arranged by seedpreneur (Based on Seed Certification Standards)
- Royalty: 1%

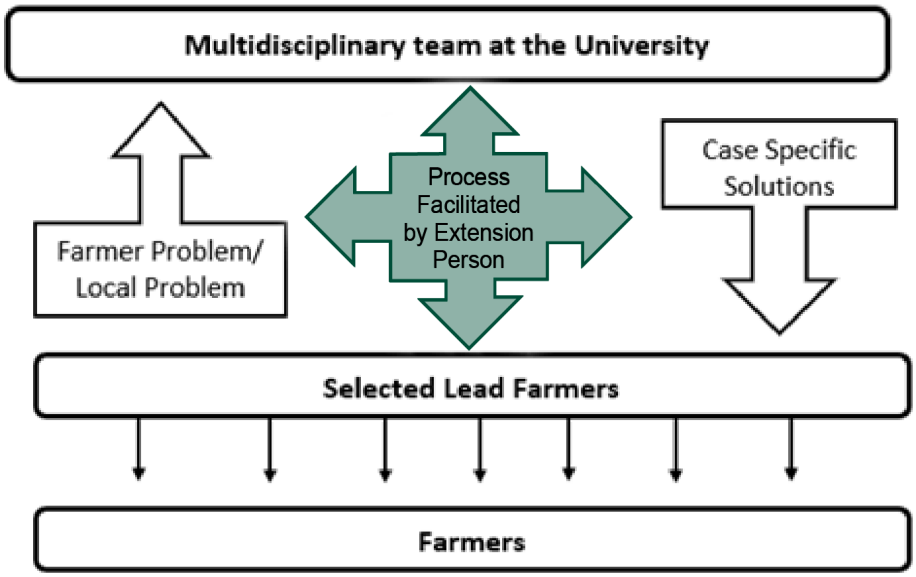
Technology Incubation Centre (TIC) is another model adopted by CTCRI with a focus on providing training and infrastructure support. The TIC provides equipment for rent for the development and testing of technologies and products before their commercialization. Village Incubation Centre, another model, offers solutions with locally available resources. The Village Incubation Centre provides local need-based training to help participants develop solutions for their local problems and optimally use the available

resources. The Multi-Institutional Collaborative Village Incubation Centre created at Riha, Manipur, India, in 2015 has 150 users from two villages, generating a revenue of Rs 25000 per year (at an average) since its inception. This center is managed by KVK, Ukhrul, Manipur. However, there was a need for scaling up with strong market linkages to make technologies profitable. The multi-level engagement with stakeholders has improved technology development and its transfer process. Such models are suitable to meet demands before a full business model is worked out.

Scientist-Farmer-Interface Programme

Kerala Agricultural University has experimented with the Scientist-Farmer-Interface Programme. The program, facilitated by the extension workers, helps in establishing an interface between scientists and selected prominent farmers to work out solutions for local problems. Under the program, the university organizes discussions to offer case-to-case solutions. There are prominent lead farmers selected from different Gram Panchayats (a village level body) under the program. These selected farmers use the platform developed for sharing information under the Scientist-Farmer-Interface for bringing their problems as well as the local problems for discussion. The multi-disciplinary team of scientists will discuss the problems shared by the lead farmers and suggest case-specific solutions. The solution emerging from the discussion is taken by these prominent lead farmers to the rest of the farmers in the locality. The model is depicted in Figure 19-3. The emphasis is on the need for using rural institutions for planning and implementation of development projects at the grassroots level. There is also a need to map the skill requirements of extension professionals in the context of grassroots-level planning and making appropriate arrangements for their training and certification.

Figure 19-3. Depiction of the Scientist-Farmer-Interface Programme.



Need for Research-Extension-Farmer Linkages

It is important to establish sound research-extension-farmer linkages in a country like India with immense potential for improvement in both quality and quantity of agricultural produce. Many farmers have not been properly reached by agricultural extension services, and the problem of poor-quality food production has been attributed to the weak linkages existing between research, extension, and farmers. Though in terms of quantity, food grains production is increasing, farmers lack in quality consciousness. Though high-yielding varieties of crops are being cultivated in India, farmers and other related stakeholders follow poor hygiene practices. This hampers the crop export potential in the international market. Further, the other limitation is the dominance of small, subsistence, and resource-poor farmers whose farm production is below the production output achieved in experimental stations and farm trials. This is due to low levels of education, inefficient farming practices, and insufficient linkages to technologies between research and production. The weak market linkages of farmers have contributed negatively to the development of demand-driven technology that could be adopted easily to actual farm situations.

In general, the agricultural research and extension system is characterized by a large number of actors in a fragmented and underdeveloped innovation system, resulting in low national and regional innovation capacities. Farmers are generally viewed as passive recipients of technology. As a result, research outputs do not reach farmers and remain shelved in research centers. Instead, research and extension need to take place within interlinked, overlapping, and interactive processes. This led to the evolution of concepts such as research-extension-farmers linkages and Market-Linked Extension in the country. Some important recommendations follow:

- The participatory technology generation approach should be used to enhance the participation of farmers in research. Feedback of the farmers regarding the new technology during the testing stage at research stations, KVKs, or at the sites where trials have been conducted should be taken in different districts.
- Participatory conduct, monitoring, and evaluation should be made mandatory for Adaptive Research Trials and extension programs to avoid wasting resources and manpower.
- A research-extension-farmer interface should be organized at block level by the KVKs twice a year with adequate representation of all sections of the farmers including small and marginal, medium, and large.
- More concentrated efforts are required in the adopted villages of the KVKs so that they become model villages. All the technologies recommended by State Agricultural Universities (SAUs), Department of Agriculture, and others should be displayed in those villages. An exposure visit of the farmers from other parts of the district should then be organized to inspire them to follow the same.
- Focus of the organizations like SAUs and the State Department of Agriculture should be shifted from production to marketing, post-harvest management, value addition, and farm-level processing. There is a pressing need to professionalize the Department of Agricultural Marketing in each state.
- Farmers should be facilitated through KVKs in gaining computer literacy and use of information and communication technology tools.

Conclusion

Globally, the governments are trying to create a conducive environment by encouraging linkages of agriculture with commercial principles, creating sufficient infrastructure to support processing and post-harvest management, and developing partnership between various players and agencies all along the value chains as per their capabilities and strengths. However, institutional innovations will play an important role in the identification and validation of technology with the potential to provide localized solutions and to take the same to end users. However, it is challenging to have an arrangement with the ability to influence the entire process of development and distribution of potential technology. The various models discussed in the previous sectors also have their own area of focus.

The MSU Product Center and models like Business Incubators and Accelerators have their focus on innovator and innovation. The strength of innovation-based models such as the MSU Product Center lies in having backward and forward linkages with appropriate institutes. The ground-level linkages established under the models in the form of innovation counselor and extension educator help in identifying the innovator and innovations, and integrate the same with the rest of the process covering development, validation, multiplication, and distribution of innovations. Although the responsibility of taking the technology to the end user lies primarily with the innovator, there are provisions to provide linkages with retailers and distributors. This helps in making the innovations available to the masses, and entrepreneurs are also able to make profits for their innovation and efforts.

In contrast, institutional arrangements made by ICAR–CTCRI focus mainly on taking the technology to the end users in partnership with an agency having ground-level-presence. The model adopted by CTCRI is about identifying the appropriate partner and sharing technology for multiplication and distribution. The model allows CTCRI to focus on its strength (research) and outsource the component of production and distribution. Under this arrangement, two agencies with their interests and strengths are coming together to efficiently deliver the technology to the end users (see Table 19-2).

Innovator-based models focus mainly on the development of innovations, while multiplication and distribution are a relatively weak link. ICAR models focus on multiplication and distribution of already developed technology to the end users. Institutional arrangements can also help farmers collaborate and learn from each other as suggested by the Scientist-Farmer-Interface of Kerala Agricultural University, which uses farmers to take the solutions to other farmers.

Recommendations

Institutional arrangements are important in identifying and developing innovations and taking developed technology or services to the end user as a solution. Some of the recommendations based on the learnings from models discussed in the previous section follow:

- Innovators need continuous handholding through the various stages of the business cycle to help them develop ideas into sustainable businesses.

Linkages with extension personnel working in the field like the innovation counselors in the case of the MSU Product Center along with forward linkages with knowledge centers may help an institute to offer an end-to-end solution to the innovators.

- Innovators will need different sets of skills at different levels of business development. The support institute needs to have a mechanism to provide appropriate training-based solutions to the innovators as required by them at different stages of business development.
- There is a need for different kinds of models for developing ideas coming from a wide range of innovators with potential to offer solutions to different target groups.
- The Extension system is required to be roped in effectively in both kind of models. In innovation-based models, extension personnel available in the field may help in identifying innovations with the potential to offer solutions to local issues. The extension system will equally be useful and effective in taking the already developed technology through multiplication and distribution.

Table 19-2. A component-wise analysis of different institutional models.

Component	MSU Product Center	Business Incubator & Accelerator	ICAR KVK	ICAR Entrepreneur
Focus	Innovator	Innovator	Technology distribution	Technology distribution
Process will revolve around	Technology, product or service development and its testing	Technology, product or service development and its testing	Identification of extension agency (KVK) and sharing technology for production and distribution	Identification of entrepreneur and sharing technology for production and distribution
Tools for achieving desired results	Training Product development Testing and validation	Identification Validation Multiplication	Agency identification MoU Multiplication and distribution	Entrepreneur identification MoU Multiplication and distribution
Structure	Three tier	Multi-agency	Partnership for endpoint access	Partnership for endpoint access
Infrastructure	Provide	Link to source	Technology only	Technology only
Ground-level link	Certified counselor	Extension educator	None	None

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