

## RESEARCH ARTICLE

# Developing Agricultural Innovations : Constraints Faced by Lead Users in Uttar Pradesh

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### ABSTRACT

*Innovations are viewed as being the major factor in agricultural growth and progress. Earlier, generating innovations and disseminating them was mainly limited to researchers but now with the passage of time, innovations are being developed by farmers as well. Farmers as lead users have a rich understanding of local resources as well as situations. They are in a better condition to identify problem and generate solutions. As users, they are developing innovations for solving various practical problems. The lead user faces a number of constraints that prevents the creation and dissemination of innovations even within a small community. The present study was conducted to highlight those major constraints faced by lead users. Uttar Pradesh was selected as locale. Based on the maximum number of lead users present, 13 districts were selected purposively from the state Uttar Pradesh. A total of 30 lead users were selected for rank analysis. Lead users were asked to rank their responses on various major heads and sub-heads. Out of different constraints economic constraints (7.16) were ranked first followed by technical (6.46), marketing (6.33), organizational (5.13) and infrastructural constraints (4.46). It was observed that farmers were keen to innovate but due to different constraints and lack of proper support system many of the innovations were at the initial stage and not commercialized. According to the results of the study, collaboration between centralized and decentralized innovation generation systems is necessary to obtain both the needed scientific validation from scientists and need-based solutions from the lead users.*

**Key words:** Lead Users; Farmers'; Innovations; Constraints.

The agriculture sector depends on innovations since they lay the groundwork for the sector's expansion and advancement. An innovation is an idea, practice, or thing that someone or the unit of adoption perceives as novel. Technology, on the other hand, is a plan for practical action that lessens the ambiguity in the cause-and-effect relationship associated with reaching a desired result (Rogers, 1995). Saad (2001) defined innovation might refer to new products like seeds or tools like hand pumps or new methods like crop rotation. The novelty need not be brand-new to the world or science; rather, it only has to be original in its application. Thus, originality and social system are the two elements of innovation.

Farmers are the users of technologies and innovations and have a rich understanding of local resources as well as situations. Their experimentation

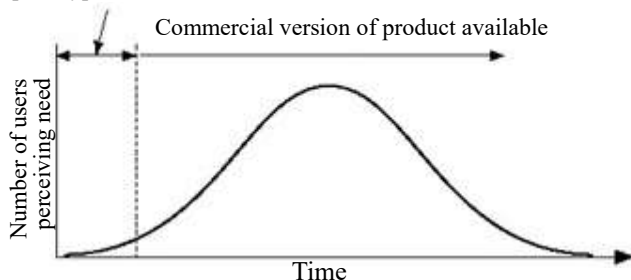
and generation of innovations can take two paths. Sometimes farmers innovate with the support of formal institutions and organizations and these are called farmer-led innovations as it involves multiple stakeholders and farmers lead the whole experimentation. Also, some farmers innovate without the support of concerned institutes and organizations and these innovations are called as farmers' innovations. Farm innovators are those who frequently try new things to address local issues and typically operate outside of established organizations (Ustyuzhantseva, 2015).

The farmer innovation is unique to a given region but not necessarily to the entire world. (Reij et al. 2001). Wu and Zhang (2013) defined farmers innovation as any technique, invention, or improvement produced by rural people to address the

complexity of their local resources and ecological, economic, and social situations. As farmers are the main users of innovations and technologies of agriculture and develop innovations continuously, they can be viewed as lead users in agriculture.

Lead users are mostly in charge of creating user-developed innovations, and they anticipate enticing rewards from these innovations.

Only lead user  
prototypes available



**Fig. 1. The Role of Lead Users in the Diffusion Process (Von Hippel, 2005)**

Agriculture sector is full of technologies and innovations. Earlier, generating innovations and disseminating them was mainly limited to researchers but now with the passage of time, innovations are being developed by farmers as well. In a particular small social system, farmers also generate innovations that are well ahead of other technologies. These innovations may be in the form of implements like combined harvester, mobile sprinkler irrigation or practices like using clay pallets for sowing paddy, in-plant germination of sugarcane, harvesting multiple varieties of mango from a single tree, etc. The defining feature of these innovations is that they are made of locally available resources and farmers' knowledge and wisdom. The cost of these innovations is low and requires less input in comparison to centralized innovations. Hence, farmer is a lead user in agriculture who develops innovations and uses it before the rest of the population, whereas the other farmers watch for innovations to happen.

The lead user faces a number of constraints that prevents the dissemination of innovations even within a small community. In a number of cases, the lead user developed innovations in agriculture is confined to lead users themselves due to their desire for getting patents for their innovations that bring likely recognition to them. This is often a long-drawn process. Thus, several lead users wait for the patenting process to be completed before dissemination which hinders the dissemination of these innovations for a long time.

Farmer also feels that everyone has their own needs and if somebody has the need they will ask for help. They typically do not share the innovation with fellow farmers or what they had learned on their farms. They keep these findings for themselves. This can be attributed to the competitiveness between the farmers. However, such cases are rare but the problem exists. It has also been observed that fellow farmers also do not take interest in advantages of farmer generated innovations.

There are other issues that prevent wider dissemination of innovations as well. Innovations developed by farmers face a lot of criticism on various aspects as the dominant view is that farmers are passive receptors of information rather than independent creators of knowledge. As a result, there is currently a strong paternalistic attitude toward advice-giving, a belief that advisory services "know best," and a hesitancy and resistance to adopt a more participative form. (Farrell *et al.* 2008). The reason behind their advice is alien concepts or categories in place of culturally rooted concepts and terms. On the other hand, the extensionists think that evaluators want to hear that farmers have only adopted innovations that have been diffused by extension agents (Bentley *et al.* 2010).

Some lead users do not establish contact with any institution because of ignorance and lack of information about these institutions. Farmers are perceived as a factor impeding the spread of innovation because they are either cut off from the sources of creativity and relevant knowledge or do not engage with other actors. (Hall and Clarke, 2009), and not connected to networks that provide access to resources and innovation (Spielman *et al.* 2009). While the Agricultural Innovation System considers disconnection of farmers from wider networks as the problem mainly for farmers, these farmers see it more as the problem of the formal institutions (Dolinska and Aquino, 2016). Thus, the debate between farmers and scientists leads to documentation and validation of few innovations through agricultural research stations and institutes.

Apart from this, lead users in agriculture face a number of issues in terms of resources which hinder development as well as wider dissemination of innovations. Lead users suffer from technical, organizational, marketing, and infrastructural constraints (Baliwada *et al.* 2017). Gupta *et al.* (2003)

identify the lack of availability of micro venture capital to grassroots innovator as both a reason why innovation do not lead to enterprises, and as evidence of a lack of appreciation for the potential of grassroots innovators by national and global policy institutions. *Wettasinha et al. (2014)* recommended that agricultural and development organizations should allocate funds to support farmers' on- farm experimentation, as well

**Table 1. Lead user developed innovations list**

Districts	No. of Innovations	Innovations
Gorakhpur	4	Low-cost sugarcane rotavator cum water pumping set Gudel Yantra Bicycle operated foot pump Highest yield of Karan Vandana Variety through organic farming
Lakhimpur Khiri	4	In-plant germination of sugarcane Low-cost high production of Sugarcane Vertical bud plantation Modified tractor
Varanasi	3	Kudrat-9 JP-151 Baba Vishwanath Variety
Kanpur	3	Marigold oil extraction through whole plant Income generating farming Vikalp Scythe
Basti	3	Improved Fodder Cutter AGM Combine harvester Captain Basti Combine Harvester
Kausambhi	3	Portable Biogas Plant along with purification system Large scale organic farming Linking of mother dairy to other Farmers
Gonda	2	Mobile Sprinkler Irrigation System Cultivation of adverse climatic Crops
Lucknow	2	Exotic vegetable Cultivation Multiple varieties of mango on a single tree
Bareilly	2	Godson organic farm Modified trench opener
Barabanki	1	Introduction of strawberry Cultivation
Sant Kabeer Nagar	1	Kabir Combine Harvester
Deoria	1	Production of bio-fertilizer
Allahabad	2	Innovative technique of using clay pellets for sowing paddy
Total	30	

as CSO and NGO- facilitated farmer-led research.

There is no appreciation of farmers as actors in the innovation system. Little information is provided about different sources of knowledge involved, and the flow of knowledge and scant attention is paid to long-term impact on livelihoods (*Brigid et al, 2012*). In the innovation systems perspective, production and exchange of (technical) knowledge are not the only prerequisites for innovation. Several additional factors such as policy, legislation, infrastructure, funding, and market development play a key role (*Klerkx and Leeuwis, 2008*).

## METHODOLOGY

The state Uttar Pradesh (UP) selected as the locale of the study. A list of lead users and their innovations was created using secondary sources, such as the databases of the Society for Research and Initiatives for Sustainable Technologies and Institutions (SRISTI), National Innovation Foundation (NIF), the Uttar Pradesh Council of Science and Technology (UPCOST), Krishi Vigyan Kendra (KVK) reports, the Innovators-meet documents, and previous studies. From the list, thirteen districts and 30 innovations (Table 1) were selected purposively for the study based on districts having maximum number of lead users. Lead users were asked to rank the constraints faced by them using a checklist.

The checklist list prepared by *Baliwada et al. (2017)* with some modification was used for the study. Constraints were divided into different sub-heads i.e. economic constraints, marketing constraints, technical constraints, infrastructural constraints, organizational constraints. Rank analysis was done to identify the major constraints. Weighted mean was calculated to rank the constraints under various major heads and sub-heads.

## RESULTS AND DISCUSSION

Lead users were asked to rank the constraints faced by them while developing the innovation. Constraints were divided into different categories i. e. economic constraints, marketing constraints, technical constraints, infrastructural constraints, organizational constraints. Weighted mean was calculated to rank the constraints under various major heads and sub-heads.

From the Table 2 it can be observed that out of five major constraints respondents had identified economic constraints (7.16) as the major one followed

**Table 2. Major constraints faced by lead users in developing innovations**

Particulars	MWS	Rank
Economic	7.16	I
Technical	6.46	II
Marketing	6.33	III
Organizational	5.13	IV
Infrastructure	4.46	V

**Table 3. Constraints faced by lead users**

Contraints	MWS	Rank
<i>Economic</i>		
High labour cost	8.0	I
High cost of inputs	8.0	I
Lack of awareness regarding credit facilities	7.3	II
Problem in accessing credit	6.7	III
<i>Technical</i>		
Non-availability of inputs	8.7	I
Lack of technical guidance	8.1	II
Need for new skills	7.0	III
Small and marginal landholdings	6.2	IV
<i>Marketing</i>		
Lack of accessibility to market	10.0	I
Lack of latest market information	8.8	II
Lack of branding of the product	6.4	III
Heavy fluctuation in price	4.8	IV
<i>Organizational</i>		
Lack of proper documentation	10.7	I
No recognition /reward	7.5	II
No standard set of indicators for validation	6.3	III
Lack of awareness about IPR	5.5	IV
<i>Infrastructural</i>		
Lack of support for refinement	8.1	I
Distant Organization (validation)	8.0	II
Lack of testing facilities for validation	7.8	III
Poor transportation and communication facilities	6.1	IV

by technical (6.46), marketing (6.33), organizational (5.13) and infrastructural constraints (4.46).

Contradictory findings were reported by *Baliwada et al (2017)* in a study on constraints and strategies in scaling up of farmer led innovations. It was reported that technical constraints were the major constraints faced by farmers followed by economic constraints and infrastructural constraints. The less severe hindrances were organizational constraints.

Lead users reported four major economic constraints faced by them while developing the innovations (Table 3). These were high labour cost and inputs, lack of awareness about credit facilities and problems faced in availing credit facilities.

Innovations like strawberry cultivation and low-cost high production of sugarcane required involvement of labour thus involved huge labour cost while all three combine harvesters (AGM, Captain Basti, Kabir) required high -cost inputs. The development of mobile sprinkler irrigation system caused problem in availing credit facilities. Similar findings were reported by *Ram et al., (2009)* in a study on constraints in adoption of crop productivity in Sikkim reported that high cost of seed and input chemicals act as constraints for Sikkim farmers in vegetable production. Also, *Khan et al., (2016)* in a study on constraints faced by farmers of Narsing Kheda village of Sihore district reported that farmers have to irrigate their fields with the help of diesel pump set which increase their cost of cultivation.

Lead users reported four major technical constraints faced by them while developing the innovations. These were non-availability of inputs, lack of technical guidance, need for new skill as well as small and marginal landholding. Innovations like combine harvesters (AGM, Kabir, Captain Basti), mobile sprinkler irrigation system required some inputs which were not easily available. While developing combine harvesters as well as in strawberry cultivation, exotic vegetable cultivation, low-cost sugarcane rotavator cum water pumping set, cultivation of adverse climatic crops, Godson organic farm, lead users faced lack of technical guidance as well as need for new skill. They learned about the innovation by trial-and-error method but they felt the need of technical guidance. Small and marginal landholding became problem for innovations like wheat varieties (Kudart-9, JP-151, Baba Vishwanath) because they propagated the business of seed production and small and marginal landholding acted as a constraint in expanding their business. Similar findings were reported by *Raj and Shivaramu (2023)* in a study on analysis of resources management by farmers in different farming situations in Karnataka. The study emphasized that farm is the basic managerial and decision-making unit by which agricultural activities are carried out necessitating the need of resource management.

Lead users reported four major marketing constraints faced by them while developing the innovations. These were lack of accessibility to market, lack of latest market information, lack of branding of the product and heavy fluctuation in price. Innovations like marigold oil extraction, strawberry cultivation, exotic vegetable cultivation, low-cost high

production of sugarcane, large scale organic farming, and production of biofertilizer faced the problem of lack of market accessibility, lack of latest market information and branding problem. The markets for these innovations were created by lead users first and branding was done later. Similar findings were reported by *Goyal and Goyal, 2022* in a study on major constraints in production and marketing of onion in Haryana in which distant market, non-availability of storage facilities and high transportation cost, besides low price of onion were the major marketing constraints. Also, *Kandpal (2022)* in a study on adoption level and constraints faced by mushroom cultivators highlighted that marketing problem is the major problem with highest Garret score of 68.46 and an average score of 59.02. Majority of people want to start their enterprises but the major problem is marketing of products.

Lead users reported four major organizational constraints faced by them while developing the innovations. These were lack of proper documentation, no proper recognition/reward, no standard set of indicators for validation and lack of awareness on Intellectual Property Rights (IPR). Initially, every innovation faced the problem of lack of documentation as well as lack of recognition and reward but later on, many of them were documented as well as awarded. Several innovations like combine harvesters (AGM, Captain Basti), mobile sprinkler irrigation system, portable biogas plant with purification system were registered but the lead users were not aware of Intellectual Property Rights (IPR). Similar findings were reported by *Mohanty et al. (2013)* in a study on limitations analysis in vegetable production technology adoption for tribal farmers' livelihood perspectives in North Sikkim. The study identified some of the key organizational constraints as being an inadequate storage facility, a lack of crop insurance, ineffective supervision and monitoring by extension workers, and low credibility of extension employees.

Lead users also reported four major infrastructural constraints faced by them while developing the innovations. These were lack of support for refinement, distant organization, lack of testing facilities nearby for validation, poor transportation and communication facilities. Innovations like combine harvesters (AGM, Captain Basti, Kabir), mobile sprinkler irrigation system and improved fodder cutter faced the problem of lack of support for refinement as well as distant organization for validation. Poor transportation and

communication facilities was the constraint faced by several lead users' innovations like mobile sprinkler irrigation system, adverse climatic cultivation crops, modified trench opener, use of using clay pellets for sowing paddy, highest yield of Karan Vandana variety, etc. Poor communication and transport facilities created problem in reaching the concerned institutions. Similar conclusions were made by *Narayan et al. (2014)* in their study on the examination of dairy farming under constraints in the Banswara District. The study found that the primary infrastructure restriction, with a Garrett score of 57.76, was a dearth of hospitals. This might be caused by the study area's disproportionately high animal to veterinary hospital ratio.

## CONCLUSION

The foundation of development and growth of agricultural sector is creativity and novel ideas. Although these come with certain difficulties. According to the study, economic constraints were the biggest obstacle, followed by technical, marketing, organizational, and infrastructural ones. Farmers were eager to develop, but because there was a lack of an effective support system, many of the ideas were still in their infancy and had not yet been marketed. In order to assist farmers in commercializing breakthroughs, interested organizations should promote those innovations that were not widely distributed. As a result, there will be more high-quality innovations and farmers will make the needed profit.

## CONFLICTS OF INTEREST

The authors have no conflicts of interest.

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