

Lead User: Concept and Relevance in Agriculture

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Abstract

Lead users are those that are substantially ahead of market trends and have needs that are significantly greater than those of the typical user. They are primarily responsible for creating user innovations. A lead user recognizes the need, solves the problem by innovating and building prototype and proves its value by using it. Benefits that lead users receive from innovating are twofold. Users innovate because they get benefitted from using the innovation, and also reap monetary benefits as a result of selling a user-created innovation to other users. In agriculture, complexity, high maintenance and installation cost, cultural and social incompatibility of centralized innovations have led to higher discontinuance of innovations. Hence it is important to involve lead users' innovation in formal system of research and development. Involving lead user in formal system is important but there are various constraints associated with it like technical, organizational, infrastructural, economic and marketing constraints. Apart from this, a lead user is usually evaluated using scientific criteria and is viewed as a passive receiver of knowledge as opposed to an independent creator. Their innovations are not often considered as science, rather they are blamed for following a relaxed approach towards research protocols. Considering these pertinent issues, it is pre-requisite for lead users to institutionalize innovations. Several organizations in India and abroad are engaged in collaborative activities with lead users and integrating their innovations into mainstream research and development. With the founding of SRISTI in 1993, India became the first nation to acknowledge and promote the lead users' capacity for innovation. The four areas of creativity that were highlighted were education, technology, institutions, and culture. Gujarat Grassroots Innovation Augmentation Network was founded in 1997, and the National Innovation Foundation was founded in 2000. SRISTI and GIAN's work were intensified by NIF. PROLINNOVA is an international organization that came into existence in 2004 in Ethiopia. It supports the identification, recording, sharing, and promotion of regional innovations. Countries across the globe are putting efforts to collaborate with lead users through different projects and ideas like small scale project, local agricultural research committee, promoting farmer innovation-farmer field school. Lead users get benefit from institutions and organizations in terms of respect and recognition, monetary benefits and patent. Extension professional can play an important role in collaborating with lead users through KVK. They can organize innovative platforms for interaction, facilitate various kinds of information exchange activities as well as orient them towards market trends using market led extension approach.

Key words: Adopter categories, Lead user, Innovation-development process, Discontinuance, Initiatives

Lead users, defined as people or organizations who are well ahead of market trends and have requirements that are far ahead than those of the typical user, are primarily responsible for creating user innovations [1]. This idea deviates from Rogers' adopter categories since those people wait for innovations to occur, whereas a lead user creates innovations and establishes a trend for others. Although the idea is well-liked in the marketing and related industries, little research has been done on how it might apply to agriculture. Farmers can be regarded as lead users of innovations and technology in agriculture if they provide a solution to a problem based on their need and gain respect and recognition as well as financial and non-financial rewards [2]. Commercial organizations often search for them through social media as they want to collaborate with them in order to identify the need of consumers. But in

case of agriculture, a lead user faces various technical, marketing, organizational, infrastructural and financial constraints. Lead users who are the subject of scrutiny are routinely judged according to scientific standards hidden lead users are not even looked for at the formal research institutions [3]. In light of these problems, institutionalizing user innovations is necessary. India is pioneer in recognizing the potential of lead users and supporting user innovation through different institutions like Society for Research and Initiative for Sustainable Technologies and Institutions (SRISTI), National Innovation Foundation (NIF) and Grassroots Innovation Augmentation Network (GIAN). International efforts are also being carried out to support innovations. Even after institutionalization, a number of challenges are still prevalent regarding the identification and nurturing of lead users. The

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current paper is an effort. to explore various dimensions of the concept of “Lead user” in general and issues and challenges associated with them in agriculture sector.

Adopter categories

An innovation is not immediately adopted by every member of a social system. Instead, they do so gradually, allowing people to be grouped into adopter categories based on when they first start adopting the innovation. It is difficult to analyze each and every individual’s adoption time, so a standard adopter categorization is followed. Adopter categories were first conceptualized by Rogers [4] when he completed and

analyzed research on Iowa, and Ohio farmers. Data were taken from field studies of (1) Ryan (1948) regarding the adoption of hybrid seed corn in Iowa (2) Dimit (1954) regarding the adoption of the same practice in Virginia and (3) Rogers [5] on the adoption of 2, 4-D weed spray and Warfarin (a rat poison) in Ohio. The number of farmers taken from 1955 study was 148 Iowa farm operators and from 1957 studies were 104 farmers. A normal bell-shaped curve was obtained when these farmers were categorized on the basis of innovativeness and using mean and standard deviation, they were divided into five categories; viz: innovators, early adopters, early majority, late majority, and laggards as shown in (Fig 1) [4].

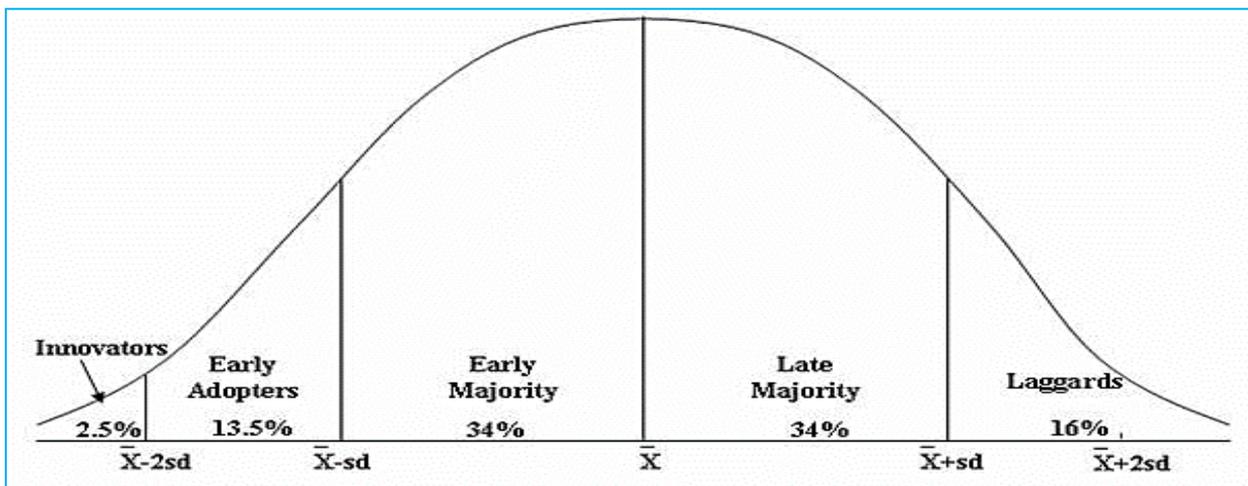


Fig 1 Adopter categories Source: Rogers [4]

Table 1 Adopter categories and their characteristics

Categories	Characteristics
Innovators	- Gate-keeper in a system - Have more cosmopolite and social relationships - Daring - Greater financial resources
Early adopters	- Individuals to check with - Highest degree of opinion leadership - Help to trigger the critical mass
Early majority	- Important link in the social system - Adopt innovations just before the average members of community
Late majority	- Adopt just after the average members of social system - Economic necessity and peer pressure are the reasons for adoption
Laggards	- Last to adopt - Point of reference is past

Source: Rogers [4]

These adopter categories have certain distinct characteristics that have been mentioned in (Table 1). These characteristics play an important role in understanding a social system as well as segmenting social system as per the target of different innovations to be diffused.

Innovators are considered to be the social deviants because they are those 2.5 percent individuals who adopt an innovation first and it is because of them an innovation gets an entry into the social system. Early adopters constitute 13.5 percent of the social system and those individuals who trigger the critical mass and are the people to check with. People come to them to take suggestions whether to adopt or reject an innovation. These people have maximum extent of opinion leadership and are respectable in a society. New concepts are

adopted by the early majority shortly before the average members of the social system. They are an essential link in the dissemination process due to their unique positioning between the very early and somewhat late adopters. They provide connectivity in the social networks of the system.

The late majority adopts novel concepts just after the average members of system. Due to peer pressure and economic necessity, they adopt new ideas. In a social system, laggards are the last to adopt an innovation. They are local in nature and have very little influence. They use the past as their point of reference.

However, even after the classification of members of a social system into adopter categories and study their characteristics, it was observed that:

- The concept is seriously affected by adopter groups' inconsistent behavior. People might, for instance, be innovators in some areas while lagging behind in others.
- Despite acknowledging that adopter profiles are product-specific, Rogers doesn't offer any strategies for anticipating how these profiles will differ across industries.
- Because the model is based on a distribution about the mean time of adoption, the mean, standard deviation, and identification of adopter categories cannot be determined until the diffusion process is complete [5].
- Does not account for all adopters, especially lead user category which is an exception to adopter categories and lies between researchers and adopters.

Concept of lead user

A lead user can be defined as a person who faces a need before the rest of the population. They are far ahead of the market trend and hence, satisfy their need by developing innovations [6]. The term "lead users" can also refer to people or groups who anticipate market trends and have needs that are

extremely different from those of the typical user [7]. Both the definitions consider them as the trend setters because they are ahead of the market trend and set the trend for other adopters. It can be seen from (Fig 2), that while the lead user recognizes the need for innovations, creates prototypes, and is prepared for commercializing innovations while the other adopters wait for innovations to occur. It can be interpreted that while rest of adopters use previous innovations, a lead user realizes the need of new innovation, builds prototype and commercialize it.

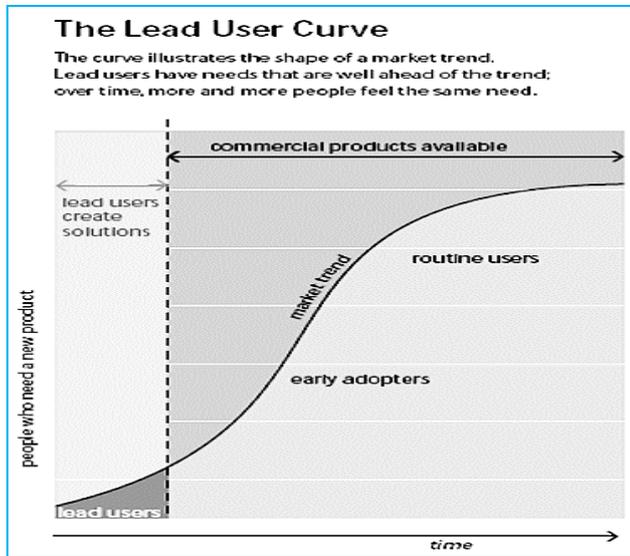


Fig 2 Concept of lead user Source: Rogers [8]

The concept of ‘Lead User’ came into existence when Hippel [6] gave a classification on the basis of functional sources of innovation. The examination of transitory profits is the most important of the many aspects that affect the functional sources of innovation. It can be understood as whosoever gets the maximum profit is considered as source of innovation. He categorized innovations as user, manufacturer and supplier developed innovations.

- User-developed innovations are those in which the end user, not the manufacturer, identifies the need, develops a prototype, and uses the prototype to demonstrate its utility. In the beginning, a user innovates if he or she perceives an internal gain from doing so and typically does not take other users' requirements into account. Manufacturer developed innovations are those in which a manufacturer gets benefit for manufacturing and selling that innovation.
- Supplier developed innovations are those innovations which are developed by supplier and given away to

manufacturers in the hope of capturing post-adoption benefits.

Lead users, who have traits like the expectation of appealing innovation-related earnings from a solution to their demands, are principally responsible for producing user-developed innovations. They experience the need as well as opportunity ahead of the majority of a target market and are experts of existing products [9].

Lead users go through certain steps in order to develop innovations and later on to diffuse these innovations through themselves or through an institution.

- Perceive the need for advancement in instrumentation.
- Innovate
- Built a prototype
- Prove the prototype's value by applying it
- Communicate detailed information on both the value of the innovation and on how the prototype device could be replicated [6].

A number of scholars have used the term innovator and lead user synonymously but there is a clear-cut difference between the two of them. From (Table 2), it can be seen that innovators are those 2.5 percent individuals who adopt an innovation first and gain windfall profits for adopting it, while lead users are those individuals who realize the need to develop a prototype of an innovation and in the process of adopting and selling innovations, they get monetary and non-monetary benefits in the form of solution to their problem, enhanced status and recognition among peers.

Table 2 Comparison of innovator and lead user

Innovator	Lead users
Adopt a centralized innovation	Innovate and adopt
Gain windfall profits	Gain monetary and non-monetary benefits
First to adopt an innovation	Innovate and adopt prior to adopter categories

Source: Rogers [4]

Lead user in innovation development process

Innovation development process comprises of six steps which includes recognizing need for the innovation to the consequence of innovations. A researcher does not go through all these steps whereas a lead user does. A researcher recognizes the need for developing an innovation by anticipating future problems. Sometimes he/she also develops innovations because of the set agenda of the government or the institution to which he/she is affiliated. On the other hand, a lead user identifies the need because of awareness about local situations as well as resources.

Table 3 Lead users in innovation development process

Innovation development process	Researcher	Lead user
Recognizing a problem or need	<ul style="list-style-type: none"> ▪ Perceive future problems ▪ Agenda setting process 	<ul style="list-style-type: none"> ▪ Aware about the local situations and resources ▪ Realize the immediate need
Basic and applied research	<ul style="list-style-type: none"> ▪ Scientific research 	<ul style="list-style-type: none"> ▪ By Practice
Development of innovation	<ul style="list-style-type: none"> ▪ Based on scientific principles 	<ul style="list-style-type: none"> ▪ Based on tacit knowledge
Commercialization	<ul style="list-style-type: none"> ▪ Private companies or parent institution 	<ul style="list-style-type: none"> ▪ Either by themselves or an institution
Diffusion	<ul style="list-style-type: none"> ▪ Centralized System 	<ul style="list-style-type: none"> ▪ Decentralized System
Consequences	<ul style="list-style-type: none"> ▪ Bring changes 	<ul style="list-style-type: none"> ▪ Bring changes

Source: Conceptualized by authors from Rogers [4] and Hippel [5]

Researchers undergo scientific research and apply scientific principles in developing innovations while lead users develop innovations because of tacit knowledge they have as well as by practicing trial and error strategies. A lead user is

most often criticized for not being scientific and for following trial and error strategies. In case of a researcher, innovations, that have been developed and commercialized through private companies or parent institution whereas most of the

commercialization of lead user developed innovation is done by lead user himself when it is confined to local situation. The innovations developed by lead users are also given to institutions for commercializing for getting maximum economic benefit. Innovations developed by researcher are diffused through centralized system due to which adaptability of those innovations is less. Lead users innovations are diffused through de-centralized system by following a problem centered approach. Hence, their adaptability is high in comparison to centrally diffused innovations. However, both types of innovations bring changes in the system.

Need of lead users in agriculture

Innovations developed by centralized systems are discontinued at a high rate. Miller and Mariola [10] indicated that all the conservation farm technologies that were initially investigated in the Parismina watershed of Costa Rica saw a high incidence of discontinuance. Among those who adopted the practice, 28% stopped using biodigestors, 40% stopped using microorganism composting, 50% ceased making worm compost, and 67% stopped using bokashi composters. Another study by Loganandhan *et al.* [11] on the post-adoption behavior of farmers in semi-arid watershed areas found that technologies including diversion drains, water ways/grassed streams, and zing terraces were completely discontinued. Additionally, it was discovered that agricultural innovations like the red gram and border strip had been largely abandoned. Huria [12] reported that the overall discontinuance of five innovations—direct seedling rice, use of bio-agents, mushroom growing, polyhouse cultivation, and nutritional gardening—was 46.05 percent in the Udham Singh Nagar district of Uttarakhand.

Higher discontinuance of centralized innovations can be attributed to several factors. Singha and Baruah [13] found that farmers were slow to accept suggestions for seed treatment, fertilizer application, plant protection measures, and other practices under various farming methods. Here, the complexity of the advances caused them to be abandoned. In a study on the post-adoption behavior of farmers toward soil and water conservation technologies in India, Bagdi *et al.* [14] discovered that farmers had stopped using SWC technologies because they were unsuitable for their field conditions. Apart from these reasons studies also showed that innovations were discontinued due to non-availability of inputs, lack of training, lack of funds, lack of extension –agency contact, etc.

Considering the extent and reasons of discontinuance of innovations, there is strong need for inclusion of lead users in formal research and development system. A lead user in innovation development process will help in developing need based and adoptable innovations.

Issues associated with lead users in agriculture

The concept of Lead User is not only confined to marketing and related sectors but is also applicable in agriculture sector. In agriculture, farmers constitute lead users. All innovative farmers who recognize their felt need and innovate to solve their problems and get monetary and non-monetary benefits from their innovations are termed as lead users.

The case of Ranjit Mirig illustrates these aspects (Box 1).

Box 1: Case study

Case Study: Ranjit Mirig (Lead user)

Farmer Ranjit Mirig lives in Sambalpur, Orissa. He had trouble finding workers to transplant paddy plants in the field because of a labor shortage. A transplanter for paddy was created by Ranjit. In 1986, he created the first

prototype, which he continued to improve until he had a model that worked in 2008. The transplanter has undergone more modifications thanks to NIF and IIT Kharagpur. The equipment requires two people to operate, can move five rows at once, and can move 0.3 acres of ground each hour.

Source: Honey Bee Newsletter (2012)

Additionally, actual outcomes from field use have proven the prototype's worth to the user. This is significant because user innovations that are of interest to businesses are undoubtedly those that have demonstrated their ability to be translated into marketable products [15]. Lead users in agriculture face a number of constraints which hinder their morale and slow the development of further innovations. Baliwada *et al.* [16] in a study found that lead users face various constraints which includes:

- 1) *Technical constraints*: Lack of awareness on promotion organizations, small and marginal farm-holdings and non-availability of skilled labor.
- 2) *Organizational constraints*: Lack of awareness about IPR issues and no standard set of indicators for validation.
- 3) *Economic constraints*: Problem of access to credit, no insurance facilities for the innovations and high cost of inputs.
- 4) *Infrastructural constraints*: Lack of testing facilities nearby for validation, lack of design support for refinement and distant organizations
- 5) *Marketing constraints*: Branding problem, lack of latest market information and lack of procurement policy of the government.

Apart from these constraints, lead user innovations are evaluated on the basis of scientific parameters. Also, attitude persist that farmers are passive receptors of information from advisory services rather than independent creators of knowledge [17]. Folk experiments are indeed experiments, according to Bentley [18], who also noted that they are not scientific. Farmers' tactics are described by Hoffman *et al.* [19] as "trial and error strategies" as opposed to formal attempts to isolate "cause and effect relationships". A variety of claims demonstrate that farmers and researchers continue to hold divergent opinions. Gupta [20] also expressed his concern by saying that lack of diffusion of frugal and sustainable innovations indicates something fundamentally amiss in public policy and the working of public administrators.

Institutionalization of lead user developed innovations in agriculture

India was the first nation to acknowledge farmers' capacity for innovation. A nonprofit organization called the Society for Research and Initiatives for Sustainable Technologies and Institutions (SRISTI) was founded in 1993 to assist the Honey Bee network. It was decided by Professor Anil Gupta to release Honey Bee Newsletter. The effort was put on hold as the Policy and Perspective Committee of the Indian Institute of Management Ahmadabad felt that such a newsletter containing unverified claims of farmers did not behave the stature of the institute. This led the emergence of SRISTI with a focus four areas of creativity: education, technology, institutions and culture [20]. In 1997, the first International Conference on Creativity and Innovation Grassroots (ICIG) was organized at IIMA. One of the recommendations of the conference was to set up a risk fund to take the innovative ideas forward. At that time, SRISTI was facing the dilemma whether to stop documentation because it was felt that it was not making

much difference in the lives of people as it lacked the necessary funds and networks. Considering the issue in 1997, the idea of Gujarat Grassroots Innovation Augmentation Network (GIAN) was born. GIAN acts as an incubator by linking innovations, investment and enterprise. It works towards bringing down the cost of grassroots innovations. As the number of branches increased, they formed a network of significant national importance that required increased and systematic support from the federal government. The National Innovation Foundation (NIF) was established, as stated by the Indian Ministry of Finance in February 1999. NIF formally came into existence on 28th February 2000 and scaled up the activities of HBN, SRISTI and GIAN to new heights [21].

PROLINNOVA is another international collaborating network of NGOs that are working for betterment of lead user developed innovations. The network was formally launched in Ethiopia in March 2004 and it has grown into well recognized international network today. It basically performs the functions of scouting, documenting, disseminating and promoting local innovations. India joined the network in 2012 under the

umbrella of the Global Forum on Agricultural Research and Development. In India, PROLINNOVA is helpful in documenting innovations related to climate change adaptation [22]. Apart from above said initiatives, various international projects and initiatives are supporting lead user developed innovations. It can be seen from the (Table 4) that lead users are supported either through small scale project fund, local agricultural research committees as well as by linking farmer-fields school and promoting farmer innovations concept.

Advantages of institutionalization of innovations

Institutionalization provides respect to farmers in different forms. First of all, their creativity gets recognized and appreciated. They get awards and rewards on different platforms like Jagjivan Ram Innovative Farmer Award, N.G Ranga Farmer Award for Diversified Agriculture etc. Apart from this, SRISTI through its benefit sharing formula provide 30 percent of the total benefits to the lead users. Thus, they get monetary benefits also. Patents can also be filed by lead users and institutions provide necessary support in this regard.

Table 4 International initiatives supporting lead user developed innovations

Name	Year and area of operation	Nature of support
Small Scale Project	70 Asia, Africa and Latin American Countries	It supported self-help groups to test and apply “small” innovations and keep them informed of technological options and experiences with proven technologies. It covered almost 373 projects of its types in different countries.
CIAL (Local Agricultural Research Committee)	1987 Columbia, Bolivia, Brazil	CIALs are designed as “research services” managed and owned by local communities. It focuses on developing elementary experimenting skills, such as simple ranking techniques, control and replication functions and record-keepings. Formed 275 such committees up to 2002
Promoting farmer innovation: farmer field School (PFI-FFS)	2001 Kenya	It helps in stimulating innovative people to become members of FFS groups interact regularly with them, tell them the techniques of innovating and motivate them for innovations.

Source: Hansen and Egelyng [23]

CONCLUSION

Lead users play an important role in agriculture. Their creativity in agriculture can be harnessed in two ways. First of all, their innovations should be incorporated in mainstream agriculture through testing, validation and wider diffusion in different parts of country. Secondly, their creative brains should be utilized in different phases of innovation development process. In order to collaborate with lead users for innovation development process, a wide networking with them is indeed a

need. Extension professionals through Krishi Vigyan Kendra can help in identifying and integrating lead users in the formal networks as they have access to remote areas. They can also provide innovative and interactive platforms for lead users and researchers so that current trends can be analyzed. With the help of extension professionals, a lead user can get technical, financial, production and marketing support from institutions. By effectively collaborating with lead users, the agricultural sector can benefit from a continuous influx of innovative solutions tailored to real-world challenges.

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