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Scalability of farmer led innovations (FLIs): A study of perceived determinants and required capacities

MANJEET SINGH NAIN[1], RASHMI SINGH[2], J R MISHRA[3] and J P SHARMA[4]

ICAR-Indian Agricultural Research Institute, New Delhi 110 012

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Sustainability of agricultural development is largely dependent upon the knowledge generation and its application in the field conditions. Most of the extension strategies are aimed to promote agricultural development through transfer of knowledge generated through research system. There is no doubt that application of knowledge to achieve desired social and economic outcomes have potential to enhance productivity, competitiveness, and economic growth by creating jobs, generating income, alleviating poverty, and driving social development. The learning and sharing the experiences regarding the best solution in particular situations can serve broader agenda of empowerment of farmers with better ways of doing things – using their own resources and on their own initiative by responding to problems or opportunities emerging from ever-changing conditions. It is argued that innovation generation practices of farm households may also be making impact in poor people's livelihoods and might form the basis for food security (Letty *et al.* 2011). Farmer led innovations generated for immediate problem solving or creative application have helped in optimizing farm profits and managing agricultural activities conveniently. On other hand farm Innovators could effectively become consultants and entrepreneurs leading to off- farm income generation options. These farmer innovations require attention for their support and sustenance, requirements for up scaling and out scaling and mitigation of constraints thereof so that farmer to farmer extension and institutionalization of such innovations could take place. Farmer-led innovations in developing countries would lead to increase in production, thereby reducing poverty among the rural people (Spielman 2009, Mariam *et al*. 2011).

Conventional strategies for encouraging innovation in agriculture tend to focus on creating incentives for private sector investment, most commonly by creating strong intellectual property rights regimes, ensuring open access to markets and increasing technology adoption rates among farmers (Bragdon and Smith 2015), whereas farmer innovations in formal agricultural research is desirable for; even farmer innovations run the risk of not becoming as geographically widespread as they theoretically could be, may be taken up into the agricultural advisory service after validation by research system and can gear towards real needs by taking men and women farmers' priorities into account and involving them actively in the programmes of the research and development (Waters-Bayer *et al*. 2016). Gupta (2013) argued that despite the huge amount spent on developmental aid, one cannot find many databases, either online or offline, of innovative solutions developed by the disadvantaged people themselves. Farmers need to be innovative to deal with 'second generation problems' like maintaining soil fertility, animal health, community issues related to resources etc., farmers will need to be innovative in how they apply these 'solutions' to fit their own situations.

In order to scale farmer led innovations, the farmer innovation fair (FIF) methodology grew out of a series of fairs organised in different countries. FIF involves creating a space to bring farmer innovators together and to provide them with an opportunity to display their work and to interact with each other as well as with formal research system and the wider public who visit the fair. But the scarcity of financial resources remained a constraint for the commercialization of grass root innovations (Olga 2015). There is no proper appreciation of farmers as actors in the innovation system, little information provided about different sources of knowledge involved, or the flow of knowledge and little attention to long-term impacts on livelihoods (Brigidletty *et al*. 2012). Institutionalization of any FLI is a complex process that requires capacity strengthening and change in individuals as well as change in organizations. Baliwada *et al*. (2017) concluded that few institutions were working for promotion of innovations but there was lack of convergence of activities between these institutions to share the resources and capital. It was also reported that the commercialization depended on many factors like feasibility and significant economic impact of the innovations. It

[1]Principal Scientist (e mail: msnain@gmail.com), [2]Principal Scientist (e mail: rashmi.iari@gmail.com), [3]Principal Scientist (e mail: jyotiranjanmishra@yahoo.co.in), [4]Joint Director Extension (e mail: jd_extn@iari.res.in.)

involves several different types of organizations with different cultures, regulations and procedures, which need to learn how to collaborate. In each organization, change has to take place through all layers. Fuentes *et al.* (2013) suggested that private players should assist in the commercialization of farmer-led innovations. Farmers should play a key role in planning the process of scaling out in their area to develop ownership and commitment to improving livelihoods. Supporting organizations need to facilitate the scaling out process beyond short term research or development projects (Miller and Connell 2009). As such a study was conducted to find out the capacities requirement and the criterion for scalability of farmer led innovation as perceived by the farmer stakeholders.

The study was conducted on specially documented, 25 number of farmers' innovations ranging from the subject matter of agricultural mechanization, resource management, diversification, specialty agriculture, high value cropping system, aggregation and new marketing configuration and value addition. To test the scalability of the farmer led innovations, a test was standardized consisting of seven broad parameters namely; credibility, complexity, testability, observability of results, relevancy, relative advantage over existing practices and sustainable source of funding with suitable modifications in scaling up toolkit of Cooley and Ved (2012). Twenty four bipolar statements related with seven parameters were devised to seek responses on seven point continuum. In order to analyze the capacities required, the subject matter of capacity building were compiled and finally nine broad subject matter ranging from documentation, distinguishing elements, demand analysis, cost benefit analysis, analysis of required changes, refinement and simplification, institutional requirements, achieving scale of economies and comparative impact analysis were included for data collection. The data for the study was collected from the selected farm innovators (25), the non-innovator farmer observers of the innovations from same locality where innovation was generated (50) and general farmers from other location (50) in National Capital Region of Delhi. As such, a total of 125 farmers, including; innovators, non-innovators and general farmers were included for data collection. Weighted mean score and Garret ranking method was used for data analysis and interpretation of the results.

Table 1 shows that relevancy, relative advantage, sustainable source of funding, observability of the results and complexity, respectively in overall were ranked as the top determinants of the scalability of farmer led innovations. Although 'credibility' of the innovation was not perceived as major determinant in overall but the sub components like 'implementable within existing systems and infrastructure', small deviation from current practices and cultures of perspective adopters', 'capable to work in diverse social and situational contexts' and 'sound evidence base' were among the high rated sub components of the major determinants. In case of testablility, all three sub components were perceived almost equal determinant of

Table 1 Perceived determinants of scalability of the innovation (n = 125)

Parameter	Mean weighted Score
Credibility	5.70
Based on sound evidence	6.2
Can be subjected to independent external evaluation	5.8
Capable to work in diverse social and situational contexts	6.4
Supported by eminent individuals and institutions	4.2
Implementable within existing systems and infrastructure	6.8
Small deviation from current practices and cultures of perspective adopters	6.5
Involvement of less number of people in adoption decision	5.9
Low technical sophistication of the components and activities	6.0
Clear and easily replicable	5.6
Complexity	6.3
Simple with few components	6.6
Easily added or adjusted on to existing systems	6.0
Testability	5.8
Able to be tested by users on a limited scale	5.8
Little supervision and monitoring	5.7
Not particularly value or process intensive	5.9
Observability of results	6.37
Very visible and tangible impact to casual observation	6.7
Clearly associated with the intervention	6.4
Evidence and documentation exists with clear emotional appeal	6.0
Relevancy	6.85
Addresses an objectively significant, persistent problem	6.8
Addresses a need which is sharply felt by potential beneficiaries	6.9
Relative advantage over existing practices	6.75
Current solutions for this issue are considered inadequate	6.7
Superior effectiveness to other established options	6.8
Sustainable source of funding	6.47
Superior cost-effectiveness to existing or other solutions clearly established	6.8
Does not require a large commitment of funds at scale	6.4
Scope for its own internal funding (user fees) or endowment	6.2
Overall	6.33

scalability. In case of 'complexity', having few components leading to less confusion and modification of knowledge and skill was perceived important determinant. Tornatzky and Klein (1982) on the basis of meta-analysis reported three innovation characteristics (compatibility, relative advantage, and complexity) which had the most consistent significant relationship to innovation adoption. Also, Yaacoba and Yusoff (2014) reported compatibility, trialability, result demonstrability, image and visibility as determinants of adoption. Regarding 'relevancy', the capacity to objectively solve the problem and felt need determined the scalability. One of the importance characteristic relates to finance, the data depicts that innovations having financial superiority over the options requiring least external finance and possessing scope for internal funding were perceived as scalable.

Table 2 shows various perceived capacities for scaling up farmer led innovations, it is clear that the institutional requirements and linkage for implementing the innovation followed by comparative analysis of the costs associated with the innovation, evaluation of the innovation's comparative impact, success and refinement and simplification of innovations and analysis of possibilities of scale were the major capacities perceived important for scaling up of innovations led by farmers. World Health Organisation (WHO 2010) also emphasized on planning actions, increasing capacities, making strategic choice and assessing environment among the steps to scale up. Baliwada *et al*. 2017 concluded that scaling up of innovations required commitment and greater budgetary support towards innovations mainstreaming in all location specific farmer-led innovations and suggested involvement of private sectors for commercialization of replicable innovations through corporate social responsibility fund. Documentation of the innovation, distinguishing the elements and types of innovations, assessing need among the larger population and analysis of the required changes to make the innovation applicable to other target groups was placed at lower end, may be due to their less importance in scaling process.

Table 2 Capacities required for scaling up of FLIs as perceived by farmers

Subject matter of capacities for Scaling up innovations	Garret mean score	Rank
Documentation of the innovation/ intervention	43.5	IX
Distinguishing technical, organizational, and/or process elements	46.8	VIII
Analysis of need or demand for the service among the larger population	53.2	VII
Analysis of the required changes to make the innovation applicable to other parts of the country / other target groups	55.4	VI
Comparative analysis of the costs associated with the innovation	65.8	II
Evaluation of the innovation's comparative impact and success	64.3	III
Refinement and simplification of the innovation	61.5	IV
Analysis of the possibilities for achieving economies of scale	61.2	V
Analysis of the institutional requirements and linkage for implementing the innovation	73.6	I

SUMMARY

Rogers' innovation diffusion theory is widely used as a theoretical framework for dissemination of technological innovation and the characteristics; relative advantage, compatibility, complexity, trialability and observability still retains acceptance as factors influencing rate of adoption in case of institutional innovations. Farmer led innovations as per conceptual framework being new or modified or experimented own or external ideas, practices, techniques or products by farmers or group of farmers without direct support from external agents or formal research institutions require validation and refinement before their scaling. The validation process requires expertise of different level and participation of local people, fellow farmers and other stakeholders like private firms for sharing benefits among the farmer entrepreneurs and the concerned scientists/ institutions through commercialization. In this scenario the characteristics of innovation like its relevancy and financial sustainability becomes utmost important as depicted from the results in addition to the Roger's framework. Accordingly, the farm innovators require certain distinguishing capacities like foreseeing institutional requirements and linkages, comparative financial impact and success analysis ability in addition to analyze projected demand and required changes in socio cultural and infrastructural domain. FLIs having additional advantage over conventional innovations to tackle second generations' problems require different set of capacities on the part of farm innovators to scale their innovations in addition to be innovative, learning institutes for which are yet to be come into existence.

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