Journal of Community Mobilization and Sustainable Development Vol. 13(1), 17-26, January-April, 2018

A Study on Instigation of Farmer-led innovations and its Spread

Hema Baliwada[1]*, J.P. Sharma[2], R.R. Burman[3], M.S. Nain[4], P. Venkatesh[5] and Anil Kumar[6]

[1]Scientist, CTRI, Rajahmundry, [2]Joint Director, Extension, [3]Principal Scientist, [4]Senior Scientist, Division of Agricultural Extension, [5]Scientist, Agricultural Economics, Indian Agricultural Research Institute, New Delhi-110012 and [6]Principal Scientist, Design of Experiments, IASRI, New Delhi-110012

ABSTRACT

To assess the process of origin and spread of farmer-led innovations, this study was conducted in Punjab and Uttar Pradesh during 2015-16.A sample size of 50 innovators and 50 non-innovators constituting 100 farmers selected by stratified sampling. The socio-economic profile was compared between innovators and non-innovators, the results showed that there is significant difference between two groups. Wilcoxon Mann Whitney test results showed that innovators have comparatively high mean rank for innovativeness (mean rank =67.11, U=419.50) and risk orientation (mean rank = 71.27, U=211.50) than non-innovators. Study also found significant difference of level of social empowerment between innovators and non-innovators by using Wilcoxon Mann Whitney test. The results revealed that innovators have comparatively high mean rank of 60.94 than non-innovators (mean rank 40.06) due to their active social involvement and striving for recognition in the society. The major stimulants for different category of innovations identified were 'Problem faced by self' for crop production (70%) and horticulture (50%), 'innovation induces innovation' for farm machinery (80%), 'experimented purposefully with curiosity' for processing and value addition (70%) and animal husbandry (60%). The time gap from idea generation to innovation is more (4-6 years) for farm machinery and processing and value addition innovations and less for horticulture innovations (1-6 months). Majority of the respondents received technical support (mean rank 3.07) from the institutes followed by input support (mean rank 2.76), extension support (mean rank 2.46) and financial support (mean rank 1.71). Friedman test analysis revealed that major means of spread by farmers is through linkage with organizations (mean rank 5.50) and by institutions is through melas/exhibitions (mean rank 4.99) conducted by different institutions involved in scaling up of innovations. The major reasons for low adoption of innovations by the non-innovators identified were location specificity of the innovations (mean rank 6.52) and lack of demonstrations (mean rank 4.66).

Keywords: Farmer-led innovations, Spread, Stimulants, Time gap

INTRODUCTION

Farmers acquire the knowledge required for their work through their own experience with agricultural practices and management of natural resources. In addition, they innovate due to necessity, changing conditions and curiosity by doing informal experiments on new ideas either from their own ingenuity or learned from other farmers, researchers, extensionists and other information sources like mass media. There are several factors that can trigger the implementation of innovation generation activities. These factors include shocks, scarcity of factors of production, opportunities, interaction with key stakeholders, coincidence, creativity or socio-economic factors (Saad, 2002). Innovation is viewed as the outcome of various actors combining knowledge from different sources. This process of combining knowledge requires different forms of interaction. Informal structures, inter-personal contact and even physical mobility are all considered mechanisms for the mobilization of knowledge and stimulating innovations (Wolf, 2008). Innovation in agriculture and rural enterprise happened for millennia through chance and through the informal and also purposive action of rural people seeking new and better ways of production and organization. Rural people themselves, therefore, have been a major source of new knowledge and practices. Small-scale farmers'

*Corresponding author email id: hema.baliwada@gmail.com

own creative responses continue to be important sources of improvement to agricultural productivity in many regions of developing countries (Nigel *et al.*, 2006).

There is often a significant interval between the time an innovation is developed and adopted by the fellow farmers. For most innovations, there will also be a period of decline where the innovation is replaced by a new one. It is also dependent on the innovative farmer contacts with other persons and the amount of distance in the locality, the adoption of a new technology by the fellow farmers may entail significant travel and transport costs, and these costs increase with distance (Sunding *et al.*, 2000). According to Akinnagbe (2010), the challenge in adoption of farmer-led innovations is that, it is not easy for fellow farmers to get accepted by fellow farmers and the community in general due to culture and attitude. Because of this reason, many people do not only provide "no support" but also discourage the innovative farmers, considering them someone wasting time for "no good" reasons. Previous studies reported that farmer-led innovations are vital and the creativity depends on the prevailing socio-economic condition of the farmers. In this context, present study was undertaken with an objective of exploring comparative analysis of profile of farm innovators and non-innovators, to understand the origin, spread of farmer-led innovations and to identify the reasons for less adoption by the fellow farmers.

MATERIALS AND METHODS

A list of innovative farmers recognized and awarded by various institutions such as

ICAR (Indian Council of Agricultural Research), PPVFRA (Protection of Plant Varieties and Farmer's Rights Authority), Ministry of Agriculture and Farmers Welfare, NIF (National Innovation Foundation) and TIFAC (Technology Information, Forecasting and Assessment Council) of Department of Science and Technology, IARI (Indian Agricultural Research Institute), State Agricultural Universities was prepared. The data from these secondary sources revealed that Uttar Pradesh and Punjab have more number of innovative farmers compared to other states. Therefore the present study was conducted in these two purposively selected states *i.e.*, Uttar Pradesh and Punjab. The whole population of innovative farmers was divided into 5 broad categories. The broad areas of innovation selected for the study were crop production, horticulture, farm machinery, processing and value addition and animal husbandry. At least 5 innovative farmers were available in each category. Therefore 5 innovative farmers were selected from each category by stratified random sampling. Similarly 5 non-innovative farmers were selected randomly from the same locality for better comparison. Fifty innovative and fifty non-innovative farmers constituted the total sample size of 100 farmers. These selected farmers fall into the 7 districts of Punjab (Batinda, Faridkot, Hoshiarpur, Nawanshahar, Ludhiana, Patiala and Sangrur) and 10 districts of Uttar Pradesh (Aligarh, Bulandshahr, Ghaziabad, Hapur, Kanpurnagar, Kannauj, Meerut, Muzaffarnagar, Rampur and Saharanpur).

RESULTS AND DISCUSSION

Economic profile: The basic economic profile of the respondents was compared between innovators and non-innovators with respect to own land, total cultivable land, farming experience and annual income. For analyzing the significant difference between two independent groups, 't' test was carried out and the results are presented.

From the Table 1, it is clear that the innovators (mean 23.82) significantly differ from non-innovators (mean 13.54) in having higher total cultivable land size. As far as own land is concerned, there is not much difference between innovators (mean 18.76) and non-innovators (mean 11.82), but the innovators can go for substantial land increase due to their progressive nature. Therefore the total cultivable land is more for innovators. It is also evident that majority of the innovative farmers lies in the category of high annual income (Rs. 454000) than non-innovators (Rs. 242000). Further return per unit land is also high in case of innovators. With respect to farming experience, there is no significant difference between innovators (mean 30.00) and non-innovators (mean 30.02). Further the value of 't' test statistic is significant at 5 per cent level for own land (-4.329), total cultivable land (-5.118) and annual income (-5.686). The present study findings are similar to Nigel *et al.* (2006) who reported that several factors influencing the number of farmer innovations include level of education, size of household, amount of land available, age of household head and degree of contact with other areas.

Social profile: The extent of involvement of innovators and non-innovators with respect to their social

Table 1: Comparative economic profile description of innovators and non-innovators (N=100)

Category		Mean	Standard error of mean	Levene's test for equality of variances F	t-test for equality of means (Equal variances) t
Own land (acre)	Non-innovator	11.82	0.97	3.099*	-4.329*
	Innovator	18.76	1.27		
Total cultivable land (acre)	Non-innovator	13.54	1.20	3.946*	-5.118*
	Innovator	23.82	1.61		
Farming experience (years)	Non-innovator	30.02	0.11	0.077	0.119
	Innovator	30.00	0.11		
Annual income (Rs)	Non-innovator	242000	20221.22	12.148*	-5.686*
	Innovator	454000	31325.80		

* $p<0.05$, F=Value of the F-statistic; t= Value of the t statistic

participation, mass media exposure and extension orientation was analyzed by Wilcoxon Mann Whitney test in order to identify the significant difference in social profile of respondents between two groups.

The data from the Table 2 indicates that the innovators (58.37) have comparatively high mean rank than non-innovators (42.63) with respect to social participation due to their active social involvement. It is also evident that the innovators have comparatively high mean rank for mass media exposure (59.54) and extension orientation (70.59) than non-innovators mass media exposure (41.46) and extension orientation (30.41). It was found that the innovators were also having high information seeking behavior. Further the test statistic of Wilcoxon Mann Whitney 'U' value revealed that there is significant difference in social participation (856.5), mass media exposure (798.0) and extension orientation (245.5) at 5 per cent level. Similar findings reported by Ruter (2008), that farm innovations arise either from their own ingenuity or learned from other farmers, researchers, extensionists and other information sources like the mass media and extension orientation. Shilpashree (2011) also reported that majority of the innovative farmers belongs to high mass media utilization and extension orientation category.

Innovativeness: Innovativeness in terms of socio-psychological orientation of an individual to get linked or closely associated with change was compared between innovators and non-innovators. The responses of both the groups were taken on the set of statements and analyzed using Wilcoxon-Mann-Whitney test in order to identify the significant difference between the groups. The mean ranks and the test statistic are presented in Table 3.

Table 2: Comparative social profile description of innovators and non-innovators (N=100)

Category	Mean rank		Mann –Whitney U value	Wilcoxon W	Z value
	Innovator (n_1=50)	Non-innovator (n_2=50)			
Social participation	58.37	42.63	856.5*	2131.50	-2.763
Mass media exposure	59.54	41.46	798.0*	2073.00	-3.190
Extension orientation	70.59	30.41	245.5*	1520.50	-7.017

* $p<0.05$ significant difference at 5 per cent level

Table 3: Comparison of innovativeness as per Wilcoxon Mann Whitney test (N=100)

Group	Mean rank	Standard deviation	Mann whitney U	Wilcoxon W	Z value
Innovator	67.11	2.532	419.50*	1.69	-5.767
Non-innovator	33.89	0.503			

* $p<0.05$ significant difference at 5 per cent level

Table 3 reveals that innovators have comparatively high mean rank (67.11) than non-innovators (33.89) due to their creative thinking and problem solving nature. Further the test statistic value (419.50) showed that there is significant difference at 5 per cent level between the two groups. Similar findings by Gebre (2014) who inferred that farming experience, participation in non-farm activities, access to credit service, participation in extension events and in social organizations were the major factors influencing innovativeness.

Risk orientation: The degree to which the respondents are oriented towards risk and uncertainty and has courage to face the problem was compared between two groups. From both the groups the responses were taken on a set of statements and Wilcoxon-Mann-Whitney test was carried out to identify the significant difference and mean ranks.

It is clear from the Table 4 that innovators have comparatively high mean rank (71.27) than non-innovators (29.73) due to their psychological willingness to take risk in the venture. The value of test statistic (211.50) indicates that there is a significant difference at 5 per cent level between two groups. Regarding the risk orientation, the study results of Leitgeb *et al.* (2013) were in controversy with the findings of present study, where it concluded that a few of the farmers indicated that their innovations were unsuccessful, and this is expected since innovation generally involves decision making under uncertainty which can result in positive or negative outcomes.

Social empowerment: The level of social empowerment of both the innovators and non-innovators were taken on the fourteen statements under the category of social empowerment. Wilcoxon-Mann-Whitney's test was carried out in order to identify the significant difference between two groups.

Data in the Table 5 represents significant difference of level of social empowerment between innovators and non-innovators by using Wilcoxon Mann Whitney test. The results revealed that innovators have comparatively high mean rank of 60.94 than non-innovators (mean rank 40.06) due to their active social involvement and striving for recognition in the society. Further Wilcoxon Mann Whitney test statistic value (728.00) reveals that it is significant as the computed p-value is less than the significant level at five per cent ($p < 0.05$). It can be inferred that the innovators and non-innovators are significantly differed in level of social empowerment due to the innovation. The findings are in line with the results of Gebre (2014) who inferred that involvement in social organizations would create suitable condition that may enable the farmers to develop leadership experience. While they are practicing leadership in the community, they would have an opportunity to get diverse information on various aspects of agricultural practices which in turn may be the basis for the enrichment of innovativeness.

Stimulants of innovation: Broadly six different stimulants of innovation (problem faced by self, problem faced by peers, experimented purposefully with curiosity, own thinking but not faced any problem, simply occurred the idea and innovation induces innovation) which were relevant to the present study were identified. Then the innovators ($n_1=50$) responses under each selected broad category of the innovations were analyzed.

From the Table 6, it is evident that the percentages of the respondents in each category varied according to the type of stimulants. In respect of innovations developed in crop production category, 'problem faced

Table 4: Comparison of risk orientation as per Wilcoxon Mann Whitney test (N=100)

Group	Mean rank	Standard deviation	Mann whitney U	Wilcoxon W	Z value
Innovator	71.27	4.479	211.50*	1.48	-7.180
Non-innovator	29.73	0.503			

* $p<0.05$ significant difference at 5 per cent level

Table 5: Level of social empowerment based on Wilcoxon Mann Whitney test (N=100)

Group	Mean rank	Standard deviation	Mann Whitney U	Wilcoxon W	Z value
Innovator	60.94	10.32	728.00*	2003.00	-3.60
Non-innovator	40.06	0.50			

* $p<0.05$ significant difference at 5 per cent level

Table 6: Comparison of thestimulants of innovation (n_1=50)

Category	Crop production *f (%)*	Horticulture *f (%)*	Farm machinery *f (%)*	Processing & value addition *f (%)*	Animal husbandry *f (%)*
Problem faced by self	7(70)	5(50)	2(20)	-	-
Problem faced by peers	-	-	-	-	-
Experimented purposefully with curiosity	-	2(20)	-	7(70)	6(60)
Own thinking but not faced any problem	2(20)	1(10)	-	2(20)	3(30)
Simply occurred the idea	1(10)	2(20)	-	1(10)	1(10)
Innovation induces innovation	-	-	8(80)	-	-

Figures in parenthesis indicate percentage

by self' is the major stimulant (70%) followed by 'own thinking but not faced any problem' (20%) and 'simply innovation occurred by idea' (10%). Similar findings reported by Olga (2015), innovations appearing at the grassroots level are triggered most often by needs of the everyday life in circumstances of limitations in resources. In horticulture category of innovations, major stimulant identified is 'problem faced by self' (50%) followed by 'experimented purposefully with curiosity' and 'simply occurred the idea' with 20 per cent each and 'own thinking but not faced any problem' (10%). It can be inferred that majority of the crop production and horticulture innovations are developed either to increase production or income, therefore problem faced by self is the major stimulant in both the categories. 'Innovation induces innovation' (80%) is the major stimulant for farm machinery category of innovations followed by 'problem faced by self' (20%). Most of the farm machinery developed at farmer's level is the modifications of the existing ones to make minor improvements either to reduce labour cost or to increase efficiency of the existing machinery. In processing and value addition category, the innovations mostly developed by 'experimenting purposefully with curiosity' to start a new venture (70%) followed by 'own thinking but not faced any problem' (20%) and 'simply occurred the idea' (10%). The same trend is also seen in animal husbandry category of innovations where majority developed innovations by 'experimenting purposefully with curiosity to start a new venture' (60%). It is followed by other stimulants like 'own thinking but not faced any problem' (30%) and 'simply occurred the idea' (10%). This is similar to the findings of Bayer (2013) who identified that one-third of the innovations developed with 'out of curiosity' and one-fourth with a target to increase the production. It can be concluded from the data that different stimulants promote different type of innovations.

Time gap from idea generation to innovation: The time gap from idea generation to innovation development under different category of innovations was analyzed from the responses of the innovators. The periods of time gap (immediately, 1-6 months, 7-12 months, 1-3 years, 4-6 years and more than 6 years) were identified based on the category and the results are presented in Table 7. The percentage of the respondents (innovators) in each category is varied according to the time gap from idea to innovation.

Table 7: Analysis of the time gap from idea generation to innovation (n_1=50)

Category	Crop production *f (%)*	Horticulture *f (%)*	Farm machinery *f (%)*	Processing and value addition *f (%)*	Animal husbandry *f (%)*
Immediately	-	-	-	-	-
1-6 months	-	7 (70)	-	-	-
7-12 months	9 (90)	2 (20)	-	-	3 (30)
1-3 years	1 (10)	1 (10)	1 (10)	-	7 (70)
4-6 years	-	-	9 (90)	10 (100)	-
> 6 years	-	-	-	-	-

Figures in parenthesis indicate percentage

In crop production category, the results showed that 90 per cent of ideas took only 7-12 months and only 10 per cent ideas took a period of 1-3 years time. More than two-third of horticulture ideas took 1-6 months followed by 7-12 months (20%) and 1-3 years (10%). Since the cereal crops are season specific, it took at least one year in majority of the cases to convert the idea into innovation. However in case of horticulture crops which are either short duration or perennial, more than two-third of the ideas took only 1-6 months. Whereas the farm machinery ideas took minimum of 4-6 years in majority of the cases (90%) followed by 1-3 years (10%). It is due to the fact that it requires sufficient time for complementary equipment for the manufacturing or modifying the design to suit the requirement. In case of processing and value addition category 100 per cent of ideas took 4-6 years as the establishment of processing unit needs suitable machinery, technical guidance and financial support. In case of animal husbandry ideas, more than one-third of the ideas took 1-3 years followed by 7-12 months (30%) as it also needs technical guidance and financial support.

Type of support: The support received by the innovators from different institutes for scaling up the innovation was categorized into technical, input, extension and financial support. The overall and category wise support is mentioned to analyze the major form of support received by the innovators. From the Figure 1, it is evident that there is significant difference in the mean ranks of different types of support received. Majority of the respondents received technical support (mean rank 3.07) from the institutes followed by input support (mean rank 2.76), extension support (mean rank 2.46) and financial support (mean rank 1.71).

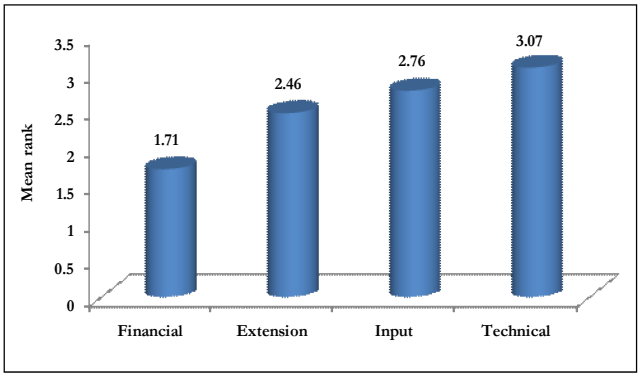

Figure 1: Type of support received by the innovators

Figure 2 shows innovation category wise support received by the innovators. Most of the crop production innovators received input support (67%) followed by technical (26%), financial (4%) and extension support (3%). In case of crop production, it does not require much financial support because most of the government schemes are focusing on giving input subsidy. In horticulture innovations, more than one-third received input support followed by technical (29%), extension (23%) and financial support (10%). Here the percentage of support is almost uniform due to the fact that horticulture needs input subsidy, technical guidance and to some extent financial support for establishment of green house and other infrastructure. Where as in case of farm machinery innovations, 71 per cent the respondents received technical support followed by input (19%), extension (8%) and financial support (2%). It is due to designing of the machinery needs technical guidance than others. More than three-fourth of the processing and value addition innovators received financial support followed by technical (10%), input (8%) and extension support (4%). The financial support is more in case of processing and value addition category, mainly due to the establishment of processing unit needs financial support for infrastructure equipment. Where as in case of animal husbandry innovations more than half of the respondents received extension support followed by technical (32%), financial (9%) and input support (4%). It is observed that animal husbandry innovations need more extension and technical support.

Table 8: Friedman test statistics ofsupport received by innovators (n_1=50)

Test statistic value	
Q (Observed value)	38.08*
Q (Critical value)	7.81
df	3
P value	< 0.02

* p<0.05 significant difference at 5 per cent level

Further Friedman's test was carried out to identify the significant difference in type of support received for different category of innovations. It is clear from the Table 8 that the computed p-value is significant at five per cent level ($p < 0.05$) with Q value 38.08. It can be inferred that the type of support received by the innovators from different institutions are significantly different according to category of innovations.

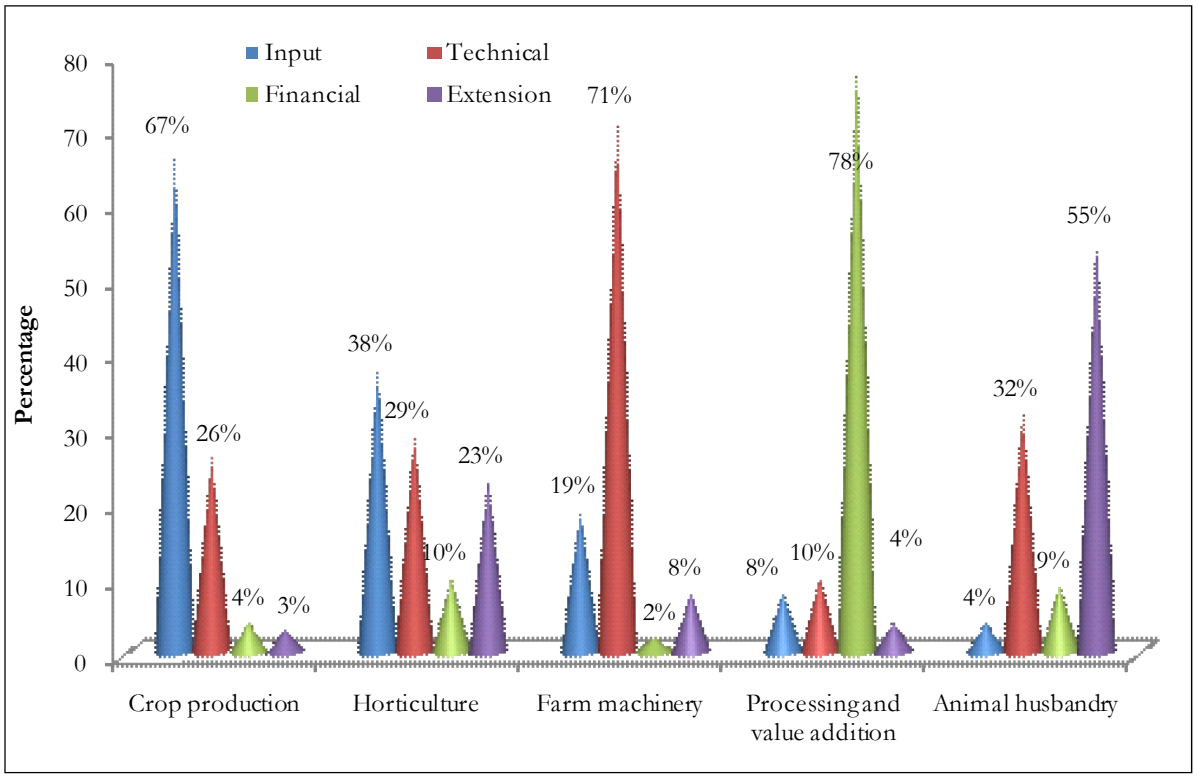

Figure 2: Category wise support received by innovators

Spread of innovations: Means of spread considered under the present study were identified to find out the different means used by innovators and institutions. The innovators were asked to rank the responses starting from 1= to a very low extent to 5= to a very high extent on different components. Total score of each component was taken into account and further compared using Friedman's test. The test results indicate that the mean ranks varied for different means of spread.

Friedman's test statistics results revealed that the computed p-value is significant at five per cent level ($p < 0.05$) with Q value 73.22. It can be inferred that the different means of spread by farmers are significantly different according to innovators perception. It is clear from the Table 9 that the major means of spread of innovations is through linkage with organizations (mean rank 5.50). Linkage provides platform for display of innovations and further the innovations are documented and then published for wider diffusion. The present study results were similar to the findings of Mckenzie (2011) who stated that there were multiple pathways for innovation exchange and the linkages between farmer innovation, education and extension are essential in generating knowledge and fostering technological change.

Table 9: Means of spread by innovators as per Friedman's test (n_1=50)

Category	Mean rank	Groups		
Distributing free samples	3.04	A		
Fellow farmers	3.12	A		
Social networking	3.27	A		
Family members	3.63	A		
Personal contact	4.21	A	B	
Attending exhibitions/melas	5.23		B	C
Linkage with organizations	5.50			C

Table 10: Means of spread by institutions as per Friedman's test (n_1=50)

Category	Mean rank	Groups	
Demonstrations	1.79	A	
Inviting as resources persons	2.94	A	
Local media	4.31		B
Published literature online/offline	4.46		B
Recognition/rewards	4.72		B
Institutional tie ups	4.79		B
Melas/exhibitions	4.99		B

The perception of the innovators on different means of spread through institutions was identified and analyzed by Friedman's test. The test statistics results with Q value 105.03 is significant at five per cent level ($p < 0.05$). It can be inferred that the different means of spread perceived by the institutions are significantly different according to innovators perception. The data from the table 10highlights that the major means of spread is through melas/exhibitions (mean rank 4.99) conducted by different institutions involved in scaling up of innovations. It is followed by tie ups of the innovators with the institutions (mean rank 4.79), recognition/ rewards (mean rank 4.72), published literature online/ off line (mean rank 4.46), local media (4.31) and inviting as resource persons (mean rank 2.94). The least means of spread is through conducting demonstrations of innovations with mean rank 1.79.

Non-innovators: The responses were taken from the non-innovators (n_2=50) in the study area regarding source of information on innovations and motivating factors for adoption. The different sources and motivating factors were identified and the respondents were asked to rank the preferences.

It is clear from the Table 11, that farmers melas/ exhibitions are the major source (mean rank 6.32) of information for the non-innovators where the innovations are displayed as live models with their economic impact and further direct interface with the innovators is possible. It is followed by information from fellow farmers (mean rank 4.90), personal contact with innovative farmer (mean rank 4.70), contact with innovative farmer (mean rank 4.70), information from family members (mean rank 3.88), published literature (mean rank 3.20) and supporting organizations (mean rank 2.94). The least source of information is local media (mean rank 2.06). Further Friedman's test statistics Q value 148.05, which is higher than the critical value (12.59) and is significant at five per cent level ($p < 0.05$). It can be inferred that the different sources of information on innovations are significantly different according to non-innovators perception.

Table 11: Source of information for the non-innovators as per Friedman's test (n_2=50)

Category	Mean Rank	Groups			
Local media	2.06	A			
Supporting organizations	2.94	A	B		
Published literature	3.20	A	B		
Family members	3.88		B	C	
Innovative farmer	4.70			C	
Fellow farmers	4.90			C	
Farmers melas/exhibitions	6.32				D

Data was collected from the non-innovators regarding the innovation category wise motivating factors. The percentage of the respondents in each category varied according to type of innovations. It is clear from the table 12that in crop production innovations, the major motivating factor for the non-innovators is economic gain of the innovation (62%) followed by demand driven (28%); business factor and drudgery reduction with 4 per cent each and social factor (2%). In horticulture innovations, the major motivating factor is business factor (40%) followed by economic gain (34%), demand driven (20%), social factor (4%) and drudgery reduction (2%). Nearly half of the respondents in case of farm machinery were opined that drudgery reduction is the major motivating factor followed by social factor (24%), business factor (14%), economic gain (8%) and demand driven (4%). In processing and value addition innovations, business factor (44%) is the major motivating factor followed by social factor (22%), economic gain (16%), demand driven (14%) and drudgery reduction (4%). The similar results are seen in animal husbandry innovations,

Table 12: Motivating factors for the non-innovators (n_2=50)

Factors	Crop production	Horticulture	Farm machinery	Processing and value addition	Animal husbandry
	f (%)	*f (%)*	*f (%)*	*f (%)*	*f (%)*
Demand driven	14(28)	10(20)	2(4)	7(14)	12(24)
Business factor	2(4)	20(40)	7(14)	22(44)	16(32)
Social factor	1(2)	2(4)	12(24)	11(22)	15(30)
Economic gain	31(62)	17(34)	4(8)	8(16)	6(12)
Drudgery reduction	2(4)	1(2)	25(50)	2(4)	1(2)

Figures in parenthesis indicate percentage

where the major factor is business factor (32%) followed by social factor (30%), demand driven (24%), economic gain (12%) and drudgery reduction (2%).

For generalization of results, Friedman's test statistics ($Q=112.02$, $P<0.05$) was carried out to analyze the major motivating factors of non-innovators for all the innovations. From the results, it is clear that the major motivating factor is drudgery reduction (mean rank 4.38) followed by economic gain (mean rank 3.85), social factor (mean rank 2.96), business factor (mean rank 2.10) and demand driven (mean rank 1.71).

Table 13: Reasons for non-adoption of innovations (n_2=50)

Problems	Mean score	Rank
Lack of awareness on innovation	3.89	V
Lack of demonstrations on innovations	4.66	II
Culture, attitude and perception of farmers	3.98	IV
Poor economic condition and size of holdings	3.10	VI
Location specificity of the innovations	6.52	I
Risk factor and psychological fear	4.06	III

Results from the Table 13 show that the major among the constraints was location specificity of the innovations as some of the innovations developed by the farmers' suits to their own requirement or to a particular locality. This was similar to the findings of Gebre (2014) who reported that three-fourth of the respondents revealed that they were unable to accept the innovations by other farmers in that area because of its unsuitability while one-fourth revealed they were complex in their application. It is followed by lack of demonstrations on innovations. This was similar to the findings of Gupta (2013) who summarized that the government and aid organizations seldom consider acquiring ideas or innovative products and services designed at the grassroots by the people they are trying to assist. The question of reciprocating the innovations to fellow farmers seldom arises. In addition, a very small number of these ideas reached people taking the initiative to do so on their own.

CONCLUSION

The present study findings concluded that there is significant difference in profile comparison of innovators and non-innovators which are directly linked to innovative thinking and creates platform for the new ideas of the respondents. The basic economic profile, involvement in social organizations, psychological characteristics were compared between innovators and non-innovators. The study results showed that the innovators significantly differ from non-innovators in having higher total cultivable land, high annual income than non-innovators. With respect to farming experience, there was no significant difference between the two groups. Social profile comparison analysis showed that the innovators have comparatively high mean rank than non-innovators with respect to social participation, mass media exposure and extension orientation than non-innovators. In the context of innovativeness, innovators were comparatively in higher side due to their creative thinking and problem solving nature. At the same time innovators have high risk orientation due to their psychological willingness to take risk in the venture. The present study mainly identified the origin and spread of farmer-led innovations. On the basis of results, category wise stimulants of innovations were identified and percentages of the respondents in each category were varied according to the type of stimulants. 'Problem faced by self' in crop production and horticulture, 'Innovation induces innovation' in farm machinery, 'curiosity to start a new venture' for processing and value addition and animal husbandry. Further, time gap from idea generation to innovation development under different category of innovations was analyzed. Farm machinery and processing and value addition category takes more time as the establishment of unit needs suitable machinery, technical guidance and financial support. Different means of spread by the innovators and institutions was identified. Linkage with organizations and conducting promotional activities in scaling up of innovations like melas/exhibitions/seminars by farmers and institutions are the major means of spread of innovations. Study also found reasons for low adoption of innovations like location specificity of the innovations and lack of demonstrations.

REFERENCES

Akinnagbe, O.M. and A.R. Ajayi. 2010. Challenges of Farmer-Led Extension Approaches in Nigeria. *World Journal of Agricultural Sciences,* 6(4): 353-359.

Andriopoulos, C. and P. Dawson. 2009. Managing Change, Creativity and Innovation. SAGE, Los Angeles.

Ann, W.B.; K. Patti; W. Chesha; V. Laurens van; Q. Gabriela; S. Kees and D. Boru. 2015. Exploring the impact of farmer-led research supported by civil society organisations.

Agriculture and Food Security journal. 4:4. Available online at: http://www.agricultureandfoodsecurity.com/content/4/1/4

Bayer, S. 2013. What determines innovation capacity in farm households? Insights fromruralGhana.https://editorialexpress.com/cgibin/conference/download.cgi?db_name=CSAE2014&paper_id=391.

Chambers, R. and J. Jiggins. 1989. Agricultural Research for Resource-poor Farmers: A Parsimonious Paradigm. *Agricultural Administration and Extension,* 27: 109-128.

Gebre, G.G. and D.M. Zegeye. 2014. Challenges of farmers' innovativeness in central zone, Tigray, Ethiopia. *International Journal of Agricultural Policy and Research,* 2(5): 215-223.

Gupta, A. 2013. Tapping the Entrepreneurial Potential of Grassroots Innovation. Stanford Social Innovation Review. Sponsored Supplement. Rockfellar Foundation.

Hall, A. 2006. Public-private sector partnerships in an agricultural system of innovation: concepts and challenges. *International Journal of Technology Management and Sustainable Development,* 5(1): 3-20.

Leitgeb, F.; F. Kummer; F.R. Funes-Monzote and C.R. Vogl. 2013. Farmers' experiments in Cuba. *Renewable Agriculture and Food Systems,* 29: 48-64.

Mckenzie, F.C. 2011. Farmer-Driven Innovation in Agriculture: Creating Opportunities for Sustainability. Unpublished Ph.D. thesis, School of Geosciences, The University of Sydney.

Million Alemayehu. 2001. Ayelech Fikre, an outstanding women farmer in Amhara Region, Ethiopia. In: Reij, C. and Waters-Bayer A. (Eds), Farmer innovation in Africa: a source of inspiration for agricultural development (London: Earthscan), pp. 28–32.

Nigel, P. and C.P. Buckley. 2006. Innovation challenges, constraints and opportunities for the rural poor. Background paper of United Kingdom's Department for International Development (DFID), implementation of the IFAD Initiative for Mainstreaming of Innovation.

Olga V. Ustyuzhantseva. 2015. Institutionalization of grassroots innovation in India. *Current Science,* 108(14768): 25.

Prolinnova. 2004. Ethiopia progress report. Unpublished Annual Report. Leusden: Prolinnova Secretariat.

Saad, N. 2002. Farmer processes of experimentation and innovation. CGIAR system wide program on participatory research and gender analysis: Working Doc. No 21.

Sunding, D. and Z. David. 2000. The Agricultural Innovation Process: Research and Technology Adoption in a Changing Agricultural Sector. Handbook of Agricultural Economics. University of California, Berkeley.

Wolf, S.A. 2008. Professionalization of agriculture and distributed innovation for multifunctional landscapes and territorial development. *Agriculture and Human Values,* 25: 203-07.

Received on November, 2017, Revised on February, 2018