International Journal of Agricultural Policy and Research Vol.2 (5), pp. 215-223, May 2014
Available online at http://journalissues.org/ijapr/

ISSN 2350-1561

Original Research Paper

Challenges of farmers' innovativeness in central zone, Tigray, Ethiopia

Accepted 3 May, 2014

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Transformation of agriculture is essential for sustainable growth and national progress of developing countries. To be successful in achieving this objective Extension worker, researchers, development practitioners, and institutions involved in rural development have to play a crucial role in increasing farmers' competency. This is measured by their success in making farmers use their ability to innovate. However, in most cases Extension is seen trying to transfer technologies developed by research scientists to farmers. But many of these technologies are too expensive for the hundreds of millions of small-scale farmers. Moreover, these packages are often standardized and promoted countrywide, without concerning to agro ecological differences. Therefore; the main objective of this study was to assess farmers' innovativeness and realize its challenges in the central zone, Tigray. To achieve this objective both purposive and random sampling procedure were used to select representative samples in the study area of the region. Accordingly, total of 160 representative farmers were intervened to generate primary data. In addition, secondary data were collected from relevant sources. Binary logit model was employed to identify the determinant factors in farmers' innovativeness. 12 explanatory variables were used for the binary logit model, out of which 5 were found to be significant to affect farmers' innovativeness. These were farm experience, participation in non-farm activities, participation in extension events, access to credit service and participation in social organizations. Any effort in promoting farmers' innovativeness, therefore, should consider these factors.

Key words: Farmer, innovation, probability of being innovative farmer, Tigray

INTRODUCTION

In most developing countries, subsistence or traditional agriculture dominates the economy. For national progress to occur, change in agriculture is essential. Significant change is needed if diets are to be improved, if a surplus is to be produced for sale, and if agriculture is to enter a phase of self sustained growth. Change is needed not only to increase production, but also to liberate households from poverty. The dependency relationship associated with the unjust distribution of capital wealth, particularly land, can then be overcome. A great deal of the responsibility for bringing about this change rests on the shoulders of extension workers (Adams, 1992). Researchers, development practitioners, and institutions involved in rural development also have important role to play to bring about the required change.

For Extension workers to be successful in achieving this objective, they have to play a crucial role in increasing farmers' competency (van den Ban and Hawkins, 1996). The farmers' competency is seen not only in their willingness to accept and adopt an innovation, but it is also seen in their effort and ability to innovate. The success of extension workers and goodness of extension is measured by their success in making farmers use their ability to innovate. However, in most cases extension is seen trying to

transfer technologies developed by research scientists to farmers. Researchers are also needed to appreciate farmers' knowledge and creative capacities and prepared to work together with farmers in their fields on questions that farmers are trying to investigate themselves (Amsalu., 2008).

Despite much rhetoric about the need for more demand-driven and participatory approach to agricultural research and development, the transfer of technology (ToT) model continues to dominate in most countries in Africa (Bauer et al., 1998, cited in Reij and Waters-Bayer, 2001). This model implies that scientists generate new or improved technologies which are then transferred by extension agents to farmers. However, many of the technologies, generated and promoted in this way are too expensive for the hundreds of millions of small-scale farmers who cannot afford to invest in the packages of required inputs, such as introduced seed, fertilizers and pesticides. Moreover, these packages are often standardized and promoted countrywide, without concerning to agro ecological differences, and poorly suited to the diverse and variable conditions of small holders in semi arid and other marginal areas. Many of these farmers have therefore been reluctant to adopt the technologies offered by conventional research and extension, despite sometimes massive 'encouragement' for them to do so (Reij and Waters-Bayer, 2001a).

With growing population pressure and growing awareness of environmental degradation, farmers are seeking more productive ways to use the available resources without depleting them. They have to adjust rapidly to changing conditions. If agriculture is to be sustainable farmers must be capable of actively and continuously creating new local knowledge (Röling et al., 1999, sited in: Reij and Waters-Bayer, 2001).

According to Röling (1994), farmers are not passive receivers of the ideas of scientists: They are active researchers and experimenters. They are very resourceful in generating and testing new ideas (Kibwana, 2000). This local innovation by farmers is making a major contribution to agricultural development.

Agricultural development demands continual innovation and experimentation. All farmers innovate and experiment in their struggle to make a living from the soil (Kibwana, 2000).

Farmer innovation is not a new phenomenon to the smallholder farmers in Ethiopia. What is actually knew is the attempt of outsiders to recognize and support the knowledge and experiences of farmers, with a purpose of developing local innovations as well as building the confidence and capacity of others to experiment new ideas. This experience is indeed in its infancy stage but lots of progresses have been witnessed in recent years, in the country. Tigray region is not excluded. -This paper briefly discusses the major challenges of farmers' innovativeness in central zone of Tigray, Ethiopia.

Review of the literature

Röling (2006) has defined as innovation, is a sexy concept that appeals to left and right, and young and old. Innovation has a promise, it sounds like a way forward. It is easy to get people behind it. But beware! The concept is used in different meanings. It can represent very different perspectives. It can lead to considerable confusion. It is a real battlefield of knowledge. According to Leeuwis (2004), sited in Dormon, (2006), innovation involves new ways of doing things or 'doing new things' however, doing things differently can only be considered an innovation if the new things work in every day practice.

According to Adams (1992) sited in Amsalu (2008), innovations are new ideas, methods, practices or techniques which provide the means of achieving sustained increases in farm productivity, and income. He also adds that some innovations originate from agricultural research stations, others from farmers.

According to Waters-Bayer (2004), sited in: Amanuel et al. (2004), "local innovation" (farmer innovation) refers to the dynamics of indigenous knowledge, how farmers develop new ways of doing things new technologies or ways of organizing work using their own resources, on their own initiative, without pressure or support from formal research or extension. These local innovations may be developed by individuals or groups in farming communities.

Farmers' innovativeness refers to the degree to which an individual farmer is relatively earlier in adopting new changes than other members of the society (Rogers, 1986, cited in Hedija, 1999). Unlike this definition, innovativeness, in relation to farmers, means developing or trying out new ideas without the support of formal extension services (Reij and Waters-Bayer, 2001). Based up on this concept, Yohannes (2001), in: Reij and Waters-Bayer (2001), defines innovation as something new that has been started within the life time of the farmer, not something inherited from parents. It is a broad terminology that can refer to discovery of a completely different way of doing something or to modification of an existing technology.

According to the PFI, those farmers who (in local terms at least) have developed or are testing new ways of land husbandry that combine production with conservation (Critchley 1999) are known as innovative farmers. The sister project, indigenous soil and water conservation (ISWC-2), also operated under the same philosophy, but each of the country-level partners developed working definitions of their own. For example, ISWC-Ethiopia defined an innovator as someone who develops or tries out new ideas without the support of the formal extension services. "New" was defined as something that has been started within the lifetime of the farmer not something that s/he inherited from parents or grandparents. In contrast,

ISWC-Tunisia decided to include technologies inherited from parents in the inventory of local innovations.

However, as a general guide for action, the working definition for ISWC-2 was: "Farmer innovation" is something new to a particular locality, but not necessarily new to the world" (Reij & Waters-Bayer 2001). Therefore, the working definition of this paper for farmer innovators is quite similar to the one developed by ISWC-2 Ethiopia. So that we have defined innovative farmers of Central zones of Tigray, Ethiopia as, farmers those who have tried or are trying out new but value-adding agricultural or natural resource management practices, using their own knowledge and wisdom but also through appropriation of outsiders' knowledge, often called scientific. Without contradicting the recognition of indigenous knowledge (IK) as an important asset of development, we believe that innovative farmers are not those who are using IK as it used to be during their ancestors' time. They are farmers who act on IK and/or outsiders' knowledge - through conducting informal experiments - and making the knowledge more usable or better fitting to their own realities.

Moreover, farmers who have been trained by extension workers may also be recognized as innovators, when they are dealing with the incoming knowledge/technology by improving it or regardless of their sex, wealth status or age) who are trying to add value to existing practices through creative engagement and experimentation and with a passion to seek changes that have economic, social and environmental significance.

Actually, it is common to see local knowledge/innovations being socialized and shared easily unless it is a marked mechanism of livelihood for the individual.

Another important dimension of the concept of "farmer innovation" is that it embraces not only technological innovation, but also new ways of managing livelihood in general. This may include new ways farmers do networking, communication, institution building, information management, marketing, planning and accessing resources in view of improving their agricultural and natural resource conservation activities. In short, this means, farmer innovation is all about new ways of doing agriculture and natural resources management. That newness entails values that may bring changes in quality of life.

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 (Nielsen, 2001, in: Reij and Waters-Bayer, 2001).

The farmers' motivations to innovate depend on their problem and the resources they have in-hand. For example, their motivations for regenerating vegetation differ and depend largely on the amount of land they have (Amsalu , 2008).

Importance of the study

This study, which focused on understanding the challenges of farmers' innovativeness, shall produce valuable information on farmers' innovations and farmers' innovativeness by identifying and documenting the type of farmers' innovations prevalent in the study area and their suitability to the farmers' conditions. The study is an attempt to shade light on the factors which determine the farmers' innovativeness which can be incorporated in the extension programme to enhance sustainable agricultural development of the study area.

Lastly, the results, of the study will provide Information to policy makers, planners, administrators, extension organizations, and development institutions, to review their strategies and provide due place to farmers in technology development process and ensure their participation in agricultural development program planning and implementation.

Statement of the problem

Being one of the oldest civilizations in the world, Ethiopia has an agricultural tradition that is over 2500 years old (Tesfaye, 2003). After 25 centuries the performance of the sector is very low; the highest proportion, about 85%, of the country's labour force is still employed in agriculture and the farmers are using backward agricultural methods, which are similar to those of their ancestors.

Different explanations have been given to the low performance or backwardness of agriculture in the country. Commonly mentioned problems are drought, war, pests, insecurity of land tenure, population pressure, soil erosion, overgrazing, deforestation, lack of efficient rural organizations, stagnant technology, distorted economic policy, weak institutional support, etc. (Tesfaye, 2003)

These explanations often lead to solutions coming from outside the very community that is facing the multitude of problems. The community's indigenous knowledge on resource management, local institutions and coping mechanisms were not given any attention. Instead, the methodological approach used is the Transfer of Technology (ToT) that suits research & extension agencies (Tesfaye, 2003).

Despite all the problems of the country's agriculture mentioned above, it provides a livelihood for 85% of the population, generates over 90% of the export revenue, and produces raw materials for the industries and food needed by its fast-growing population (Tesfaye, 2003). When the history of the performance of extension in the country is seen, it is impossible to say that the achievement of the agricultural sector mentioned above was because of the achievement of extension in introducing appropriate and acceptable technologies. It is the effort of the large number of small-scale farmers that enabled agriculture to sustain

the country. In general, owing to the farmer's effort, agriculture is sustaining the country by providing all its requirements. Every farmer must innovate to some degree because of the difference between farmers with respect to household and plot characteristics. Some site specific modification of a technique is always needed. Moreover, because conditions are constantly changing farmers have to modify their farming techniques over time (Yohannes, 1998, cited in Mitiku et al., 2001). But the problem is that farmers seldom record their accomplishments in writing, rarely write papers on their discoveries and do not attach their names and patents to their inventions. As a result, the history of agriculture is written without reference to the main innovators in the long-term process of technological change. Moreover, academic discipline which one might expect would have documented farmers' contributions, such as economics and anthropology, have not done so (Rhoades, 1990, in: Chambers et al., 1990). Therefore, the subject(s) in which they innovate, the innovations developed or redesigned by them and even the extent to which farmers' innovations have situational and cultural compatibility is not known in the study area.

The aim of the study, therefore, was to assess farmers' innovativeness and realize its challenges in the study area.

Objectives of the study

The general objective of the study was to understand the challenges of farmers' innovativeness in central zone of Tigray, Ethiopia. The specific objectives of the study were:

- To assess farmers' innovativeness in the study area
- To identify determinants of farmers' innovativeness in the study area.

METHODOLOGY

Data sources and sample size

The study were used both primary and secondary data sources. Primary data were collected from 160 sampled farmers by using personal interview in the study area. The method of data collection used purposive and simple random sampling strategies. Secondary data were collected from office of agriculture in the study area. Moreover, qualitative data were gathered from heads of GOs and NGOs, subject matter specialists, and development agents, through informal discussions, to supplement the quantitative data.

Method of data analysis

The collected data were subjected to both descriptive and econometric data analysis techniques. Descriptive analysis Such as percentage, average and standard deviation were used to make analysis in the form of tables and graph.

Econometric model was employed to identify the determinant factors in farmers' innovativeness; in this case binary logit model was used. The dependent variable in this case is dummy variable, which takes a value of zero or one depending on whether or not a farmer is innovative. Thus, the main purpose of a qualitative choice model is to determine the probability that farmer with a given set of attribute will fall in one choice rather than the alternative (in this study becomes innovative or not).

Following Gujarati (1995), the functional form of logit model is specified as follows:

$$pi = \frac{1}{1 + e^{-z(i)}} \quad \text{.....1}$$

Where P (i) is a probability of deciding to develop new ways of doing things for i^{th} farmer and Z (i) is a function of n explanatory variables (Xi) and is & expressed as:

$$z(i) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots\ldots\ldots\ldots + \beta_i X_i \quad \text{.....2}$$

Where B_0 is the intercept and Bi is the slopes parameter in the intercept model. The slopes tells how the log - odds in favor of deciding to develop new ways of doing things changes by a unit. The stimulus index, Zi, refers to as the logs of the odds ratio in favor of deciding to develop new ways of doing things. The odds is defined as, the ratio of the probability that a farmer develops new practice, $P_{i,}$ to the probability that he will not, $(1\text{-}p_i)$. But,

$$(1 - pi) = \frac{1}{1 + e^{z(i)}} \quad \text{.....3}$$

Therefore,

$$\left(\frac{pi}{1 - pi}\right) = \frac{1 + e^{z(i)}}{1 + e^{-z(i)}} = e^{zi} \quad \text{.....4}$$

$$\frac{pi}{1 - pi} = \frac{1 + e^{zi}}{1 + e^{-zi}} = e^{\beta_0} + \sum_{i=1}^{n} \beta_i X_i \quad \text{.....5}$$

Taking the natural logarithms of the odds ratio of **equation (5)** will result in what is called the logic model as indicted below.

$$Li = \ln\left(\frac{pi}{1 - pi}\right) = \left[e^{\beta_0} + \sum_{1=i}^{n} \beta_i X_i\right] = zi \quad \text{.....6}$$

If the disturbance term **ui** is taken in to account the logit model becomes:

Table 1. Fields of agriculture in which farmers have innovated

Field of agriculture	innovators	
	Freq	Percent
Crop production	7	7.77
Livestock	22	24.4
Irrigation	35	38.89
Crop production and irrigation	20	22.2
Livestock, crop production and irrigation	6	6.67
Total	90	100

Table 2. motive to innovate as expressed by the respondents

Motives	Innovators	
	Frequ	Percent
Own creativity	37	41.11
Influenced by extension agents	32	35.55
Observed the innovation else where	11	12.22
To increase household income	9	10
Others	1	1.11
Total	90	100

$$zi = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_i X_i + \upsilon i \quad .....7$$

Where:

β_o is an intercept

β_1, β_2 .....βn are slopes of the equation in the model

Xi = is vector of explanatory variables

RESULTS AND DISCUSSIONS

Descriptive results

This section reports the descriptive results of the study. According to study result, irrigation practices were the most common type of innovation generated by a large proportion of the innovator farmers (38.89%) in the study area followed by livestock, mix of crop production and irrigation, 24.4% and 22.2% respectively.Of the respondents, some farmers were reported to have innovated in multiple fields of agriculture. Accordingly, 6.67% of the farmers innovated in crop and livestock and irrigation (Table 1).

Moreover, the compatibility of innovations was assessed in terms of its acceptance and non-acceptance of innovations in the study area. Accordingly, about 84.62% of farmers innovations have got acceptance while remaining 15.38% of respondents, found that their innovations were not accepted by other farmers for different reasons. It is a useful reminder of the fact that the innovation which does not fit to the local situation will not be accepted by the farmers. With the result at hand, it can safely be concluded that most of the farmers' innovations were considered suitable to the situation and culture of the area and hence accepted by the farmers.

Some of the farmers' innovations could not get acceptance among the community members due to various reasons. Among those innovative farmers about 75% were responded that the main reason for non acceptance of their innovation by other farmers in their area was its unsuitability for other farmers while 25 % of the innovative farmers surveyed replied that their innovations are not accepted by other farmers because they are complex in their application.

An effort was also made in the investigation to assess the impact of farmers' innovations on yield. Accordingly, about 95.5 % of the innovator farmers replied that their innovations increased the production yield in their fields. While 4.4% of them replied that their innovations did not bring any incremental change on yield. There are many important incentives that motivate or trigger innovative farmers to innovate.

As it is presented in the Table 2, about 41.1% of the innovator farmers were triggered to innovate due to their own creativity. The results of the survey further show that the reason to innovate for 35.55 % of the innovator farmers was "influence by extension agents". "Observation elsewhere" of similar innovations also triggered 12.22% of the respondents and 10% of them were to increase their household income.

Econometric analysis

The result of the logistic regression model estimate revealed that out of the 12 factors, 5 variables were found to have a significant influence on the probability of being innovative farmer. These variables include farming experience, participation in non-farm activities, access to credit, participation in social organization, and Participation in different extension events. That means the coefficients of participation in different extension events, access to credit and participation in social organization were statistically significant at 5 percent probability level of significance. Furthermore, the coefficient of farming experience and participation in non-farm activities were significant at 10 percent probability level. The code, type, variable description and result obtained from the binary logit model are presented in the Table 3 and 4, respectively.

In light of the above summarized model results possible explanation for each significant independent variable are given consecutively as follows:

Farming experience

In this study, farming experience was found to be significant to determine farmers' innovativeness. The coefficient for farming experience was found to positively related with farmer innovativeness and statistically

Table 3. Description of variables included in the model estimation

Code	Type	Description
HHSIZE	Continuous	number of the household
EDUC	Continuous	Education level of Respondents
SEX	Dummy	1, if respondent is male,0 otherwise
Age	Continuous	Age of farmer in year
Farmex	Continuous	farming experience in year
Partnon	Dummy	1, if respondent has participated in non-farm activities, 0 otherwise
psocial	Dummy	1 if respondent has participated in social organization, 0 otherwise
conothrplace	Dummy	1, if respondent has contact in other place, 0 otherwise
Livsno	Continuous	Number of livestock the respondents owned
Land	Continuous	Amount of land that respondents owned in hectar
credaceses	Dummy	1, if farmer has got credit, 0 otherwise
partc	Continuous	Participation in different extension events

Table 1. Binary logit result for determinants of farmer innovativeness

Variables	Coefficient	Stand.Error	p-value	Odds Ratio
HHSIZE	-.2015675	.3441196	0.587	.8174484
EDUC	.9047254	1.401852	0.529	2.471253
SEX	-.4814376	1.807235	0.790	.6178945
Age	-.0025612	.178509	0.989	.9974421
Farmex	.1540886	.1975729	0.055***	1.166594
Partnon	-7.96457	4.409272	0.071***	.0003476
psocial	7.931391	3.771714	0.035**	2783.296
conothrplace	.4406442	1.976755	0.823	.6436217
Livsno	.4350215	.369362	0.184	1.544996
Land	2.084865	1.494161	0.199	.124324
credaceses	11.97204	5.239795	0.017**	.158267.4
partc	1.252433	.685732	0.025**	3.498846
_cons	-14.07053	9.884433	0.144	
Log likelihood =	23.411758			
Number of obs =	160			
LR chi2(12) =	76.28			
Prob > chi2 =	0.0000			
Pseudo R2 =	0.4197			
Count R2	92.31%			

Source: model Output **Significant at 5% probability level, *** Significant at 10 % probability level

significant at 10% percent probability level. This indicates that respondents with high farming experience are more likely to be innovative farmers than respondents with low farming experience. The implication is that having cumulative experience on farming will enable farmers to have better knowledge about agricultural activities and to understand its requirements to develop, which in turn may be the basis for innovativeness. As a result, cetris paribus, the odds ratio, in favour of innovativeness, increases by a factor of 1.167 as farming experience increases by a single year. This result is in conformity with the findings of Critchley et al., (1999); Nielsen (2001), in: Reij and Waters-Bayer (2001); Nasr et al., (2001), in: Reij and Waters-Bayer (2001); Yohannes (2001), in: Reij and Waters-Bayer(2001), and Amsalu Bedaso, (2008).

Participation in non-farm activities

This variable affects farmer innovativeness negatively and significantly at 10 percent probability level in the study area. The implication is that innovator farmers devote most of their working time to farming. They are often in their fields, digging pits, constructing bunds, planting and protecting trees, caring for their livestock, producing compost, carting compost, and so on. It appears that the more innovative farmers can produce enough from their land, and therefore need not seek non-farm sources of income. As a result, keeping the influences of other factors

constant, the odds ratio, in favour of innovativeness, decreases by a factor of .0003476 for a unit increase in participation in non-farm activities. This result confirms with the findings of Sawadogo et al. (2001), in: Reij and Waters-Bayer (2001) and Amsalu B., (2008).

Participation in social organizations

This reflects on the degree of involvement of the respondents in existing formal and/or non-formal organizations. Involvement in social organizations is determined by many factors, and in turn it influences the innovativeness of farmers. This opportunity would create suitable condition for these farmers that may enable them 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. In light of this it was hypothesized that those farmers who participate in social organizations are likely to be innovative. In this study, participation in social organization was found to be positively and significantly influences farmer innovativeness at 5 percent probability level. The positive relationship indicates that farmers made more frequent participation in social organization are more innovative than those who made less participation. Further analysis result shows that, other things held constant, the odds ratio, in favor of innovativeness increases by a factor of 2783.29 for a unit increase in the frequency of participation in different social organizations.

Credit service

The sign of the coefficient of this variable showed a positive relationship with farmer innovativeness and is significant at 5 percent probability level. The positive relationship implies that farmers with access to credit service have more chance to be innovative than without access ones. This result is fully in conformity with the prior expectation. This is due to the fact that access to credit can relax farmers' financial constraints to do things in a way they consider paying. It gives the framers an opportunity to be involved in agricultural activities through purchasing different agricultural inputs. As result famers can produce different types of fruit, vegetables and crops. So that they can get balanced diet and become more health and more innovative than those who gets less nutritious diet. The odds ratio indicate that, other factors held constant, in favor of innovativeness increases by a factor of 0.158267 for a unit increase in access of credit service. This result confirms the finding of Amsalu (2008).

Participation in different extension events

Participation in different extension events positively and significantly at 5 percent probability level. The positive relationship indicates that participation in extension events play a great role in raising awareness about farmer innovation. By doing so it enhances farmers' innovativeness. If the number of times the farmer participation on extension events is more frequent, the probability of the farmer to be influenced to innovate will be higher. In the extension event farmers can make contact with extension agents and other subject matter specialists. So that farmers who make extension with subject matter specialists more frequently are more likely to be innovative farmers than those who make such contacts less frequently. Further observation of the result indicates that, other things held constant, the odds ratio, in favor of innovativeness increases by a factor of 3.499 for a unit increase in the frequency of participation in different extension events. The finding of this study was found consistent with what had been found by Amsalu (2008).

CONCLUSIONS

The foregoing analysis attempted to analyze the challenges of farmers' innovativeness in Tigray, Ethiopia. First, an attempt has been made to assess the farmers' innovativeness in the study area. Second, an attempt has been made to identify factors that determine the farmers' innovativeness in the study area using binary logit model of regression. Accordingly, in the study area, the result of the descriptive analysis farming experience and participation in non-farm activities have significant relationship with innovator categories while the relationship between the innovator categories and age, educational status, sex and family size was not reported to be significant.

The result of the logistic regression model indicated that five out of twelve variables namely farming experience, participation in social organizations, participation in non-farming activities, access to credit service and participation in different extension events were found to be theoretically consistent and statistically significant determinants of farmer innovativeness in the study area.

RECOMMENDATIONS

In the study several issues were observed and revealed in relation to the determinants of farmers' innovativeness in the study area. The result, description and interpretation of the data were mainly depended on the context of the research objectives and the situation of the study area. The study has led to the discovery of numerous and diverse local innovations and have furnished proof of the ingenuity, creativity and perseverance of small-scale farmers in the study area in seeking to derive a living from the land. This study may serve as an initial input for further study in the same and other areas of the country. With the major

findings of the research and the conclusion drawn, the following policy issues and processes are forwarded:

- To make agricultural research results more relevant to smallholder farmers living in diverse and complex realities *researchers* should appreciate farmers' knowledge and creative capacities and be prepared to work together with farmers in their fields on questions that farmers are trying to investigate themselves.

- *Extension agents* could play major roles in identifying innovative farmers and local innovations, organizing farmers' workshops to examine innovations and to identify those of interest to different categories of farmers, supporting farmers in organizing their own exchange and study visits, linking farmers with sources of ideas with which they can experiment and linking them with technical specialists who can help them to interpret their experimental findings.

- Approaches to agricultural development that take local innovation as their starting point will help to identify the ever new attempts to adjust and improve the local situation and will be able to point to useful ideas from other areas facing similar problems. Agricultural development policies of the country should be made follow this direction.

ACKNOWLEDGMENT

We thank Aksum University for their financial support in this endeavor. Without their support this study could not have reached at this level.

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