DETERMINANTS OF FARMERS' INNOVATIVENESS IN ALABA SPECIAL WOREDA, SOUTHERN NATIONS, NATIONALITIES AND PEOPLES REGION, ETHIOPIA

M. Sc. Thesis

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April, 2008
Haramaya University

DETERMINANTS OF FARMERS' INNOVATIVENESS IN ALABA SPECIAL WOREDA, SOUTHERN NATIONS, NATIONALITIES AND PEOPLES REGION, ETHIOPIA

A Thesis Submitted to the Faculty of Agriculture
Department of Rural Development and Agricultural Extension
School of Graduate Studies
HARAMAYA UNIVERSITY

In Partial Fulfilment of the Requirements for the Degree of
MASTER OF SCIENCE IN RURAL DEVELOPMENT AND AGRICULTURAL EXTENSION
(AGRICULTURAL COMMUNICATION AND INNOVATION)

By
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April, 2008
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APPROVAL SHEET OF THESIS

SCHOOL OF GRADUATE STUDIES
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As Thesis Research advisor, I hereby certify that I have read and evaluated this Thesis prepared, under my guidance, by *Amsalu Bedasso* entitled: **Determinants of Farmers' Innovativeness in Alaba Special Woreda, Southern Nations, Nationalities and Peoples Region, Ethiopia.** I recommend that it be submitted as fulfilling the Thesis requirement.

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As a member of the Board of Examiners of the MSc Thesis Open Defence Examination, We certify that we have read, and evaluated the Thesis prepared by *Amsalu Bedasso* and examined the candidate. We recommended that the thesis be accepted as fulfilling the Thesis requirements for the Degree of Master of Science in Rural Development and Agricultural Extension (Agricultural Communication and Innovation).

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DEDICATION

To the loving memory of my late parents,
Ato Bedasso Gebbi
W/ro Fantaye Mihirete

STATEMENT OF AUTHOR

First, I declare that this thesis is my bonafide work and that all sources or materials used for this thesis have been duly acknowledged. This thesis is submitted in partial fulfilment of the requirement for an advanced M.Sc. degree at Haramaya University and to be made available at the University's Library under the rules of the Library. I confidently declare that this thesis has not been submitted to any other institutions anywhere for the award of any academic degree, diploma, or certificate.

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Date of submission: 22 April, 2008

BIOGRAPHY

Amsalu Bedasso Gebbi was born in Addis Ababa, Ethiopia on August 27, 1961. He attended Primary, Junior Secondary, and Secondary schools at “Birhan Le’ennante”, “Dejazmach Balcha Abba-Nefso”, and the then “Prince Mekonnin” currently, “Addis Ketema” Comprehensive Secondary School respectively. He obtained Diploma in Animal Science from the then Debre-Zeit Junior College of Agriculture in July 1981. Following that he was employed by Bale region Ministry of Agriculture in August, 1981 and worked in different capacities. Later he joined the then Alemaya University in 2000 and obtained BSc degree in Agricultural Extension in 2003. After obtaining degree he joined MoA again, in 2003, to serve Alage Agricultural Technical and Vocational Education and Training College (AATVETC). During his service at AATVETC, he served as Senior Instructor and Academic Vice Dean of the College. In July 2005, he was granted a scholarship to pursue MSc study at Alemaya University, currently Haramaya University, Ethiopia.

ACKNOWLEDGEMENTS

First of all, I would like to thank God for making everything beautiful in his time.

My MSc study has brought me in contact with many people. The invaluable contribution and collaboration of these people made this work possible.

Among these people, my utmost words of thanks go to Professor N. K. Panjabi for his dedication, guidance, encouragement and valuable feedback. His supervision and guidance during my study was not limited to Haramaya University. He also visited me in the field.

I am most grateful to farmers of Alaba special woreda for the time they gave in responding all the questions in my lengthy interview schedule with patience and for giving the necessary information that made the successful completion of this work possible.

My heartfelt gratitude also go to ILRI/IPMS for generously funding my on-campus MSc study and research work.

The success of this work owes a great deal to the enthusiasm, support and constant interest of colleagues and friends. In this regard I am particularly indebted to ILRI/IPMS staff of Alaba Pilot Learning Site, and staff of the Bureau of Agriculture and Rural Development of Alaba special woreda. I would also like to thank all the enumerators for their commitment and dedication in collecting the data required for the study.

Finally, I extend my special thanks to my wife Debrework Aseffa, to Sennait Amare and to Haimanot Gebeyehu and greatly appreciate their careful handling, encouragement, patience and understanding.

LIST OF ABBREVIATIONS

AATVETC	Alage Agricultural Technical & Vocational Education & Training College
CC	Contingency Coefficients
CIP	International Potato Centre
CSA	Central Statistical Authority
CTA	Technical Centre for Agricultural and Rural Development
e.g.	*exempli gratia*, Latin, "for example"
FAO	Food and Agriculture Organisation of the United States
GDP	Gross Domestic Product
GOs	Government Organisations
i.e.	*id est*, Latin, "that is"
ILRI	International Livestock Research Institute
IPMS	Improving Productivity and Market Success of Ethiopian Farmers
ISWC	Indigenous soil and Water Conservation in Africa
NGOs	Non-Government Organisations
NVS	Natural Vegetation Strips
PAs	Peasants Associations
PFI	Promoting Farmer Innovation in Rain fed Agriculture
PTD	Participatory Technology Development
SD	Standard Deviation
SMS	Subject Matter Specialist
SNNPR	Southern Nations, Nationalities and Peoples Region
SPSS	Statistical Package for Social Science
SWC	Soil and Water Conservation
T & V	Training and Visit
TLU	Tropical Livestock Unit
ToT	Transfer of Technology
TV	Television
UNDP	United Nations Development Programme
VIF	Variance Inflation Factor

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ABSTRACT

For agriculture to enter a phase of self sustained growth and national progress to occur in the developing countries, agricultural transformation is essential. A great deal of the responsibility for bringing about this transformation rests on the shoulders of extension workers, researchers, development practitioners, and institutions involved in rural development. For extension workers, researchers, development practitioners, etc. to be successful in achieving this objective, they have to play a crucial role in increasing farmers' competency, which is seen in their effort and ability to innovate. Strategies dealing with the diversity, complexity and variability of African rain-fed agriculture, from the start, incorporated reliance on farmers' own knowledge and on their innovative capacity. The major concern of this study was, therefore, to identify demographic & personal, socio-cultural, wealth-related and institutional factors that could determine farmers' innovativeness in the study area. The study was conducted in Alaba special wareda, Southern Nations, Nationalities & Peoples Regional State, Ethiopia. Multistage sampling procedure was employed to select PAs and respondents. Accordingly, six PAs were selected using Probability Proportional to Size sampling method from the two Farming Systems, viz. Teff/Haricot bean & Pepper/Livestock Farming Systems available in the area. A total of 180 farmers were interviewed to generate primary data. Interview schedule was developed, pre-tasted & used for the collection of the essential quantitative & qualitative data for the study. In addition, secondary data were collected from relevant sources. Binary logit model was employed to identify the determinant factors in farmers' innovativeness. 16 explanatory variables were used for the binary logit model, out of which 8 were found to be significant to affect farmers' innovativeness. These were time spent in the locality, farm experience, family size, number of livestock owned in TLU, participation in non-farm activities, mass media exposure (frequency of radio listening), extension contact (Contact with Subject Matter Specialists and contact with woreda extension officials). Any effort in promoting farmers' innovativeness, therefore, should consider these factors. If the same are taken in to account, any attempt to promote agricultural transformation through farmers' innovativeness could be successful.

1. INTRODUCTION

1.1 Background

In most developing countries, subsistence or traditional agriculture dominates the economy. For national progress to occur, change in agriculture is essential. Substantial 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 drudgery of manual labour, ill-health and early death. 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.

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 can not 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).

For years, The World Bank strongly pushed a form of ToT called Training and Visit (T&V). In reflection on the T&V system by the World Bank and the various countries involved led to suggestions to strengthen the voice of the farmer (CTA, 1996, cited in Reij and Waters-Bayer, 2001). The dissatisfaction with conventional extension triggered the development of new approaches, such as Farmers Field School, (Röling *et al.*, 1994, cited in Reij and Waters-Bayer, 2001). Basically it concerns applying participatory approaches to improving ToT, but gives little or no attention to techniques generated by farmers or to strengthening farmers' capacities to develop and adapt technologies (Reij and Waters-Bayer, 2001).

Though scientific research is seen to play a major role, strategies dealing with the diversity, complexity and variability of African rain fed agriculture, from the start, incorporated reliance on farmers' own knowledge and on their innovative capacity as experimenters and researchers (Chambers *et al*., 1987, cited in Röling, 1995).

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, 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).

Adams (1992) has defined an *innovation* as an idea or object perceived as new by an individual. He also adds that some innovations originate from agricultural research stations, others from farmers.

According to Yohannes (2001), in: Reij and Waters-Bayer (2001), an *innovation* is defined as something new that has been started with in the life time of the farmer, not something inherited from parent or grand parents.

Indigenous Soil and Water Conservation in Africa (ISWC), a Dutch-funded programme that focused on farmer innovation in land husbandry, defined *Farmer Innovators* as those farmers who spontaneously try out new things, without the direct support of formal research and extension: They are not the *'Model'* or *'Progressive'* farmers who have often been selected by projects to test new crop varieties or packages of external inputs (Reij and Waters-Bayer, 2001).

Farmers in general are said to be innovators. They innovate for many reasons. In Ethiopia, a lot seems to be done to know whether it is natural, as repeatedly mentioned by many authors (Kibwana, 2000; Reij and Waters-Bayer, 2001; Yohannes, 2001) that, farmers are really innovators or not. If the answer for this question reveals the truthfulness of farmers' innovativeness, this in turn will guide interventions to support innovation by farmers. If farmers' innovativeness is ascertained, it will also be possible to make further study to reveal what the determinants of farmers' innovativeness are. Therefore, the aim of the study was to assess farmers' innovativeness and understanding the determinants of the same in the study area.

1.2. 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 understand the determinants of the same in the study area. The study dealt with identifying farmers innovations. It was focused on the situational and cultural compatibility of farmers' innovations in the study area.

1.3 Objectives

The general objective of the study was to understand the determinants of farmers' innovativeness in Alaba Special Woreda.

The specific objectives of the study were:

to assess farmers' innovativeness in the study area,

to identify farmers' innovations and assess their situational and cultural compatibility in the study area, and

to understand the determinants of farmers' innovativeness in the study area.

1.4 Research Questions

The following research questions have been dealt with:

1. To what extent are the farmers of the study area innovative?

2. What type of agricultural innovations have been generated by farmers in the study area & how compatible are they with the situation and the culture of the people?

3. What are the possible factors determining farmers' innovativeness in the study area?

1.5 Scope and limitations of the Study.

The study was conducted in Alaba special woreda in Southern Nations, Nationalities and Peoples Region and focused on understanding the determinants of farmers' innovativeness. Considering the size and diversity of Ethiopia this one-woreda-focussed study results can not be generalised to farmer innovativeness in the whole country. Secondly, farmers are active generators of new ideas and they are keen to test these new ideas in their fields. The challenge is to identify those innovative farmers. The process of identifying farmer innovators is not easy and straightforward because farmers are not necessarily aware that they are experimenting and innovating. For most farmers, the process of generating knowledge through experimentation is part of their every day agricultural activities, not separated from them as it is in the scientific knowledge system (den Biggelaar, 1996, cited in Reij and Waters-Bayer, 2001). Moreover, they seldom record their accomplishments and due to some prohibitive local traditions some farmers, especially women farmers, do not come forward and announce. These situations have minimized the opportunity to get farmer innovators easily and have caused time limitation. Promotion of farmer innovation fosters sustainable improvement in agriculture. This requires a total change in mindsets and strategies for conducting formal research, which in turn requires evidences obtained from results of studies conducted to identify, study, and promote farmer innovation in the country. But, no such study has been conducted so far. Hopefully, the results of this study will fill this gap and give clear insight. The recommendations and policy implications of the result of this study may be useful for other areas of similar contexts and as a basis to undertake other detailed and comprehensive nation-wide studies.

1.6 Significance of the Study

The purpose of agricultural extension is primarily to contribute to improved levels of living among rural farm families by helping farmers increase the productivity of their farms. Contribution of extension to the transfer of technology developed by research scientists to farmers alone may not fulfil the purpose.

Many problems that are arising in the rural areas are not easily tackled by extension which is trying to transfer research-generated technologies only because, many farmers are reluctant to adopt these technologies offered to them by the same for different reasons.

For an extension organization to be successful in achieving its purpose, it should also know and accept that farmers are innovative and then use this as a starting point for the development and introduction of technologies that suits their farming conditions which is at the same time acceptable to them.

The present study, which focused on understanding the determinants of farmers' innovativeness, shall produce valuable information on farmers' innovations, farmers' innovativeness, etc., 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.

2 LITERATURE REVIEW

The major focus of the study was to find out the extent to which farmers in the study area are innovative, to understand farmers' innovations and to assess the situational and cultural compatibility of the innovations they have developed and finally to find out the determinants of farmer innovativeness in the study area.

In this chapter a number of studies and literature relevant to the theme of the study were reviewed to provide insight and guidance during the research process. The chapter contains reviews about the historical and current perspectives of innovation; the theoretical perspectives of farmers' innovativeness and farmers' innovations; the history of development in farmer innovation; and latest researches and development in the field of farmers' innovation and determinants of farmers' innovativeness.

2.1 Perspectives in Innovation and the Tradition of Adoption & Diffusion of Innovation

2.1.1 Innovation

Technological change has been a major factor shaping agriculture in the last 100 years (Schultz, 1964; Cochrane, 1979). The basic elements of technological and institutional changes are Innovations.

According to Röling (2006), 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. Some times it is in need of innovation itself!

An 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 (Leeuwis, 2004, cited in Dormon, 2006).

According to Adams (1992), innovations are new ideas, methods, practices or techniques which provide the means of achieving sustained increases in farm productivity, and income. Some innovations originate from agricultural research stations, others from farmers. As van den Ban and Hawkins, (1996), put it; innovation is not always the result of recent research.

2.1.2 The tradition of adoption and diffusion of innovation

Innovation decision process is the process through which an individual or other decision-making unit passes from first knowledge of an innovation, to forming an attitude toward the innovation; to a decision to adopt or reject; to implementation of the new idea and to confirmation of this decision (Rogers, 1983, cited in Sharma *et al.*, 2004-05).

According to Leeuwis (2004), between 1950 and 1970 especially, thousands of studies were conducted across the world which sought to explain why and how people came to adopt, or not, new agricultural technologies and practices. Almost invariably such studies took place in a context where the uptake of particular innovations was deemed too low. The purpose of the research was frequently to help accelerate the adoption and diffusion of innovations on the basis of the findings. Studies on adoption and diffusion of innovations tended to start with a predefined innovation, the uptake of which was regarded as desirable for those being researched. But, Röling (1994), cited in Leeuwis (2004), shows that, much of what scientists developed is not relevant in farmers' conditions. This is not to say that scientific agricultural research has no role to play in agricultural innovation. On the contrary, it has a very important role to play. However, science is not the source of innovation. What is necessary is an active involvement of farmers to help researchers and experimenters determine what is useful and relevant, and to contribute their own knowledge and experimental capacity. Scientists are among those who contribute to a dynamic interaction between themselves, farmers, extension workers, traders and companies. Innovation emerges out of the interaction between these actors. Innovation is a creative response to a disaster or an opportunity, and usually both at the same time.

The physical, social and economic conditions of the resource poor agriculture differ more from those of research stations. Simple and high input packages do not fit well with the small scale, complex and diverse of their farming systems, nor with their poor access and risk-prone environments (Chambers *et al*., 1990). For them, as Richards (1990), cited in Chambers *et al*., (1990), describes, each season demands its own adaptive performance depending on unpredictable weather, and the interplay overtime of farming activities with the household resources. Farm families often lack reliable access to purchased inputs, and need to use them sparingly, if at all, in the face of risks. In this condition, there are limits to the extent their needs can be met by conventional research. Here comes the necessity of identifying local innovation and linking up farmers with useful ideas, also from formal research (Waters-Bayer, 2004, in: Amanuel *et al*., 2004). This study thus has tried to examine the status of farmer innovation in the study area

2.2 Perspectives of Farmers' Innovativeness and Farmer Innovation as an Alternative to Research-Generated Technologies

2.2.1 Farmers innovativeness

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 Yohannes (2001), in: Reij and Waters-Bayer (2001), every farmer has to be innovator to some degree. Among the smallholders, there is a great diversity with respect to characteristics of the household and plots (example, altitude, slope, soil type, plot size and shape, physical structure). Two plots are not treated identically by the same farmer, let alone

by different farmers. Similarly, a technology can not be applied in exactly the same way in different plots; some site-specific modifications will be necessary. Only the basic principle or functions of the technology will remain the same. The farmer innovator is not necessarily a 'model' or 'contact' farmer; rather, s/he creates or tries out new ideas, without their having been recommended by extension workers.

Owusu (1993), cited in Bajwa *et al*. (1997), describes that, farmers have the inclination and ability to modify and adapt technologies to local conditions through experimentation. The present investigation intended to study, whether farmers are really innovators as they are being said or not through scientific enquiry.

2.2.2 Farmer innovation as an alternative to research-generated technologies

According to Waters-Bayer (2004), 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 organising 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. They may be of benefit to individuals or to a larger group or to the entire community. This is something that the community has to examine and analyse, in order to see if the innovation is really useful, if it is something that others in the community regard as interesting to support and to take up. Indigenous innovation has always been taking place but it is not paid particular attention.

Many of the locally developed techniques, as Waters-Bayer (2004), describes, are not new; in the sense of never having been done before anywhere in the world or even the country concerned. What is important is the creativity and initiative displayed by people who, not being aware of these practices in other areas, visualized the possibility of improving the use of local resources and set out to realize these possibilities.

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).

2.3 Development in farmer Innovation

Farmer innovation is not a recent development or phenomenon. Braidwood (1967), cited in Rhoades (1990), in: Chambers *et al*. (1990), discusses the atmosphere of experimentation which characterized the Neolithic farmer since the earliest stages of agriculture. Farmers selected and domesticated all the major and minor food crops on which human kind survives today.

From recently conducted researches it is possible to count many farmer innovations. In addition to the approval of the availability of farmer innovation, scientists are also said to learn about different technologies from farmers. As Rhoades (1990), in: Chambers (1990), explains, a work on diffused light storage of potato carried out at the International Potato Centre (CIP) scientists was first learned from Third World farmers.

In most countries of the third world, rural people's knowledge is an enormous and underutilised national resource. Hatch (1976), in: Chambers (1983), has written that the small farmer's expertise 'represents the single largest knowledge resource not yet mobilised in the development enterprise', and 'we simply can not afford to ignore it any longer'.

According to Reij and Waters-Bayer (2001), there are many reasons for seeking to find out why farmers innovate. The answers can provide academic insight into the how and the why of development. From the practitioners' point of view, it can guide interventions to support innovation by farmers.

2.4 Determinants of Farmers' Innovativeness

Farmers' innovativeness is determined by different factors. Population pressure on a limited resource base is an important incentive for innovating and investing in agricultural diversification and intensification (Reij and Waters-Bayer, 2001b). Higher yields are other important factors for innovative farmers to innovate not only because they improve food security at household level, but also because more agricultural product can be sold to generate cash for other expenditures (Hassane *et al.*, 2000). The main reason for some farmers to innovate is to provide food for their family's own consumption and for others to increase the household income and still other farmers aim at maintaining or increasing soil fertility. A few innovations are undertaken out of curiosity without any particular goal in mind. Curiosity experiments do not appear to be very common among innovative farmers (Nielsen, 2001, in: Reij and Waters-Bayer, 2001).

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. The aim of farmers, who own lands which are more than enough to meet their family's subsistence needs, would be to create a multipurpose forest and they give priority to planting trees at the expense of producing cereals. These farmers plan to invest more in growing medicinal woody plants and they would like to reintroduce wild fauna (small dear, hyenas, birds, etc) into their forest. The major objective of other farmers, who have large families and do not have enough land to be able to feed them properly, would be to produce food, while the regeneration of trees is second priority. As soon as they feel that the tree density could reduce their cereal production, they start cutting down the weaker trees and lop some of the remaining ones. They place the leaves of the lopped trees in the compost pit to produce fertilizer (Sawadogo *et al.*, 2001, in: Reij and Waters-Bayer, 2001).

Drudgery of farm work is another factor that triggers farmers' innovativeness. Stark and his colleagues, give good example to clarify this point. According to their study conducted in Philippines, contour hedgerows using nitrogen-fixing trees have been widely promoted in Southeast Asia to minimize soil erosion and improve crop yield, but few farmers have taken them up. This is partly because establishing and managing such hedgerows is very labour-intensive. The spontaneous use and rapid dissemination of narrow buffer strips consisting of natural vegetation, so-called Natural Vegetation Strips (NVS), among farmers in the Philippine uplands has provided a low-cost, yet effective alternative to the establishment of tree hedgerows. Formal research on this farmer technology proved that NVS are at least as effective in controlling soil erosion as tree hedgerows, while causing minimal competition effects on the associated field crops and requiring only a fraction of the labour needed to establish and maintain pruned tree hedgerows (Stark *et al.,* 2000).

2.5 Conceptual Framework

This study was about understanding farmers' innovativeness. Its major aim was to identify the determinants of farmers' innovativeness. It draws its conceptual framework from the theoretical perspectives on farmers' innovativeness

An innovation is something new. Some innovations come from outside, while others are developed by farmers themselves. With respect to farmers, innovation means, anything new the farmer is doing in his farm in his life time.

Defining an innovation as 'something new' leads to another question, namely: 'new to whom?'. For instance, a farmer may experiment with early planting without knowing that other farmers in the area have done similar experiments. Generally, what is new to a particular farmer qualifies as an innovation (Nielsen, 2001, in: Reij and Waters-Bayer, 2001).

Farmers' reasons for innovation vary from farmer to farmer and from place to place. However, the main reasons could be, to provide food for their families own consumptions, to increase the household income, etc. Though not common, some innovations are also undertaken out of

curiosity without any particular goal in mind (Nielsen, 2001, in: Reij and Waters-Bayer, 2001).

In anthropology, a distinction is made between the view from outside-the etic view-and the view from within-the emic view. Case studies usually capture the actors point of view i.e. they have an emic approach. Surveys are often made to gain an etic view.

Only an emic approach could reveal what motivate farmers to innovate and what they see as major obstacles to innovation. However, an etic approach may reveal the importance of factors that the individual farmer cannot easily observe, such as the relationship between innovativeness and gender, age, etc. This indicates that an etic approach can give additional insights that an emic approach does not capture.

In this study both emic and etic approaches were used to capture the farmers' point of view and to reveal the importance of factors that the individual farmer cannot easily observe. Thus, the conceptual framework for this study was developed based on the theoretical perspectives on farmers' innovativeness discussed above. In the conceptual framework the different factors supposed to influence farmers' innovativeness particularly, those related to demographic and personal, Socio-cultural, wealth-related and institutional variables were considered. The conceptual framework emphasized mainly on the relationship of explanatory variables with the dependent variable, farmers' innovativeness.

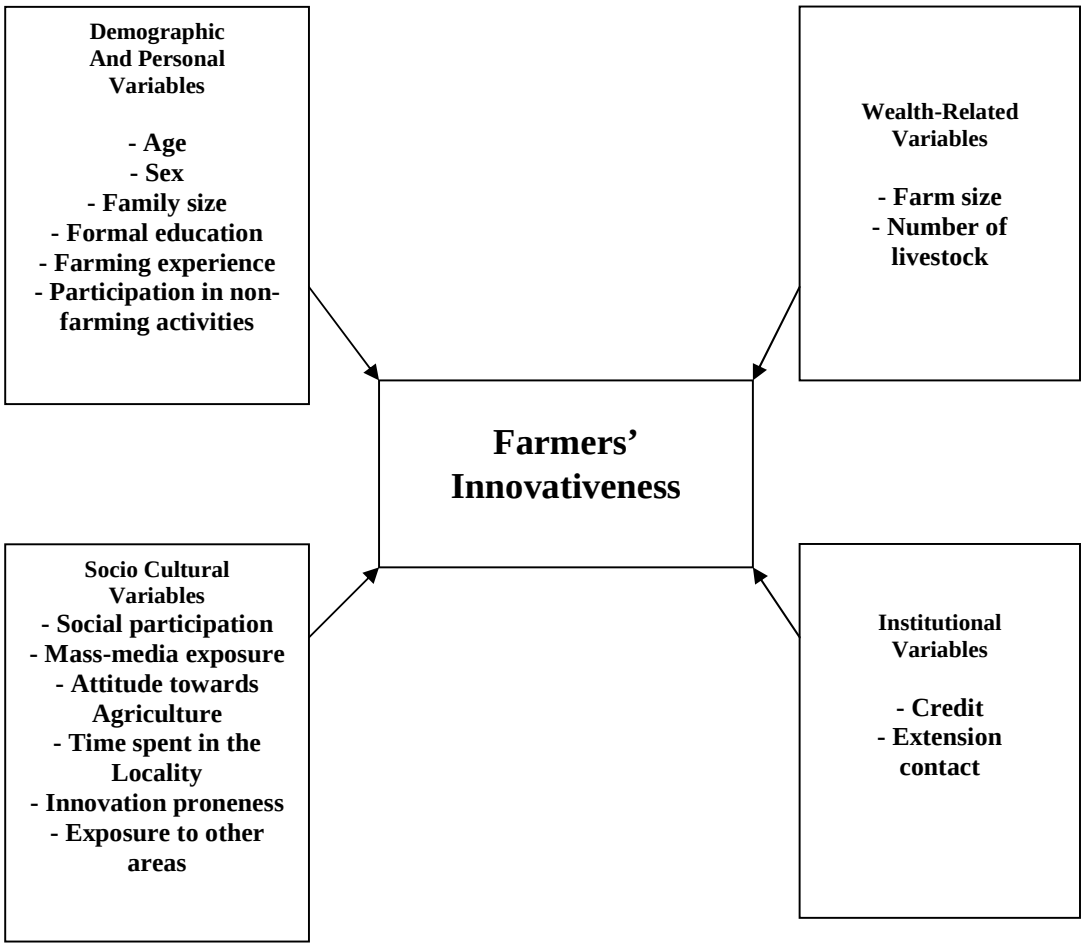

Figure 1: Analytical Framework for the Study Showing the Relationship between the Dependent & Independent Variables

3. RESEARCH METHODOLOGY

3.1. Description of the study area

3.1.1 Location of the study area

Location & geography

Alaba woreda is located 310 kms south of Addis Ababa and 85 kms southwest of Southern Nations, Nationalities, and Peoples Regional (SNNPR) state capital of Awasa. The woreda is geographically located **7^0 17' N latitude & 38^0 06' E longitudes.** It is located west of Oromia region, north of Hadiya (Sike), east of Kembata Tembaro, southeast of Silte and Hadiya zones. It is a special woreda and has a special status where the administration directly reports to the regional state. There are 76 peasant and 2 urban associations (ILRI/IPMS, 2005).

Altitude of the woreda ranges from 1154 to 2159 masl, but most of the woreda is found at about 1800 masl. Except for few hills, the woreda has an agriculturally suitable land in terms of topography. Despite the recurrent drought, flood has also been a major problem in the area. The latter is induced as a result of dominantly level topography *(ibid).*

Land use

The total land area of Alaba woreda is 64,116.25ha of which 48,337ha (75%) is considered suitable for agriculture. The main land use types of the woreda include arable land, grazing land, forest, potentially cultivable, uncultivable land (hills) and others (Table 1). As a result of long history of agriculture and high population in the area, vegetative cover is very low. Consequently, erosion hazards in the sloppy areas are enormous. Huge gullies are observed towards the southern end of the woreda, where the soils are totally removed beyond recovery. This is believed to have been aggravated due to the easily detachable nature of the soil.

Table 1: Land use patterns of Alaba woreda, SNNPR, Ethiopia

No	Land use	Area Coverage (ha)
1.	Arable land	44,020.00
2.	Grazing land	4,316.95
3.	Forest	4,592.00
4.	Potentially cultivable land	3,644.50
5.	Uncultivated land	2,805.00
6.	Others	4,737.80
	Total	**64.116.25**

Source: Alaba Special woreda Bureau of Agricultural & Rural Development (2007)

Climate

Agro ecologically, the woreda is classified as Weina Dega. The annual rainfall varies from 857 to 1,085mm while the annual mean temperature also vary from 17^0c to 20^0c with mean value of 18^0c. The woreda receives a bimodal rainfall; the small rains are between March and April while the main rains are from July to September. The reliability of the small rains is low that farmers do not plant other crops except pepper the seedling of which is raised to be transplanted during the main rains. However, during the main rains, all crops grown in the area are planted. Rainfall during the main rains is erratic that most of the time crops fail due to uneven distribution of rainfall over the growing period.

Soil

The major soils of the woreda are Anisole (feralic), Andosole (orthic), Chromic Luvisols (orthic), Phaeozem (orthic), Solonchak (orthic). The most dominant soil of the woreda is Andosol (orthic) which followed by Phaeozem (orthic), and Chromic Luvisoles (orthic) in the second and third order. The soils of the woreda are believed to be relatively fertile and during good rains farmers can harvest good yield even without fertilizer application *(ibid).*

3.1.2 Socio-economic characteristics of the study area

Population

According to the recent woreda population reports (2004/05), the total number of rural households in 76 peasant associations in the woreda was 35,719. Out of these, 26,698 (75%) were men and 9,021 (25%) were women households. The total population of the woreda was 210,243, out of which 104,517 (49.7%) were male and 105,726 (50.3%) were female. Economically active population of the woreda, (15-55 years of age), is estimated at about 102,176 people out of which, 55,668 were male and 46,508 were female *(ibid).*

Major Crops

Maize, teff, wheat, pepper, haricot bean, sorghum and millet are the dominant crops. Maize is grown on more than 50% of the cultivable land in the woreda while all the other crops account for the remaining 50% of the area. In most cases, because of the irregularity of rainfall, production fails and hence the woreda is known as drought-prone woreda *(ibid).*.

Livestock

Livestock are a major source of farm power and cash income for farmers in Alaba. Concerning the livestock population; there were 161,728 Cattle, 30,750 Sheep, 36,552 Goat, 20,960 Donkeys, 1,685 Mules, 1,933 Horses, 62,920 Poultry and 10,000 Bee hives in the woreda. Livestock in the area are suffering from shortage of feed. Free grazing and use of supplemental crop residues are common sources of livestock feeding in the area. Animal and animal products are good sources of cash income to farm households. In addition to the shortage of feed resources, many livestock diseases are also reported. The common animal diseases in the area include; Anthrax, Blackleg, Internal and External Parasites *(ibid).*

Farming System

Two major farming systems were identified. Use of altitudinal, vegetation and soil variability were difficult due to similarity of these factors, almost throughout the woreda. However, other means of classification where, dominance of one crop/livestock species in one area than the other, was employed to distinguish between farming systems. Accordingly, the major farming systems identified are 1) Teff/Haricot bean/Livestock Farming System and 2) Pepper/ Wheat/ Goat/Apiculture Farming System, (shortly referred to as Pepper/Livestock Farming System). 45 and 31 PAs belong to Teff/Haricot bean/Livestock Farming System and Pepper/Livestock Farming System respectively *(ibid).*.

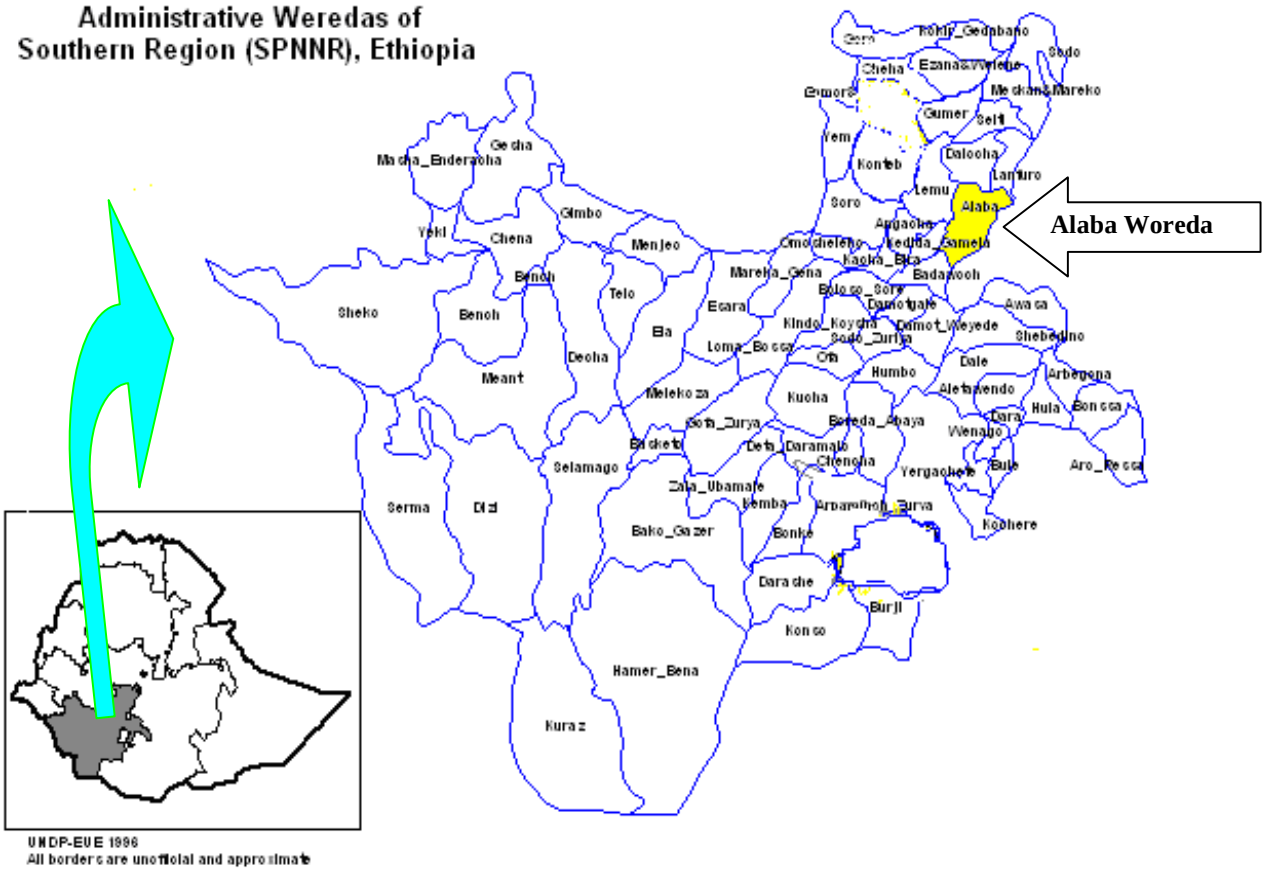

Figure 2: Map of SNNPRS and Location of Alaba Special Woreda

3.2. Research Design

Based on the specific objectives and the nature of the research questions of the study required, quantitative data were collected and appropriate analytic techniques were employed. The quantitative data were substantially supplemented by qualitative data in order to make the results sound. Quantitative methods usually involve surveys, in which data are collected, using interview schedule, with the aim of analysing the resultant data, and making generalizations from the result. In this section, sampling procedures, method of data collection and *technique of data analysis* for this study are discussed. Theoretical econometric model, which was used to find out the determinants of farmers' innovativeness, is also discussed in detail.

3.2.1. Sampling procedure

Sampling is done with the purpose of attaining controlled and systematic accuracy and precision. Thus, if sampling design is implemented well, an investigator can use relatively small sample to make inferences about an arbitrary large population. This study defines the survey population at the rural kebele level. Once the target population was defined, the next task was the question of taking representative sample from the population. Alaba special Woreda was selected purposively, because it is one of the ten Pilot Learning Centres of ILRI/ IPMS (the funding organisation).

In principle, the sample size required depends on the required precision, the variability among the population and the sampling technique used. In practical terms, however, the sample size is often restricted by the available fund, time and other related reasons. To this end, considering financial constraints, time available at the disposal of student researcher and lack of transportation, from the population of the study area 180 respondents were included in the study sample.

Based upon the dominance of one crop/livestock species in one area than the other, the study area was classified in to two farming systems, viz. Teff/Haricot bean/Livestock Farming System and Pepper/Livestock Farming System. The number of the PAs available in Teff/

Haricot bean and Pepper/Livestock farming systems are 45 and 31 respectively. These two major farming systems were the basis for the selection of respondents. For sample selection, a multistage sampling procedure was employed. *At the first stage*, due to non-accessibility of some PAs & farness of the others, (some PAs are about 100km far from the woreda capital), and due to time and budget constraints 20 accessible PAs were purposively identified. Then, these purposively identified PAs were stratified in to two strata based on the two farming systems and. From among the twenty PAs identified 13 (thirteen) PAs were from Teff/Haricot been farming system and 7 (seven) PAs were from Pepper/Livestock farming system. Then, from the two strata, totally six PAs, (four from Teff/Haricot bean/Livestock farming system and two from Pepper/Livestock farming system), were selected using Probability Proportional to size Sampling procedure. Next, in each PA, key informants consisting of local leaders, older inhabitants, progressive farmers, educated farmers, and other influential community members were invited to a meeting and asked to recall and suggest the names of farmers known to be innovators and trying out new things or doing something different. DAs, working in the area, were also used as key informants. As stated earlier, for the purpose of this study, a working definition was used (Box 1, p. 40). This definition was explained to each key informant at the commencement of the discussion. In this way the sampling frame for the target population of the innovator farmers was identified. The remaining members of the PAs constituted the sampling frame for the non-innovator farmers.

As expected and mentioned earlier, the number of innovator farmers to be identified would be small. Therefore, using probability proportional to size sampling procedure may result in getting small number of innovator farmers. Since the main focus of this study was on innovator farmers, care was taken not to under represent this target group. Therefore, to include the required number of the sample units of innovator farmers, the proportion of the sample units in each stratum was deliberately determined. Accordingly, 2:3 ratio of innovator farmers and 1:3 ratio of non-innovator farmers were selected randomly by a lottery method from the sampling frame to have statistically valid number of sample respondents. Thus, in all 120 innovator farmers and 60 non-innovator farmers were selected for the study (See Fig 4). The details of sampled respondents from each PA are given in Table 2.

Table 2: Number of respondents in each of the selected rural PAs in the study woreda

Farming System	Name of PA	Selected number of respondents					
		Innovators			Non-innovators		
		M	F	T	M	F	T
I Pepper/Livestock	1 Andegna Teffo	18	2	20	8	2	10
	2 Huletegna Teffo	18	2	20	9	1	10
	Total for	***36***	***4***	***40***	***17***	***3***	***20***
II Teff/Haricot bean	1 Wanja	20	-	20	10	-	10
	2 Gedeba	19	1	20	10	-	10
	3 Qufe	20	-	20	10	-	10
	4 Andegna Ansha	20	-	20	10	-	10
	Total	***79***	***1***	***80***	***40***		***40***
	Total for both FSs	**115**	**5**	**120**	**57**	**3**	**60**
	Grand Total			**180**			

Source: own survey, (2008)

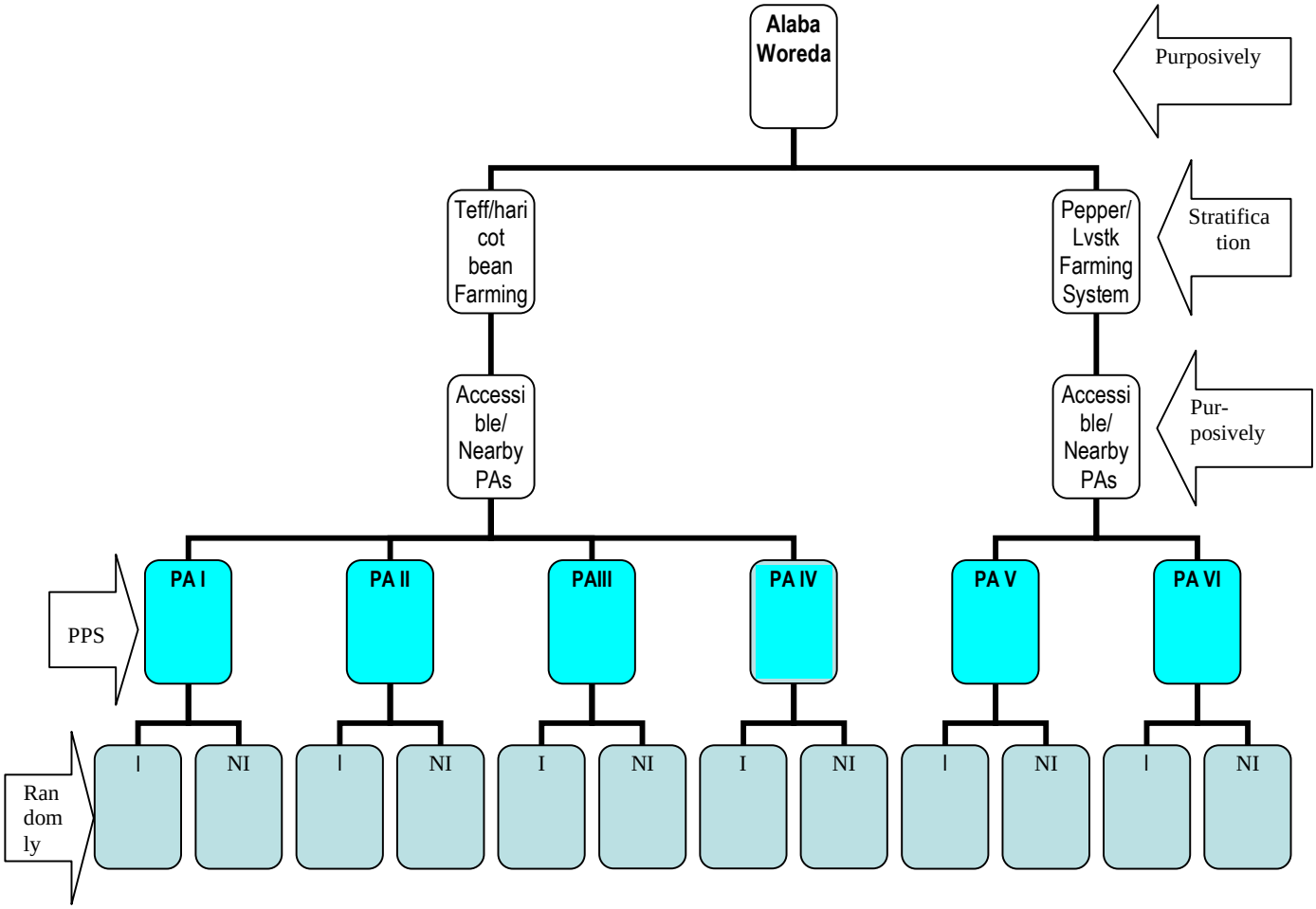

Figure 3: Flow chart of sampling procedure

3.2.2. Data Sources and methods of data collection

Necessary data for the study were collected through observation, key informants discussion, and interview schedule. The interest of the respondents in survey work is an issue to be given top priority. Farmers will show little cooperation unless their concerns are taken care of very seriously. Therefore, in order to gain their trust, the respondents were carefully informed about the objectives of the survey and the direct and indirect benefits to them. In this regard, chair person of the respective PAs were first approached and efforts were made to convince them of the objectives of the study. Farmers were also informed that the information related to household and farm characteristics would be kept confidential.

Prior to the final administration of the interview schedule, first, enumerators were recruited and given training on the concept, and objectives of the study and the contents of the interview schedule. The enumerators were also acquainted with the basic techniques of interviewing and data gathering including how to approach farmers.

Thereafter, the interview schedule was pre-tested among the non-sampled respondents. In the light of pre-testing, essential amendments were made about ordering and wording of questions and coverage of the content of interview schedule. The pre-test enabled to know whether enumerators and farmers had clearly understood the interview schedule. As a result, some questions were deleted and others were refined due to language problems and some questions which were deemed important for the purpose were incorporated into the final version of the interview schedule.

Then using the amended interview schedule, primary data were collected by using personal interview technique from sample farmers. The interview schedule was administered by using trained enumerators under the close supervision by the researcher. In order to increase the reliability of the survey data, by reducing technical problems, the researcher, has spent much time with enumerators during all the survey days. 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.

3.3 Methods of Data Analysis

The quantitative data were analyzed using descriptive statistics such as frequency, percentage, mean, standard deviation, variance, test of significance, correlation and regression, as well as content analysis of farmers' innovations, observed and registered during field observation. Content analysis was also used to analyse information collected by the researcher during field observation. The qualitative data obtained through interviews and discussions were analyzed and interpreted. To analyze the factors determining farmers' innovativeness, Binary Logit model was used.

Logit Model

A valuable model provides explanation on underlying relationship between farmer innovativeness and factors affecting it. An analysis of the relationships between innovativeness and its determinant factors involves a mixed set of qualitative and quantitative data.

In the present study logistic distribution function (logit) model was used to analyse the quantitative data. According to (Gujarati, 2003), the logistic distribution function for the decision on developing new ways of doing things can be stated as:

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

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 **m** explanatory variables **(Xi)** and is & expressed as:

$$\mathbf{Z(i) = B_0 + B_1X_1 + B_2X_2 + \text{---------- } + Bmxm} \quad \text{---------- (2)}$$

Where $\mathbf{B_0}$ is the intercept and **Bi** is the slopes parameter in the intercept model. The slopes tells how the log - odds in favour 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 favour 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, $\mathbf{P_i}$, to the probability that he will not, $\mathbf{(1-p_i)}$.

But **(1-pi)** = $\frac{1}{1+e^{z(i)}}$ ---------- (3)

Therefore, $\left(\frac{pi}{1-pi}\right) = \frac{1+e^{Z(i)}}{1+e^{-Z(i)}} = e^{Zi}$ ---------- (4)

$$\frac{pi}{1-pi} = \frac{1+e^{Z(i)}}{1+e^{-Z(i)}} = e^{Bo} + \sum_{i=1}^{M} BiYi \text{----------} (5)$$

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

$$\ln\left(\frac{pi}{1-pi}\right) = lm\left[e^{Bo} + \sum_{i=1}^{M} BiXi\right] = Zi \text{----------} (6)$$

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

$$\mathbf{Zi} = \mathbf{Bo} + \sum BiXi + ui \text{ ----------} (7)$$

Hence, the above econometric model was used in this study to identify variables that affect innovativeness. All analysis was done after the coded responses to the questions in the interview schedule were entered in to computer and the final analysis was done using the SPSS program.

3.4. Definition of Variables and Hypothesis

Different studies conducted elsewhere on determinants of farmers' innovativeness (Characteristic of innovator farmers) indicate the role and combined effect of demographic

and personal, socio-cultural, wealth-related, and institutional factors, which are related to their objectives and constraints. Once the analytical procedures of the study are known, identifying potential explanatory variables and representing them in symbol become necessary. In the section ahead, the variables to be used in the logit model and the associated working hypothesis are presented.

3.4.1. Dependent variable

A dependent variable is a variable that is said to be affected or explained by another variable/ variables. In this study, farmers' innovativeness is treated as a dichotomous dependent variable, i.e. it takes the value of 1 if the farmer is innovative and 0 otherwise.

3.4.2. Independent variables

The independent variables are those, which are assumed (hypothesized) to have an association with the farmers' innovativeness. However, the choice of these independent variables in the study of the determinants of farmers' innovativeness often lacks a firm theoretical basis. Nielsen (2001), in: Reij and Waters-Bayer (2001), says that answers to many questions about farmer innovators and innovation processes are often only anecdotal or based on only a small number of case studies. According to Nielson (ibid), to reveal factors associated with farmers' innovativeness, an emic - view from within, and etic – view from outside approach should be used. An emic approach could reveal what motivates farmers to innovate and what they see as major obstacles to innovation. However, an etic approach may reveal the importance of factors that the individual farmer cannot easily observe, such as the relationship between innovativeness and gender, age, etc. Both approaches have their merits and each can be used to reveal different types of information. Some studies reveal a marked association between demographic and personal factors, and others show wealth-related or economic factors such as farm size, increment of household income, etc. to be the main reasons for farmers to innovate (Nielsen, 2001, in: Reij and Waters-Bayer, 2001). Others suggest institutional factors as major contributors of farmers' innovativeness. Others consider the combination of all the above factors.

Table 3/4: Definition of variables and units of measurement

Table 3*:* Dependent variable

Variable Name	**Description**	**Unit/Type**
respocat	Respondents category; 1 = If innovator 0 = If non-innovator	Dummy

Table 4: Explanatory variables

Variable Name	Description	Unit/Type	Expected Sign
respoage	The respondents age	No of years	+
levledcn	Level of education of the respondent	No of years in school	No impact
tsplyrs	Time spent in the locality	No of years	+
farmexpr	Farm experience	No of years	+
familysz	Family size	No of members in the family	+
nlvstkod	No of livestock owned, in TLU	TLU	+
farmsize	Farm size owned, in hectare	Total land holding in ha	+
resposex	The respondent's sex (1, Male; 0, Female)	Dummy	+
partnfa	Participation in non-farm activities (1, participate; 0, not)	Dummy	-
Mass media Exposure			+
a- frerlsng	*Frequency of radio listening*	*No of times*	
b- frtvwchg	*Frequency of TV watching*	*No of times*	
c- frnpredg	*Frequency of reading*	*No of times*	
AttdAgri	Attitude towards agriculture	Likert scale	+
InnoPrns	Innovation Proneness	Scale	+
accesscr	Has access to credit	No of times	+
Extn. contact			+
a- condago	*Frequency of contact with DA*	*No of times*	
b- consmsgo	*Frequency of contact with SMSs*	*No of times*	
c- conwofgo	*Contact with Woreda Extn. Officials*	*No of times*	
prtnsorg	Participation in social organisation(s) (1, Participates; 0, not)	Dummy	+
expoares	Exposure to other areas (1, exposed; 0, not)	Dummy	+

Based on theoretical background and empirical results of different studies on farmer innovation and determinants of farmers' innovativeness, as well as the researchers' exposure, the selected variables, and their operational definitions are given in tables 3 and 4 on the preceding page.

3.5. Working Hypothesis of Selected Variables

3.5.1. Demographic & personal variables

Age: age is measured on a continuous scale in terms of the respondents' number of years of age at the time of data collection. The level of innovativeness is expected to be affected by the age of the farmer. There are some studies which indicate the level of innovativeness to be lower among older and younger farmers (Reij and Waters-Bayer, 2001). It was hypothesized that the pick in innovativeness is found among farmers in the age bracket of 35-50 years.

Sex: Sex is nominal variable to be used as a dummy (1 if male, 0 otherwise). Some studies reported that most innovators, (about 75 %), are men. Although women often do a large share of the farm work, it is usually the men who are the household heads and represent the family in public, and are therefore most likely to take credit for any changes made on their farms (Reij and Waters-Bayer, 2001). So it was hypothesized that male farmers are more likely to be innovative than female farmers.

Family size: It is measured by the number of members of the household or the number of members in the family of the respondent farmer. Families often work very closely together in building up their farm. Moreover, most innovators will need support from the rest of the family as a new technique may require extra labour, divert resources and involve some risk and therefore, at least in some cases, require consultation within the family (Reij and Waters-Bayer, 2001). Therefore, it was hypothesised that family size and innovativeness are directly related. As family size increases farmer innovativeness also increases.

Formal education: Formal education is measured in terms of the number of years of formal schooling the respondent has completed at the time of data collection. Some studies indicate that innovators are better educated (Reij and Waters-Bayer, 2001). On the other hand there are studies which indicate the level of formal education may not be a determining factor with respect to farmers' creativity and propensity to experiment. In agreement with the latter, it was hypothesised that there is no significant correlation between the level of formal education and the innovativeness of farmers.

Farming experience: Defined as the number of years spent in farming by the respondent. Experience will enable farmers to have better knowledge which in turn may be the basis for innovativeness. Hence, farming experience was hypothesised to affect farmer innovativeness positively.

Participation in non-farm activities: This reflects on the degree of involvement of the respondent in non-farm income generating activities. Majority of farm families derive their livelihoods not only from crop and livestock production but also from a range of activities outside of agriculture. According to some studies it was found that the innovators devote most of their working time to farming. It appears that the more innovative farmers can produce enough from their land, and therefore need not seek off-farm sources of income (Reij and Waters-Bayer, 2001). Therefore in this study it was hypothesised that participation in non-farm activities affects farmer innovativeness negatively.

3.5.2. Socio-cultural variables

Social participation: This reflects on the degree of involvement of the respondents in existing formal and/or non-formal organizations. Those farmers who participate in social organisation(s) or play a lead role in the organisation(s) are likely to be innovative. They have an opportunity to get information on various improved agricultural practices, which in turn may be the basis for their innovativeness. Therefore it was hypothesised that those farmers who participate in some social organizations like, Idir, Iqub, PAs, Marketing cooperatives,

Unions, school councils, are likely to be innovative. This variable was treated as a dummy variable in that if the respondent was a social participant he was coded as 1 and 0, otherwise.

Mass-media exposure: It is measured by the number of times a respondent listens to radio, watches TV, and read printed materials. Mass media play great role in creating awareness about farmer innovation in shortest time possible over large area of coverage. This will motivate farmers to innovate. Mass media exposure, therefore, was expected to have positive influence on farmers' innovativeness.

Attitude towards agriculture: Some people do not feel proud to be a farmer and consider farming as a last option. They generally prefer to go for other option than agriculture. In contrast, some farmers are proud of their farms and do not consider farming to be an inferior occupation. Studies have shown the latter to be the ones who are much innovative than the former. Therefore, it was hypothesised that, favourable attitude towards agriculture influences farmer innovativeness positively. It was measured using Likert scale.

Time spent in the locality: It is defined as the number of years spent in the area by the respondent. It is expected that, a farmer who has longer time spent in the locality would have better knowledge about the agricultural problem of the locality, which would initiate him to find appropriate solution. Seeking a solution for a problem would result in some innovative work. Therefore, this variable was hypothesised to affect farmer innovativeness positively.

Innovation proneness: refers to one's inclination to innovate or susceptibility of a person to be affected by innovation once he is disposed to new idea or innovation. It is used to measure the individual's orientation toward innovation. Innovation proneness scale was developed and used to measure this variable. It was hypothesised that innovation proneness influences an individual's innovativeness positively.

Exposure to other areas: According to some studies innovators have better exposure to external areas. They pick up ideas while in other parts of the country, outside their own PAs, or abroad (Reij and Waters-Bayer, 2001). Therefore, it was hypothesized that exposure to

other areas influences farmers innovativeness positively. It was used as a dummy variable (1 if exposed, 0 otherwise).

3.5.3 Wealth-related variables/ resource ownership

Farm size: It is measured in terms of total land holding of the respondent excluding land leased-in and out. It was expected that there is a relation between farm size and innovativeness. Owners of big farms are often rich, have access to more resources, including information, and can better afford failed experiments (Reij and Waters-Bayer, 2001). Therefore, it was hypothesized that farm size and farmers' innovativeness are positively related.

Number of livestock: It is measured by Tropical Livestock Unit (TLU) (Table 1 in the appendix). Owners of large number of livestock are often rich, have access to more resources, including information, and can better afford risk. It was thus assumed to be positively associated with innovativeness.

3.5.4 Institutional variables

Credit: Using available resources in new ways is considered to be a characteristic of innovative farmers. Some studies show that if innovative farmers are not obliged to take credit to do specific things like buying fertilizer only, they would prefer to look for ways to use what they have more efficiently (Fetien *et al.*, 2001, in: Reij and Waters-Bayer, 2001). Access for free credit; therefore, was assumed to be positively associated with innovativeness. It was measured in terms of whether respondents have received any sort of credit from governmental or non-governmental organizations.

Extension contacts: Contact with extension agents refers to the number of times the extension agent visits the farmer to give extension advice in a year. The frequency of extension contact was hypothesized to positively influence farmer innovativeness.

4. RESULTS AND DISCUSSION

4.1 Introduction

This chapter is devoted to results and discussion of the study. In this chapter results on *Farmer Innovation and Farmers' Innovativeness*, *current status of farmers' innovation including situation and cultural compatibility of farmers' innovations* is discussed. To understand the relationship of farmers' characteristics and farmers' innovativeness, the descriptive analysis is provided and discussed under different appropriate subheadings. In doing so, the influence of different demographic and personal, socio-cultural, wealth-related and institutional factors, affecting farmers' innovativeness is discussed consecutively.

4.2 Farmer Innovation and Farmers' Innovativeness

"Local innovation" (farmer innovation) refers to the dynamics of indigenous knowledge, how farmers develop new ways of doing things – new technologies or ways of organising work – using their own resources, on their own initiative, without pressure or support from formal research or extension (Waters-Bayer, 2004, in: Amanuel *et al*., 2004).

Innovative farmers refer to those farmers who have tried or are trying out new but value added agricultural or natural resource management practices using their own wisdom. Innovative farmers in most cases act on indigenous or outsiders knowledge through conducting informal experiments and make it more usable or well fit to their own realities. They are not like the model farmers who are intentionally trained by extension workers on specific and predetermined technologies (Amanuel, 2005).

Since recently, farmer innovation and innovativeness seem to be a point of concern for many individuals and institutions. This study was also operated under same philosophical ground to understand farmers' innovativeness and identify farmer innovation in the study area. Accordingly, the innovativeness of farmers in the study area was proved by identifying

farmers' innovations related to the different categories of agriculture, viz., crop, livestock and soil and water conservation, (Box 2).

4.3 Current Status of Farmer Innovation

Farmers continually generate new ideas to innovate and experiment in their struggle to make a living from the soil. This holds true to the study area also. One of the most important activities of the survey conducted in the study area was to try to identify the innovator farmers in the selected PAs. The selection of innovator farmers was conducted through discussion with key informants group in each PA, and through the Development Agents and staff members of the Woreda Office for Agricultural and Rural Development. Other local contacts that are familiar with farmers in the area were also used for the identification purpose.

During the survey, after identifying the innovator farmers, the other point sought to be performed was to find out in which field of agriculture these identified innovative farmers were trying out new ways of doing things.

Currently, unprecedented international, regional and national movement is observed towards the promotion of farmer innovation. If this movement is to achieve its goal, it needs to create a new order to change the attitude of researchers, extension professionals, etc. who are brought up in a system in which outsiders are considered as the major role players in bringing about agricultural transformation. To protect the negative impact from the unchanged attitude of Development Agents, staff members of the Woreda Office of Agriculture and Rural Development, and enumerators recruited to collect data, it was tried to stimulate the individuals involved in the survey to recognize the conceptual meaning of the same followed in the study, (Box 1). In trying to create this harmony, a long and repeated discussion was required to sharpen these peoples' awareness of the differences between farmer innovation and adoption of introduced technologies.

Box 1: Working definition of 'Farmer Innovation' and 'Farmer Innovator'

Farmer Innovation: *Farmer innovation refers to discovery of a completely different way of doing things or to modification of an existing technology. It is a process through which individuals or groups discover or develop new & better ways of doing things and managing resources. The innovation may be not only in the technical but also in the socio-institutional sphere. An innovation is something new that has been started within the lifetime of the farmer, not something inherited from parents.*

Farmer Innovator

Farmer innovator is someone who develops and tries out new ideas, without support from formal research & extension.

After creating consensus on the conceptual matter mentioned above, the efforts were made in the study to find out fields (areas) of agriculture in which the innovative farmers of the study area have experimented and innovated. Multiple fields of agriculture were grouped together to see the frequency of farmers who innovated. The results are presented in Table 5 below.

Table 5: Fields of agriculture in which farmers have innovated

Field of agriculture	Innovators	
	n	%
Crop	63	52.50
Livestock	5	4.17
Soil and Water Conservation	0	0.00
Crop and Livestock	19	15.83
Crop and Soil and Water Conservation	19	15.83
Livestock and Soil and Water Conservation	2	1.67
Crop, Livestock and SWC	12	10.00
Total	120	100.00

Source: own survey data, 2008

Innovations related to crop production practices were the most common type of innovations experimented/generated by a large portion of the innovator farmers (52.5%). Innovations related to livestock accounted for 4.17%. Of the respondents, many farmers were reported to have innovated in multiple fields of agriculture. Accordingly, 15.83% of the farmers innovated in crop and livestock, similarly 15.83% of them have innovated in crop production and soil and water conservation. Further 1.67% of the respondents were found to have innovated in both livestock and soil and water conservation. Interestingly 10.0% of the farmers' innovations were related to the three agricultural fields, viz. crop, livestock, and soil and water conservation.

The study results indicate that the maximum farmers' innovations are experimented in the field of crop alone. High cost of research-generated improved crop varieties which are unaffordable to farmers, moving back to traditional/local varieties, and simplicity of introduction of different crop varieties from other areas may be the possible reasons for this.

The purpose of the investigation was not only to know the areas of agriculture in which the farmers of the study area have experimented but also to know the specific innovation in each field. Different types of innovations developed in each category of agriculture are given in Box 2.

As shown in Box 2 below, innovator farmers have developed many innovations related to each of the above mentioned categories. Hereunder, some of the prominent farmer innovations are described.

Box 2**:** Types of farmer innovation

Typology of Farmer Innovation

1 Introduction of new crops

2 Adaptation of fertilizer

3 Mixed use of compost and chemical fertiliser

4 Crop rotation

5 Weed control

6 Bee keeping

7 Rotational grazing practices

8 Land rehabilitation

9 Fallowing

10 Erosion control

11 Buried clay pot watering

12 Battle drip irrigation

13 Introduction of water harvesting technologies

14 Soil moisture conservation

15 Marketing (selling of produces which were previously used for house consumption)

16 Time change in agricultural practices

17 Adaptation of extension/research-recommended agricultural practices

18 Ripening Vegetables

l9 Use of drilled "Jeri can" for watering

20 Use of large clay pitcher

21 Experimentation

Source: own survey data, 2008

Box 3: Description of farmers' innovations identified in the study area

a) Introduction of new crops

One of the characteristics of innovator farmers is to ask their friends and to observe their surroundings attentively hoping to get new ideas, new ways of doing things, etc. While doing this, they will find some new ideas or new ways of doing things and feel like to try them to find whether they are suitable to their specific situation or to see if they are relevant to solve their specific problems. Through this process, many farmers in the study area have reported to have found new ideas, new ways of doing things, new varieties of crops etc. from other areas and introduced to their areas. Accordingly, different varieties of crops such as Teff, "Enset", fruits, vegetables, pepper have been introduced by many respondents.

Amongst these innovator farmers Ato Dibaye, from the pepper/livestock farming system, is highly recognised for the high-yielding Teff variety which he introduced to his area, "Andegna Teffo". Ato Dibaye brought the Teff variety from Kembata zone. Many farmers, even from the neighbouring PAs have taken the seed from him and grown in their fields. The Teff is now called in Amharic as "Ye Dibaye Teff", which means "the Teff of Dibaye".

b) Adaptation of fertilizer

Farmer Ayano Beyago Jabir lives in Huletegna Teffo, a PA found in Pepper/Livestock Farming System. According to Ato Ayano, there was a recommendation concerning spacing and fertiliser application on maize, given by the extension agent who is working in the area. As per this recommendation seeds of maize are dropped on line keeping a fixed distance between seeds. In the middle of every two seeds a cork full of fertilizer is applied. But, Ato Ayano does not want to fallow this recommendation; instead, he divided the cork full of fertiliser into two and applied near each seed of maize. As a result of this, the farmer reported to have harvested higher amount of maize when compared to other farmers who are following the recommendation of the DA.

Box 3 (continued)

c) Mixed use of compost and chemical fertiliser

Every innovation is triggered by a reason or more. Among the many reasons triggering farmers to innovate, high input price is one. At present the price of fertiliser has reached to the level some farmers could not afford to buy the same. This situation triggers some farmers like, Aman Mustafa Ayano of Wanja PA to seek alternative resources to use. Ato Aman uses chemical fertiliser mixed with compost to fertilize his field. From this practice the farmer harvests relatively high yield.

d) Crop rotation

Most agricultural practices have specific recommendations from research. Recommendations do not come from research centres only. There are some agricultural practices the recommendations of which emerge from farmers. The rotational cropping system implemented by farmer J*emal Mukebo Igimo* is one of the agricultural practices that are recommended by farmers. Ato Jemal who is living in Qufe PA, uses Maize, Teff and Pepper, as a rotational crops. In the first year he plant maize, in the second year he sow Teff and in the third year he sow pepper. As a result of this practice Ato Aman could increase yield and at the same time he could sustain the fertility of his farm.

e) Weed control

Previously, *Ato Rejato Imam Seid Dido,* Huletegna Teffo PA, used to apply fertilizer to his field at the same date of planting. This practice on his pepper field enhanced the growth of weed. Ato Rejato who observed the enhanced growth of the weed, decided to separate fertiliser application and sowing date. Accordingly, he applied fertiliser to his field on the first ploughing date. In the following fifteen days, in which he left his field untouched, the weed got time to grow. On the fifteenth day the farmer ploughed-in the grown weed. This time was not sufficient enough for the weed to produce seed. On the same date he planted the pepper. As a result of this practice he controlled the growth of the weed on his field.

Box 3 (continued)

f) Bee keeping

Some bee hives have queen excluder. Queen excluder is a structure that enables the beekeeper to produce pure honey. The traditional bee hive in Ethiopia does not have this structure. Innovator farmers like Ato Isa Sheh Amid Ousmael of Andegna Teffo PA, who observed the advantage of the queen excluder in some bee hives have tried to introduce this structure in to their local bee hives. In doing so Ato Isa has been successful in getting pure honey production.

g) Rotational grazing practices

Rotational grazing is one of the required practices in improved animal husbandry. Some farmers in the study area implement this practice with out being advised by extension agents. Ato Sirbala Imam Ibrahim Suraj from Andegna Teffo PA is one of these farmers who is implementing rotational grazing practice. He makes his animals graze his grazing land by dividing it into three parts. This practice has enabled him to feed his farm animals in the dry season with out much problem.

h) Land rehabilitation

Ato Abdela Seid Kijisa is an innovative farmer who is living in Andegna Ansha PA, Teff/ haricot bean Farming System. One of his plots was exposed to flooding and highly degraded. The farmer who observed the impact of the flood on his field, ultimately, decided to take measure to prevent his land. Accordingly, he constructed terrace on the field and left the land fallow for two years. During the time in which the land was left fallow, it was rehabilitated by the silt that was brought-in by the flood. After two years the plot became fertile and useful.

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Box 3 (continued)

i) Fallowing

Fallowing is another agricultural practice in which farmers' innovativeness is displayed. One of the innovative farmers in the study area who tries to innovate in this area is Ato Rajeto Haji Adem Abdlhakim. From this practice, according to his report, he has benefited a lot

j) Erosion control

Naju Berisa Mundino is an innovative farmer who is living in Andegna Teffo. He is an innovative farmer. Field of agriculture in which he innovated was Soil and Water Conservation. He was able to control soil erosion of his field by planting grass in a line.

k) Buried clay pot watering

Buried clay pot watering is another farmer innovation which enables farmers to use water economically for their plants. Farmer Belete Temesgen Wolde is an innovative farmer who lives in Wanja PA. He uses buried clay pot to water his coffee plant. He developed this system when he observed his coffee tree drying due to lack of water. Ato Belete bought a pot and make a hole at one side of it. He dug a ditch near the coffee tree and buried the pot living its mouth open. He fills the pot with water. The water reaches the coffee tree through the hole.

l) Battle drip irrigation

Gezahegn Belete .Gizaw lives in Wanja PA. As the woreda, some times confronts with shortage of rain innovations which help farmers to economize on water are essential. Ato Gezahegn uses plastic battles to water his plant. He drills a hole at the bottom of the battle, fill it with water and tie it on the stem of the plant. Through the drilled hole of the plastic battle the water drips slowly to irrigate the plant.

Box 3 (continued)

m) Introduction of Water Harvesting Technologies

Water Harvesting Technologies are recommended by extension agents to be used by the farmers. But some farmers used to construct and use this technology since long time. Ato Hameto Toricha Mohammed was one of those farmers to use this technology before it was recommended by extension agent. He constructed and used small ponds in his homestead to collect rain water in 1955 Eth. calendar. With the water from the pond he grew pepper & tree seedlings and produced cabbage

n) Soil moisture conservation

Sheh Tura Ahimed from Andegna Teffo PA has a "Chat" plot. In September there is a rain fall. In the plot of the "chat" he prepares ditches here and there and drives-in the run off of the September rain. When each ditch is filled with water he puts cattle dung and other crop residues in the ditch. This is used to conserve the water by minimizing evaporation. At the same time the water slowly infiltrates in to the soil. The soil moisture conserved this way is used by the "Chat" and enables the farmer to harvest "Chat" in the dry season.

o) Marketing (selling) of farm produces which were previously used for home consumption

In some communities some agricultural produces are produced for home consumption only. But, some farmers who observed the economic advantages of such produces, somewhere, try to get money by offering it to market. Similarly, Ato Salo Godebo Mesero who is living in Andegna Ansha PA of Teff/Haricot bean Farming System, produces cabbage in his 0.125 ha of land to sell it in the market. It was his observation of the selling of the same in the market place that triggered him to do so.

Box 3 (continued)

p) Time change in agricultural practices

In Huletgna Teffo PA of Pepper/Livestock Farming System farmers in the community sow maize on 7 April (Miazia) of the Ethiopian calendar. Against this usual practice, Nasir Ousman Debe sows maize on 17 April (Miazia) of the Etihipian Calendar. His reason for this is the weather change in the area. According to Ato Nasir the rainy season is changing. This practice has helped him to get rain water to the requirement of his sown crops which helped him to relatively increase his farm production.

q) Adaptation of extension /research-recommended agricultural practices

Ato Nasiro Shibamud Ribo is a farmer who is living in Andegna Teffo PA. In his plot the extension agent prepared a method demonstration on horticultural crops. In the next production season the farmer grew the same horticultural crops. When he grew the crops in his field he didn't follow the recommendation given by the extension agent. He decreased the space between plants. The agent did not agree with the decision made by the farmer. But the farmer, deciding to accept whatever a risk that may follow, proceeded on the implementation of his decision. Finally the amount of production he obtained was larger than the other farmers who followed the recommendation given by the extension agent.

r) Ripening vegetables

Pepper, to be harvested, should be red. There are some peppers which do not become red together with the others in the time of harvesting. Usually, these unripe peppers are left on the field until they become red. W/ro Hegene Anute Baruye who is living in Andegna Teffo PA takes another measure, other than leaving the unripe peppers on the field. She collects the unripe peppers separately and put in a heap or pile-up them and covers the pile-up with Grass and a stock of sorghum. After some time she gets ripen pepper.

Box 3 (continued)

s) Using drilled jerry can for watering plants

To water plants farmers are usually using watering can manufactured for the purpose. But, Ato Mundino Kedir Leramo of Gedeba PA has another locally generated innovation to perform this agricultural activity. Ato Mundino uses jerry can by drilling it with plaiting bodkin.

t) Use of clay pitcher to store maize

In the area maize in local barns is highly attacked by weevil. The hot weather condition in the area has become suitable to the weevil. Triggered by this problem, Ato Mundin Husen Ahimed of Andegna Ansha PA used large clay pitchers to store maize and become successful in controlling weevil attack. The temperature in clay pitcher is cool, that was the secrete behind the success of Ato Mundino's innovation.

u) Experimentation:

All innovative farmers conduct experimentation to innovate. But, some of them conduct experimentation to see the significance of the difference in performance between research-recommended technologies and local counterparts. Ato Gobena Husen Gengo who is living in Andegna Teffo PA is one of these farmers. Once, he received improved maize variety seed form the extension agent. According to the recommendation he had to use fertilizer. Chemical fertilizer and compost were the types of fertilizers he wanted to experiment to see the difference in production of the maize. On 0.125ha of land he sowed some amount of the maize seed with compost. On the other hand, he sowed the remaining seed on 0.50ha of land with chemical fertilizer. He did not change the recommended seed rate. When the result was seen, the maize sown with compost compared to that sown with chemical fertilizer had good yield and the individual seed size and structure were preferable. Even though the yield and other characteristics of the maize sown with compost was good, the farmer do not want to use compost again because its preparation was time taking and it was not good for health.

4.4 Situational and Cultural Compatibility of Farmers Innovations

In order to achieve the objective of the study, the situational and cultural compatibility of innovations tried by the farmers was also assessed. The compatibility of innovations was assessed in terms of its acceptance and non-acceptance of innovations in the study area.

Farmers' innovations have got acceptance by other farmers as reported by fair majority of innovators (83.3%), while remaining respondents (16.7%), found that their innovations were not accepted by other farmers for various 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.

Reasons for non-acceptance of farmers' innovations

According to the results given in Table 7, some of the farmers' innovations could not get acceptance among the community members due to cultural incompetence. For instance a farmer in one of the villages surveyed, ("Andegna Ansha"), planted tobacco which he brought from another area. This plant was not accepted by the community for some cultural reasons. This farmer was criticized by the local people for his unethical practice. Even though his practice was condemned by the society, this farmer has managed to obtain good amount of money from selling his harvest and become relatively rich. This shows cultural constraints to hinder the promotion of the acceptance of some farmers' innovations by other members of the society. This diverts our attention towards cultural constraints in adopting farmers' innovations.

Table 6: Non-acceptance of innovations generated by farmers in the study area

Reasons for Non-acceptance of Farmers'Innovations	Innovators	
	n	%
culturally incompetent	1	0.83
complex	2	1.67
lacks observability	7	5.83
unaffordable	2	1.67
other	8	6.67
accepted	100	83.33
Total	120	100.00

Source: own survey data, 2008

An observation to data in Table 6, shows that innovations generated by innovators were discarded by farmers due to some reasons. Accordingly, 1.67% of the innovative farmers surveyed replied that their innovations are not accepted by other farmers because they are complex in their application. Similarly, 5.83% of them said that the innovations they generated are not accepted by the community members for they are lacking observabilty. Likewise, 1.67% of the respondents expressed that the innovations are unaffordable, while 6.67% respondents have mentioned "other" reasons for the non-acceptance of their innovations by other members of the society. Totally eight respondents replied that their innovations were not accepted by other farmers for different reasons. Accordingly, the innovation of one respondent was not accepted by others because he was not willing to give the seed of the groundnut which he brought from another area, before getting "sufficient" benefit for himself. The reason mentioned by other four respondents for the non-acceptance of their innovations by others was that their innovations were labour consuming. A farmer changed the time of cultural practices, such as sowing and weeding, of some crops. For this reason other farmers do not want to take the risk of changing the times of the cultural practices which are accepted in the society. Similarly, the innovation of a farmer was not accepted by other members of the society because it was yet a newly tried out innovation by the farmer.

An effort was also made in the investigation to assess the impact of farmers' innovations on crop yield. The result given in Table 7 shows that 94.17% of the innovator farmers replied that their innovations increased the crop yield in their fields. While 5.87% of them replied that their innovations did not bring any incremental change on crop yield. Even the farmers, who said that their innovations did not bring any incremental change on the crop yield, were enjoying other advantages which may have long term positive impacts on land resource management and the like.

Table 7: Impact of farmer innovation on crop yields in the study area

Impact on yield	Innovator	
	n	%
Increased yield	113	94.17
No change on yield	7	5.87
Total	120	100.00

Source: own survey data, 2008

The results given in Table 8 shows that the innovations generated by 2.5% of the respondents were reported to reduce drudgery of farm work. Similarly 2.5% of the respondents expressed that their innovations are suitable, specifically, to their agricultural fields. Further the innovations of 0.83% of the respondents were said to have other advantages. The *"other"* advantage obtained by the farmers was increase in income by diversifying the type of produces received from the farm.

Table 8: In case of no impact on crop yield, other added values of the farmer innovation

Other added value of the innovation	Innovator	
	n	%
drudgery reduction	3	2.50
Suitable to specific farm situation	3	2.50
Other (diversified crop produces)	1	0.83
None (Increase in crop yield)	113	94.17
Total	120	100.00

Source: own survey data, 2008

There are many important incentives that motivate or trigger innovative farmers to innovate. Population pressure on a limited natural resource base appears to be an important reason for innovating and investing in agricultural diversification and intensification. Where farmers have their 'backs against the wall' and few options left, experimentation and innovation find 'fertile ground' (Reij and Waters-Bayer, 2001). When farmer innovators surveyed in the study area were asked why they had innovated, the main reason for 40.83% of them was "own creativity". (Table 9).

Table 9: Trigger to innovate as expressed by the respondents

Trigger to innovate	Innovator	
	n	%
Own creativity	49	40.83
Influenced by extension agents	5	4.17
Observed elsewhere	7	5.83
To increase household income	1	0.83
Multiple reasons from above triggers	58	48.33
Total	120	100.00

Source: own survey data, 2008

The results of the survey further show that the reason to innovate for 4.17 % of the innovator farmers was "influence by extension agents". "Observation elsewhere" of similar innovations also triggered 5.87% of the respondents. It is interesting to note that 48.33% of the innovator farmers had more than one reason to innovate. It was noted that the multiple reasons to innovate were repetition from the list of trigger to innovate, (Table 9).

4.5 Influence of Independent Variables on Farmers Innovativeness

It is an accepted fact that there are several factors which influence farmers' innovativeness. The earlier studies group these factors under different major categories depending on the purpose and variables of the study. In order to understand the influence of existing personal

and demographic, socio-cultural, wealth-related and institutional variables with respect to farmer innovation and innovativeness, the descriptive analysis is discussed and summarised under each category separately. The relationship of these variables with farmers' innovativeness is discussed under the following sub-sections.

4.5.1 Personal & demographic variables

4.5.1.1 Age

Age is one of the demographic factors that is useful to describe respondents and provide clue about the age structure of the sample and the population. The level of innovativeness is said to be affected by the age of the farmer. Accordingly, there are some study results which indicate the level of innovativeness to be lower among older and younger farmers and the pick in innovativeness to be found among farmers in the age bracket of 35-50 years (Reij and Waters-Bayer, 2001). In agreement with this it was hypothesized that the pick in innovativeness is found among farmers in the middle age bracket.

Table 10: Relationship between age of the respondents & innovator category

Category	**Mean**	**SD**	**Min**	**Max**	**Total**	t-value
Innovator	44.08	10.587	23	72	42.01	
Non-innovator	37.85	11.935	22	65	22.00	
Total	42.01	11.408	22	72	72.00	3.567***

Source: own survey data, 2008. ***, Significant at less than 1% level

The results given in Table 10 reveal that the mean age of the total respondents was found to be 42.01 with Standard Deviation of 11.408. The minimum and the maximum age of the respondents, as shown in the table, is 22 and 72 respectively, which at the same time shows, the variation of the range of the respondents' age. Concerning the age of respondents with

respect to their innovator category, the average age of innovator farmers is indicated to be 44.08 with Standard Deviation of 10.587 and that of the non-innovators is 37.85 with Standard Deviation of 11.935. The age range of innovator farmers is between 23 and 72, and the non-innovator farmers are found in the age range of 22 and 65 years.

This result indicates that there is statistically significant mean age difference, (t-value = 3.567, P = 0.000), between innovator and non-innovator groups implying the presence of significant relationship of age with farmers category. The mean age of innovator farmers, which is 44.08 years (middle age), confirms the hypothesis of the study to be true. The study of Nielsen (2001), in: Reij and Waters-Bayer (2001), entitled, "Why do farmers innovate and why don't they innovate more? Insights from a study in East Africa", also reported the same age group of farmers to be innovative.

4.5.1.2 Sex

In many studies conducted in various countries of Africa it is stated that about three-quarters of the identified innovators are men. Although women often do a large share of the farm work, it is usually the men who are the household heads and represent the family in public, & are therefore most likely to take credit for any changes made on their farms. This may partly explain the lower percentage of female innovators identified (Reij and Waters-Bayer, 2001; Yohannes, 2001, in: Reij and Waters-Bayer, 2001). This hold true for the present study also. According to the result of the study, out of the total sampled respondents 95.6% were male and 4.4% of them were female which shows the number of female in innovator category to be very small.

The results of the relationship between sex and innovator category is given in Table 11. With respect to innovator categories, out of the total innovator respondents, (n = 120), females were 5 and out of the total non-innovator respondents, (n = 60), females were only 3. When the proportion is seen, from the total of female respondents sampled, (n = 8), 62.5% were innovators. Similarly, from the total of male respondents sampled, (n = 172), 66.9% were

innovators, and the remaining, 37.5%, and 33.1% were female and male non-innovator farmers respectively.

Though, it was hypothesized that male farmers are more likely to be innovative than female farmers, the results of the Pearson Chi-square, indicates the relationship of sex with innovativeness to be not significant (P = 0.798). The results confirm that females are also innovating in the field of agriculture. They can share all sorts of responsibility in agriculture including experimentation and invention in the fields.

Table 11: Relationship between sex of respondents & innovator category

The respondent's Innovator category	The respondents sex				Total		χ^2
	Male		Female				
	No	%	No	%	No	%	
Non-innovator	57	95.0	3	5.0	60	100.0	
Innovator	115	95.8	5	4.2	120	100.0	
Total	172	95.6	8	4.4	180	100.0	0.065NS

Source: own survey, 2008. NS, Not significant, (df = 1, CV = 0.019)

4.5.1.3 Family size

Families often work very closely together in building up their farm. Moreover, most innovators will need support from the rest of the family as a new technique may require extra labour, divert resources and involve some risk and therefore, at least in some cases, require consultation within the family (Reij and Waters-Bayer, 2001). Therefore, it was hypothesised that family size and innovativeness are directly related. As family size increases farmer innovativeness also increases.

Table 12: Relationship between family size of respondents & innovator category

Family size in number	N	Mean	SD	Min	Max	t-value
Innovator	120	6.33	3.106	1	18	
Non-innovator	60	6.03	2.957	1	16	
Total	180	6.23	3.052	1	18	0.603NS

Source: own survey, 2008. NS, Not significant

According to the results accommodated in Table 12, the average family size of the sampled farmers is 6.23 persons, with SD of 3.052 which is higher than the national average of 5.2 persons CSA (1995). The minimum and the maximum family size of the total sampled households is 1 and 18 respectively. The average family size for the sampled innovator farmers is 6.33 persons and of the non-innovators is 6.03 with standard deviation of 3.106 and 2.957 respectively. Though it was hypothesised that family size and innovativeness are directly related, in this study no significant difference was seen in the number of family members between innovators and non-innovators (P = 547). In agreement with this result, Yohannes (2001), in: Reij and Waters-Bayer (2001), in his study entitled, "Community assessment of local innovators in northern Ethiopia", reports family size not to be a decisive factor for innovativeness on its own.

Table 13: Relationship between marital status of respondents & innovator category

Marital status	Innovator category				Total		χ^2
	Non-innovator		Innovator				
	N	%	N	%	N	%	
Married	58	96.7	118	98.3	176	97.8	
Single	0	0.0	1	0.8	1	0.6	
Widow	2	3.3	1	0.8	3	1.7	
Total	60	100.0	120	100.0	180	100.0	2.011NS

Source: own survey, 2008. NS, Not significant (df = 2, CV = 0.106,)

Of the total sampled respondents, 97.8% were married, 0.6% divorced and 1.7% were widow. With respect to marital status, as indicated in Table 13, it has no significant relationship with the innovator categories (P = 0.366). The result shows that majority of the respondents, irrespective of their category are married. This in tern confirms the reality of the rural population that almost all farmers are taking the responsibility of farming only after they are married.

4.5.1.4 Educational status of respondents

Appropriate information about an innovation or a technology initiates farmers to make use of the technology or to create another which is suitable for their particular need. Education enhances the capacity of individuals to obtain, and utilize information disseminated by different sources. This in turn strengthens their innovativeness. Based up on this premise, some studies indicate that innovators are better educated (Reij and Waters-Bayer, 2001). There are also other studies which indicate the level of formal education not to be a determining factor with respect to farmers' creativity & propensity to experiment (Nasr *et al.,* 2001, in: Reij and Waters-Bayer, 2001). In agreement with the latter, it was hypothesised that there is no significant relationship between the level of formal education and the innovativeness of farmers.

Table 14: Relationship between educational status of sample respondents and innovator category

Educational Status of Respondent	Innovator Category				Total		χ^2
	Innovator		Non-innovator				
	n	%	n	%	n	%	
Illiterate	29	24.2(16.1)	25	41.7(13.9)	54	30.0	
Read & write	32	26.7(17.8)	18	30.0(10.0)	50	27.8	
1-4	29	24.2(16.1)	12	20.0 (6.7)	41	22.8	
5-8	27	22.5(15.0)	5	8.3 (2.8)	32	17.8	
9-10	2	1.7 (1.1)	0	0.0	2	1.1	
10+	1	0.8 (0.6)	0	0.0	1	0.6	
Total	120	100.0	60	100.0	180	100.0	10.564*

Source: own survey, 2008. *, Significant at less than 10% level, (df = 5, CV = 0.242)

* Numbers in parenthesis indicate proportion from total.

As indicated in Table 14, the distribution of total sample respondents in terms of educational status shows that 30% of the respondents are illiterate, 27.8% of them can read and write and the rest, 42.3%, of the respondent farmers are indicated to have completed grades up to 10 and above. The results show that the proportion of illiterate farmers in the innovator and non-innovator categories is 24.2% and 41.7% respectively. It can also be observed that, 26.7% of the innovator and 30% of the non-innovator farmers can read and write, whereas 49.1% of the innovator and 28.3% of the non-innovator farmers have completed grades 1 to 10 and above.

As against the expectations, the Chi-square test indicates the relationship between innovator categories and level of education to be statistically significant (P = 0.061). The finding of this study is in agreement with the study conducted by Miiro *et al.*, (2001), in: Reij and Waters-Bayer (2001), in his study, "Innovation and impact: a preliminary assessment in Kabale, Uganda", he has reported significant relationship of education with innovativeness.

Farmers Perception about Education

Table 15: Relationship between perception about education and innovative category

The respondent's Innovator category	Perception										χ^2
	Less important		Important		Very important		Most important		Total		
	n	%	n	%	n	%	n	%	n	%	
Non-innovator	2	3.3	30	50.0	20	33.3	8	13.3	60	100	
Innovator	0	0.0	1	0.8	21	17.5	98	81.7	120	100	
Total	2	1.1	31	17.2	41	22.8	106	58.9	180	100	96.265***

Source: own survey, 2008. ***, significant at less than 1% level, (df = 3, CV = 0.731)

The survey results indicate the significant relationship between level of education and the innovator categories at less than 10% probability level (Table 15). Further it also shows a significant relationship between perception about education and the innovator categories (P = 0.000). As indicated in Table 15, 81.7%, 17.5%, and 0.8% of the surveyed innovator farmers, when asked about the importance of education, replied by saying 'most important', 'very important' and 'important' respectively. Similarly, the answers for the same question by

13.3%, 33.3%, 50% and 3.3% of the surveyed non-innovator farmers were ‘most important’, ‘very important’, ‘important’ and ‘less important’ respectively. This result, clearly shows the positive outlook about education among innovator farmers, and furnishes proof of the significant relationship between innovativeness and level of education discussed above.

4.5.1.5 Farming experience of the respondents

Higher farming experience 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. Hence, farming experience was hypothesised to affect farmers’ innovativeness positively.

Table 16: Relationship between farming experience and innovator category

Innovator Category	N	Mean	SD	Min	Max	t-value
Innovator	120	23.00	9.796	5	50	
Non-Innovator	60	15.97	9.091	2	45	
Total	180	20.66	10.104	2	50	4.649***

Source: own survey, 2008. ***, Significant at less than 1% level

As indicated in Table 16, the farm experience of the sampled farmers ranges from 2 to 50 years. The average farming experience is 20.66 years with standard deviation of 10.104 years. About 85.8% of the total respondents have more than 10 years of farming experience. Independent treatment of the sample respondents in to innovators and non-innovators indicates the average years of farm experience to be 23.00 (SD = 9.796) and15.97 (SD = 9.091) respectively underlining the higher farm experience of innovators.

Further more t-test was run to see the association between innovativeness and the number of years of farm experience of the respondents and it shows that, there is significant relationship between the number of years of the respondents’ farm experience and innovativeness (P = 0.000). This result confirms the hypothesis formulated earlier. The results are in agreement with the result of the study of Nasr et al., (2001), in: Reij and Waters-Bayer (2001). Nasr and

his colleagues, in their study entitled, “Innovators in land husbandry in arid areas of Tunisia”, state the innovator farmers identified in their study area, to be relatively experienced.

4.5.1.6 Participation in non-farm activities

This reflects on the degree of involvement of the respondents in non-farm income generating activities. In most African countries, the majority of farm families derive their livelihoods not only from crop and livestock production but also from a range of activities outside of agriculture. According to Bryceson (1999), farmers in sub-Saharan Africa derive 60-80 percent of their income from non-farming activities. But, according to some studies, it was found that most of the innovators 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 (Reij and Waters-Bayer, 2001). Therefore in this study it was hypothesised that participation in non-farm activities affects farmer innovativeness negatively.

Table 17: Relationship between participation in non-farm activities & innovativeness

Participation in Non-farm activities	Innovator Category				Total		χ^2
	Non-innovator		Innovator				
	N	%	N	%	N	%	
No	13	21.70	79	65.80	92	51.1	
Yes	47	78.30	41	34.20	88	48.9	
Total	60	100.00	120	100.00	180	100.0	31.227***

Source: own survey, 2008. ***, Significant at less than 1% level (df = 1, CV = 0.417)

According to the results in Table 17, of the total sampled respondents, 51.1% did not involve themselves in non-farm activities, while the remaining 48.9% involve in non-farm activities. The categorical analysis shows that, 34.2% of innovator farmers and 78.3% of non-innovators are involved in non-farm activities. Chi-square test shows a significant association between

non-innovativeness and involvement in non-farm activities (P = 0.000). This result agrees with the already hypothesized point in question that says, participation in non-farm activities affects farmer innovativeness negatively. Reij and Waters-Bayer (2001), and Yohannes (2001), in: Reij and Waters-Bayer (2001), have also reported similar result in their studies. The results are contradictory to the studies of Nielsen (2001), in: Reij and Waters-Bayer (2001), which says that "households with non-farm activities as the main source of income were found to be more innovative than those depending mainly on income from the farm".

4.5.2 Socio cultural variables

4.5.2.1 Social participation

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. Therefore, it was hypothesised that those farmers who participate in social organizations are likely to be innovative. This variable was said to be treated as a dummy variable in that if the respondent is a social participant he will be coded as 1 and 0, otherwise. In this level of treatment all the respondents, without variation, have been found to be social participants, because, to be a member of some important social organisations in a community is a necessity. For example, "Idir" is an important social organisation in which every member of a society is required to be a member. For that matter, the treatment of this factor as a dummy variable to be answered by saying "Yes" or "No", results in no variation. This result, in turn, may cover the reality in variation of farmers' participation in social organisations. As there are different types of social organizations in a community, there might be variation among respondents in participation from organization to organization. Therefore, to see this variation, if at all there is, this variable was treated with respect to different social organisations.

The survey results concerning social participation of the respondents, is given in tables18, 19 and 20. To see each farmer's level of social participation in different social organizations, 8 organizations were included in the interview schedule.

According to the results of the study, participation of respondents varies from social organisation to social organisation. The variation is seen both in membership and level of leadership. In some organisations, like "Idir" and Religious Groups, all the respondents participate. In some organisations many while in the others, only a few of the respondents participate. The results in Table 18 show that, all respondents participate in "Idir" and Religious Groups, but their participation as a member, as a committee member or as a leader differs. Participants in "Iqub", Marketing Cooperatives and Union are 8.3 %, 30.1%, and 22.8% respectively. The analysis within the category reveals that, there is a significant relationship between participation in "Idir", (P = 0.000), Marketing Cooperatives, (P= 0.037), and Union, (P = 0.012) and innovator categories. Accordingly, all the three significant relationships mentioned above indicate the participation of the innovator farmers to be prominent.

Leadership status of respondents in social organisations is given in Table 19. If a respondent is a chair person of an organization he will be considered as a leader of that organization. In addition to this any respondent who is a chair person of any committee he will be included in a leader category. The results of the study clearly show that at PA level, 27% of the respondents are participating at leadership level. Similarly, in the district and school councils 7% and 31% of the respondents participate with leadership status respectively. The analysis within the category indicates that 20% innovator farmers and 5% non-innovator farmers hold a leadership status at PA level. At district level, 7% innovator farmers participate with leadership status. The proportion of participants in school councils are reported to be 22.5% and 6.7% of innovators and non-innovators respectively. The result of the Chi-square test shows a significant relationship between innovator category and participation in PA council, (P = 0.003) district council, (P = 0.056), and school council (P = 0.011) with leadership status. The result of the study shows that, innovator farmers participate in social organizations more than non-innovator farmers. The results are in line with the hypothesis formulated earlier.

As shown in table 20, 36.7% of the respondents were found to be mediators (“Ye’hager Shimagile”). Further, with respect to innovator categories 43.3% of sample innovator farmers and 23.3% of sample non-innovator farmers are reported as mediators. Significant relationship was found between innovator category of respondents and mediator status of the respondents, (P = 0.009). The results of the study are in line with Hamado Sawadogo and his colleagues conducted in Burkina Faso (Sawadogo *et al.*, 2001, in: Reij and Waters-Bayer, 2001)

Table 18: Relationship between participation in social organisations & innovator category

Participation	Innovator category						χ^2
	non-innovator			innovator			
	n	%	Total %	n	%	Total %	
Idir							
Member	57	95.0	31.7	81	67.5	45.0	
Committee Member	3	5.0	1.7	28	23.3	15.6	17.252***
Leader	-	-	-	11	9.2	6.1	
Iqub							
Member	1	1.7	0.6	3	2.5	1.7	
Committee Member	-	-	-	-	-	-	0.636NS
Leader	-	-	-	1	0.8	6%	
Religious Group							
Member	57	95.0	31.7	111	92.5	61.7	
Committee Member	1	1.7	0.6	6	5.0	3.3	1.270NS
Leader	2	3.3	1.1	3	2.5	1.7	
Marketing Cooperatives							
Member	10	16.7	5.6	39	32.5	21.7	
Committee Member	-	-	-	2	1.7	1.1	8.469**
Leader	-	-	-	3	2.5	1.7	
Union							
Member	5	8.3	2.8	33	27.5	18.3	
Committee Member	1	1.7	0.6	2	1.7	1.1	8.863**
Leader	-	-	-	-	-		

Source: own survey, 2008. *Idir*; ***, Significant at less than 1% level, *Iqub*; NS, Not significant, *Religious Group*; NS, Not Significant, *Marketing Cooperative*; **, Significant at less than 5% level and *Union*; **, Significant at less than 5% level.

Table 19: Leadership status of respondents in social organisation

Leadership Status	Innovator Category						χ^2
	Non-Innovator			Innovator			
	n	%	Total %	n	%	Total %	
PA							
1: Leader	3	5	1.7	24	20	13.3	
2: Committee Member	0	-	-	7	5.8	3.9	
Total	3	5	1.7	31	25.8	17.2	11.640***
District Council							
1: Leader	0	-	-	7	5.8	3.9	
2: Committee Member	0	-	-	0	-	-	
Total	0	-	-	7	5.8	3.9	3.642**
School Council							
1: Leader	4	6.7	2.2	27	22.5	15	
2: Committee Member	0	-	-	3	2.5	1.7	
Total	4	6.7	2.2	30	25	16.7	8.980**

Source: own survey, 2008. *PA*; ***, Significant at 1% level,(df= 2, CV = 0.254), *District Council*; **, Significant at 5% level, (df = 1, CV = 0.142), *School Council*; **, Significant at less than 5% level, (df = 2, CV = 0.223).

Table 20: Mediatorship status of respondents in social organisations

Leadership Status	Innovator Category				Total		χ^2
	Non-Innovator		Innovator				
	n	%	n	%	n	%	
Mediator							
No	46	76.7	68	56.7	114	63.3	
Yes	14	23.3	52	43.3	66	36.7	
Total	60	100.0	120	100.0	180	100	6.890***

Source: own survey, 2008. ***, Significant at 1% level, (df = 1, CV = 0.196)

4.5.2.2 Mass media exposure

Mass media play a great role in creating awareness about agricultural innovations or technologies in shortest time possible over large area of coverage. The information about new agricultural technologies or innovations, disseminated by mass media will motivate farmers to use the same or it will encourage them to generate appropriate innovation which is suitable for their particular situation. It will also help to disseminate, and raise awareness about, farmer innovation and to influence policy in its favour if it is used particularly in relation to farmer innovation. Hence, mass media exposure was expected to have positive influence on farmer innovativeness. Mass media exposure was treated with respect to Radio listening, TV watching and News Paper reading. The survey result on mass media exposure of sample respondents is provided in Tables 21, 22 and 23.

Table 21: Radio listening among different category of respondents

Frequency	Non-innovator		Innovator		Total		χ^2
	n	%	n	%	n	%	
Never	3	5.0	2	1.7	5	2.8	
Rarely	14	23.3	7	5.8	21	11.7	
Once in a Week	4	6.7	5	4.2	9	5.0	
Every day	39	65.0	106	88.3	145	80.6	
Total	60	100.0	120	100.0	180	100.0	15.303***

Source: own survey, 2008. ***, Significant at less than 1% level, (df = 3, CV = 0. 292,)

It can be seen from the data in Table 21 that radio listening is popular in both innovators and non-innovators with varying degree. It is encouraging to note that 88.3% of the innovators are listening to radio every day as against 65% non-innovator. The proportion of non-innovators and innovators who listened to radio rarely was 23.3% and 5.8% respectively. Incidentally there was no respondent falling in ‘once in a month’ and ‘once in fortnight’ frequency for radio listening in both the category of respondents

Table 22: Television watching among different category of respondents

Frequency	Non-innovator		Innovator		Total		χ^2
	n	%	n	%	n	%	
Never	24	40.0	39	32.5	63	35.0%	
Rarely	33	55.0	62	51.7	95	52.8%	
Once in a Month	0	0.0	2	1.7	2	1.1%	
Once in Fortnight	0	0.0	1	0.8	1	0.6%	
Once in a Week	3	5.0	14	11.7	17	9.4%	
Every day	0	0.0	2	1.7	2	1.1%	
Total	60	100.0	120	100.0	180	100.0	5.109NS

Source: own survey, 2008. NS, Not significant, (df = 5, P= 0.403, CV = 0.168,)

Table 23: News Paper reading among different category of respondents

Frequency	Non-innovator		Innovator		Total		χ^2
	n	%	n	%	n	%	
Never	41	68.3	54	45.0	95	52.8%	
Rarely	19	31.7	53	44.2	72	40.0%	
Once in a Month	0	0.0	3	2.5	3	1.7%	
Once in Fortnight	0	0.0	4	3.3	4	2.2%	
Once in a Week	0	0.0	5	4.2	5	2.8%	
Every day	0	0.0	1	0.8	1	0.6%	
Total	60	100.0	120	100.0	180	100.0	12.189**

Source: own survey, 2008. **, Significant at less than 5% level, (df = 5, CV = 0.260)

The Chi-square test result shows that there is a significant relationship between Radio listening and innovator categories of the respondents, (P = 0.002). Accordingly, innovator farmers are seen to be holding the prominent place in Radio listening. This relationship signifies that if farmers are most frequently listening to radio they can get relevant information on different agricultural practices in different areas and various technologies generated by researchers and farmers. This may motivate them to try new ways of doing things

implemented in other areas for themselves or generate another innovation suitable to their specific situation.

As given in Table 22, the result of the survey conducted concerning TV watching shows that 1.1% of the total respondents are watching TV every day. Furthermore, 9.4%, 0.6%, 1.1% and 52.8% of the respondents watch TV once in a week, once in fortnight, once in a month and rarely, respectively. To the contrary there are 35.0% respondents who never watch programmes transmitted through Television. When the result is categorically analyzed it shows the two categories of respondents, innovators and non-innovators, to be having different TV watching habits. Accordingly, 32.5% of the innovators and 40.0% of the non-innovator farmers never watch TV programmes, 51.7% innovator farmers and 55.0% non-innovator farmers watch TV rarely, and 11.7% innovators and 5.0% non-innovators watch TV once in a week. Unlike non-innovators, 1.7%, 0.8%, and 1.7% of the innovator farmers watch TV every day, once in fortnight, and once in a month respectively. The result of the Chi-square test conducted to understand the TV watching characteristics of the respondents in the study area displays the relationship between this independent variable and innovator categories to be insignificant (P= 0.403). This signifies that there is no difference in watching TV between innovator and non-innovator farmers. On the one hand, this may be because of the non-availability of the medium, TV, in the rural areas of the country, on the other hand, though some farmers have opportunity to watch TV programmes sometimes, the programmes they may be watching are not related to agriculture.

The result of the survey depicted in Table 23 shows the degree to which the respondents in the study area are reading News Paper or printed medium to get information on extension. As indicated in the results, 52.8% of the total respondents never read News Paper or any printed medium while the rest of the respondents have opportunity to read printed medium at varying frequency. Accordingly, 0.6% of the respondents read News Paper, every day, 2.8% weekly, 2.2% once in fortnight, 1.7% once in a month and 40.0% rarely. When we categorically analyze this result we get the two innovator categories to be having exposure to the medium at different level of frequency. Here the result shows that, 44.2% innovators and 31.7% non-innovators read printed medium rarely while 45.0% innovators and 68.3% non-innovators

never read any printed medium. When this particular result is further analyzed, it is clearly seen that, non-innovator farmers do not read any printed medium at all. As shown in Table 24 there is significant relationship between News Paper reading and innovator categories, (P= 0.032), implying that more number of innovator farmers read News Paper as compared to non-innovator farmers.

Table 24: Nature of radio programmes preferred by the respondents

Programmes	The respondent's Innovator category						χ^2
	Non-innovator		Innovator		Total		
	n	%	n	%	n	%	
Agricultural	**4**	6.7	**12**	10.0	**16**	8.9	
Entertainment	4	6.7	2	1.7	6	3.3	
1 & 2	**6**	10.0	**48**	40.0	**54**	30.0	
2 & 3	1	1.7	5	4.2	6	3.3	
All the three	**41**	68.3	**51**	42.5	**92**	51.1	
Other	1	1.7	0	0.0	1	0.6	
None	3	5.0	2	1.7	5	2.8	
Total	60	100.0	120	100.0	180	100.0	25.073***

Source: own reference, 2008. ***, Significant at less than 1% level, (df = 6, CV = 0.373)

Table 25: Nature of television programmes preferred by respondents

Programmes	The respondent's Innovator Category						χ^2
	Non-innovator		Innovator		Total		
	n	%	n	%	n	%	
Educational	2	3.3	2	1.7	4	2.2	
Agricultural	0	0.0	**3**	2.5	**3**	1.7	
Entertainment	10	16.7	34	28.3	44	24.4	
1 & 2	0	0.0	**17**	14.2	**17**	9.4	
1 & 3	**1**	1.7	**3**	2.5	**4**	2.2	
2 & 3	0	0.0	7	5.8	7	3.9	
All the three	**23**	38.3	**16**	13.3	**39**	21.7	
None	24	40.0	38	31.7	62	34.4	
Total	60	100.0	120	100.0	180	100.0	28.697

Source: own reference, 2008. ***, Significant at less than 1% level, (df = 7, CV= 0.399,)

From among the total respondents who have media exposure, only 16.0% are listening agricultural radio programmes, (Table 24), 3% watch agricultural TV programmes (Table 25), and 61% of them are interested in agricultural news (Table 26). In all cases the Chi-square test result shows highly significant relationship between the media exposure viz. *Radio,*(P= 0.000), *TV, (* P= 0.000) *and News* (P= 0.000) and innovator categories. The significant relation

between innovator category and programme preference signifies that there is a specific and varying attraction towards each programme by the different categories of respondents.

Table 26: News category preference of respondents

News	Innovator category				Total		χ^2
	Non-innovator		Innovator				
	n	%	n	%	n	%	
Educational	1	1.7	1	0.8	2	1.1	
Agricultural	**15**	25.0	**46**	38.3	**61**	33.9	
Entertainment	1	1.7	0	0.0	1	0.6	
1 & 2	**11**	18.3	**62**	51.7	**73**	40.6	
2 & 3	3	5.0	1	.8	4	2.2	
All the three	**23**	38.3	**5**	4.2	**28**	15.6	
None	6	10.0	5	4.2	11	6.1	
Total	60	100.0	120	100.0	180	100.0	50.677***

Source: own reference, 2008. ***, Significant at less than 1% level, (df = 6, CV= 0.531,)

4.5.2.3 Respondents attitude towards agriculture

Some farmers consider farming to be a last option of which they are not very proud of. Work in areas other than agriculture is the preferred option. Only if the option fails they return back to farming option. In contrast some farmers are proud of their farms and did not consider farming to be an inferior occupation. Studies have shown the latter to be the ones who are much innovative than the others. Therefore, it was hypothesised that, favourable attitude towards agriculture influences farmer innovativeness positively.

Table 27: Attitude of respondents towards agriculture

Innovator category	N	Mean	SD	Min	Max	t-value
Innovator	120	33.20	1.498	28	35	
Non-innovator	60	23.92	2.110	15	27	
Total	180	30.11	4.714	15	35	34.033***

Source: own survey, 2008. ***, Significant at less than 1% level

Attitude of farmers towards agriculture was measured with the help of five point likert scale. The scale contained seven attitude statements which were allotted scores on the continuum as; strongly agree = 1; agree = 2; neutral = 3; disagree = 4; and strongly disagree = 5.

Individual's attitude towards agriculture determines the measure to be taken by the individual to improve the same. A person having positive attitude towards agriculture may take any possible measure to bring transformation. A man-of-negative-attitude towards agriculture will do the opposite. The positive-minded person would try to get new information and skill which would make him capable of taking appropriate measure for the transformation of agriculture. As a result innovativeness follows.

The results regarding attitude of respondents towards agriculture is presented in Table 27. The highest and lowest attitude scores for sample respondents were found to be 35 and 15 respectively. Out of an obtainable potential score of 35, the highest attitude score of innovators and non-innovators were 35 and 27 respectively. The mean attitude score for non-innovators towards agriculture was 23.92 and that of innovators 33.20.

T-test was computed to see the relationship between innovativeness and attitude of respondents towards agriculture. The result shows that there is significant relationship between attitude towards agriculture and innovativeness, (P = 0.000), implying that innovator farmers have the highest average score than the non-innovator respondents which in turn furnishes a proof of innovator farmers to have positive attitude towards agriculture. This result agrees with the hypothesis of the study which was made at the beginning.

4.5.2.4 Time spent in the locality

It referred to the chronological time or the number of years spent in the area by the respondent. It is expected that, a farmer who spent longer time in the locality would have better knowledge about the problem related to agriculture of the locality which would initiate him to find appropriate solution. Seeking a solution for a problem would result in some innovative work. Therefore, this variable was hypothesised to affect farmer innovativeness positively.

The mean scores of time spent in the locality by the respondents are presented in Table 28. The average time spent by the respondent in the locality is 39.90 years, with SD of 13.069. The minimum and the maximum time spent in the locality by the sampled respondents are 7

and 72 years respectively. The categorical analysis of the results shows the mean years spent in the locality by innovator and non-innovator farmers to be 41.62 and 36.47 years with SD of 12.754 and 13.118 respectively. The minimum number of years spent in the locality by sampled innovator farmers is 8 and the maximum years spent in the locality by the same category of farmers is 72. Similarly, the maximum and the minimum years spent in the locality by non-innovator farmers, according to the study result is 7 and 65 respectively.

Table 28: Relationship between time spent in the locality and innovator categories

Time spent in the locality in years	N	Mean	SD	Min	Max	t-value
Innovator	120	41.62	12.754	8	72	
Non-innovator	60	36.47	13.118	7	65	
Total	180	39.90	13.069	7	72	2.530**

Source: own survey, 2008. **, Significant at less than 5% level

T-test was run to see the relationship between innovativeness and time spent in the locality by the respondents. It shows that, there is significant relationship between innovator categories and time spent in the locality respectively (P = 0.012). The result implies that the innovator farmers are those who spend relatively longer time in the locality than the non-innovator farmers. This result agrees with the assumption of the study which was made at the beginning. Therefore, as the number of years spent by the farmer in the locality increases, his innovativeness will also increases.

4.5.2.5 Innovation proneness

Innovation Proneness refers to ones' inclination to innovate or susceptibility of a person to be affected by innovation once he is disposed to new idea or innovation. It is used to measure the individual's orientation toward innovation. Individual innovation proneness scale was used to measure this variable. Innovation Proneness was hypothesised to have positive influence an individual's innovativeness.

Table 29: innovation proneness among different category of respondents

Innovator category	N	Mean	SD	Min	Max	t-value
Innovator	120	14.38	1.070	10	15	
Non-innovator	60	6.90	1.893	2	10	
Total	180	11.89	3.802	2	15	28.434***

Source: own survey, 2008. ***, Significant at less than 1% level

This section focuses on farmers' innovation proneness which was measured by using innovation proneness scale. The results related to this aspect are presented in Table 29. In order to achieve score on innovation proneness different statements were presented to sampled respondents. A total of 15 statements, reflecting innovation proneness, were developed and presented to both categories of respondents.

The responses for each question were coded with numbers based on nature of statements. Finally, the innovation proneness score for each respondent was calculated by summing up the value of each statement. To see the degree of association between each statement, correlation matrix was conducted.

As given in Table 29, the highest and lowest Innovation Proneness score obtained by sample respondents was found to be 15 and 2 respectively. The mean Innovation Proneness score for the total respondents was 11.89 with SD of 3.802. Categorical analysis of the data shows that, out of an obtainable potential Innovation Proneness score of 15, the highest Innovation Proneness scores of innovators and non-innovators was 15 and 10 respectively. The mean Innovation Proneness score of the non-innovators was 6.9 and that of the innovators was 14.38 with SD of 1.893 and 1.070 respectively.

T-test was run to see the association between innovator categories and Innovation Proneness of the respondents. As given in Table 29, there existed a significant relationship between Innovation Proneness and innovator categories, (P = 0.000). The result indicates the innovator farmers to be more innovation prone than non-innovators and this result agrees with the hypothesis of the study which was made at the beginning. Therefore, Innovation Proneness of an individual affects his innovativeness positively.

4.5.2.6 Exposure to other areas

Some studies have stated that innovators are better exposed to other areas, usually through labour migration or military service. They pick up ideas while in other parts of the country or abroad and, in some cases, made earnings that they could invest in agriculture (Reij and Waters-Bayer, 2001). Based on this premise, it was hypothesized that exposure to other areas influences farmers innovativeness positively.

The results related to this aspect of study are presented Tables 30, 31, 32 and 33. It can be seen from the data in these tables that 96.1%, (Table 30), 75.6%, (Table 31), 63.9%, (Table 32), and 1.1%, (Table 33), of the respondents have been exposed to other woredas, other zones, other regions and abroad respectively while, 3.9%, 24.4%, 36.1% and 98.9%, of them do not have any exposure to other woredas, other zones, other regions and abroad respectively.

Categorical analysis indicates that 91.7% of the non-innovator farmers and 98.3% of the innovator farmers had exposure to other woredas, (Table 30). The Chi-square test indicates the relationship between innovator categories and exposure to other woredas to be statistically significant, (P = 0.029). Further categorical analysis of the result with respect to exposure to other zones, given in Table 31, shows that 97.5% of the innovator farmers and 31.7% of the non-innovator farmers had good exposure to other zones. The result of the Chi-square test indicates the relationship between exposure to other zones and innovator category to be highly significant, (P = 0.000). Accordingly, the exposure of the innovator farmers to other zones is seen to be very high when compared to the non-innovator farmers.

Table 30: Respondents' exposure to other woredas

	Innovator Category				Total		χ^2
	Non- Innovator		Innovator				
	n	%	n	%	n	%	
Yes	55	91.7	118	98.3	173	96.1	
No	5	8.3	2	1.7	7	3.9	
Total	60	100.0	120	100.0	180	100.0	4.756**

Source: own survey, 2008. **, Significant at less than 5% level, (df = 1, CV = 0.163)
Table 31: Respondents' exposure to other zones

Exposed	Innovator Category				Total		χ^2
	Non- Innovator		Innovator				
	n	%	n	%	n	%	
Yes	19	31.7	117	97.5	136	75.6	
No	41	68.3	3	2.5	44	24.4	
Total	60	100.0	120	100.0	180	100.0	13.865***

Source: own survey, 2008. ***, Significant at less than 1% level, (df = 1, CV = 0.722)

Table 32: Respondents' exposure to other regions

Exposed	Innovator Category				Total		χ^2
	Non- Innovator		Innovator				
	n	%	n	%	n	%	
Yes	6	10.0	109	90.8	115	63.9	
No	54	90.0	11	9.2	65	36.1	
Total	60	100.0	120	100.0	180	100.0	113.286***

Source: own survey, 2008. ***, Significant at less than 1% level, (df = 1, CV = 0.793)

Table 33: Respondents' exposure to abroad

Exposed	Innovator Category				Total		χ^2
	Non- Innovator		Innovator				
	n	%	n	%	n	%	
Yes	0	0.0	2	1.7	2	1.1	
No	60	100.0	118	98.3	178	98.9	
Total	60	100.0	120	100.0	180	100.0	1.011NS

Source: own survey, 2008. NS = Not significant, (df = 1, CV = 0.675)

The result of the categorical analysis, shown in Table 32 indicates that 10.0% of the non-innovator farmers and 90.8% of the innovator farmers had an exposure to other regions. A highly significant relationship between innovator categories and exposure to other regions,(P = 0.000), was found when Chi-square test was applied. A very few number of respondents reported to have exposure to abroad, (Tale 33). The Chi-square test shows the relationship between exposure to abroad and innovator categories to be insignificant, (P = 0.315). The results, in general, indicate that innovator farmers have better exposure to other woredas, zones, and regions when compared to non-innovator farmers. Hence, the results agree with the assumption of the study postulated about the relationship between exposure to other areas and innovativeness. Therefore, it is confirmed that exposure to other area(s) affects innovativeness

of farmers positively. The result of this study goes along with the findings of Yohannes (2001), in: Reij and Waters-Bayer (2001).

4.5.3 Wealth-related variables

4.5.3.1 Farm size

Land is perhaps the single most important resource, as it is a base for any economic activity especially in rural and agricultural sector. Farm size influences farmers' decision to use or generate new technologies. A farmer who has relatively large size of farm land will not hesitate to try new ways of doing agricultural activities. This will motivate ones innovativeness. Therefore, it was expected that there is a relationship between farm size and innovativeness (Reij and Waters-Bayer, 2001).

Table 34: Relationship between total landholding & Innovator category of respondents

Innovator category	N	Mean	SD	Min	Max	t-value
Innovator	120	2.952	1.461	0.75	10.25	
Non-innovator	60	1.865	0.897	0.63	5.00	
Total	180	2.589	1.395	0.63	10.25	6.152***

Source: own survey, 2008. ***, Significant at less than 1% level

The results on landholding and innovativeness are given in Table 34. In this study, the average land holding of the surveyed farmers is 2.589ha with Standard Deviation of 1.395 ha. This figure is a bit larger than the national figure, which is 1.5 ha implying relatively better holding in the area. The maximum land size owned by sample respondents was 10.25ha, while the minimum is 0.63ha. The average land holding for non-innovator group was 1.865ha while that of the innovator group was 2.952ha. The results of the t-test show that there is statistically significant relationship between farm size and innovator category of the respondents (P = 0.000). Accordingly, landholding of innovator farmers, when compared to non-innovator

farmers, is larger and as was already hypothesised, this result agrees with the hypothesis of the study.

The result of this study goes along with the findings of Yohannes (2001), in: Reij and Waters-Bayer (2001). Contradictory to this results of studies of Verhoeven and van der Kroon (1999), cited in Reij and Waters-Bayer (2001), and Nielsen (2001), in: Reij and Waters-Bayer (2001), have revealed that there is no correlation between farm size and innovativeness

Land security

Farm size only can not influence the propensity to innovate. Land security may also influence innovativeness of farmers. To understand the respondents' perception about land security the issue was considered in data collection device. The results are given in Table 35 below.

Table 35: Relationship of perception on land security and innovator category of respondents

Feel , the Land I Owned Belongs to Me	Innovator category				Total		χ^2
	Non-innovator		Innovator				
	n	%	n	%	n	%	
Yes	14	23.3	97	80.8	111	61.7	
No	46	76.7	23	19.2	69	38.3	
Total	60	100.0	120	100.0	180	100	55.946***

Source: own survey, 2008. ***, Significant at less than 1% level (df = 1, CV = 0. 558)

Of the total respondents 61.7% of them expressed that the land belongs to them while the rest, 38.3%, stated that the land does not belong to them. Among the total innovator and non-innovator farmers 80.8% and 23.3% respectively perceived that the land belongs to them. The result of the Chi-square test shows that there exists a significant relationship between innovativeness and perception about land security, (P = 0.000). The results contradict the findings of Yohannes (2001), in: Reij and Waters-Bayer (2001), who stated that land security has little influence on innovativeness.

4.5.3.2 Livestock holding

In rural context, livestock holding is an important indicator of household's wealth position. Similar to owners of large farm, owners of large number of livestock are often rich, and have access to more resources, including information, and can better afford risk. It was thus, assumed to be positively associated with innovativeness.

Table 36: Relationship of Livestock holding of respondents in TLU and innovator category

Innovator category	N	Mean	SD	Min	Max	t-value
Innovator	120	10.777	8.867	0.76	59.97	
Non-innovator	60	4.379	2.086	0.13	8.67	
Total	180	8.644	7.927	0.13	59.97	7.499***

Source: own survey, 2008. ***, Significant at less than 1% level

In the study area, farmers undertake mixed farming where in livestock rearing is one of the important components. To indicate the livestock holding of each respondent in terms of Tropical Livestock Unit (TLU), the TLU per household was calculated. (Table 1 in the appendix).

The results in Table 36 indicate that livestock holding of the respondents ranges from 0.13 to 59.97 TLU. This indicates that, there exists a variation among the respondents in the size of livestock owned. The average livestock holding of the farmers is 8.644 TLU with Standard Deviation of 7.927. Further in depth analysis of the results show that, the average livestock size owned by innovators and non-innovators is 10.777 and 4.379 respectively indicating that, innovators have relatively large livestock size than non-innovators. Therefore, total Tropical Livestock Unit (TLU) owned is found to have significant relationship with innovator category, (P = 0.000). This clearly shows the significant role of livestock holding in enhancing innovativeness.

4.5.4 Institutional variables

4.5.4.1 Credit

Using available resources in new ways is considered to be a characteristic of innovative farmers. Some studies show that if innovative farmers are not obliged to take credit to do specific things like buying fertilizer only, they would prefer to look for ways to use what they have more efficiently (Fetien *et al.*, 2001, in: Reij and Waters-Bayer, 2001). Access for free credit; therefore, was assumed to be positively associated with innovativeness.

Access to Credit

Access to credit can relax farmers' financial constraints to do things in a way they consider paying. It is measured in terms of whether respondents have received any sort of credit from governmental or non-governmental organizations.

Table 37: Access to credit across innovator categories

Access to credit	Innovator category				Total		χ^2
	Innovator		Non-innovator				
	n	%	n	%	n	%	
Yes	74	61.7	47	78.3	121	67.2	
No	46	38.3	13	21.7	59	32.8	
Total	120	100.0	60	100.0	180	100	5.043**

Source: own survey, 2008. **, Significance at less than 5% level (df = 1, CV = 0.167)

The results concerning access to credit of innovator categories are given in Table 37. It can be observed that out of the total farmers surveyed, 67.2% of them had access to credit, while 32.8% of them are missing this opportunity. The categorical analysis of the results shows that 78.3% non-innovators and 61.7 % innovators have access to credit.

Chi-square test shows a significant association between access to credit and innovator categories of the respondents, (P = 0.025). As the result of the survey shows, non-innovators are larger in proportion in credit utilization than innovators. Access to credit was earlier, assumed to be positively associated with innovativeness. However, in this study, access to

credit did not encourage as motivating factor for innovativeness. This signifies that non-innovator farmers try to get credit as compared to innovator farmers, may be because of low income from agricultural activities.

4.5.4.2 Extension contacts

Extension contacts play a great role in raising awareness about technology including farmer innovation. By doing so the increased awareness would enhance farmers' innovativeness. When such contacts are for promotion of farmer innovation, the possibilities of farmers to be influenced to innovate is multiplied in the same way if the frequency of contact by extension agent is more, the innovativeness will be increased with the same proportion. Therefore, extension contact was hypothesized to positively influence farmer innovativeness.

The Village-level Development Worker, (D. A.), the Subject Matter Specialists and in some cases, Woreda Extension Officials are the most important sources of information about farmer innovation to other farmers. The results related to extension contact in relation to three categories of extension personnel and the innovativeness are presented in Tables 38, 39 and 40 respectively.

The data in Tables 38, 39 and 40, clearly indicate that out of the total surveyed respondents 2.2%, 12.2%, and 38.3% of them did not have any contact with extension agents, subject matter specialists and woreda extension officials respectively, It can be further observed that 10.0% of the respondents have occasional contact with Extension Agents, and 5.0% of them had an opportunity to make such contacts once in a quarter. Similarly, 0.6%, 39.4%, 21.1% and 21.7% of the surveyed farmers could make these contacts every day, once in a week, once in fortnight and once in a month respectively.

The results in Table 39 also indicate that, 6.7% of the respondents have extension contact with subject matter specialists once in fortnight. Similarly, 52.8%, 16.7%, and 11.7% of them have extension contact with subject matter specialists occasionally, once in a quarter and once in a month respectively. The result displayed in Table 40 shows that 1.1%, 3.9%, 3.3%, and 53.3%

of them had an opportunity to make extension contact with woreda extension officials once in fortnight, once in a month, once in a quarter and occasionally, respectively.

Table 38: Relationship between contact with extension agent & innovator category of respondents

Frequency of Contact	Innovator Category				Total		χ^2
	Non-innovator		Innovator				
	n	%	n	%	n	%	
Never	4	6.7	0	0.0	4	2.2	
Occasionally	10	16.7	8	6.7	18	10.0	
Once in a Quarter	3	5.0	6	5.0	9	5.0	
Once in a Month	17	28.3	22	18.3	39	21.7	
Once in Fortnight	12	20.0	26	21.7	38	21.1	
Once in a Week	14	23.3	57	47.5	71	39.4	
Everyday	0	0.0	1	0.8	1	0.6	
Total	60	100.0	120	100.0	180	100.0	20.321***

Source: own survey, 2008, ***, Significant at less than 1% level, (df; 6, CV = 0.336,)

Categorical analysis of the survey result of farmers extension contact with extension agents, given in Table 38 shows that 21.7% of the innovator farmers had extension contact with extension agents once in fortnight while 18.3% of them could contact once in a month. Similarly, 5.0% and 6.7% of the same category of the respondents made extension contact with Extension Agents once in a quarter and occasionally respectively. With respect to non-innovator farmers surveyed, the result shows that 23.3%, 20.0%, and 28.3% of them had extension contact with Extension Agents once in a week, once in fortnight, and once in a month respectively. Similarly, 5%, and 16.7%, of the same category of the respondents had an opportunity to make extension contact with extension agents once in a quarter and occasionally, respectively. It is discouraging to note that 6.7% of the non-innovator farmers never had extension contact with extension agents. The Chi-square test result shows a significant relationship between extension contact with extension agents and innovator categories (P = 0.002). The significance in relationship between extension contact with extension agents and the innovator categories shows dynamics of changing from innovator to non-innovator and vice versa, as the frequency changes. For example, large number of innovator farmers are making extension contact with extension agents once in a week and

once in fortnight when compared to non-innovator farmers while, large numbers of non-innovator farmers make such contacts once in a month and occasionally when compared to innovator farmers. According to the result of the survey, 6.7% of the non-innovator farmers never had any extension contact with Extension Agents, but from among the non-innovator farmers surveyed, there is no any farmer who never made extension contact with extension agent.

Category wise analysis of data shows that 3.3% of the innovator farmers and 30% non-innovator farmers never had extension contact with subject matter specialists, (SMSs). on the other hand, 9.2%, 13.3%, 22.5%, and 51.7% of the innovator farmers surveyed had extension contact with SMSs once in fortnight, once in a month, once in a quarter and occasionally respectively.

Table 39: Relationship between contact with subject matter specialists & Innovator category

	Innovator Category				Total		χ^2
	Non-innovator		Innovator				
Frequency of Contact	n	%	n	%	n	%	
Never	18	30.0	4	3.3	22	12.2	
Occasionally	33	55.0	62	51.7	95	52.8	
Once in a Quarter	3	5.0	27	22.5	30	16.7	
Once in a Month	5	8.3	16	13.3	21	11.7	
Once in Fortnight	1	1.7	11	9.2	12	6.7	
Once in a Week	0	0.0	0	0.0	0	0.0	
Everyday	0	0.0	0	0.0	0	0.0	
Total	60	100.0	120	100.0	180	100.0	34.939***

Source: own survey, 2008. ***, Significant at less than 1% level, (df; 4, CV = 0 .441)

Similarly, 1.7%, 8.3%, 5.0%, and 55.0% of the non-innovator farmers surveyed made extension contact with SMSs once in fortnight, once in a month, once in a quarter and occasionally respectively, (Table 39). The result of the Chi-square test shows significant relationship between extension contact with SMSs and innovator categories (P = 0.000). As seen in the analysis of extension contact with extension agents, the significant relationship between extension contact with SMSs and the innovator category revealed by the Chi-square test also shows the place of the majority to be changing among the categories based on the

frequency of contacts. Accordingly, majority of the innovator farmers had extension contact with SMSs once in fortnight, once in a month and once in quarter. The place held by the innovator farmers here, is reversed when the occasional contact of non-innovator farmers with SMSs is seen in which, the majority of them had the contact when compared to innovators.

The results concerning extension contact of the respondents with woreda extension officials, given in Table 40, reveals that 29.2% and 56.7% innovator and non-innovator respondents respectively never had extension contact with woreda officials, whereas, 64.2% innovator farmers and 31.7% non-innovator farmers had extension contact with the officials occasionally. Likewise, 4.2% innovators and 1.7% non-innovators are found to have contact with woreda officials once in a quarter, in search of some kind of extension service. Like wise 2.5% innovator farmers and 6.7% non-innovator farmers have replied to have contact with woreda extension officials once in a month. Further, 3.3% of the non-innovator farmers have extension contact with woreda Officials once in fortnight. From among the surveyed respondents there is no farmer who has every day and once-in-a-week extension contact with woreda officials. The result of the Chi-square test reveals significant relationship between extension contact with woreda Officials and the innovator categories (P = 0.000). Here also the innovator categories exchange their places, they held by being a majority, as the frequency changes from one level to another.

Table 40: Relationship between contact with woreda extension officials & innovator category

Frequency of Contact	Innovator Category				Total		χ^2
	Non-innovator		Innovator				
	n	%	n	%	n	%	
Never	34	56.7	35	29.2	69	38.3	
Occasionally	19	31.7	77	64.2	96	53.3	
Once in a Quarter	1	1.7	5	4.2	6	3.3	
Once in a Month	4	6.7	3	2.5	7	3.9	
Once in Fortnight	2	3.3	0	0.0	2	1.1	
Once in a Week	0	0.0	0	0.0	0	0.0	
Everyday	0	0.0	0	0.0	0	0.0	
Total	60	100.0	120	100.0	180	100.0	22.349***

Source: own survey, 2008. ***, Significant at less than 1% level, (df = 4, CV = 0 .352)

Attending extension events

In the present investigation information on the level of participation of the respondents in different extension events was also considered. The results on the level of participation of the respondents in different extension events are given in Tables 41, 42, 43, 44 and 45.

It can be seen that of the total respondents, 36.7%, (Table 41), 54.4%, (Table 42), 60.0%, (Table 43), 50.6%, (Table 44), and 0.6%, (Table 45) of them never participate in training, field day, demonstration, extension visit, and extension meeting. The results in Table 41 shows that of the total respondents surveyed, 62.2% and 1.1% of them participated in training sometimes, and frequently respectively. Similarly, of the total respondents 45.6% of them participated some times in field day, (Table 42), 73.3% of them participated some times in demonstration, (Table 43), 48.3% and 1.1% participated in extension visit some times and frequently respectively, (Table 44), and 75.0%, 22.2% and 2.2% participate some times, frequently, and most frequently respectively, (Table 45).

Categorical analysis of the survey result given in Table 41 shows that 80.8% and 1.7% of the innovator farmers participated in training sometimes and frequently respectively while, 17.5% of them never participated. Likewise, 25% of the non-innovator farmers participated in training only some times while 75% of them never participated. The Chi-square test result shows highly significant relationship between participation in training and innovator categories, ($P = 0.000$).

Further categorical analysis of the results given in Table 42 shows that 60.8% of the innovator farmers participated in field day sometimes while, 39.2% of them never participated. Likewise, 15.0% of the non-innovator farmers participated in field day only some times while, 85% of them never participated. The Chi-square test result shows highly significant relationship between participation in field day and innovator categories, ($P = 0.000$).

Table 41: Participation in extension training by the respondents

Innovator Category	Participation in Extension Training						Total		χ^2
	Never		Sometimes		Frequently				
	n	%	n	%	n	%	n	%	
Non-innovator	45	75.0	15	25.0	0	0.0	60	100	
Innovator	21	17.5	97	80.8	2	1.7	120	100	
Total	66	36.7	112	62.2	2	1.1	180	100	57.108***

Source: own survey, 2008. ***, Significant at less than 1% level, (df = 2, CV = 0.563)

Table 42: Participation in field day by the respondents

Innovator Category	Participation in Field day				Total		χ^2
	Never		Sometimes				
	n	%	n	%	n	%	
Non-innovator	51	85.0	9	15.0	60	100	
Innovator	47	39.2	73	60.8	120	100	
Total	98	54.4	82	45.6	180	100	33.879***

Source: own survey, 2008. ***, Significant at less than 1% level, (df = 1, CV = 0.434)

A close observation of data in Table 43 shows that 81.7% of the innovator farmers participate in demonstration sometimes while, 18.3% of them never participated. Likewise, 56.7% of the non-innovator farmers participated in demonstration only some times while, 43.3% of them never participated. The Chi-square test result here also shows highly significant relationship between participation in demonstration and innovator categories, (P = 0.000).

Table 43: Participation in demonstration by the respondents

Innovator Category	Participation in Demonstration				Total		χ^2
	Never		Sometimes				
	n	%	n	%	n	%	
Non-innovator	26	43.3	34	56.7	60	100	
Innovator	22	18.3	98	81.7	120	100	
Total	48	60.0	132	73.3	180	100	12.784***

Source: own survey, 2008. ***, Significant at less than 1% level, (df = 1, CV = 0.267)

Table 44: Participation in extension visit by the respondents

Innovator Category	Participation in Extension Visit						Total		χ^2
	Never		Sometimes		Frequently				
	n	%	n	%	n	%	n	%	
Non-innovator	53	88.3	7	11.7	0	0.0	60	100	
Innovator	38	31.7	80	66.7	2	1.7	120	100	
Total	91	50.6	87	48.3	2	1.1	180	100	51.441***

Source: own survey, 2008. ***, Significant at less than 1% level, (df = 2, CV = 0.535)

When the survey results given in Table 44 are categorically analyzed it shows that 66.7% and 1.7% of the innovator farmers participate in extension visit sometimes and frequently respectively while, 31.7% of them never participate. Likewise, 11.7% of the non-innovator farmers participate in demonstration only some times while, 88.3% of them never participated. The Chi-square test result once again shows highly significant relationship between participation in extension visit and innovator categories, (P = 0.000).

Table 45: Participation in extension meeting by the respondents

Innovator Category	Participation in Extension Meeting								Total		χ^2
	Never		Sometimes		Frequently		Most Frequently				
	n	%	n	%	n	%	n	%	n	%	
Non-innovator	1	1.7	54	90.0	5	8.3	0	0.0	60	100	
Innovator	0	0.0	81	67.5	35	29.2	4	3.3	120	100	
Total	1	0.6	135	75.0	40	22.2	4	2.2	180	100	14.513***

Source: own survey, 2008. ***, Significant at less than 1% level, (df = 3, CV = 0. 284)

The results given in Table 45 clearly show that 67.5%, 29.2% and 3.3% of the innovator farmers participated in extension meeting sometimes, frequently and most frequently respectively. Likewise, 90.0% and 8.3% of the non-innovator farmers participate in extension meeting some times and frequently respectively while, 1.7% of them never participated in the same. The Chi-square test result shows significant relationship between participation in extension meeting and innovator categories, (P = 0.002).

4.6 Summary of Results of Descriptive Analysis

Before passing to the econometric part of the analysis it is important to summarize the results of the descriptive statistics. In general, 16 explanatory variables were considered to be affecting the dependent variable in one way or another. Out of the 16 explanatory variables, 2 of them, viz. social participation and exposure to other areas did not show variation. The remaining 14 of them, (6 Demographic and Personal Variables, 4 Socio-cultural Variables (mass media treated in three categories), 2 Wealth-related Variables, 2 Institutional Variables (extension contact treated in three categories), showed significant association with innovator category. Marital status, though not proposed, was also observed to know as to what impact it would have on the dependent variable. Summary of the overall findings is presented in tables 46 and 47.

Table 46: Summary of Results of Continuous Explanatory Variables

Variable (Name/Description)	Mean Value		t-value
	Innovator	N on-innovator	
respoage (Respondents age)	44.08	37.85	3.567***
tsplyrs (Time spent in the locality	41.62	36.47	2.530**
farmexppr (Farming experience)	23.00	15.97	4.649***
familszN (Family size)	6.33	6.03	0.547NS
nlvstkod (Number of livestock in TLU)	10.78	4.38	7.499***
farmsize (Farm size in ha)	2.95	1.87	6.152***
AttdAgr (Attitude towards agriculture)	33.20	23.92	34.033***
InnoPrns (Innovation proneness)	14.38	6.90	28.434***

Source: own survey, 2008. (***, **, and NS, significant at 1%, 5% and Not Significant respectively).

Table 47: Summary of Results of Discrete Explanatory Variables

Variable (Name/Description)	Percentage Value		
	Innovator	Non-innovator	χ^2 - value
levledcn (Level of education)			10.564*
resposex (Respondents sex)			0.065NS
Male	95.8	95.0	
Female	4.2	5.0	
maristat (Marital status)			2.011NS
partnfa (Participation in non-farm activities)			31.227***
Yes	34.2	78.3	
No	65.8	21.7	
frerlsng (Frequency of Radio listening)			15.303***
frtvwchg (Frequency of TV watching)			5.109NS
frnpredg (Frequency of News Paper reading)			12.189**
accesscr (Access to Credit)			5.043**
Yes	61.7	78.3	
No	38.3	21.7	
condago (Frequency of contact with DA)			20.321***
consmsgo (Frequency of contact with SMS)			34.939***
conwofgo (Frequency of contact with WO)			22.349***

Source: own survey, 2008.
(***, **, * and NS, shows significance level at 1%, 5%, 10% and not significant respectively).

4.7 Results of the Econometric Model

4.7.1. Determinants of farmers' innovativeness

For the present study, *Binary Logistic Regression Model* was used to identify the determinant variables of farmer innovativeness. In the following section, procedures to select independent variables and results of logistic regression analysis conducted to identify determinants of farmer innovativeness in Alaba woreda are presented.

4.7.1.1 Econometric results for the binary logistic regression model

The purpose of this section is to identify the most important hypothesized independent variables that influence the dependent variable, i.e. farmer innovativeness. Prior to running the Logit model, the presence or absence of multicolliniarity was checked. There are two

measures that are often suggested to test the existence of mulitcollineality. These are: Variance Inflation Factor (VIF) for association among the continuous explanatory variables and Contingency Coefficients (CC) for dummy variables.

A Statistical Package for Social Science, (SPSS), was employed to compute the values. Once VIF values were obtained, the R^2 values can be computed using the formula. The larger the value of VIF, the more "troublesome" or collinear the variable X_i is. As a general rule, if the VIF of a variable exceeds 10, there is multicollinearity. According to Gujarati (2003), to avoid serious problems of multicollinearity, it is quite essential to omit the variable with value 10 and more from the Logit analysis. Thus, the Variable Inflation Factor (VIF) was employed to test the degree of multicollinearity among the continuous variables.

The values of the VIF for six continuous variables were found to be small (i.e VIF values less than 10) indicating that the data have no serious problem of multicollinearity, (see Table 2 in the appendix). Hence, all the six continuous explanatory variables were retained and entered into the Binary Logistics analysis.

Similarly, Contingency Coefficients were computed from survey data to check the existence of high degree of association problem among discrete independent variables. The decision rule for Contingency Coefficients states that when its value approaches 1, there is a problem of association between the discrete variables, i.e., the values of contingency coefficients ranges between 0 and 1, with zero indicating no association between the variables and the values close to 1, indicating a high degree of association.

The result of the Contingency Coefficient, (Table 3 in the appendix), reveals absence of multicollinearity or high degree of association problem among independent variables. All the screened variables, therefore, were decided to be included in the model analysis. The dependent variable is; "either a farmer is innovator or non-innovator", and Logit model was employed to estimate the effects of the hypothesized independent variables on farmer innovativeness.

In doing so a total of twelve independent variables were included in the model. These are; age, time spent in the locality, farming experience, family size, number of livestock owned in TLU, farm size, level of education, sex, participation in non-farm activities, mass media exposure; (frequency of radio listening, frequency of TV watching, frequency of reading news paper), access to credit, extension contact; (contact with Development Agent, contact with Subject Matter Specialists, contact with woreda extension officials). But, regardless of their importance and their significant relationship, some of the variables were excluded due to the instability they created in the model. The included variables were selected, based on literatures, practical situations, observation and experience of the researcher and the relevance of the variables. Further more; they were selected by testing significant differences of the mean using t-test and χ^2-test.

The various goodness of fit measures were checked and validated to confirm that the model fits the data. The likelihood ratio test statistics exceeds the Chi-square critical value at less than 1% probability level. This implies that the hypothesis, which says all coefficients except the intercept is zero, was rejected. The value of Pearson Chi-square test shows the overall goodness of fit of the model at less than 1% probability level.

Another measure of goodness of fit of the model is based on a scheme that classifies the predicted value of events as one if the estimated probability of an event is equal or greater than 0.5 and 0 otherwise. From all sample farmers, 91.7% were correctly predicted in to innovator and non-innovator categories by the model. The correctly predicted innovators and correctly predicted non-innovators of the model were 95.0% and 85%, respectively. The estimated model, thus, groups innovator farmers and non-innovator farmers accurately. The maximum likelihood estimate of the parameters and the effect of independent variables on probability of innovativeness were analyzed and presented in table 51.

Table 48: The Maximum Likelihood Estimates of the Binomial Logit Model

Innovativeness (Dependent Variable)	Estimated Coefficient (B)	(S.E)	Wald Statistics	Sig. Level	Exp (B) (Odds Ratio)
rspoage	0.052	0.111	0.217	0.641	1.053
tsplyrs	-0.148	0.088	2.845	0.092*	0.862
farmexpr	0.177	0.098	3.300	0.069*	1.194
familszN	-0.391	0.154	6.469	0.011**	0.677
nlvstkod	0.854	0.220	15.084	0.000***	2.348
farmsize	0.291	0.374	0.605	0.437	1.337
levledcn	0.160	0.480	0.111	0.739	1.173
resposex	-0.727	2.730	0.071	0.790	0.483
partnfa	-3.582	0.878	16.644	0.000***	0.028
frerlsng	0.623	0.294	4.486	0.034**	1.865
frtvwchg	0.196	0.327	0.359	0.549	1.216
frnpredg	0.911	0.659	1.914	0.167	2.487
accesscr	-1.086	0.853	1.621	0.203	0.337
condago	-0.047	0.291	0.026	0.872	0.954
consmsgo	1.888	0.597	10.011	0.002***	6.603
conwofgo	-1.197	0.545	4.818	0.028**	0.302
constant	-4.021	3.967	1.027	0.311	0.018

Notes:

Exp(B): shows the predicted changes in odds for a unit increase in the predictor,

Omnibus Tests of model coefficients: Chi-square=158.755*, Sig 0.000,*

*-2log likelihood = 70.390**

Percentage of correct prediction = 91.7; and

, ** and * significant at 10%, 5%, and 1% probability level.*

4.7.1.2 Interpretation of empirical results and discussion

As indicated in the previous section, a number of independent explanatory variables (demographic and personal, socio-cultural, wealth-related and institutional) were postulated to influence farmers' innovativeness. Out of sixteen explanatory variables hypothesized to affect farmers' innovativeness, eight were found to be statistically significant. These factors include *time spent in the locality, farming experience, family size, number of livestock owned in TLU, participation in non-farm activities, mass media exposure* (frequency of radio listening), *extension contact* (Contact with Subject Matter Specialists and contact with woreda extension officials).

Two of the significant variables were found to be statistically significant with expected signs. Accordingly, farm experience, (farmexpr), and number of livestock owned (TLU), (nlvstkod), were positively and significantly related with farmer innovativeness. As was also expected, participation in non-farm activities, (partnfa), was negatively and significantly related with farmer innovativeness. Opposed to the expected, time spent in the locality, (tsplyrs), and family size, (familszN), were negatively and significantly related with farmer innovativeness. To the contrary and as opposed to the expected, age, (rspoage), farm size, (farmsize), sex, (resposex), and access to credit, (accesscr), were not significantly related to farmer innovativeness,

Mass media exposure, as proposed, was treated with respect to three types of media, viz. Radio, Television and News Paper. From among the three media, frequency of radio listening, (frerlsng), was positively and significantly related with farmer innovativeness. Similarly, extension contact was also treated with respect to three extension information sources, viz. development agent, subject matter specialist, and woreda extension officials. From among the three extension information sources, frequency of extension contact with subject matter specialist was positively and significantly related with farmer innovativeness, whereas frequency of extension contact with woreda extension officials, as opposed to the expected, was negatively and significantly related with farmer innovativeness.

Level of education (levledcn) was hypothesized to have no significant relationship with innovativeness. As expected it was found to have no significant relationship with innovativeness. The section ahead describes interpretation of findings of the model as a result of the influence of independent variables.

Family Size:

Families often work very closely together in building up their farm. Moreover, most innovators will need support from the rest of the family as a new technique may require extra labour, divert resources and involve some risk and therefore, at least in some cases, require consultation within the family. Based up on this premise, this factor was previously hypothesized to affect innovativeness positively. The result of the model is in agreement with the hypothesis at less than 5% probability level, unlike originally proposed, indicating negative and significant relationship of family size and innovativeness. The implication of inverse relation of family size and innovativeness signifies that the larger the number of the family the lesser will be the innovativeness of the farmer. The odds ratio in favor of innovativeness decreases by a factor of 0.677 for an increase in family size by a single member. This result agrees with the findings of (Yohannes, 2001, in: Reij and Waters-Bayer, 2001). As he argues, large family size is not a decisive factor for innovativeness on its own for, many innovators are single or have small families. They do their innovation in a way that does not demand a great deal of labour at one time, but rather spread the work over several months or years of day-to-day work.

Farming Experience:

The positively significant result of the model, at probability level of 10%, witnessed 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 the same. This in turn will increase their capacity to solve problems related to agriculture, which is an act of innovativeness. As a result, keeping the influences of other factors constant, the odds ratio, in

favour of innovativeness, increases by a factor of 1.194 as farming experience increases by a single year. A study by 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), acknowledge significant association between farm experience and innovativeness.

Participation in non-farm activities:

As expected, participation in non-farm activities influences farmer innovativeness negatively and highly significantly at less than 1% probability level. 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 0.028 for a unit increase in participation in non-farm activities. This result accords with the findings of Sawadogo *et al., (2001),* in: Reij and Waters-Bayer (2001).

Mass Media Exposure:

Frequency of Radio Listening:

Mass media play a great role in creating awareness about farmer innovation in shortest time possible over large area of coverage. Being aware of the presence of farmer innovation and most of all, being aware of the ability of farmers to innovate will motivate farmers to try the same. Mass media exposure, as was proposed, was treated with respect to three types of media, viz. Radio, Television and News Paper. From among the three media, frequency of radio listening, according to the result of the model, was positively and significantly related with farmer innovativeness. The result of the model is in agreement with the hypothesis at less than 5% probability level. The result witnesses that farmers listening to radio more frequently are more likely to be innovators than farmers who listen to the same less frequently. Other

things held constant, the odds ratio, in favour of farmers innovativeness, increases by a factor of 1.865 for a unit increase in the frequency of radio listening. This result is convergent with the findings of Nasr *et al.,* (2001), in: Reij and Waters-Bayer (2001), in their study on "A bridge between local innovation, development and research: the regional radio of Gafsa, Tunisia".

Time Spent in the Locality:

It is expected that, a farmer who has longer time spent in the locality would have better knowledge about the problem of the locality which would initiate him to find appropriate solution of the agricultural problems. Seeking a solution for a problem would result in some innovative work. Based up on this premise, this factor was previously hypothesized to affect innovativeness positively. The result of the model was in agreement with the hypothesis at less than 10% probability level, unlike originally expected, indicating negative and significant relationship of time spent in the locality and innovativeness. The implication of the inverse relation of time spent in a locality and innovativeness signifies that the longer the time a farmer spend in a locality the lesser will be his innovativeness. This could be related with lack of opportunity to be exposed to other areas from where one can pick up ideas to try or made earnings that he could invest in agriculture. As a result, other things held constant, the odds ratio, in favour of innovativeness, decreases by a factor of 0.862 for an increase in time spent in the locality by one year. This result agrees with the findings of Tchawa *et al.*, (2001), in: Reij and Waters-Bayer (2001), in his study on "the career and influence of Barthelemy Kameni Djambou in Cameroon".

Livestock Owned (TLU):

The positively significant result of the model, at probability level of less than 1%, witnessed that respondents with large number of livestock are more likely to be innovative farmers than respondents with small number of livestock. The implication is that owners of large number of livestock are often rich, have access to more resources, including information, and can better afford risk. In addition to this livestock husbandry practices have a stronger integration with

cropping activities with mutual benefit. Thus, investment in livestock will be paralleled by changes in cropping practices and vice versa. Other things held constant, the odds ratio, in favor of innovativeness, increases by a factor of 2.348 as the number of livestock owned increases by one tropical livestock unit. This result is in consistent with the findings of Sawadogo *et al.*, (2001); Taonda *et al.*, (2001), in: Reij and Waters-Bayer (2001); and Hien and *Ouedraogo*, (2001), in: Reij and Waters-Bayer (2001).

Extension Contact:

Extension plays a great role in raising awareness about farmer innovation. By doing so it enhances farmers' innovativeness. If the number of times the extension agent visits the farmer is more frequent, the probability of the farmer to be influenced to innovate will be higher. For our case, this factor was made to include three extension information sources, viz. development agents, subject matter specialists and woreda extension officials. As mentioned earlier, contact with development agent was not significantly related to farmer innovativeness. Therefore, in this section contact with subject matter specialists and woreda extension Officials will be interpreted.

Contact with Subject Matter Specialists (SMSs):

The result of the model shows that contact with Subject Matter Specialists is positively and highly significantly related with farmer innovativeness at probability level of 1%. It witnesses that farmers who make extension contact 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 6.603 for a unit increase in the frequency of contact with subject matter specialist.

Contact with Woreda Extension Officials:

Contact with woreda extension officials was one of the variables studied under extension contact. It was previously assumed to affect innovativeness positively. The result of the model, in agreement with the hypothesis, shows that contact with woreda extension officials is related with farmer innovativeness at less than 5% probability level. Unlike originally expected, the result indicates negative and significant relationship of the factor and innovativeness. The implication of inverse relation of contact with woreda extension officials and innovativeness signifies that farmers who are making more frequent contact with woreda extension officials are less likely to be innovative farmer. This signifies that the contact between farmers and woreda extension officials may not be concerning problems related to agriculture. Keeping the influence of all other factors constant, the odds ratio, in favour of innovativeness decreases by a factor of 0.302 for a unit increase in the frequency of contact with woreda extension officials.

5. SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary and Conclusion

In most developing countries, subsistence or traditional agriculture dominates the economy. For national progress to occur, change in agriculture is essential. Substantial 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 (Adams, 1992). A great deal of the responsibility for bringing about this change rests on the shoulders of extension workers, scientists, communication specialists, practitioners and institutions involved in rural development.

These functionaries to be successful in achieving the above mentioned objective have to play a crucial role in increasing farmers' competency which is seen not only in their willingness to accept and adopt an innovation, but also in their effort and ability to innovate. Strengthening the innovative capacities of farmers is a precondition for sustainable agriculture and natural resources management. The agricultural development actors will be able to make important contribution only if their roles are redefined. With their changed role they will be able to appreciate farmers' knowledge and creative capacities and will be prepared to work together with farmers, on the basis of equal partnership, in their fields on questions that farmers are trying to investigate themselves.

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 still very low. Different explanations have been given to the low performance of agriculture in the country which often leads to solutions coming from out side the very community that is facing the multitude of problems. The community's indigenous knowledge, local institutions and coping mechanisms, the most important component of which is farmer innovation, were not given any attention. The effort made to strengthen and exploit this vast resource is not significant and it has hardly benefited from scientific research outputs.

This study was conducted to understand the determinants of farmers' innovativeness in Alaba Special Woreda of Southern Nations, Nationalities and Peoples Region. The study tried to

assess farmers' innovation and innovativeness and to investigate the determinant factors, (demographic, socio-cultural, wealth-related and institutional), influencing farmers' innovativeness.

In the present investigation, primary data were generated from 180 randomly selected respondents through personal interview, conducted by well trained enumerators, using pre-tested personal interview schedule, and by conducting group and individual discussions, as well as the researcher's personal observations. The respondents, involved in the interview were selected randomly and proportionally from six sample Peasant Associations (PAs). Secondary data were collected from various concerned woreda sources to supplement the data obtained from the survey. Discussion with key informant groups too, was used to generate qualitative data which in turn supplemented the quantitative one.

Data were analyzed and presented quantitatively using different statistical methods such as percentage, frequency, tabulation, Chi-square test (for dummy /discrete variables) and (t-test for continuous variables). Logit model was used to estimate the effects of hypothesized independent variables on the dependent variable.

Descriptive statistics and econometric analysis were used to analyze personal and demographic, socio-cultural, wealth-related, and institutional factors affecting farmers' innovativeness. Using the descriptive analysis personal and demographic variables; viz. age, sex, family size, educational status, farming experience and participation in non-farm activities, socio-cultural variables; viz. social participation, mass media exposure, attitude towards agriculture, time spent in the locality, innovation proneness and exposure to other areas, wealth-related variables; viz. farm size and livestock holding, and institutional variables; viz. access to credit and extension contact were analyzed.

According to the result of the descriptive analysis age, educational status, farming experience and participation in non-farm activities have significant relationship with innovator categories while the relationship between the innovator categories and sex and family size was not reported to be significant. Concerning age, the survey result indicates that there is statistically significant mean age difference between innovator and non-innovator groups implying the

presence of relationship between age and farmers innovativeness. In agreement with other studies, the result of the study shows the average age of innovator farmers to be about 44 years. As indicated above the significant relationship between educational status and innovator categories implies that the proportion of educated innovator farmers is higher than the proportion of educated non-innovator farmers. As per the result of the descriptive analysis the relationship between farming experience and innovator categories is significant at less than 1% probability level implying the innovator farmers to be having longer farm experience than non-innovator farmers. The analysis also shows significant association between innovator categories and involvement in non-farm activities at less than 1% significant level. This relationship shows that farmers participating in non-farm activities were found to be non-innovators.

The relationship between social participation and innovator categories was also analysed using descriptive statistics. As there are different types of social organizations in a community, to see if there is any variation in participation of the respondents in different social organizations, this variable was treated by including eight social organizations, viz. Idir, Iqub, Religious groups, Marketing Cooperatives, Union, PA Council, District Council and School Council. In the rural part of Ethiopia, mediators ("Yehager Shimagile") have a respected position in a society. They play important role in advising the community members and consulting the local administrators. In the study, it was also tried to see if at all there is any relationship between the same and innovator categories. As the result of the descriptive analysis shows there is significant relationship between each of the above-mentioned factors and the innovator categories.

Mass media exposure was also another variable concerning which descriptive analysis was conducted. This factor was analysed with respect to radio listening, TV watching and news paper reading. According to the result, radio listening and news paper reading have significant relationship with innovator categories while the relationship between TV watching and the innovator categories is not significant. The result implies more innovator farmers to be radio listeners and news paper readers than non-innovator farmers.

Further scrutiny of the result of the descriptive analysis shows that attitude towards agriculture, time spent in the locality and innovation proneness have significant relationship with innovator categories. As the result indicates innovator farmers have the highest average score than the non-innovator respondents. This in turn furnishes a proof of innovator farmers to be having positive attitude towards agriculture. Similarly, Innovator farmers are those groups of farmers who, on an average, spend longer time in the locality than the non-innovator farmers. The innovator farmers are also innovation-prone farmers, as it was indicated in the analysis. The result of the descriptive analysis conducted on exposure to other areas generally, shows that innovator farmers have more exposure to other areas than non-innovator farmers.

Wealth-related factors, viz. farm size, in hectare, and livestock holding, in TLU, are the other factors the relationship of which with innovator categories was analysed using descriptive analysis. Both variables have significant relationship with innovator categories at less than 1% significant level. The implication of this result shows that innovator farmers have large size of livestock, in TLU, and large size of farm in hectare.

Access to credit and extension contact are other most important factors categorized as institutional variables and analysed using descriptive statistics. The Chi-square test run to see the association between access to credit and the innovator categories shows their relationship to be significant at less than 1% probability level implying that non-innovator farmers are larger in proportion in using credit than innovator farmers. As there are different extension information sources, the relationship of this factor with innovator categories was scrutinised with respect to contact with development agents, subject matter specialists and woreda extension officials. As the descriptive analysis result shows, all of these factors are significantly related with innovator categories. The implication of this result varies depending upon the frequency of use.

As mentioned earlier, logit model was also used to estimate the effects of hypothesized independent variables on the dependent variable. Out of sixteen explanatory variables hypothesized to determine farmers' innovativeness, eight were found to be statistically significant. These factors include; *family size, farming experience, participation in non-farm*

activities, mass media exposure (frequency of radio listening), *time spent in the locality, number of livestock owned in TLU, extension contact* (Contact with Subject Matter Specialists and contact with woreda extension officials). Accordingly, the result of the binary logit analysis indicated that three variables at less than 1% probability level, three variables at less than 5% probability level and two variables at 10% probability level were found to be significant to determine farmers' innovativeness.

Family size was negatively and significantly related with farmer innovativeness at less tan 5% significance level. Unlike originally expected, the result indicates negative and significant relationship between family size and innovativeness indicating that large family size is not a decisive factor for innovativeness for, innovator farmers can do their work with the creativity they have and did not demand any assistance from family members. Farming experience is positively and significantly related to innovativeness at 10% probability level. This relationship witnesses that respondents with more farming experience are more likely to be innovators.

As expected, participation in non-farm activities influences farmer innovativeness negatively and significantly at less than 1% significance level. The implication is that on the one hand, innovator farmers devote most of their working time to farming. The passing of most of their working time to farming may enable them to clearly identify problems specific to their farm which in turn may initiate them to find their creative solutions. On the other hand, these farmers have relatively higher income and it may give them some flexibility to experiment and innovate. From among the three media; viz. frequency of radio listening, frequency of TV watching and frequency of news paper reading, only frequency of radio listening was identified as positively and significantly related explanatory variable with innovativeness at less than 5% probability level. The result implies that farmers listening to radio more frequently may have opportunity to get information about new agricultural technologies or innovations generated by other people living in other areas. Time spent in the locality is the other socio-economic factor analyzed using logit model. The result of the model, in agreement with the assumption of the study, shows significant relationship between this explanatory variable and the innovator categories at 10% significance level. Unlike originally expected, the

relationship is negative implying that the longer the time a farmer spent in a locality, the lesser will be his innovativeness.

From among the hypothesized wealth-related independent variables livestock ownership was one, the effect of which on the dependent variable was estimated by the model. The positively significant result of the model, at probability level of less than 1% witnessed that the respondents with large number of livestock are more likely to be innovative than the respondents with small number of livestock.

Three sources of extension information were analyzed to see the impact of extension contact on farmers' innovativeness. From the three sources of extension information, viz. development agent, subject mater specialists and woreda extension officials, the last two were identified by the model as having significant relationship with innovator categories.

The result of the model shows that contact with subject matter specialists is positively and significantly related with innovativeness at probability level of 1%. The result implies that making more frequent extension contact with subject matter specialists more likely makes a farmer innovative. The result of the model, in agreement with the hypothesis of the study, shows that contact with woreda extension officials is related with farmers' innovator categories at less than 5% significance level. Unlike originally assumed, the result indicates negative and significant relationship of the factor and innovator categories implying that farmers who are making more frequent contact with woreda extension officials are less likely to be innovative farmers. This signifies that the contact between farmers and woreda extension officials may not be related to exchange of information on agricultural extension.

Based on the research findings, the following conclusions are drawn:

In this study, the findings revealed that there is positive and significant relationship between farmers' innovativeness and farming experience, frequency of radio listening, number of livestock held (in TLU) and contact with subject matter specialists.

Potentially, the increase in agricultural production and the greater diversity of production can be achieved through farmers' innovativeness. Therefore, taking measures to strengthen the innovative capacities of farmers is appropriate intervention for attaining agricultural transformation in Ethiopia. The measures to be taken should particularly focus on the above mentioned factors which could positively and significantly affect farmers' innovativeness.

5.2 Recommendations

Overall economic growth in Ethiopia is highly dependent on the performance of the agricultural sector that represents about 47% of the GDP followed by 39% from the service sector and 14% from the industrial sector. In the country, more than 14 million hectares of land is presently being farmed to produce cereals, pulses, and a plethora of other crops. Of these, only some 19,000ha of land is irrigated. Therefore, every year, the nations' 9 million peasant farmers stand hostages to the fortune of the quality and quantity of the variable annual rains (FAO, 2007). As a response to the problems, considerable support programmes were directed to the farmers from GOs and NGOs. Nevertheless most of these programmes launched were externally designed and driven. The preconceived interventions happen to ignore the potentials of the local resources, local innovations and needs. Therefore, the external supports have, in many cases failed to ensure sustainable development.

Farmers are seen as passive receivers of the ideas of scientists. The technological inputs that have been identified and packaged by outsiders, with very little or no consultation of the smallholder farmers, were not able to respond adequately to local realities.

The history of agricultural development we see today in the modern world started its root with the local wisdom, built upon the foundation of knowledge accumulated through painstaking processes of trial and error and informal experimentation by the local people of those early days and which was gradually developed over time into the pinnacles of today's modernization (PROFIEET, 2006). It holds true to Ethiopia also. Although not well explored and received adequate attention by outsiders, Ethiopia is also the home of amazing Indigenous

Knowledge bodies and systems that helped the people survive diverse environmental conditions.

Farmers, especially resource-poor farmers, have the capacity to experiment, adapt and innovate. These innovative farmers are trying new ways of doing agricultural and natural resources management practices in the country. Their effort has been resulted in increased diversity of production and this in turn, has sustained the country and has buffered the risks of farming households in the face of climatic variability.

In the study several issues were observed and revealed in relation to the determinants of farmers' innovativeness in the study area, Alaba. 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:

Farmer innovations, which are often adequately available but also invisible, unless there is a complete change in attitude of the outsiders, do not get recognition as a source of technologies and ideas that even better address the worlds of smallholder farmers. Strengthening the innovative capacities of farmers is a precondition for sustainable agriculture. To do this the agricultural research and extension services can make an important contribution. They will be able to do this only if the roles of formal researchers and extension agents are redefined.

- 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. With these farmers and researchers can work hand in hand and support them to precisely answer their own

problems. Therefore, to bring this harmonious situation government should create policy situation that could legitimize farmer innovation in the eye of researchers.

- *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. To fit extension approaches and services into this new paradigm of agricultural research and development, extension agents need training in the skills required to fulfil these roles. To create this situation, extension policy including the activities, mentioned above is important to be formulated.

- Identification of Innovative Farmers and local innovations is not however, an end for itself. The most critical issue is "how best can we support those identified innovators" to improve their works and help them ensure sustainable livelihood and how best can we cultivate and encourage the spirit of innovativeness among the smallholder farmers. The main goal of identification, recognition and providing support to local innovations is to help farmers develop and sharpen their own innovations and overcome problems which might not be precisely addressed by the formal research and extension system. The policy suggested to be formulated concerning extension service should indicate the direction toward which farmers are helped.

- 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.

The policy issues suggested above could serve as fertile ground for the promotion of the development of farmer innovation in the country in general. But when the findings of the

research are considered, the factors indicated to be having positive impact on farmer innovativeness, viz. livestock holding, mass media exposure, and extension contact, need special emphasis, if farmer innovation and farmers' innovativeness is to play important role in the promotion of sustainable agricultural transformation in the study area. Hence, with respect to the above mentioned factors the following policy related issues should get relevant attention by the concerned bodies, especially by the government

- As depicted above, livestock holding affects farmer innovativeness positively. This factor shows the importance of the enabling environment that fosters the emergence of innovativeness. The condition includes strengthening the economic performance of farmers. Therefore government should formulate policy that enhances the formation development of supportive private and government institutions

- The second policy issue to enhance farmer innovativeness is related to farmers' exposure to mass media. As seen above mass media exposure has positive and significant relationship with farmer innovativeness. Based upon this reality government should take an appropriate measure to establish relevant mass media and increase their accessibility by the farmers.

- The last but not the least point that needs attention towards policy formulation is extension contact. If it is made to be having an objective related to the promotion of farmers' innovativeness, extension contact could have an important role to play. Therefore, government should facilitate for the formation of an appropriate policy, which encompasses redefinition of the role of extension agents, capacity building and expansion and access by farmers of extension institutions.

Finally it is the felt need of the author to see research studies on determinants of farmers' innovativeness focusing on the extent to which *Personal and Demographic, Socio-cultural, Wealth-related, Institutional and other factors* affecting the same at a broader scope in the nation.

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7 APPENDICES

Table 1: Conversion factors used

Conversion factors to estimate Tropical Livestock Unit equivalents

Animal Category	TLU	Animal Category	TLU
Calf	0.25	Donkey (young)	0.35
Weaned Calf	0.34	Camel	1.25
Heifer	0.75	Sheep and Goat (adult)	0.13
Cow and Ox	1.00	Sheep and Goat (young)	0.06
Horse	1.10	Chicken	0.013
Donkey (adult)	0.70		

Source: Storck, *et al*. (1991)

Table 2: Variance Inflation Factor for the continuous explanatory variable.

Variable	Collinearity Statistics	
	Tolerance (R^2_i)	Variance Inflation Factors (VIF)
Age	0.195	5.126
Time spent in the locality	0.243	4.044
Farm experience	0.194	5.142
Family size	0.708	1.412
Number of livestock	0.540	1.853
Farm size	0.566	1.768

Source: own survey, 2008.

Table 3: Contingency Coefficients for discrete explanatory variables

	levledcn	resposex	partnfa	frerlsng	frtvwchg	frnpredg	accesscr	condago	consmsgo	conwofgo
levledcn	1.000	0.265	0.169	0.387	0.580	0.671	0.187	0.373	0.391	0.419
resposex		1.000	0.103	0.220	0.181	0.149	0.079	0.208	0.099	0.075
partnfa			1.000	0.060	0.250	0.135	0.205	0.180	0.192	0.165
frerlsng				1.000	0.340	0.339	0.168	0.407	0.266	0.188
frtvwchg					1.000	0.687	0.335	0.403	0.398	0.397
frnpredg						1.000	0.244	0.506	0.394	0.367
accesscr							1.000	0.165	0.145	0.109
condago								1.000	0.569	0.507
consmsgo									1.000	0.581
conwofgo										1.000

Source: own survey, 2008.

Table 4: Types of farmer innovation and number of farmers who innovated with respect to the two farming systems in the study area

Farmer Innovation	No of Farmers	
	Teff/Haricot bean FS	Pepper/Livestock Farming System
1 Introduction of new crops	16	18
2 Adaptation of fertilizer	5	6
3 Mixed use of compost and chemical fertiliser	3	3
4 Crop rotation	3	1
5 Weed control	2	1
6 Bee keeping	10	4
7 Rotational grazing practices	-	1
8 Land rehabilitation	1	1
9 Fallowing	1	-
10Erosion control	5	3
11 Buried clay pot watering	1	-
12 Battle drip irrigation	1	1
13 Introduction of water harvesting technologies	11	2
14 Soil moisture conservation	5	-
15 Marketing (selling of produces which were previously used for house consumption)	1	1
16 Time change in agricultural practices	9	2
17 Adaptation of extension/research-recommended agricultural practices	4	1
18 Experimentation	12	4
19 Ripening Vegetables	1	1
20 Use of drilled jerry can for watering	1	-
21 Use of large clay pitcher	1	-

Source: own survey, 2008

Table 5: Interview Schedule

Interview Schedule for MSc Research Proposal Entitled Determinants of Farmer Innovativeness in Alaba Special Woreda, Southern Nations, Nationalities, and Peoples Region, Ethiopia

Instructions for enumerator

- ☞ Make brief **introduction** to each farmer before starting the interview, get introduced to the farmers, (greet them in the local way) get his/ her name, tell them the **purpose** and **objective** of your study.
- ☞ Please, ask each question so clearly and patiently until the farmer understands.
- ☞ Please, fill up the interview schedule according to the farmer's reply (do not put your own opinion)
- ☞ Please, do not try to use technical terms while discussing with farmers and do not forget to use/record the **local unit**.
- ☞ During the process; 1: **write** the answer of the respondent on the space provided,
  2: **ask** & **write** details where required,
  3: **encircle** or **tick** the chosen answer.
- At the end prove that, all questions are asked & the interview schedule format is properly completed

Respondents Full Name ----------

Serial N^{o} ----------

Category ---------- **(1 = Innovator, 2 = Non Innovator)**

PA ----------

Farming System ----------

Name of the Interviewer ----------

Date of Interview ----------

Signature of the Interviewer ----------

I. DEMOGRAPHIC/PERSONAL VARIABLES

General Information

V1. Name of the peasant association _____

V2. The Respondent's **Sex**:* **1**) Male, **2**) Female

V3. **Age**:* (How old are you?) _____ years

V4. **Marital status; 1**) Married, **2**) Single, **3**) Divorced, **4**) Widow, **5**) Widower

V5. Level of education*

V5.1. Level of Literacy: **0)** if illiterate, **1)** Read & write,

V5.2. Level of Formal education: **2)** 1-4, **3)** 5-8, **4)** 9-10, **5)** 10+

V6. (T.I), Perception about the importance of education in life & Development

5	4	3	2	1

5) Most important, **4**) Very important, **3**) Important, **2**) Less important, **1**) Least important

V7. (T.2), **Family size*** (Adult Equivalent)

No	Name of Family Member	Relation with the HH head *	Sex	Age	AE	Education Level (Years in School)	Occupation **
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

* **1**) Husband, **2**) Wife, **3**) Son, **4**) Daughter, **5**) Relative (other than mentioned)

** **Occupation**: **1**) Farming, **2**) Off-farm, **3**) Non-farm, **4**) 1&2, **5**) 1&3, **6**) 2&3

AE: Adult Equivalent, (to be calculated by the researcher).

Education Level: As number 5 above

V8. How long have you been engaged in farming? **(<u>Farm experience</u>)**,* _____ years

V9. Do you **<u>Participate in Non-farm activities</u>?*** **1)** Yes**,** **2)** No

V10. If yes**,** name the type(s) of non-farm activities you participate?

1) Weaving, **2**) Pottery, **3**) Blacksmithing, **4**) Carpentry, **5**) Shopping, **6**) Other (specify)

II. SOCIO CULTURAL VARIABLES

V11. <u>Social Participation</u>*: Do you participate in social organizations?

1) Yes, **2)** No

V12. (T.3), If yes, in which of the following formal & informal organization(s) do you participate? And what is the level of your participation? (member/leader),

(Tick the response in the corresponding cell)

Organization	Ordinary Member		Committee Member		Leader*	
Idir	V13		V14		V15	
Iqub	V16		V17		V18	
Religious Group	V19		V20		V21	
Irrigation Association	V22		V23		V24	
Marketing Cooperative	V25		V26		V27	
Union	V28		V29		V30	
PA Council	V31		V32		V33	
District Council	V34		V35		V36	
School Council	V37		V38		V39	
Farmer Research Group	V40		V41		V42	
Mediator (‘Yehager Shimagile’)	V43		V44		V45	
Other (specify)	V46		V47		V48	

* **Leader**: Chair person of the organization, Chair person of any committee, Secretary, etc.

V49. <u>Mass media Exposure*</u>

V50. (T.4), How often do you make use of the following Media facilities?

(Tick the response in the corresponding cell)

Mass Media		Frequency of listening, watching, reading					
				Once in			
		Never 0	**Rarely 1**	**A week 2**	**Fort-night 3**	**A month 4**	**Everyday 5**
V51	Radio						
V52	Television						
V53	Print Media						

V54. Which radio programme(s) do you listen?

1) Educational

2) Agricultural

3) Entertainment

4) Any other (specify)

V55. Which TV programme(s) do you watch?

1) Educational

2) Agricultural

3) Entertainment

4) Any other (specify)

V56. What news interests you?

1) Educational

2) Agricultural

3) Entertainment

4) Any other (specify)

V57. <u>Attitude toward Agriculture</u>*

V58. (T.5), To what extent do you agree on the following statement?

(Tick the response in the corresponding cell)

Statement	Degree of Agreement				
	Strongly agree (1)	**Agree (2)**	**Neutral (3)**	**Disagree (4)**	**Strongly disagree (5)**
a) We should do farming the way our ancestors did					
b) Farming should be considered as a way of life, not as business					
c) Changes are always damaging & shall not be encouraged					
d) Today is better than tomorrow					
e) Farming is a gamble for the farmer					
f) Farming can not make farmers prosper					
g) Agriculture is the best mean for livelihood for Ethiopian farmers					

V59. <u>Time spent in the locality</u>*

V60. How long have you been in this village?

1) By birth,

2) Since _____ (Eth. Calendar) **(Write the number of years spent by the respondent in the locality)**

V61. <u>Innovation Proneness</u>*

(T.6)**,** Individual Innovation Proneness Scale

[Standardized scale developed by earlier researchers]

(Tick the response in the corresponding cell)

No	Statement	Yes	Undecided	No
1	I want to learn new ways of doing agriculture? +	1	0	-1
2	I am willing to attend extension lecture/talks, delivered by extension worker on agricultural innovation? +	1	0	-1
3	I want to change my way of life for betterment, even if little risk is involved? +	1	0	-1
4	The farmer should try farming in the way his parents did.-	-1	0	1
5	I want my sons to be innovative farmers? +	1	0	-1
6	The farmers' fortune is in the hands of the Almighty God.-	-1	0	1
7	It is better to enjoy today, & live tomorrow to take care of itself.-	-1	0	1
8	My peers often ask me for advice. +	1	0	-1
9	I enjoy trying new ideas. +	1	0	-1
10	I seek out new ways to do things. +	1	0	-1
11	I frequently improvise methods for solving a problem when an answer is not apparent. +	1	0	-1
12	I am reluctant about adapting new ways of doing things.-	-1	0	1
13	I am challenged by ambiguities and unsolved problems. +	1	0	-1
14	I am an inventive kind of person. +	1	0	-1
15	I am receptive to useful new ideas. +	1	0	-1

Box: 1

- **FARMER INNOVATION & FARMER INNOVATOR**

Farmer Innovation: *Farmer innovation* is a broad terminology that can refer to discovery of a completely different way of doing things or to modification of an existing technology. *It* is a process through which individuals or groups discover or develop new & better ways of managing resources. *The innovation* may be not only in the technical but also in the socio-institutional sphere. *An innovation* is something new that has been started within the lifetime of the farmer, not something inherited from parents

Farmer Innovator

Farmer innovator is someone who develops new ideas, without support from formal research & extension

V62. (IF) In which fields of agriculture you have innovated or are you innovating?

1) Crop production

2) Livestock

3) Soil & water conservation

4) Other

V63. (IF) Which innovation did you tryout?

(**Write the details of the innovation(s) generated by the farmer as he is telling)**

V64. (IF) To what extent has your innovation spread in the social system, how?

V65 (IF) Did other persons (farmers) try/adopt your innovation?

1) Yes, **2**) No

V66. (IF) If not, why?

1) Culturally incompetent, (explain)

2) Complex (explain)

3) Luck observability (explain)

4) Costly/unaffordable (explain)

5) Unsuitable for the situation on the farms of other farmers (explain)

6) Other (specify)

V67. (IF) What is the impact of your innovation on yield?

(Measurements or estimates by farmers)

1) Production increase

2) No change in production

3) Decrease in production

V68. (IF) If there is no change in production or it decreases production what **added value** did your innovation brought to you?

1) Decreased drudgery of farm work

2) Suitable to farm condition when compared to other similar technologies

3) Motivated researchers

4) Motivated extension workers

6) Other (specify)

V69. (IF) What triggered you to start innovating?

1) Own creativity

2) Influenced by extension agents

3) Observed the innovation elsewhere

4) To provide food for home consumption

5) To increase household income

6) Land pressure

7) Labour Shortage

8) Other

V70. <u>Exposure to other areas</u>/Degree of contact with other areas*

V71. Have you ever been to other places?

1) Yes, **0**) No

V72. If yes, where?

1) Market places, **5**) Other zones,

2) Woreda capital, **6**) Other regions,

3) Other PAs, **7**) Abroad,

4) Other woredas, **8**) Other (specify)

III. WEALTH RELATED VARIABLES

V73. Livestock ownership*

Livestock Type	Breed type	Number		In LTU (To be completed by the Researcher)
cows	1. Local	V74		
	2. Cross	V75		
Oxen	1. Local	V76		
	2. Cross	V77		
Bulls	1. Local	V78		
	2. Cross	V79		
Heifer	1. Local	V80		
	2. Cross	V81		
Calves	1. Local	V82		
	2. Cross	V83		
Sheep	1. Local	V84		
	2. Cross	V85		
Goat	1. Local	V86		
	2 Cross	V87		
Donkey		V88		
Horse		V89		
Mule		V90		
Poultry	1. Local	V91		
	2. Cross	V92		

V93. Farm size*

V94. (T.8), Land Ownership & Tenure Status

Plot No	Area in hectare		Ownership*		Crop Grown**		Production in 1999 EC	
1	V95		V96		V97		V98	
2	V99		V100		V101		V102	
3	V103		V104		V105		V106	
4	V107		V108		V109		V110	
5	V111		V112		V113		V114	
6	V115		V116		V117		V118	
7	V119		V120		V121		V122	
8	V123		V124		V125		V126	
9	V127		V128		V129		V130	
10	V131		V132		V133		V134	

*** Ownership: 1**) Received from PA, **2**) Inherited, **3**) Rented

*** Crop grown: 1**) Maize, **2**) Millet, **3**) Sorghum, **4**) Haricot bean, **5**) Wheat, **6**) Teff, **7**) Pepper

V135. Do you feel that, the land you owned belongs to you?

1) Yes, **2**) No

V136. If you do not feel that, the land belongs to you, why?

1) I expect that, land will be redistributed

2) Land belongs to the government

3) I expect that, my land can be taken any time by the government

4) Other, specify

IV. INSTITUTIONAL VARIABLES

V137. <u>Credit</u>*

V138. What is your perception about the importance of credit? Rate your feeling on the following scale

(T.9), Perception Scale, about Credit **(Tick the response in the corresponding cell)**

1	2	3	4	5

1) Least important, **2**) Less important, **3**) Important, **4**) More important, **5**) Highly important

V139. <u>Access to credit</u>

V140. Mention main sources of your income

1) Farming activities **2**) Off-farm activities

3) Non-farm activities **4**) Others, specify

V141. Have you ever faced shortage of money when you want to do agricultural or other activities? **1**) Yes, **2**) No

V142. If yes, how do you solve such a problem?

1) By borrowing money from friends,

2) By borrowing money from merchants,

3) By borrowing money from other formal credit sources

4) Sell of farm produces

5) Sell of animals

4) Other, (specify)

V143. How often do you get credit?

1) Whenever I need, **2**) Quarterly, **3**) Once in six months, **4**) Once in a year, **5**) Other

V144. How much credit do you get? _____ Birr (the highest amount he can get)

V145. What do you use the money you borrow for?

1) To buy food for home consumption

2) To buy agricultural inputs

3) To cover other house hold costs (other than food)

4) To innovate

5) Other, (specify)

V146. Extension Contact *

V147. (T.10), How often do you see the following?

(Tick the response in the corresponding cell)

Agent	Frequency of Contact (tick one)						
			Once in				
	Never 0	**Occasionally* 1**	**A Quarter 2**	**A Month 3**	**Fortnight 4**	**A Week 5**	**Everyday 6**
V149. DA							
V150. Woreda expert (SMS)							
V151. Woreda extension officials							

* Irregularly & more than a quarter

V156. Put them in order of their importance

1st) The most important, …… **8th**) The least important.

V157. Is there any extension education/advice/service, particularly in relation to promoting Farmers' Innovativeness? **(Here it is important to explain farmer innovativeness)**

1) Yes, **2**) No

V158. (T.11), Participation in different extension events

(Tick the response in the corresponding cell)

No	Extension Event	Frequency of Participation			
		Most Frequent (3)	**Frequent (2)**	**Sometimes (1)**	**Never (0)**
V159	Training				
V160	Field day				
V161	Demonstration				
V162	Visits				
V163	Meetings				
V164	Other (specify)				

V165 Do you use research-generated technologies proposed or suggested by extension agents? **1**) Yes, **2**) No

V166. (T.12), If yes, what technologies & how, or in what manner?

(Tick the response in the corresponding cell)

No	Technologies used	How are they used?			
		As proposed by the agent (readily adopted)		**With some modifications (adapted) ***	
1	Crop varieties	V167		V168	
2	Exotic/cross-bread animals	V169		V170	
3	Soil & Water Conservation	V171		V172	
4	Fertilizer	V173		V174	
5	Pesticide	V175		V176	
6	Other (specify)	V177		V178	

- If the farmer uses technologies proposed by extension agents with some modifications, **DISCUSS** on the details in each case & write down as the farmer is telling.