ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES
INSTITUTE OF REGIONAL AND LOCAL DEVELOPMENT STUDIES (RLDS)

FARMERS' RESPONSE TO AGRICULTURAL EXTENSION PACKAGE IN RAYAAZEBO WOREDA OF TIGRAY REGION

By: Kiros Asefa

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Addis Ababa; Ethiopia

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Kiros Asefa

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List of Acronyms AND Glossary

ADLI	Agricultural Development Led Industrialization
BOFED	Bureau of Finance and Economic Development
CADU	Chilalo Agriculture Unite
DAs	Development Agents
E.C.	Ethiopian Calendar
masl	Meter above sea level
MoA	Ministry of agriculture
mm	millimeter
MPP	Minimum Package Program
PADETEs System	Participatory Agricultural Demonstration Training Extension
SG	Sasakawa Global
SPSS	Statistical Package for Social Science

Birr	Ethiopia currency
Kushet	Village
Tabia	Sub district
Timad	Local unit of measurement equivalent to 0.25 hectare
Woreda	District

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Abstract

The main purpose of this study research was to assess the attitudes and response of farmers to agricultural extension package in Rayaazebo woreda. Agricultural extension package intervention is an arena of struggle in which adopt or reject to the technology inputs such as improved seeds ,chemical fertilizer , credit, treadle pumps etc become the a focus of the dynamic interactions among different social actors.

Both qualitative and quantitative methods are employed to collect data. In other words, data is collected from key informants' interview, focus groups discussion and household survey. This study conducted a survey of 161 sample rural households selected from three tabias.

Most of farmers in the study area do not have positive attitude to development agents in the study areas. About 67 % of farmers do not satisfy from the service given by the development agents. About 56 % of the respondents reported that the transfer of technology to the community's did not base on the society knowledge and interest. Improved technology packages have not been adequately tested locally before they are promoted on large scale. *In this study, even farmers have awareness on the importance of fertilizer, majority farmers do not apply in their farm lands. Results show that 86.3 % of the respondents do no use chemical fertilizer for the last two years. The main reasons which affect for the non-adoption of fertilizer in the study areas are: high price of fertilizer, lack of cash and the presence of shortage and unreliable rain fall in the area. Besides this, due to high price of improved seeds, poor quality and no yields difference in the improved seeds contributed for the low adoption of improved seeds in the study area. A result shows that* about 62 percent of sampled household respondents are using local seeds while 29% of the respondents are using improved seeds in Rayaazebo. The major source of irrigation in the study area is river diversion, ponds and well dugs. About 61 %of *the respondents constructed water-harvesting ponds for the last three years. However, about 53 % of the constructed ponds are either out of function or do not hold water.* The major responsible factors contributing to ineffectiveness of the pond to hold water are problem in site selection, design, leakage, siltition, shortage of construction materials. Failure of ponds to hold water in the study area show that farmers do not participate voluntarily in planning and implementation. They constructed the ponds either they are forced by government agents or to get aids and to participate in food for work (63.6%). Extension contact is an important instrument for dissemination of agricultural technologies. About 67.2 percent of farmers' contact with extension agents during extension meeting where as 21.8 percent gets extension service during social gathering. Fourteen percent of the respondents reported that they diverted their loans to other activities than the original stated purpose because the package credit loans do not keep their interest.

It was revealed that farmers were not passive recipients of the government intervention intended to improve their lives. Farmer's responses to different extension packages were mixed: adoption, rejection and transformation. In study area, demonstration the practice of agricultural extension remains based on the top-down approach. Typically, this approach is linear, rigid, and linked to introduce modern technology. This linked to the ideas of achieving planning targets through coercive persuasion of farmers on improved seeds and water harvesting schemes.

CHAPTER ONE: INTRODUCTION

1.1 Back ground of the study

Agriculture remains the main activity in the Ethiopian economy. It is the most important contributor to the country's GDP: accounted, on the average, 65.5%, 52.7% and 47.1% of the GDP during 1960-1973, 1974-1991 and 1992-2002, respectively. Agriculture accounts for about 90% of the total export earnings of the country. About two-third of the total foreign exchange earnings is generated from coffee export. Exports from the livestock products that include mainly hides and skins, live animals and leather products are other main source of foreign exchange (Mulat et al,. 2004). Ethiopia had been a self sufficient in staple food and classified as a net exporter of food grains till the late 1950s (Debebe, 1995)

A very high population growth rate is also a typical feature of rural Ethiopia. The total population more than doubled during the past three decades, from 29.1million in 1972 to 67.2 million in 2002 (NOP, 2000).

Rapidly growing population with limited possibility of expanding the area under rain-fed agriculture and lack of employment opportunities outside agriculture have led to a sharp decline in farm sizes. About thirty nine percent of the farming households in the country cultivate less than half hectares and about eighty nine percent cultivate less than two hectares (Mulate al et ,2004).

Subsistence farmers heavily rely on traditional tools and implements and local seeds with low genetic potential, which have resulted in low yield. The traditional tillage tool is inefficient in terms of depth, width of operation as well as pulverization of the soil. The traditional plough unchanged and requires several passes to prepare land for planting (Mulat, 1999). Apart from its labor-intensive nature and requiring many draught animals, the present technology of land preparation is of little use for turning the subtle and weeds into the soil. It has been

repeatedly argued that the food crisis in the country necessitates the importance of promoting technological innovations for increasing food production and minimizing post-harvest losses. The apparent lack of problem solving technical innovations in the agriculture has led to yield stagnation.

Over the past decades, the objective of policy makers towards improving productivity and income of traditional farmers was the provision of extension training and visit system on soil and water conservation practice, application and use of fertilizer. However, introduction of new farming practices to Africa has in general not been successful and most of the growth in production in Africa has been due to the expansion of the cultivated area. Major reasons for the failure of past efforts to introduce yield-enhancing technologies have been inappropriate agricultural and economic policies; discrimination and heavy taxation of the sector; low population densities and poorly developed rural infrastructure; high transport and transaction costs for inputs and products; low investment in agricultural research; and low general education levels (Dejene, 2000)

It is well known that the Ethiopia agricultural system is characterized by the use of low technology, low productivity and output, heavily reliance on nature and hence, is subjected such natural calamities as drought. Indeed, poverty is pervasive, deep and persistent. According to FAO/WFP (2001), about 45%-51% of the population is under nourished. Domestic production is estimated to supply only about 70% of total food requirement, and each year 4 to 6 million people need food assistance.

The major pitfall in the development of the Ethiopia agriculture was less attention was given to smallholder agriculture. During the imperial regime, emphasis was given either to industrial development or to the development of big commercial farms. Similarly, during Derge regime more emphasis support was given to big commercial state farms and cooperatives.

Recognizing the key role of agriculture in Ethiopian economy, its weakness and challenge, the EPRDF government has been engage in efforts of promoting rural agricultural development. The ADLI strategy sets out agriculture as primary stimulus to generate increase out put, employment, income for the people. In order to realize these development goals, support for the improvement of the smallholder agriculture has been taken as a prime strategy direction. Hence wider dissemination of research results and technological options, improved management and know how to smallholder farmers have been the major activities implemented by the federal and regional governments.

Agricultural research is an important wing in the technology generation – dissemination / extension – utilization continuum. While the presence of appropriate, affordable and productive research out put facilitate the extension program activities. However, the absence of desirability from the research side poses a great challenge to extension system. The poor linkage between research, extension and farmers is commonly observed constraints in the flow of technology. The other challenge to smallholder agriculture is lack of or limited access to capital resources for operational and investment in the farm activities.

1.2 Statement of the Problem

In Ethiopia, like in many other developing countries, many researchers are struggling to reduce poverty and enhance the effectiveness of agricultural extension to increase productivity. In this process, they have identified problems that limit extension effectiveness in the country in order to solve and mitigate the problem. Linkage between researchers, extension agents and farmers play a vital role in agricultural development. This linkage helps the extension service to carry farmers' problems to the researcher and return with solution. For variety s of reasons, this has not working well in the country. Poor extension research links are among the factors that arrested the level of technology adoption and productivity (Dejene, 2000)

Different agricultural extension systems have been implemented in Ethiopia since 1950s. Different literature reveal that agricultural extension program during the Imperial and Dergue regime were operational in very limited areas and end up benefiting the land lords and few producer cooperatives and state farms (Befkadu and Berhanu, 1999/2000).

The present government extension system agreed upon between central and regional levels is based on the package approach and is called the "Participatory Demonstration and Training Extension System" (PADETES). It combines technology transfer and human resource development, and promotes the participation of farmers in the research process (Percy, 1997). However, there are several weaknesses in this approach, such as the promotion of inappropriate technology, insufficient on-farm and adaptive research, continuation of inappropriate promotion criteria for research and extension staff (i.e. based on scientific publications), poor research and extension linkages, and the lack of "real" participation of farmers (Misgana ,1998). This has meant that, because of a range of biases (class, gender, literacy and location), most small-scale farmers have derived limited benefits from this programme. In addition, the capacity of research and extension is very low to respond to the problems and needs of the farming communities

A participatory approach takes as a point of departure the needs of the different groups of farmers. Extension is focused on farmers' needs rather than farmers being "targets" of extension. Participatory extension should be based on the farmer's knowledge, and farmers should be involved in the planning and implementation of extension programs. Thus, extension becomes more responsive to the needs of the different clients in the community i.e., wives, youth female-headed household, as well adult men. The participatory approach is therefore considered as essential if extension is to be more client-oriented (Dejene, 2000:6). However, these principles are not followed in the current extension

system. What is being practiced is top-down (Dejene, 2000; Woldeab, 2003). The present agricultural extension system acknowledges in theory that participation of stakeholders in the package implementation process, but what has been practiced is different from what is being believed in principle.

Different studies focus on the impact, performance and challenge of the extension program. For example, a study conducted in Kilte Aweloalo Woreda in Tigray region attempted to asses the impact of the extension package on alleviating food insecurity and enhancing the income of beneficiaries (Tsegue, 2006). Another study conducted in Benshangul Gumuz region focused on the performance of the agricultural extension program in the study area. However, both researches did not consider or incorporate response of farmers during the intervention of the package and the attitude farmers towards to the extension package.

There fore, the research focused on the attitude of farmers towards extension package and the response of farmers during the intervention of agricultural extension package in Rayaazebo of Tigray region and study will able to fully understand people's experience and perception in relation to extension package to fill the research gap.

1.3 Objective of the Study

The objective of the study is to assess the attitude farmers towards the agricultural extension package and to assess farmers' response or reaction to the government intervention of agricultural extension package in Rayaazebo woreda

1.4 Research Questions

- What is the attitude of farmers towards the agricultural extension package?
- How farmers responded to the intervention of agricultural extension package? Why?

1.5 Scope of the Study

The study is based on micro level analysis of the response of farmers to agricultural extension package introduced in Rayaazebo woreda of Tigray region.

Different types of agricultural extension packages are introduced to the study area. Yet, assessment of farmers' response to agricultural extension packages is limited to inputs enhance for crop production. Hence, the focus of farmers' response to agricultural extension packages is limited to chemical fertilizer, improved seeds, credit service and water harvesting pond.

1.6 Limitation of the Study

One major problem faced was the difficulties in getting the respondents to be interviewed. This was because the respondents were busy on farm work, since the research coincided with the raining season. The most suitable time was therefore in the evenings after they have returned from their farms.

One limitation that must not be lost sight of is the time constraint. Three months was allocated initially for the work. In addition, this was in accordance with the university's academic calendar. It however proved after the three months stay to be inadequate, for one to collect data for a master's thesis of this sort within such a limited period.

1.7 Organization of the Paper

This thesis is organized in six chapters of which its problem statement, objectives are presented in the first Chapter. After the introductory section,

research methodology is briefly discussed in Chapter two. Chapter three considers the literature review. Description of the study areas is found in Chapter four. Chapter five focuses on the analysis and discussion of the main findings, and the conclusion is offered in Chapter six.

CHAPTER TWO: RESEARCH METHODOLOGY

2.1 Research Design and Sampling Procedures

Choosing appropriate research design reflects decision on the priorities being given to the research process. The research had most of its bearing from the cross sectional research design. A cross sectional design defined as the collection of data on more than one case and at a single point in time in order to collect a body of quantitative data in connection with two or more variables, which are then examined to detect pattern of association. More than one case implies that there is a variation in respect of people, families, organization (Bryman, 2001). This research looked in to farmers' response towards agricultural extension at household levels. In this study, questionnaires and interviews were employed in collecting data that was relevant, valid and more easily comparable. Qualitative research can represent a form of cross sectional design when using focus groups discussion and semi-structured interviews at a single point will be conducted. There fore, cross-sectional design thereby provided a good base line for my research for the quantitative methods and qualitative research.

The methods of selecting tabia and households were based on a probability sampling. Probability sampling means that a sample has been selecting using random selection so that each unit in the population has an equal chance of being selected .The aim of random sampling is to keep the sampling error low (Bryman, 2001).Simple random sampling were used to select the tabias.

Rayaazebo woreda has fifteen rural tabia administrations (KAs).About 95 % tabia administrations are found in "kola" (semi-arid) agro climate. Three (20%) tabias were selected for the study. These KAs were randomly selected.

To select a household from the selected tabias, the researcher used a simple random sampling method. The number of households selected for the study was 161(5%) households' heads from 3100 household heads. This figure could seem small but the agro-ecology and social, culture and economic characteristics of the households are similar. Due to this homoginty among the households, generalizing about the population from the sample households did not affect the reliability of the out comes of this study.

Once total number of households to be studied was determined, the size of sample household from each study (*tabia*) was determined based on the total number of households who reside in each *tabia.*

Table 1 the number of households selected from each tabias is listed below

tabia administration	Agro-climate	Total number of households	Sample size
Abo	Kola	840	42
Genete	Kola	1301	65
Mechare	kola	1079	54
Total		3220	161

Using simple random sampling technique, proportional to the population of kebele or tabia identified, study sample was selected from the list of households. Respondents in the study were household heads

and in cases where household heads were missing, the next households were selected for the missing household heads.

2.2. Methods of Data Collection

Different methods of data collection were involved .These are: interviewing, written survey, focus group's discussion. Combing questioners, interviews and secondary data and participant observation can yields more reliable and valid information and create a triangulation effect when you use more than one person or method to collect the same information (kane, 1997).

As mentioned, the researcher decided to use quantitative methods in the form of questionnaires and qualitative methods using semi-structured interviews. A combination of both quantitative and qualitative methods thereby becomes important in my research to gain the effect of providing a reliable and valid data basis for my analyses and discussions.

2.2.1 Quantitative Data Gathering Tools

2.2.1.1 Survey Methods

A questionnaire gives the respondent time to consider each question before answering at the speed they wish. It also capture a lot of information and is less time consuming (Bryman, 2001).Both open and closed ended questions were developed. These questions become more easily quantifiable and it is easily understand to interviewees.

The first part focused on general information of the respondents' are sex, age, religion, marital status, number of children, and level of education. The second part focused on the farmers' access to resource like land and livestock and farm implement whether they had adopted or rejected for the introduce technology. Third part sought to examine how farmers contact with development agents and their access to the training. Fourth part dealt with the agricultural inputs, credit service

and water-harvesting ponds. Topics such as chemical fertilizer, improved seeds, credit and water harvesting were included. These questions focused on why and how farmers responded to agricultural extension package intervention. These questions provided indicators for farmers' response whether they continue application or reject the intervention technologies in the study area. Finally, questions were asked regarding their attitude to agricultural extension package (on development agents, technologies and extension service).

2.2.2 Qualitative Data Gathering Tools

2.2.2.1 Key Informants Interview

Qualitative data collection, in the form of semi structured interviews and focus group discussions represent essential research methods (Kane, 1997). Ten key farmers informants interviewees , four development agents , one agricultural office expert and four *tabia* leaders were conducted to fill the gap and to further enrich that was not covered by survey methods. The Interviews with development agents, staff of agriculture office and *tabia* leaders concentrated mainly on the technologies successfulness, attitude of the farmers to technologies, the relation between extension agents and farmers, the source of technologies, the challenge of the technologies to adopt, participation of farmers in the intervention. Key farmer informants were asked on the extension intervention, why they adopt or reject the agricultural technologies and their reaction with different actors.

2.2.2.2 Focus Group Discussion

Focus group discussions were conducted in order to gather information on attitudes and response of agricultural extension package particularly on the chemical fertilizer, improved seeds, ponds, and credit and extension system. Five focus group were conducted to get an in depth information. The meetings comprised of men and women. Focus groups included general questions on adoption of technology, credit service and

water harvesting ponds and attitude of farmers. They were also asked why farmers reject or adopt technology.

2.3 Secondary Sources of Data

Information was sought from documentary sources such as books, journals, reports, articles and other research related to this study. The essence is to review literature about actor perspective, extension. The literature reviewed served as both theoretical and empirical base for the analysis of the data collected. It also supplemented the information gathered during the fieldwork.

2.4 Methods of Analysis

The process of analysis has been carried out by using qualitative description and descriptive statistics. The portion of data that is readily quantifiable (information from the close-ended questions of the questionnaire) has been entered into the SPSS program and the output has been discussed using tabulation and cross-tabulation of variables with percentage values in descriptive statistics. Readily qualitative data (information from open-ended questions, key informant interviews, and focus group discussions) have been discussed through qualitative description.

CHAPTER THREE: LITERATURE REVIEW

3.1 Theoretical and Concept

3.1.1 Theoretical Framework

It is truism that theories in the field of development sociology have advanced and improved tremendously in the past few years under the influence of the actor-oriented approach. These new theories are emerging due to the demise of the grand theories, that is, modernization and dependency theories, which dominated in the field of development up to the 1980s. Neither of the grand theories has survived intact as a viable paradigm for understanding change and transformation, or processes of poverty and inequality in time and space (Gardner et al. 1996).

The argumentation of these theories were so abstract, which meant that they failed to reflect the complexity of the real world situation and thus ended up with circular statements (Seppala, 1998).This means that they could not be use in explaining realistically, the problems of global processes (Seppala, 1998). The approach that has been adopted by both sociologists and anthropologists re-asserts the importance of the agency of individuals in the face of structural constraints. The work of Norman Long and the Wageningen Schools 'actor-oriented' approach is an illustrative example to cite (McGregor, 1998 cited in Ansoglenang, 2006).

Long (1984, cited in Long, 2004) had stressed the importance of what he called an actor-oriented analysis of development, was to advance a more sophisticated treatment of social change and development that emphasized the central significance of 'human agency' and self-organizing processes, and the mutual determination of so-called 'internal' and 'external' factors and relationships .This implied a focus on the life worlds and interlocking 'projects' of actors, and the

development of theoretically grounded methods of social research that allowed for the elucidation of social meanings, purposes and powers. It also required delving more deeply into the social and cultural discontinuities and ambiguities inherent in the 'battlefields of knowledge' that shaped the relations between local actors, development practitioners and researchers (Long 1989, and Long 1992 cited in Long, 2004). Life worlds are lived-in and largely taken –for- granted social worlds centering on particular individuals (Long, 2001:241; cited in woldeab, 2003:12)

The actor-oriented approach paints a picture of poor people having power and agency, although subordinate, and underestimating the importance of the societal structures within which people are located. The actor theory therefore seeks to explain development outcomes in ethnographic terms, in which there are processes of negotiation between clients, local structures and institutions (Seppålå, 1998).

Skocpol (1979) cited in Arce et al (1994) view the state or government is to be conceived as a set of administrative, policing and military organizations headed, and more or less well coordinated, by an executive authority. Primarily interests within the state itself regulate the activities of states. However, this does not mean that the state necessarily enjoys great power in relation to society. Development intervention programs can play a positive role to reverse the scenario of poverty and steer the rural economy along a sustainable path of economic development.

Intervention

Long (2001:33) argue that 'intervention implies the confrontations or interpretation of different life worlds and socio-political experiences, which may be significant for generating new forms of social practice and ideology'. Intervention becomes a ways of reshaping existing social practice and knowledge and of introducing new elements that either replace or accord new meanings to already established ways of doing

things (Va der Ploeg, 1989, cited in Long, 2001). An actor-oriented approach is useful then to understanding and analyzing the process of change initiated by the government such as agricultural extension intervention and farmers' response. Interventions need to be planned and implemented in a manner that it will bring the highest benefit to the target group in line with the intended development path. To this end, policy programs need to be congruent with farmers' priority problems and felt needs and; fit the agro-ecological and socio-economic circumstances. Such development program interventions will have a greater chance of being accepted and practiced in a sustainable manner than programs based on temporary incentives and coercive pressure (Wagayehu, 2004)

Social interface

Farmers interact with a multitude of people of different backgrounds and organizations. Long calls the face-to-face encounters between farmers and these 'outsiders' (researchers, extensionists, development and social workers) social 'interfaces'. Long(2003:60) defines 'social interface as a critical point of intersection between different social systems, fields, domains or levels of social order where social discontinuities, based upon discrepancies in values, interests, knowledge and power, are most likely to be located'.

Actor

'Actor' can refer to an individual person, a group, an organization or a network: all interact, taking and implementing decisions based on their own perceptions, interests, understandings and the opportunities they perceive (Engel, 1997: 72). Certain actors, especially public sector extension services and private commercial organizations have been involved in providing extension services for a very long time. The involvement of NGO's is more recent. Other actors clearly can and should incorporate extension functions in their work, but they may not

consider themselves extension agencies as such (traders, producer organizations, credit providers (Christoplos et al., 2001).

The individual actor has the capacity to process social experience and strategize ways of coping with situations, even if under extreme coercion. No matter whatever uncertainty or constraints he/she might have faced with, social actors are 'knowledgeable' and 'capable'. This implies that, despite the situation that actors may find themselves, exercise some kind of 'power', leverage or room to maneuver. They learn how to intervene in the flow of social events around them, and in one way or the other monitor the reactions of others to their behaviors (Giddens, 1984 cited in Long, 2001). Indeed the actor-oriented approach assumes that actors are capable when even under restricted situations, in formulating decisions and act upon them.

Human Agency

Human agents are knowledgeable and capable of taking actions meaningful to their life. Agency commonly refers to the ability of actors to operate independently of the determining constrains of social structure. The concepts of 'agency refers to knowledge ability, capability and social embedded ness associated with acts of doing that impact upon or shapes others' actions and interpretations' (Long, 2003: 59) . Agency attributes to the individuals' actors the capacity to process social experience and devise ways of coping with life, even under the most extreme forms of coercion (Long et .al., 1992 cited in Long, 1994).

3.1.2 Concept of Agricultural Extension

Ensuring a thriving agricultural economy is critical for reducing poverty, enabling food security and managing natural resource in a sustainable fashion. Agriculture provides a livelihood for more than 60 % of developing country populations and in many countries, farm families make up 80% or more of the population (World Bank, 1990).

The most difficult problem is how to provide the basic needs like housing, food, clothing, education, health etc for a rural people that have been increasing their need from time to time. In order to solve this problem, an intensive and productive use of land is the best solution. For that matter, millions of farmers must be given access to agricultural extension (Adams, 1992)

Agricultural extension is a difficult term to define precisely. It has different meanings at different times, in different places, to different people. The role of agricultural extension is to help farmers make efficient, productive and sustainable use of their land and other agricultural resources, through the provision of information, advice education and training.

Van den Ban and Hawkins (1996) arrive at a concept of extension that seems to synthesize diverse perspectives into five goals — transferring knowledge from researchers to farmers; advising farmers in their decision-making; educating farmers to be able to make similar decisions in future; enabling farmers to clarify their own goals and possibilities and to realize them; and stimulating desirable agricultural developments (rural guidance). They note that stimulating desirable agricultural development is the most common goal of extension directors.

A concept of agricultural extension widely used in FAO is one included in the FAO publication Agricultural Extension: A Reference Manual (Swanson, 1984). Agricultural extension is a service or system which assists farm people, through educational procedures, in improving farming methods and techniques, increasing production efficiency and income, bettering their levels of living and lifting the social and educational standards of rural life . A definition, revised in the light of the World Conference on Agrarian Reform and Rural Development (WCARRD) and other developments since 1973, might refer specifically

to men, women, youth, and the most disadvantaged groups in general, encouraging and involving rural people's own organizations, enhancing individual and collective self-reliance, and environmental and population issues.

3.1.3 The Role of Extension in Agricultural Development

In developing countries where agriculture is the principle means of livelihood for 40 to 90% of the population (Jazairy, 1992), strengthening the ability of agriculture to compete domestically and in export markets is an important premise for an economically competitive agricultural sector. The State of Food and Agriculture Report (2000) concluded that reducing poverty and food insecurity is not simply a question of enhancing agricultural productivity and production or of generating more income. Productivity is the result of complex relations that involves not only farmers but also complex relationships. Maalouf et al. (1991) have stated that the quality, capability and performance of farmers in agriculture are fundamental indicators of the level of the agricultural sectors efficiency, productivity, development and sustainability.

According to FAO (1990), the Global Consultation on Agricultural Extension has stated that farm people who receive non-formal education through extension programs generally increase their productivity and efficiency. However, research shows that in Africa, 2 out of every 3 farmers have no contact with public extension services; in Asia 3 out of 4; in Latin America, 6 out of 7 and 5 out of 6 in the Near East (Maalouf et al. 1991).

Agricultural extension work is a significant social innovation, an important force in agricultural change, which has been created and recreated, adapted and developed over the centuries. Today, the

organizations and personnel engaged in agricultural extension encompass a diverse range of socially sanctioned and legitimate activities, which seek to enlarge and improve the abilities of farm people to adopt more appropriate and often new practices and to adjust to changing conditions and societal needs (Jones & Garforth, 1997).

The quality, capability and performance of farmers in agriculture are fundamental indicators of the level of the agricultural sector's efficiency, productivity, development and sustainability. Information and organization in the agricultural sector must assume greater importance. People involved in agriculture need improved skills, information and ideas in order to develop agriculture that will meet complex demand patterns, reduce poverty and preserve or enhance ecological resources (Feder, and Zijp, 1999).

Extension services are an important element within the array of market and non market entities and agents that provide human capital-enhancing inputs, as well as flows of information that can improve farmers' and other rural peoples' welfare; an importance long recognized in development dialogue (Roberts, 1989). The goals of extension include the transferring of knowledge from researchers to farmers, advising farmers in their decision making and educating farmers on how to make better decisions, enabling farmers to clarify their own goals and possibilities, and stimulating desirable agricultural developments (Van Der Ban and Hawkins, 1996).

3.2 Ethiopia Extension System

3.2.1 Extension Intervention in Ethiopia

A review of extension activities for the last five decade's reveals that a range of extension approaches has been used. The approaches tended differ with each successive political regime. In what follows the

extension approaches used by the different political regimes are presented separately.

3.2.1.1 The Extension Intervention in the Imperial Regime

In this regime, attempts to increase crop yields included the comprehensive and minimum package projects initiated in the 1960s and 1970s with massive external support. It was thought that concentrating resources on the most promising regions would yield better results than spreading resources thinly over large area (Befekadu and Birhanu, 1999/2000).

Chilalo Agricultural Development Unit (CADU) was first designed in 1967 with financing from the Swedish International Development Agency (SIDA) to be implemented in Arsi. The program components were: crop and livestock development, credit and marketing service, institutional building, social and physical infrastructure, input supply and home economics (Tenkir et al, 2004).

Based on the CADU's experience, other projects such as Walayita Agricultural Development Unit, Ada'a Woreda Development Project etc also initiated. Evaluation of the comprehensive package approach led to the conclusion that the approach did not benefit small holders, and was too expensive to scale out and both financial and in terms of manpower requirement (Birahanu et al, 2006).These comprehensive projects failed to bring any change in production and productivity of small scale peasant farming .It's benefit largely went to the land lords which rather induced eviction of the peasant farmers (Tsegu, 2006)

The first national wide extension programs, the Minimum Package Projects 1(MPP-1)was designed for the period 1971-1979 and extension center were opened following the main high way road to provide extension service to small scale farmers. However, poor farmers were not beneficiaries for the lack of collateral for credit and extension service.

3.2.1.2 The Extension Intervention in the Dergue Regime

The two major agricultural extension programs during the 1974-1991 were Minimum Package Program 11 (MPP-11) and the Peasant Agricultural Development and Extension Project (PADEP) .though the initial plan was to implement MPP-11 between 1975 -1979, the then political and institutional instability did not allow its timely implementation(MoA,1994a ; cited in EEA,2006) .

In 1980s, a project called the peasant Agricultural Development Program (PADEP) was launched with the external assistance (Befkadu and Berihanu, 1999/2000). This program aimed at increasing national food production, promoting cash crops production, expanding rural cooperatives ad employment opportunities, and preventing soil erosion (EEA, 2006). However, PADEP was giving priority to state and collective farmers at the expense of smallholder individual farmers (Belay, 2003).

On all counts, the extension approach was defective, not only because it was not participatory, but also because of its inflexible and top-down nature (Befekadu and Berhanu, 1999/2000). The principal factor responsible for the inefficiency of extension work during 1975-1991 was the government's agricultural policy, which favored the development of state and collective farms. Although the 1975 radical land reform put an end to the tumultuous tenant-landlord relationships, the collectivization and villagization policies pursued by the Marxist government and its commitment to increasing public ownership contributed greatly to the low performance of the agricultural sector in the 1980s(Belay,2003)

Paradoxically, state and collective farms have proved disappointing in terms of productivity, employment creation and environmental protection (Cohen and Isaksson 1988, Mengisteab 1990; cited in Belay, 2003). In general, in the 1980s extension activities were obstructed by the government's selective agricultural policy and 'the non-surplus producing regions' had not received enough attention (Belay, 2003).

3.2.1.3 The Extension Intervention in the Current Regime

The strategy of food security in Ethiopia is tied with the overall development strategy of Agricultural Development-Led Industrialization (ADLI). This strategy is aimed at structural transformation of the economy in which a high growth of agricultural development is envisaged to contribute to raise the share of industry and social services in terms of outputs and employment. The strategy also visualizes export-led growth, which feeds into an interdependent agricultural and industrial development.

By and large, the strategy of ADLI focuses primarily on agricultural development and this is to be attained through improvement of productivity in small-holdings and expansion of large-scale commercial farms particularly in the lowlands.

The Ethiopian government formulated a smallholder extension program known as Participatory Agricultural Demonstration and Training Extension System (PADETES) to attain the objective of raising farm productivity. PADETES was formulated in 1994/95 primarily based on the experience and much tout success story of Sasakawa Global 2000 program (Gebrekidan et al, 2004). The ADLI strategy was a technology-based, supply-driven intensification that consisted of enhanced supply and promotion of improved seeds, fertilizers, on-farm demonstrations of improved farm practices and technologies, improved credit supply for the purchase of inputs and close follow up of farmers' extension plots (Habtemariam, 2005).

This extension system is the first in the country extension history to be developed by the Government with out foreign assistance (Ebrahim, 2005). The main features of PADETS include-

- Increasing production and productivity of small-scale farmers through research generated information and technologies.

- Empowering farmers to participate actively in the development process.
- Increasing the level of food self-sufficiency.
- Increase the supply of Industrial and export crops.
- Ensure the rehabilitation and conservation of natural resource base of Agriculture.
- Encourage farmer's organization.

Initially, PADETES promoted cereal production packages and the beneficiaries were mainly those farmers who live in high rainfall areas of the country. Over the years, however, the packages have been diversified to address the needs of farmers who live in different agro-ecological zones of the country (Belay, 2003).

The new system follows also the package approach for the development of the agricultural sector. In this approach, all essential components, such as information on agriculture technology, provision of inputs and credit, and communication methods are provided to farmers as a complete set. The transfer of technology is done through demonstration on a realistic size for the various agricultural development activities and adopted on a cluster approach to transfer the knowledge through diffusion from farmer to farmer extension and organizing field days. The system also considers strong research-extension farmer's linkage, proper supervision and evaluation (Ebrahim, 2005).

Since the 1995/96 crop season, when PADETS became operational in all regional states and ecological zones of the country, the two main inputs, fertilizer and selected seeds, have witnessed increasing rate of adoption. The numbers of participating farmers increased from 31,256 in 1995 to 3,731,217 in 1999 covering nearly 40% of the farming population. The value of credit, which began at 8.1 million birr, has reach 150.2 million birr (Tenkir et al, 2004).

PADETS involved the use of extension management and training plots, usually half hectares on farm demonstration plots that were managed by farmers and used to train farmers and extension workers on appropriate agronomic and farm management practice (Alemu and Demese, 2005). PADETS also follows package for agricultural technology, provision of inputs and credit, communication methods (Alemu and Demese, 2005). The current extension is also based on the provision of input credit under local government collateral arrangements, institutional linkages with rural development committees and systematic inclusion of women and the young (Tenkir et al., 2004).

The new extension programs have increasingly been geared towards production rather than extension. Development agents are under pressure to work with as many farmers as possible. One agent may be required to supervise the demonstration plots of 200 farmers (Befkadu and Berhanu, 1999/2000).

At least three reasons are generally provided to questions the sustainability of the current program (Dessalegn, 1999; cited in Befkadu and Berhanu, 1999/2000) according to Dessalegn:

- The first reason is the rising cost of fertilizer. Following the removal of subsides in 1997; the cost of package has significantly increased. There is danger that this may result in high rates of default, especially in bad years and undermine the effectiveness of the program.

- The second problem is the input themselves. Both the seed varieties and fertilizers that are being offered to farmers require high rainfall variability as in most parts of Ethiopia.

- The third reasons is the problems of micro holding farmland.

The current extension service appears to give more attention to small holders. The realization that farmers need to adopt technologies

voluntarily and that development agents should not be involved in non-extension activities encouraging development. However, these realizations need to be operationalzed. The low moral and high mobility of extension personnel is another major problem with the current extension system (Berhanu et al, 2006)

Owing to the nature and limitations of the current extension package, some critics (e.g., Belay, 2000) have questioned its effectiveness and sustainability. Shortcomings that have been highlighted include dependence on high cost external inputs; excessive reliance on a narrow genetic base; inadequate availability of inputs in the required quantity and quality for various socio-economic categories of farmers; and the consequences of continuous use of chemicals. Above all, it is argued that the excessive focus on the introduction of external technologies has contributed much to the neglect and erosion of local genetic resources and farmers' indigenous knowledge systems (Negussie, 2002).

3.2.2 Participation of Farmers in Extension Package in Ethiopia

Small farmers have multiple objectives, low resource endowments and they avert risk. Thus, farmers' participation in technology generation and evaluation is crucial. The principal lessons of the package-testing program at Nazareth Research Center were that farmers adopt new techniques component by component and recommendations must be prescribed to ensure that they are appropriate for farmers. Participation of farmers in an on-farm research program helped in designing problem-solving types of experiments and in fine-tuning technologies. In addition, it is demonstrated that yield is only one of several parameters used by farmers to evaluate a technology (Aleligne, 1992).

Coffee seedlings of well-adapted Coffee Berry Disease (CBD), resistant selections were used to raise seedlings for the demonstration. Agronomic packages such as fertilizer, herbicide pruning, intercropping, and use of mulch, frequent hand-weeding practices, and their

combinations were taken as components of techniques. There were six pairs of treated and untreated plots. Farmers' participation was appreciable in the course of establishment of the demonstration, implementation of the program, evaluation of the trial, and dissemination of the results. Use of fertilizer, mulch, and hand weeding gave better yield over untreated plots, and innovators and early adopters adopted some of these techniques (Furgessa andYehasab, 1992)

A study on technology development and transfer: A Case study on On-Farm Vertisol technology experience in Ethiopia shows those farmers' participatory roles in technology development and transfer, drawing an experience from on-farm vertisol technology research in Ethiopia. Constant consultation with farmers enabled technical refinements and brought attitudinal changes to the technology. The principal element of the vertisol technology is the use of an animal drawn broad-bed maker (BBM) for shaping land structures to overcome seasonal water logging problem. This opens up opportunities for alternative land uses such as early planting of improved seed and multiple cropping. Increased crop yields, income, land, and labor productivity resulted from use of the technology. Where manually made broad-beds are the traditional seedbeds on vertisols, use of BBM relieved the drudgery of shaping broad-beds by hand. The potential impact of the technology seems high, judging by farmers' interest in its transfer to other farmers (Getachew and Mohammed, 1992)

A detailed examination of recommended practices for wheat and *teff* showed not only farmers knowledge is increased but also that the pattern in the way farmers acquire information ranges. The importance of communication among framers in favor of development agents to which a direct link is attached and problem-solving approach can effectively be executed. Though the extension system may revile as an encouraging sign, it must be noted that it involves more scarce resources than the traditional one. It demands a strong link between

research and extension and this link has to be strengthened in order to make it more successful. In addition to this, timely supply of inputs in sufficient quantity and quality is a panacea for development of this type of extension system (Gezahegn, 1989).

The Ethiopian farmer is not so far considered in the decision making process of technology generation and transfer. The farmer is expected to accept and adopted what ever technologies are recommended by the research institutes through the extension agents of ministry of agriculture (MoA) (Goshu, 1994).

A study on the Agricultural Extension in Ethiopia: the case of Participatory demonstration and training extension System in Ethiopia indicated that one hundred and twelve respondents (7.6% of the total respondents) reported that they had served as contact farmers during the military regime. However, the outcome of this study is that the majority of the former contact farmers had not participated either in PADETES or in the SG 2000 extension program at the time of the survey (Belay, 2003). It is obvious that, under the military regime, contact farmers had been working very closely with extension agents and shared their experience and skills with a number of follower farmers. Therefore, the fact that the majority of the former contact farmers had not participated either in PADETES or SG 2000 extension program at the time of the survey must be considered as a very important point of concern in that it reflects lack of continuity in extension work (Belay, 2003).

A study conducted by Ethiopian Economic Association indicated that of the total sample of 4587 sample households, 4575(99.7%) responded to a questionnaire whether they have participated or not in the extension packages. 56% of the respondent households were found to have ever participated in the current extension package and the remaining did not participated. The study also added that the participant households in

moisture reliable was 62 % and 46% was in moisture stress woredas (EEA, 2006).

The Ethiopian Economic Association also carried out a research on the impact of PADETES on production and productivity .This research conclude that two –third of household participant indicated that the involvement in the package program has been participatory and based on the their ability and willingness (EEA,2006). However other study concluded in their work that the extension work in Ethiopia was non-participatory and coercive , giving little consideration to farmers experience and knowledge(Dejene, et al,2000; Belay,2003).

3.2.3 Agricultural Technology Inputs in Ethiopia

Many factors affect the use of fertilizers in the peasant agricultural sector in Ethiopia. Some of the factors are related to the general condition of agriculture such as security, lack of roads, uncertainty weather condition, and the limited development of improved seeds variety (Itana, 1985). Low effective demand could result from several factors, including inadequate promotion by the extension service; unavailability of seed at the local level; high seed prices; the inability of farmers to obtain credit for seed from the state banks until this season; packaging problems; and because farmers may not consider improved seed superior to local varieties, e.g., some improved sorghum is more vulnerable to birds than local varieties (Ali et al, 1995)

PADETES was designed to improve agricultural extension by providing training, inputs and services, including credit, with the aim of transforming subsistence farmers into small-scale commercial farmers. In limited areas where rainfall and soils are favorable for the introduced technologies, PADETES brought benefits to some farmers but, in most parts of the country, the approach was not very effective. It put too much emphasis on quantitative achievements – extension agents were expected to meet quotas in terms of the number of farmers they

convinced to adopt the technologies. It did not give adequate recognition to farmers' interests (Ejigu and Ann, 2005).

The Development agents' incentive system is built around the need to persuade farmers to adopt 'packages', usually of improved seed and fertilizer. Their relatively meager pay can be supplemented with evidence of uptake of packages. They are therefore most likely to work with those 'model' farmers who show interest in such technologies. This is at odds with notions that farmers should determine their own needs, and confirms a view that in fact the government knows best (Tenkir et al, 2004). The same study pointed out that the choice of packages available is not always appropriate to the particular agro ecological and economic conditions of an area. In areas of greater rainfall variability and uncertainty, the risks for farmers are much greater. Critically too, having met their quotas, Development agents then must recover loans, even if the farmer has had a poor harvest. Individual Development agents may be very sympathetic to the needs of farmers during such times. However, loan recovery is also a measure of their success. This compounds the problematic position of development agents as both ally of the farmer and instrument of coercion. Another study conducted in Tigray region on the irrigation practice, state intervention farmer's world life in drought prone Tigray indicated that farmers forced to purchase fertilizer by the development agents and tabia administration (Woldeab, 2003).

A study conducted in Ethiopia by Tenkir et al (2004) found that about 40% of the households under study have never tried the use of DAP fertilizer and 15% had used it but for some reasons had discontinued and only 3.5 % re-started. Currently, close to 44% of the households are using DAP fertilizer. In similar vein, about 47% of the households never used urea fertilizer and 14% of them had used but discontinued and only 1.7 % restarted using it. The same study also indicated that the range of adopting rates between the zones within the region is partly a

reflection of the agro-ecological difference and the farming system they gave rise to given the current state of the art of production.

There are various reasons for the non-adoption of technology as perceived from the respondents. High price of inputs and shortage of complementary inputs were the major constraint for adoption of both fertilizers –seed technologies (45%). risks associated with climatic factor are also held responsible as one of the adoption problems (Tenkir et al, 2004)

Previous studies also estimated that improved seeds meet only about 7% of the seed requirement, which is definitely low (Amaha, 1999) and the proportion of households in the 1995/96 who bought improved seeds was 2.3 %(MoLSA, 1997). The same study pointed out that the use of improved seeds is influenced by price, access to credit, fertilizer use, economic status of the households, chemical use, visit of extension agents and infrastructure development. The overall law rate of use of improved seeds corroborates previous estimate that 85 %of the Ethiopian farmers are believed to depending up on seeds of local cultivars (Tafesse, 2002). The reasons for largely depending on own saved seeds could be that the farmer does not have to pay cash for it nor travel to procure it, that the farmer may not have well organizes supply system for the particular seeds.

CHAPTER FOUR: DESCRIPTION OF THE STUDY AREA

The Tigray National State is found in the northern part of Ethiopia. Geographically, it is located between 12°15' -14°49' North latitude and 36°27'- 40°00' East longitude (Peter et al, 2000). The region covers an area of 80,000 sq. km and has a total population of 3.8 million, out of which 51% is with in the age range of 15-64(productive age group). 85% of the population lives in rural areas (Tigray region BOFED, 2005).

Altitude of the region ranges from 500 to 3935 meters above sea level to result for 11% Dega (high land), 40.5% woynadega (temperate) and 48% kola (low land) agro-ecologically. The average annual rainfall is between 650-980 mm (Tigray region BOFED, 2005).

In addition to Mekelle, the regional capital, there are five administrative zones: Western; Northwestern, Central; Eastern and Southern; comprising a total of 47 Woreda and 660 *tabias* .Each Tabia consists of small villages called *kushets* (REST, 2003).

Rayaazebo Woreda: Location

Rayaazebo, which covers an area of 181,987 hectare, is located in the southern part of Tigray. Endamhoni Woreda bound it in the West, Alamata Woreda in the South, Ofla Woreda in the West and Afar region in East, Alaje in north, Hintalo Wejerat in Northeast direction. Mohoni town is the center of the woreda administration where as Chercher town is the second town in the woreda.

The geographical location of the woreda is between 12 °18'15" second and 12° 38' 15"latitude and39 ° 14'30" and 39 ° 43'00"longitude.

Climate

The annual mean rainfall of Mohoni is 488 mm that of chercher 620. It has a bimodal but erratic and poor distribution of rainfall pattern. The belg rain occurs during the month February to April, and the other rain season occurs from July to early September.

Land use and land holding

The land use pattern of the woreda shows that 36,577ha (20.1%) of land belongs to cultivated land, 5774(3.2%) grazing land, 133537 ha (73.4%) forest land 6099(3.3%) ha miscellaneous.

In related to land holding size, the data obtained from national state of Tigray integrated food security program indicates that the landing holding size of the woreda is 1.05 hectare which is greater than the southern zone(.985ha) and the regional average (0.88ha)(IFSP,1998).

Vegetation

The dominant vegetation found in low land (altitude approximately range between 1400-1500 in most following the water way or seasonally flooded area in the low land) including acacia, seyal, acacia fortillis,balanite egypticazizyphus etc.

The areas with altitude below 2000 m a.s.l constitute a zone of particularly deciduous wooded grassland and range bush land. The dominant species include acacia spp, zizyphus spp, balanites eqyptica, euclea shimmer.

This zone also consists of a substantial area predominantly covered by cactus and scattered shrubs of India puerperal (shilen) on north hills bordering to flat arable land of the woreda.

Range bush land in this woreda usually occurs in the lower parts of the particularly deciduous wooded grassland and range bush land category of vegetation.

Livestock

Two type of cattle are found in the woreda:the Raya or mammary and Arado cattle. The Raya cattle which are usually found in the mid and low land area of the woreda possess long horns and legs with small to medium body size and color of the skin ranging from brownish and grayish to black dotted whitish.

In the high land part, the Aroda cattle are found. They have short horns, small and compact body size and color of their skin their ranges from complete black or brown to mixture of black, white and gray.

These two type /breeds of cattle provide most of the drought required for cultivation and product milk and meat for consumption and sale .These cattle are well adapted to the area particularly to the low level of nutrition that prevails almost through out the year.

Administration

Rayaazebo Woreda has been divided in to 15 Peasant associations (locally known as *tabias*) and 60 Sub Peasant associations (also known as *Kushets*) for administrative purposes.

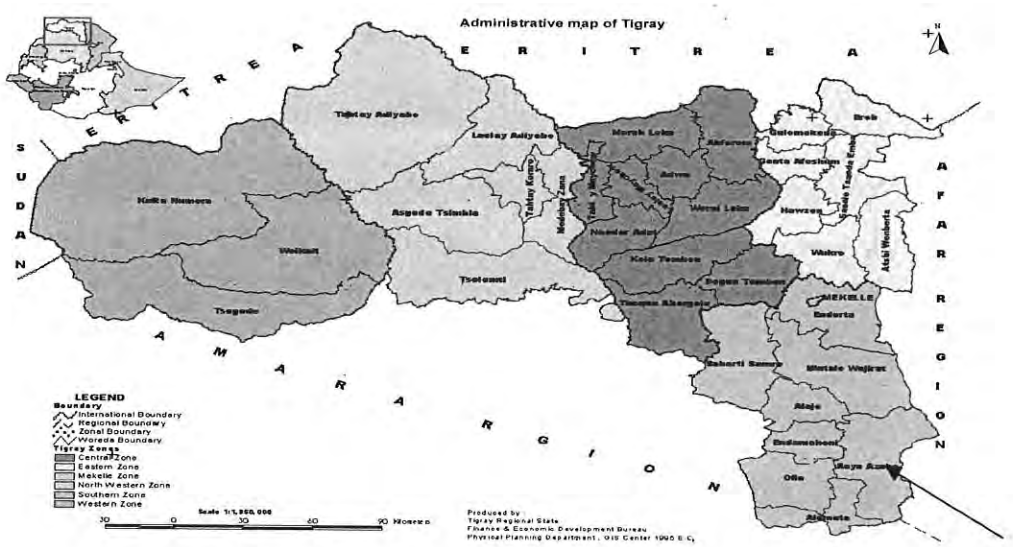

Figure 1 Location of Rayaazebo Woreda in the administrative map of Tigray Region

Source: Tigray Region BOFED, 2000

Demographic characteristics

Table 2 Projected Population Size of Rural Rayaazebo Woreda by 5 year Age Group, Sex; Medium Variant: 1 July 2006

Population of Rayaazebo			
Age	Total	Male	Female
0-4	19821	9906	9915
5-9	17827	8907	8920
10-14	14487	7331	7156
15-19	12692	6424	6268
20-24	10941	5494	5447
25-29	9128	4514	4614
30-34	7240	3469	3771
35-39	5830	2719	3111
40-44	4629	2089	2540
45-49	3816	1703	2113
50-54	3269	1498	1771
55-59	2758	1287	1471
60-64	2276	1083	1193
65-69	1759	841	918
70-74	1240	588	652
75-79	745	350	395
80+	476	231	245
Total	118934	58434	60500

Source: Tigray region BOFED, 2006

Based on the population and housing census of 1994, the population size of the Woreda projected in 2006 was 118931. From this size, 60498 are females and 58433 are males. 52.6 % of the population is found in the age range of 15-64 (the productive age group) with 43.8% young age of less than 15 years of age as cited in the table below. This shows there is high level of dependency ratio as is true in the case of the country. In addition, the large share of the bottom age of the figure indicates there is higher fertility rate in the Woreda.

CHAPTER FIVE: FINDING AND ANALYSIS

5.1 Demographic and Socio-Economic Character of Sampled Households

Demographic and socio-economic characteristics of sample households have direct implications on the agricultural technology adoption. Accordingly, data was collected with regard to age, family size, educational status, land-holding size and livestock ownership. Table 3 presents the family size, martial status and sex sample households.

Table 3 Background Characteristics heads of the sample households

Feature	Frequency	Percent
Sex		
Male	133	82.6
Female	28	17.4
Tot al	161	100
Martial status		
Married	122	75.8
Single	10	6.2
Divorced	19	11.8
Widow	10	6.2
Total	161	100
Household size		
2-4	50	31.1
5-6	66	40.9
7-9	41	25.5
>9	4	2.5
Total	161	100

Source: own survey data

Household size is related to a household technology adoption as it determines the labor availability for the productive activities in the household. Arene (1994) reported a positive and significant relationship between family size and adoption. The household size of the sample households shows variation. The majority of sample households (40.9%) has 5-6 families and followed by those with 2-4 families (31.1%). The minimum households' size is 2 and the maximum is 10. The average family size of the sample of the households is 5.5

In terms of sex, 82.6 % of households were male headed where as 17.4% were female headed households

More than three-quarter of the respondents of the households are found to be married. As indicated in the table one, from the total sample households, 6.2 % single, 11.8% divorced, and 3.8% are widowed

Age of the respondents

A household's age structure is an indication of the presence of productive age group in the households. Households with young age group are expected to have better productivity providing that they have assets like land, capital and oxen.

Table 4 Percentage distribution of sample house household heads by age

Age distribution	frequency	percent
20-24	2	1
25-29	8	5
30-34	16	10
35-39	24	15
40-44	34	22
45-49	32	20
50-54	14	7
55-59	14	9
>60	17	11
Total	161	100

Source: own survey data

. In terms of age, the sample households show difference age in groups. From the total sample, household respondents indicated in table 4, 73 % of the households found in the 20-49 age groups. Where as 11 % and 9% of the sample respondents also found above 60 ages and found between in the range 55-59 age groups respectively. The age pattern of

sample households indicates that there is no household whose age is below 20 years.

Education

Education plays in the adoption of new technology in a given locality. Education enhances one's ability to receive, decode, and understand information. Educated people make good innovators, so that education speeds the process of technological diffusion. Rubas points out that though imperfect information causes new technologies to be risky, better-educated people are better prepared to manage the risk (Rubas, 2004).

Table 5 Percentage distribution of sample households heads by education status.

Education	Frequency	Percent
Illiterate	92	57.1
Read and write	61	37.9
Church school	8	5.00
Total	161	100

Source: own survey data

At the time of survey, sample households heads were asked to state their educational attainment. The survey findings indicate that the level of educational attainment of households is very low and this may have a direct impact on the level of awareness of households with respect to improved farming activities. As presented in Table 5, a large number of households (57.1%) were found to be illiterate while 37.9% have no participated on formal education at all.

Land holding

Land is the critical resource needed for adopting new technology. However, the land holding size of the majority of the sample households is survey diminished due to population density. In table 6 indicated that more than 62 % of the farming households cultivate less than one hectare. Those having less than half hectare also constitute 30.4% of the sample households. The average size of holding for all sample households is just over a hectare.

Table 6 Percentage distribution of land holding size of sample households

Land holding (ha)	Number of households	Percentage
< 0.5-0	49	30.4
0.51-1.00	51	31.7
1.01-1.50	28	17.4
1.51-2.00	21	13
2.01-2.50	5	3.1
2.51+	7	4.4
Average farm size	1.11	

Source: own survey data

Livestock owner ship

Livestock ownership is one of the most important forms of asset and factors for adoption a particular technology in the farming systems of smallholder agriculture. Beside traction, livestock service as sources of major asset holdings and a means of food security. Livestock is also the only the available wealth of the farm households. It has several advantage and uses such as a source of food, organic fertilizer and cash required in the meet various needs and as a hedge against possible future risks.

Table 7 Percentage distribution of livestock holdings of sample households heads

Number of livestock	Number of households	Percent
Have no	16	9.9
1-4	49	30.4
5-8	47	29.2
9-13	21	13.1
14-18	23	14.3
>19	5	3.1
Average livestock holding	7.1	

Source: own survey data

About 10 % of the sample households do not have any livestock. About 29 % of the samples respondents have between the ranges of 5 to 8 livestocks .Where as 17.4 % of the respondents had above 14. According the data obtained from the survey, the average livestock holdings of sample households in the study area is 7.1

5.2. Attitude of Farmers to Agricultural Extension

5.2.1 Attitude of Farmers towards Extension Agents

The majority of the respondents had negative attitudes towards the extension agents. In table 8, it is shown that about 67 % of respondents are not satisfied from the services given by development agents in the study area. A farmer from Abo *tabia* explained that the performance of development agents has increased from time to time. Development agents have given more training and it helps them to enhance their capacity. However, the service deliveries given by development agents are still not satisfactory. A farmer from Mechare tabia explained that development agents have adequate knowledge, but their service could not meet the interest of farmers. The focus group has also explained that most of the time the development agents do not give service at the right time. They do not tell for farmers' appropriate time to when plough, harvest, weed, plant

and water whereas, of the total farmers, 32.1 % reported that they are satisfied with the services given by development agents.

Table 8 Attitude of farmers to extension agents

items to test	Response of farmers			
	agree		disagre	
	N	%	N	%
Service given by development agents are satisfactory	53	32.9	108	67.1
Development agents have weak technical capacity to demonstrate agricultural packages	82	50.9	79	49.1
Accountability of extension agents has not been to far	110	68.3	51	31.7
Farmers receive quality of extension service at a right time	61	37.9	100	62.1

Source: own survey, 2007

About 51 % of the respondents have stated that development agents have weak technical capacity to demonstrate agricultural package. Whereas 49 % of the respondents said that development agents have technical capacity to demonstrate agricultural package. Generally, more than half of the respondents have given less weight to the capacity of development agents in the demonstration of agricultural package. In this regard, Belay and Degnet (2004) said that development agents have weak capacities to demonstrate technological packages and offer adequate technical assistance to farmers

Two third of the sample household farmers have stated that the accountability of extension agents is not to the farmers rather, it is to the officials. The basic requirement for development agent is a commitment to serve farmers in their capacities. Farmers in Genete *tabia* expressed concerns at their being unable to hold development agents accountable: they said we need extension advice on weekends but development agents are not often available and willing to advise us. They are criticized ever time by farmers but they do not take

corrective measures. 'So we do no have good attitude for extension agents working in our *tabia*'.

5.2.2 Farmers' Attitude towards Agricultural Technology

The sample (55.3 %) has responded that both development agents and research organization do not encourage them in the evaluation of the performance of the technology.

As indicated in the table 9, 55.9 % of the respondents reported that the transfer of technology to the community's did not base on the society knowledge and interest. Improved technology packages have not been adequately tested locally before they are promoted on large scale. This makes farmers and development agents lose confidence in the effectiveness of new inputs under local conditions (Mamusha and Hoffmann, 2005). A focus group discussion revealed that most of the transfers of technology to the community are more technical and sophisticated. Farmers do not easily understand their importance and recommendation levels. Most of the coming technologies do not base on the farmers' knowledge. An informant has indicated that the recommended technology coming to his locality was not compatible to the environment. For example, the government, according to this informant, promotes the practice of adopting fertilizer and water harvesting pond. However, the promotion does not take the farmers' interest and knowledge in to account. Most of the farmers, he observes, have no trust on the new technology.

Table 9 Attitude of farmers to agricultural technology

items to test	Responses of farmers			
	agree		Disagree	
	N	%	N	%
Farmers have benefited much from agricultural technology	57	35.4	103	64.6
Technologies increased production	86	53.4	75	46.6
Agricultural technological have not been adequately tested locally	92	57.1	69	42.9
Evaluation of performance of technology in demonstration site do not encourage farmers	89	55.3	72	44.7
Transfer of technology do not base community knowledge	90	55.9	71	44.1

Source: own survey, 2007

5.3.3 How Do Farmers Perceive Extension Program

The extension program in the study area shows that rigid and top down approach. Two third of the respondent indicated that the existing extension system are top down approach and rigid. The extension package program has been implemented a top-down approach base on a quota system. Despite much resistance, development agents forced farmers to join the extension program (Mamusha and Hoffmann, 2005). Whereas, about 70 % of the respondents indicated that the extension system do not promote demand driven system. Ethiopian agricultural research system could not be as effective as expected for it has not been demand driven and not able to solve the complex problems of the agricultural sector (Berhanu,2006)

of low lands. Thus 86.3 percent of the households responded that they did not use the chemical fertilizer during the past two years.

Reasons of farmers for applying chemical fertilizer

A bout 14 percent of the households responded that they have accepted and continued in the application of fertilizer. Among the users of chemical fertilizer, all respondents have believed that using fertilizer increases production. They are participating voluntarily. A study conducted in Tigray region on irrigation practice, state intervention in farmer's world life in drought prone Tigray indicated that farmers are forced to purchase fertilizer by the development agents and *tabia* administration (Woldeab, 2003). However, in study area reported that none of the respondents replied that they had been forced to use chemical fertilize. The head of extension department of the woreda said that few farmers are using chemical fertilizer voluntarily because there is no imposition on farmers to use chemical fertilizer. In stead, they are promoted to use the organic fertilizer. The focus group discussion explained that there were imposition farmers to purchase fertilizer before five years. However, after three or four years farmers are not forced to apply chemical fertilizer. As the result, the users of chemical fertilizer are very limited.

The qualitative interviews revealed that fertilizers increase the productivity of the land and give high yields per hectare. This is explained very clearly in the stories told by one the users in the study area:

> *Since 2000, I have been a user of fertilizer. Fertilizer indeed has increased the productivity of the land. For example, before 2000 I did not use fertilizer. The production of teff was not more than four qts per hectare. However, after I applied fertilizer the production of teff has increased from four to eight qts per hectare. I could not support my consumption. Now I can supply crop to the market. This has changed my life.*

In addition, another has asserted as follows:

> *I am a user of fertilizer since 1996 E.C. Fertilizer has increased the agricultural productivity and has enhanced the yields. I had eight qts of sorghum per hectare before I used fertilizer. However, after I applied fertilizer in my plot land, the yield of sorghum has increased to 16 qts per hectare.*

Although the majority of fertilizer users are applying fertilizer based on the blanket recommendation, still some respondents are applying chemical fertilizer below the blanket recommendation. Among the users of chemical fertilizer, 68.2% of the respondents indicated that they have used chemical fertilizer based on the blanket recommendation given by the extension agents where as, 31.8% of the sample farmers did not apply chemical fertilizer in their plot land based on the blanket recommendation. Farmers have given many reasons why they modify the application of fertilizer in their plot lands. The major reasons described by the respondents are lack of capacity to purchase (14.3 %), limited supply of fertilizer (71.3%) and delayance in supplying the fertilizer to the farmers (14.3%).

Table 11 Reasons why farmers did not apply chemical fertilizer based on the recommended rate

Reasons	Frequency	Percent
Lack of capacity	1	14.3
Limited supply/No supply	5	71.4
Due to delay	1	14.3
Total	7	100

Source: own survey, 2007

The focus group discussion also ascertains the above finding. They explained that within three or four years there was no fertilizer supply in the woreda. Because, voluntary user of chemical fertilizer farmers were either forced to use chemical fertilizer below the recommended level or mixed with the organic fertilizer. The storekeeper who was a

development agent of agricultural inputs in Rayaazebo woreda also indicated that there was no fertilizer supply for the last three years in the woreda. Even few farmers who have irrigated land, have interest to use, and could not apply due to absence supply of fertilizer. The researcher also observed this problem.

To ascertain the above responses, one of the informants has suggested that the absence of supplying fertilizer to agriculture and rural development office, has forced them to use below the blanket recommendation. Following is the evidence taken from one of the informants:

> *The major problems we have faced in fertilizers are the high price and absence of fertilizer supply in the woreda. Before 2003, fertilizer was supplied by agriculture and rural development. The price of the fertilizer was slightly affordable. After 2003, agriculture office in the woreda did not supply any fertilizer. I was forced to buy fertilizer from other neighboring woreda. The price is very high. Therefore, I have decided to use chemical fertilizer below the recommended rate.*

From the above life history of elder informants, it might be concluded that most of the fertilizers users are applying fertilizer because they believed that it increases the productivity of land and enhance their production. However, the absence of fertilizer supply in the study area discouraged them to apply chemical fertilizer based on blanket recommendation.

Reasons of farmers for not applying chemical fertilizer

Chemical fertilizer is one input that farmers are supposed to apply in order to increase the agricultural productivity .However, 86.3 % of household respondents in the study area have rejected to use chemical fertilizer. They had different reasons why they did not use fertilizer in their farmland.

Table 12 Reasons why farmers rejected fertilizer application

Reasons	Frequency	Percent
Not profitable	4	2.9
Expensive	16	11.5
Lack of cash	27	19.4
High repayment	9	6.5
Not available	10	7.2
Shortage of rain fall	73	52.5
Total	139	100

Source: own survey, 2007

As indicated table 12, 52.5% of the respondents reported unreliable and erratic rainfalls are the major reasons for not applying chemical fertilizers. 11.5 % of the respondents have stopped using fertilizer because they could not afford the fertilizer and the price of fertilizer is expensive. 19.4 % of them have not used fertilizer because they had not money to purchase fertilizer. Still 2.9 %of the respondents have claimed that using fertilizer was not profitable. Still others 6.5%have refused to use fertilizer because it required them to make high repayment. Yet others (7.2%) have asserted that fertilizer was not available in the market. From this analysis, it could be said that fertilizer was not applied in study area, as the majority (52.5%) have asserted. Because there is moisture stress and the presence of shortage rain fall. The focus group discussion indicated that almost no farmers apply chemical fertilizer because there is shortage of rainfall, erratic nature of the rain and lack of cash to purchase as well as the expensiveness of the fertilizer. The presence of frequent drought in the woreda, applying fertilizer aggravated crops to dry. To support the above finding in Rayaazebo woreda, different studies in drought prone area also indicated that due to shortage of rainfall and erratic, unreliable most farmers did not apply fertilizer. For example, in areas with lower

agricultural potential due, for example, to low and uncertain rain fall, in Northern and Eastern Ethiopia, the potential for intensive production of food or cash crops using fertilizer is more limited, except where investment in irrigation enables farmers to over come soil moisture constraint (Ehui and Pender, 2003). In Tigray, substantial efforts have been made by the extension program to promote fertilizer and improved seeds have not been very profitable to farmer in rain fed areas (Pender, 2002a). Uncertainty of rainfall is a major risk especially in the dry land areas. It is also contributing to low adoption of fertilize and other inputs have contributed (Pender, 2001).

Another study conducted in Sub Saharan drought prone areas also found that few farmers use chemical fertilizer. Fertilizer will remain a high cost item for the African farmers. It is critical, therefore, that farmers are able to get most out of whatever fertilizer they are able to purchase (Black, 2005)

Different informants describe that fertilizer has high risk. They argue that fertilizer use in moisture stress and erratic rainfall increases the risk of production because the area is highly exposed for shortage of rainfall. In addition, the price of fertilizer is considered as a problem. Following is the evidence taken from one of the informants in Genete tabia:

> *Halofom Maridie, who is 58, married with 5 children. He had no the skill to read and write. He did not apply fertilizer because his plot is found in moisture stress area and because the price of fertilizer is high. He says that Fertilizer helps crop to grow at fast rate if there is a good rainfall. However, his local area has shortage of rainfall. He also says that the crop dries when applying a fertilizer. Even during drought, the crops give a good yield if fertilizers are not applied. .*

Another informant explained why he did not use chemical fertilizer. He stated that as follows:

I am not applying fertilizer on my plot of land. The price of the fertilizer is very high. There is no supply in the woreda. Two or three of my neighbors apply fertilizer because they have it from other farmers who live in other woreda. The other problem why I did not apply fertilizers is the presence of moisture stress in my locality. Crops do not give any yields in drought time if Fertilizers are used. However, you can get yields even in drought period if you are not applying fertilizer. Therefore, I prefer to use lands with out fertilizer application: (A case story of head households from Tsiga Wargiba tabia)

Farmers do not apply fertilizer in their farm plots. Because, they claimed that fertilizer are aggravating crops to dry. Having shortage and erratic rainfall in the region, farmers do not apply fertilizer. The other problem raised is the expensiveness. However, before the last four years, farmers were forced to purchase and apply fertilizer in their farmlands. Local administrators and development agents coercively persuaded farmers to apply chemical fertilizer. Farmers accepted to apply chemical fertilizer due to fear of being labeled as anti development and ignored from any development activities like food for work. However, the result was not promising. They struggled to reject applying fertilizer every time because they believed that fertilizer could cause the crop to dry when there is shortage of rainfall.

Surafiel explained the past and the present situation on the fertilizer. He was a user of fertilizer before 2002.He stated that, the development agents and *tabia* leader forced him to purchase fertilizer. He purchased fertilizer because he felt they would cancel him from food for work and participating in income generating activities. He explained that there was a shortage of rain in the region. During this time, applying fertilizer caused him to lose his crops. His crops grew fast and dried soon. He said that though the development Agents knew the negative impact of the fertilizer they refused our ideas for the mere reason that the program was from the government. They even imposed on us to take

additional fertilizer. After making a consistent appeal, we were able to convince the regional and local governments. Since 2001/2002, both Local government and Regional government have accepted our appeal. Since then there is no imposition either by development agents or from *tabia* leader. Now he is not a fertilizer user.

DA currently is working as extension development agent in one of the study *tabia* for 9 years. He explained the situation why farmers did not use fertilizer for the past years. He stated that, farmers used fertilizer before ten years in our *tabia*. He said that they did not voluntarily take fertilizer by that time. He also added that farmers were imposed to purchase fertilizer. Woreda agricultural office gave development agents quota system to distribute fertilizer for farmers. Farmers did not voluntary take fertilizer. They did not accept. Development agents were forced farmers to take fertilizer and apply in their farmland. Because their performance measured based on the amount fertilizer of distributed. To achieve this, farmers were forced to purchase fertilizer. However, woreda administration prepared a conference on the importance fertilizer in the woreda. The farmers gave their ideas why did not use on the conference. Among the major reasons raised by the farmers were due to the presence of short rainfall, recurrent drought and erratic rainfall negatively affect to use fertilizer. The woreda administration and regional government accepted the farmers' ideas. From this day, except those who have irrigated land, majority of farmers did not use fertilizer. Not only is this, at woreda level there no fertilizer supply.

It could be said that farmers were forced to purchase fertilizer with out their interest. Now majority of farmers do not use chemical fertilizer instead they are using the organic fertilizer.

5.3.2 Farmer's Response to Improved Seeds

As indicated in table 13, about 62 percent of sampled household respondents indicated that they are using their local seeds in the study area. About 29% of the respondents reported that they are using improved seeds in Rayaazebo. Another 9.3 % of respondents used both local and improved seeds. Previous study at country level also indicated that three-quarter of the participating households were found to use local seeds (EEA, 2006).

Farmers in Rayaazebo woreda use different seeds for planting such as local seeds and improved seeds .The major source of the users of their local seeds is from their own saved seeds from the previous harvesting times where as the user of improved seeds are getting improved seeds from the agriculture and development office.

Table 13 Responses of farmers to the kinds of seeds used

Kinds of seeds	Farmers response to the type of seeds	
	Frequency	Percent
Local seeds	100	62.1
Improved seeds	46	28.6
Mixed improved seeds and local seeds	15	9.3
Total	161	100

Source: own survey, 2007

Reasons of farmers for using improved seeds

In Rayaazebo woreda, sample household respondents gave their reasons why they are using improved seeds. Out of the users of improved seeds, 67.4 % said that they have used improved seeds because they believe these seeds give more production than the seeds they used before. Yet

about 17% of the users of improved seeds stated that they have used improved seeds because they are forced to use improved seeds by the government agents. Others of the subjects have said that they have used improved seeds in order to be employed in different development activities in their *tabia*. Besides, they get aids if they use these seeds.

Table 14 Response of farmers why they accept to apply improved seeds

Why farmers accept	Frequency	Percent
Government forced me	8	17.4
Give more production	31	67.4
To participate in food for work and to participate in different development activities	6	13
Fear from labeling anti development	1	2.2
Total	46	100

Source: own survey, 2007

I have discussed why farmers are using improved seeds. I would attempt to describe and analysis based on the qualitative data why farmers use improved seeds.

Improved seeds have high demanded at market, drought resistant and give high yields. The following information taken from one of the informants can further support this notion:

> *Most of the time I used CR- 37 improved teff. Some time I used chick beans. My locality is characterized by high moisture stress and unreliable rainfall. I get a good yield when there is shortage and unreliable rainfall. This encourages me to use improved seeds. However, the local seeds need surplus rainfall and it takes long time to harvest. It is dry when the rain becomes short and erratic. Due to shortage and unreliable rainfall in the local area, I use improved seeds. In addition to this, the demand of the improved seeds in the market is very high. For example, the price of*

improved teff is 600 birr per qt whereas the price of local teff is 400 birr per qt. As the result, my income is increased.

Similarly, another informant has stated this as follows:

I had a great harvest. These improved seeds are one hundred times better than the local seeds. Improved seeds resist drought. I know that my neighbors had lost past year's crops due to drought. However, I was able to harvest when everyone else has lost crops. That is because of I used improved seeds. The price of improved seed in the market is also high. It is highly demanded at market

In the above case study indicated that improved seeds give high yields even when there is shortage of rainfall. It is also demanded and the prices of improved seeds in the markets are very high. As the result, users of farmers might change their lives. A chairperson of one tabia also supports the above case studies. He describe that farmers are using improved seeds based on their interests. They believed that using improved seeds could increase their production. It is also improved seeds are market demanded. However, in the focus group discussion found that the delivered improved seeds to the farmer are not productive and do not disease resistance. However, most of improved seeds users are using either they are forced to use by development agents or to get food aid or to participate in food for work. The researcher observed that the price of the improved teff has high demanded and it sold at higher price than the local variety teff in the center of the woreda. From these analyses, it could be said that the majority of the respondents have said these improved seeds could increase their production and improve their life condition.

Reasons why they use below recommended rate

Despite lower than blanket recommendation derived from the questionnaire, most respondents in table 12 indicated that they use the recommended level of seed rate. About 39%, 9 %and 7% of the

households in Mechare, Genete and Abo reported to have used the recommended level of seeds rate where as 33.3 % of the households in Genete tabia indicated to have used below the recommended rate

Table 15 Application of improved seeds recommended levels

Tabia	Number	Less than (%)	The same (%)
Mechare	22	8.7	39.1
Abo	5	2.2	8.7
Genete	19	32.6	8.7
Total	46	43.5	56.5

Source: own survey, 2007

Farm households have various reasons for sub optimal application of improved seeds. Most reasons provided by respondents are economic. In table 16 indicated that in the entire sample tabias, 60 % of the respondents indicated that lack of cash to purchase was their reason for use below blanket recommendation of improved seeds. About 25 % of the respondents have pointed out that the limited supply of improved seeds in the area has become a challenge. Delay to the supply this improved seed has contributed to the problems. Because of these, farmers were forced to use a mixture of local seeds and improved seeds. Thus, the use of improved seed was highly modified by farmers using a mixture of local seeds and improved seed due to the latter's high price. They could not afford buying seed each year.

Table 16 Response of farmers use below recommended levels

Reasons	Response of farmers	
	frequency	percent
Lack of capacity	12	60
Limited supply	5	25
Delay	3	15
Total	20	100

Source: own survey, 2007

Reasons of farmers for not use improved seeds

Some farmhouse holds respondents reported that improved seeds increase production. As shown in table 17, however, 62 % of the household respondents indicated that due to various reasons they did not use improved seeds in study areas. From the non-user of improved seeds, 60% of the respondents did not use improved seeds because they did not get in yields difference. The other reasons contributed to non-adoption of improved seeds in the study area: poor quality (3%), high price (24%) vulnerable to disease and climate not suitable(11%). The principal factors for the rejection of improved seeds are: no yield difference between local variety and improved seeds, and high price of improved seeds. The focus group explained that most of the improved seeds have low quality and the yields gained from improved seeds are more or less the same as the local variety. They argued that some times the improved seeds do not germinate and it is easily attacked by disease. Development agent also expressed that more than 50 % of the farmers use the local variety teff. According to him most of the farmers claim that the local teff price is relatively cheaper; it is more drought resistance than the improved seeds. A study indicated that the quality of improved seeds offered for sales has been inferior and sometimes less than farmers own seeds physical and physiological quality (Getnet et al, undated)

Table 17 Reasons why farmers do not use improved seeds

Reasons	Frequency	Percent
Not different from local variety	60	60
Poor quality	3	3
High price	24	24
Vulnerable to disease	1	1.2
Climate not suitable	11	11
Not germinated	1	1
Total	100	100

Source: own survey, 2007

One informant described why he did not apply improved seed.

> *I am not a user of improved seeds. The prices of improved seeds are very expensive. I do not have a capacity to purchase. Not only this, improved seeds are highly suspected for disease and it needs more care and protection. As town boy needs more care in his growth, improved seeds also need more care .This incur additional cost to protect from disease. Even the yields gains from improved seeds are not satisfactory.*

It might be said that most of farmers do not use improved seeds for different reasons. The major reasons raised are price of the improved seeds, quality as well the yields given less or the same with that of local seeds.

Problems Associated with improved seeds supply

Regarding the problems associated with improved seeds, majority of the respondent reported multiple problems. About 27 percent, 42 percent and 11 percent of households reported the problems are lack of competitive suppliers; availability of variety does not meet the farmer preference, low quality seeds respectively.

Table 18 Major problems in the supply of improved seeds

problems	frequency	percent
Lack of competitive	7	27
Availability of variety does not meet the farmer preference	11	42.4
Low quality	7	19.2
Delay of delivery	3	11.4
Total	28	100

Source: own survey, 2007

Abadi Tigabu is the chairperson of tabia Hada Aliga. He explained that improved seeds have been more demanded than previous time. However, the supplies of improved seeds are more limited because there

is only one supply of improved seeds in the woreda. Because of this, farmers do not get improved seeds on time and their preference. The delivery of improved seeds is also another problem. Most of the time improved seeds reached to the farmers more delay. Farmers do not get improved seeds at right time. Hence, farmers have the chance to consume the improved seeds rather sow to in their land.

5.3.3 Farmer Response to Water Harvesting

Large-scale dam and irrigation projects have not been widely implemented in Ethiopia as they have proved to be expensive and demanding in construction and maintenance. Therefore, water-harvesting ponds at village or household levels are proposed as practical and effective alternative to improve the life of rural people. Household water harvesting can be done mainly through the effort of the individual farmers. Use of stored rainwater could supplement natural rainfall and make families less vulnerable to drought (Rome, 2003).

More than 75% of the population of Tigray is food insecure and seriously threatened by droughts, which hit the region every 3-4 years. Major climatic limitations for agricultural production are erratic rainfall, often combined with intermittent dry spells that regularly threaten the survival of crops (Rami, 2003).

According to the Tigray Bureau of Water Resources, variability of annual rainfall is high with 20%-40%. Like in most other regions, the amount of rainfall is not the main problem; but collection and storage is.

In order to reduce dependency on large amounts of assistance, the regional government had set itself to reduce 88% of the food deficit for the last three years. It is formulated a "Rural development strategy plan" based on water, agriculture and cooperatives. Water harvesting with ponds and ground water extraction by shallow wells is one of its main

components, which is intended to increase agricultural production during relatively good times and secure crop production during drier years (Rami, 2003). To achieve the regional policy, the Rayaazebo woreda has introduced the water harvesting since 2002/2003. The use of water harvesting has been widely promoted.

The major sources of irrigation in the study area are river diversion (9.94%), water harvesting ponds (61.49%) and well dugs (2.48%). The majority of the household respondents constructed water-harvesting schemes in all tabias. While significant numbers of respondent adopted the river diversion.

Table 19 Percentage distribution of water harvesting in the sample tabia

Source of irrigation	Frequency	Percent
River diversion	16	9.94
Water harvesting pond	99	61.49
Well dug	4	2.48
No participant	42	26.09
total	161	100

Source: own survey data, 2007

Due to the emphasis, that government gave to water harvesting, about 61.49 percent of the respondents reported to have been engaged in water harvesting activities for the last two years.

From the user of water harvesting respondent, more than 98% of household respondents reported that they adopted or engaged pond while 2 % of households also adopted roof water harvesting in the study area. Most of the people are well experienced on traditional ponds, which are used for people and mostly for animals.

Table 20 Percentage of sample household response to the constructed pond structure

Tabia	Number	Yes	No
Mechare	39	13.3	26.27
Genete	35	20.2	15.15
Abo	25	11.11	14.14
Total	99	47.47	52.53

Source: own survey, 2007

However, most of the constructed ponds do not hold water or they are out of functions in the study area. As indicated in table 20 that more than half of the households who constructed water harvesting pond replied that the pond could not hold water. Whereas about 47 % of households responded that, the pond somehow held water. However, a study conducted by the Ethiopian Economic Association indicated that 57% of the respondents responded that the pond could some how hold water (EEA, 2006). The major responsible factors contributing to ineffectiveness of the pond to hold water are problem in site selection, design and leakage. Earlier evaluation of water harvesting in Tigray, Amahara, and Oromia showed that the problems of design, shortage of construction materials, leakage and siltation (UNDP/OCHA, 2003). Focus group discussion revealed that most of the pond did not hold water even in good rainfall. According to these focus groups, ponds were constructed in inaccessible areas (out of the catchments areas and at the center of farmland).

Supporting the above argument, a development agents working in Genete tabia also explained that most of the ponds failed .Even though most of farmers have constructed ponds; most of the ponds do not hold water even in good rain seasons because ponds constructed inaccessible area, they have a design problems and stolen of plastic. It could be said that the failure of ponds to hold water in the study area show that farmers do not participate voluntarily in planning and implementation.

They constructed the ponds either they are forced by government agents or to get aids and to participate in food for work. However, few farmers have been successful in using the ponds and they change their life condition after the intervention.

The majority of the respondents have been practicing water harvesting due to different reasons. The major reason has to do with increased production, participation in food for work, government imposition and fear from being labeled anti development.

About 24.3 percent of household respondents reported that they adopted harvesting water from ponds because these ponds helped them to increase their production. Yet others (10.1%) have pointed out that they have been imposed to construct ponds. The rest (63.6%) have constructed ponds because they had to participate in food for work program unless they constructed water pond, they cannot participate in the program.

Table 21 Reasons for the adoptions water harvesting technologies

Reasons why they adopted	Frequency	Percent
To increase production	24	24.3
To participate food for work	63	63.6
Government forced me to participate	10	10.1
Fear for labeling to antidevelopment	2	2
Total	99	100

Source: own survey, 2007

It might be explained that the majority of the farmers constructed water-harvesting ponds directly or indirectly by the imposition of government agents.

The use of water harvesting has been widely promoted in Rayaazebo woreda since 1995 E.c. Despite skepticism and resistance from farmers, Development agents and local government officials aggressively promoted the ideas of constructing water-harvesting system in the area .Due to this strong promotion participant farmer have got their life changed. Their income has increased from time to time .One of the informants addressed this fact as follows:

> *I constructed water harvesting in 1995 E.C in my homestead farmland. I was not aware of the importance of water harvesting when the program was introduced. I refuse to accept. At first, I refused to practice it. However at last, I was forced to construct water-harvesting pond for the first time because the tabia administrator and the Development agents did not allow me to participate in food for work program. Even though I was forced to participate in constructing water-harvesting pond, the result has changed my life. Since then, I have cultivated different types of cash crops like cabbage, onion, tomato, gesho etc. They are highly demanded in the market and have a good price. I can cover my house expense. I did not sell cereal like teff at low price. Now I have two water harvesting pond in my farmland.*
>
> *However, wild animal damages plastics that cover my pond. Wild animals want to drink water go into to the pond. However, the membrane would be destroyed at the time of animals face difficulty to out from the pond. In addition to this, the geo membranes highly demanded in market. Unknown people take away from the pond. The pond would be left with barring. Finally the water infiltrate from the pond to the under ground.*

5.3.3.1 Pond Leaking and Land Loss

Pond leaking

Rayaazebo lies in the Raya valley, mostly flat area with a great irrigation potential, high productive and numerous traditional ponds. Despite this, it is observed that most of the ponds do not hold water. Reasons for the problems were site selection with lack of run off and leakages.

Different informants and development agents of *tabias* explained why the ponds are leaking. Most of the ponds do not hold water even in a good rainfall times because unknown people stole plastic lined ponds and expensive of cements. One of the informants addressed this fact as follows:

> *Halka Woldu, age 40, in Tsiga Warigba Tabia, grade 6, explained why ponds are leaking .I constructed a pond in 1996 E.C .The pond was constructed in cement and had a problem when I applied cement. The amount of cement I used was less. Due to this, the pond did not hold water. He also added that most of the ponds were constructed inaccessible area. They are found far away from the home. This creates lining plastic to be taken away by robbers and make the ponds to leak. Some people do not have the awareness on the importance of ponds. Of course, the prices of lining plastic are highly demanded in markets. This makes farmers take their lining plastic to their home and the pond will be left without cover. Finally, the collected water would leak. As the result, the adoption of water harvesting pond becomes less. However, farmers who have pond s in their home, get good benefit.*

In Bala Ulaga tabia, 600 ponds were constructed since 2002/2003. Only 20 ponds have line plastic cover. Most of the ponds do not have lining plastic because thieves took them. The ponds do not hold water because they leak. Now farmers were inclined to abandon using ponds. An extension agent from Bala Uluga tabia.

It might be said that the farmers who were involved in the program had no knowledge on the importance of the ponds. They had made those ponds for the sake of getting jobs and aids.

Land loss and resistance

Excavating material has consumed valuable arable land. The farmers obviously did not know what to do with it, piling it up on large heaps around the ponds.

A farmer, in *tabia* Abo, claimed that ponds have reduced the farmland. He explained his stories as follows:

> *In 2002, local people constructed pond in my plot farm to get food aid. I did not believe the importance of pond. It is difficult to believe to harvest crops by watering from this small pond. I resisted and tried to stop them constructing a pond in my plot of land. The tabia leaders forced me to allow them to construct a pond. My land is far from my residential area. The pond is not giving any function. However, the size of the farmland is reduced. The yields of the production also decrease due to pond construction.*

In addition, the chairperson from the selected *tabia* explained that many farmers did not allow constructing ponds in their land in 2002. People to get grain of wheat constructed ponds. They said that it is difficult to irrigated teff and sorghum having with small ponds. w´"w ²Ã}ÖhU"e wg"¢K hÉQ" "ØkU. Meaning a bucket of water from ponds cannot be sufficient to water crops. Rather it reduces our fertile land. Due to this, there was resistance from farmers. Another research also supported the ideas of the above that it has never been established to what extent the water harvesting ponds are able to increase food security during potentially bad times. They note that in a year with minimal rainfall, when water and food are most needed, the ponds intended for irrigation and backyard gardening will most likely dry up before harvest is made (Rami, 2003).

5.2.3.2 Coercive Persuasion and Distribution of Treadle Pump

Pressure still appears to exist on development agents to fulfill quota of farmers expected to purchase treadle pump and motor pump, since fulfillment of quotas is still a criterion in DA performance evaluation.

A development agent illustrates how he is forced to distribute treadle pump to farmers by coercive action:

> *Farmers do not accept water harvesting, especially ponds. However, the woreda agriculture and rural development office ordered us to distribute treadle pump and motor pump in our tabia. They convinced us that it is a government plan. They told us we had to take and distribute for farmers. They gave us in quota system. We are evaluated based on the numbers of treadle pump distribute to farmers. In the tabia, there are about 150-treadle pumps, which are not yet distributed to the farmers. Farmers do not take the treadle pump voluntarily. The woreda agriculture office gave additional 20-treadle pumps to the tabia in quota system. I tried to refuse the 20 additional treadle pumps. They argued it was a government program. Finally, I accepted to distribute the treadle pump because my performance could be measured base on the criteria. I tried to convince farmers to take the treadle pump and to use for their ponds so many times. However, farmers do not voluntary accept and use for their farmland. Finally, I imposed them to accept and to use the treadle pumps.*

In line of this argument, a farmer from Mechare tabia supports the ideas of the development agent. He explained that he took package credit to buy an ox, goats and a cow. The development agent rejected his proposal because he could not include the treadle pump in his proposal. The farmer was imposed to accept taking treadle pump in order to get credit. Although the farmer accepted to take treadle pump to get credit, the treadle pump has now with out function because the pond does not have water.

Getting farmers adopt technologies and improve their farming practices through their will power can obviously make them understand the importance of modern farming. However, coercion has been a common practice. Farmers are imposed to implement a program. This is evident in the study areas.

Reasons why farmers do not have ponds

Less significant portion of the respondents did not have to engage in water harvesting practice. Those households who did not engage in constructing water harvesting structure cited the following reasons: not profit (4.8%), the area is black cotton (4.8 %), makes vulnerable to eruption of disease (32.3%), no available land (35.5%), land is not convenient for water harvesting (19.4%), siltation (3.2 %).

Table 22 Percentage distributions of reasons for not have water-harvesting ponds

Reason why they rejected	Frequency	Percent
Not profit	3	4.8
The area is black cotton	3	4.8
Makes breeds disease	20	32.3
No land availability	22	35.5
Land is not convenient for water harvesting	12	19.4
Siltation	2	3.2
Total	62	100

Source: own survey, 2007

In the study area, I have made a discussion with a focus group on issues of constructing water-harvesting schemes. From the discussion, it was found out that farmers' feared malaria and other water born disease would break out. Unavailability of land has been considered as another factor, which has contributed to the failure of adopting new

practice of water harvesting schemes. One of the young respondents I have made a discussion who has stated this fact as follows:

> *I had rented a land since 1995 E.C. I had constructed water-harvesting pond. Using this system, I have cultivated different cash crops. My income had increased time to time. I was able to cover my household expense. I could also afford to buy improved seeds and to pay the loan. My life has really changed. However, the owner of the land has taken it from me in 1998 E.C. now I have no land. I have lost the all benefits I could get from water harvesting scheme due to this condition. This is due unavailability of land.*

The distance of a land is one of the factors, which could affect water-harvesting schemes. As reported by respondents, if the land is nearer one's residence, it is appropriate effectively to implement water-harvesting schemes. One of the respondents from Genete details as follows:

> *I do not have any pond. My land is far from my residence. I can manage all the farm activities that have to do with the pond easily if I have a land near by. A pond, most of the time, are used to cultivate vegetable and fruit. Moreover, to look after and water the vegetable and fruits, evenings and mornings are appropriate. My farmland is away from my home and it is difficult for me to cultivate cabbage, tomato and chat as my neighbors have been doing. My neighbors have a land near by, they are lucky. Through water harvesting system, they have increased their income and changed their living. I try many times to get land or to change my farmland to construct water pond. However, no one give me any response. Due to this, I do not use water-harvesting scheme.*

Limitations of water harvesting are identified in various parties of Ethiopia. For instance, Tedros et al (1999) cited in Daniel (2007) have revealed that in areas where altitudes less than 2000 masl, households living near to the stored water are faced with increased risk of malaria.

Even though construction of home-based water harvesting structure has been undertaken in campaign manner since 2002/2003, the expected results have not achieved. Development agents in Genete tabia indicated the following reasons why farmers do not construct water-harvesting schemes: ponds holds limited water and can not be watering for crops, increase the eruption of malaria, the stolen of the plastic , unavailability of land and distance of farm land .

5.4 Extension Service and Credit Service

5.4.1 Extension Service

Extension contact is an important instrument for dissemination of agricultural technologies. This facet is very important particularly when the technology is relatively hitherto unknown in specific locality. In the study area, government extension agents are the most important instruments in the dissemination of the technologies.

Table 23 Respondents' ways of contact with development agents

Ways of contact	Extension service			
	Extension user		Non extension user	
	N	%	N	%
Social gathering	18	11.2	17	10.6
Farm visit	10	6.2	1	0.6
Field day demonstrations	15	9.3	7	4.3
Formal organized extension meeting	67	41.6	25	15.6
Home visit	1	0.6	-	-
Total	111	68.9	50	31.1

Source: own survey, 2007

The sample household respondents' contact with extension agents was made during social gathering, farm visit, travel fields, formal extension meeting and home visit. About 67.2 percent of respondents , both users and non-users, reported that they contact with extension agents during extension meeting where as 21.8 percent of them indicated that they get extension service from development agents during social gathering. However, 16% of respondents indicated that the ways of contact with extension agents are farm visit and field days demonstration. Only one respondent reported that the ways of contact with extension agents are home visit. Extension agents indicated that most of the time, the way of contact of extension agent with farmers is in farmer training centre, which could consists of 10 to 15 farmers. According to them, the effective dissemination of information is made through the home visit and field visits. However, due to shortage of extension agents, absence of transport, etc hinder to visit either in their home or in fields

Table 24 Respondents' response on extension service

How do find extension service	Extension service			
	Extension users		Non extension users	
	N	%	N	%
Good	4	2.5	1	0.6
Bad	104	64.6	18	11.2
Indifferent	1	0.6	3	1.9
No response	2	1.2	28	17.4
Total	111	68.9	50	31.1

Source: own survey, 2007

In the study area, there are different responses given to the services of extension agents. Respondents, both the users and non-users of extension service have given their responses to the service given by those extension agents. About 65 % of the extension users and 11% of the non-extension users have indicated that the extension service given was bad.

Contrary to this, 2.5% the extension user respondents have claimed that the extension service is good. Yet, the 17.4 % of the non-users of extension service did not give any response. Both the focus group and informants indicated that though the extension agents have knowledge both in crop and livestock production, they do not give advice due time.

5.4.2 Credit Service

During the survey, it was found that 50.9 percent of the households get credit service. About 39 percent of household respondents who have received credit reported that the interest rate is moderate whereas 35.5 percent of the household respondents reported that the interest rate is very high.

Table 25 Response of farmers on condition of interest rate at tabia level

Condition of interest rate	Frequency	Percent
Very high	29	35.4
High	17	20.8
Moderate	32	39
Low	2	2.4
Very low	2	2.4
Total	82	100

Source: own survey, 2007

From this, it is possible to say that the interest rate for the majority of the respondents (56%) is high and very high.

I have discussed so far on the condition of the interest rate of the credit farmers have to pay. Base on the following table, I would attempt to describe and analysis condition of repayment.

Table 26 Major reasons for problems repayment of credit

Major reasons	Frequency	Percentage
Crop failure	21	45.7
Low price of agricultural production	13	28.3
No flexible schedule of repayment	12	26
Total	46	100

Source: own survey, 2007

Respondents have stated that there is a problem with credit repayments. According to these respondents, crop failures, low price of agricultural products have no consideration for credit payment collectors. They usually stick to their rigid schedule of payments. Farmers must pay according to the schedules. As indicated in table 26, crop failure was reported to be the major problems for the respondents in Rayaazebo woreda (45.7%). Yet, the presence low price of agricultural products and the non-flexible schedule of the credit institution worsen the problems. The focus group discussion also strengthens the above findings in the study area. They indicated that most of borrower farmers faced with credit repayment problems. The major problems faced farmers in repay their loans are: crop failure due to drought or disease/pests, low price of agricultural products.

Table 27 Measure taken by credit institution during crop failure

Measure	Frequency	percent
Suspending credit repayment	13	16.5
Repayment collected by coercive action	35	44.2
Taking to court	31	39.3
Total	79	100

Source: own survey, 2007

As indicated in table 27, administrative agents take different measures on farmers who delay in paying the credit. About 44 % of the household respondents have replied that they were coerced in to paying their credit though they had a crop failure. About 39% of the household respondents stated that they were taken to court even though they have shown that they had a failure of crop due to drought and death of their cattle.

Farmers have taken credit to improve their livelihood and to secure from any shocks. In order to make this, they borrow loan from credit institutions to engage in different agricultural activities like oxen, goats or cows. However, borrows may not be successful in their activities due to death of the livestock or crop failure due to drought. Then the farmers face a big challenge to repay their loan at the right time. The institution tries to collect its money from his customers. Unfortunately, the borrowers do not have capacity to repay his loan and the institution oblige to the borrower to repay his loan. Farmers who were not able to pay their credit, the institution took to the court. To mentioned a concrete example, in Mechare tabia few farmers indebted because of DECSI credit. One informant lives in the tabia bought an ox the first time he obtained credit. The ox is died. Currently he remains with debt. The institution asked him to repay his loan. However, he does not have any fixed asset to pay the loan. He said that one time they might take me to the court because many defaulters are found in prisons. Another informant also added that due to different reasons defaulters are found in prison in the capital as well as in different tabia. The major reason farmers default are due to the death of their oxen and goats and recurrent drought.

The focus group discussion also explained that borrowers might take loan from credit institution to improve his or her lives. However, due to natural calamity borrowers may loose their property .They could not pay their loan on time. The credit institution ordered to the borrowers to pay the loan on time. If they fail to pay, the institutions either forced them to pay their loan or take them to the court. However, one tabia administrator

denies the above informants idea. According to the tabia administrator, credit institutions have tried to investigate the capacity of farmers, that is, the capacity to pay. Accordingly, they force those of farmers who have any asset to pay. However, those of farmers who have no any asset are helped to be involved in safe net programs.

Yet it can be said that there are gaps that responsible bodies should take. Prior to giving credit to farmers, there is a need to make a continuous awareness for farmers who would be involved in he credit. They have to be aware on how they use the money, and how and when they should return it.

Table 28 Proportion of households reported methods of credit repayment during danger of crop failures

methods	Frequency	percent
Renting out of farm land	54	68.4
Borrow from friends and relatives	19	24.1
Borrow from money lender	6	7.5
Total	79	100

Source: own survey, 2007

The above table gives ideas on the gap discussed above. According to the respondents, farmers who take credit from lending institutions use the following strategies to pay their credit. About 68 % of the respondents have indicated that they had to rent their farmland in order to pay their credit. Other 24.1 % of the respondents have stated that they had to borrow money from friends and relatives. Therefore, they could pay their credit. Still, some others take loan from a moneylender at high interest rate so that they can settle their debt.

According to focus group discussion with borrower held how to repay their loan expressed as: most of the loan are repaid by renting out land, selling assets like oxen, cow etc, .Even a few farmers sell animals (ox,

cow goats) purchased by the loan. Some farmers take loan from moneylender at high interest rate to settle their debt. These all situations, as indicated by these respondents, lead them to asset depletion rather than asset building, leads to further indebtedness. They aggravate poverty.

5.4.2.1 Credit Diversion and Its Effectiveness

A large majority of package borrowers take loans to purchase oxen, cow, improved seeds, fertilizer, goats, sheep etc. Package loan does not include trading, to purchase packed animals like camel, donkey and other off farm activities. food security strategies envisages" improved credit services for food insecure rural and urban households ...in order to address both supply and demand side problems...and improving rural financing system aimed at catering the needs of micro and small scale enterprises as well as small resource poor farmers"(MOFED, 2002 cited in Woldeab et al, 2005). However, it fails to enable borrower with skills and know-how to exploit or develop what they design for profitable activities.

Fourteen percent of the respondents reported that they diverted their loans to other activities than the original stated purpose. One informant indicated why a borrower diverts his/her loan to other activities than the original purpose. According to him, package loan demanded only cow, oxen, sheep, goats etc. However, some people want to have camels, donkeys and other have an interest to engage in off farming activities like trade. Nevertheless, the package does not permit to those activities. Yet farmers use different strategies to get credit. The main one is they apply to the credit institution to take credit for ox, cow, goats or oxen or all. The institution permits and finally they divert their loans either to buy camels or to make a trade. The farmers who divert the loan for other purposes like buying camels or making trade, they are successful to repay their loan on time. The same idea also generated from the focus

group. The group stated that the program do not keep the interest of borrowers. Rather it imposes the borrowers. Some farmers diverted their loan to other purpose. Most of them are successful in their activities.

CHAPTER SIX:CONCLUSIONS and RECOMMENDATONS

6.1 CONCLUSIONS

This study was conducted with a general purpose of assessing the response of farmers to extension package in Rayaazebo woreda. In order to achieve this, the investigation focused on the work of getting answers to the following specific questions:

- *How farmers response to extension package in the study area?*
- *What are the attitudes of farmers to extension package?*

Secondary data review, key informants interview, focus group discussion and household interviews survey were used as methods of data collection. Both qualitative and quantitative research methods were used for the data analysis.

Agricultural extension package intervention is an arena of struggle in which adoption or rejection of the technology inputs such as improved seeds, chemical fertilizer, credit, treadle pumps etc become the focus of the d interactions among different social actors. A central component of the approach is the concepts of agency, which refer to the ability of actors to operate or take meaningful action with their life worlds. In this study, farmers were not passive recipient of the government intervention intended to improve their lives. Farmer's responses to different extension packages were mixed: adoption, rejection and transformation.

Chemical fertilizer, improved seeds and water harvesting application, which forms parts of a package inputs promoted by the PADETS in Rayaazebo woreda, have been impressive. In Rayaazebo case, demonstration the practice of agricultural extension remains based on the top-down approach. Typically, this approach is linear, rigid, and linked to introduce modern technology. This linked to the ideas of

achieving planning targets through coercive persuasion of farmers on improved seeds and water harvesting schemes. This made the major concerns of development agents and local government officials. The government actors were lacking the technical capacity to convince the farmers by showing demonstration trials in their locality. Moreover, they do not invite farmers to participate in the planning process. Rather the developments agents and local leaders were preoccupied with fulfilling the numbers of ponds constructed, sales of treadle pumps sets for each farmers.

A voluntary choice of technology is evident when we compare the construction of ponds with chemical fertilizers. Since farmers were no forced to purchase chemical fertilizer, the numbers of fertilizer user's farmers are low compared to those who constructed ponds and use improved seeds.

Development agents are government employees who are tied to sets of the official duties. They are in an ambivalent position. On one hand they have to achieve the targeted plan because they are evaluated based on given plan and on the other, farmers are not willing to construct ponds and purchase the treadle pumps.

In Rayaazebo woreda, farmers rejected the use of chemical fertilizers. Although farmers were aware of the importance of chemical fertilizer in improving soil fertility and enhanced the yields, they were not applying it. There are factors insights into farmers' decision in the applying chemical fertilizers: expensiveness of chemical fertilizer, lack of cash and the presence of shortage of rainfall. Different studies in drought prone areas indicated that due to shortage of rainfall, erratic, unreliable and high price of chemical fertilizer. Uncertainty of rainfall is the major risky especially in the dry land areas. It is contributing to low adoption of fertilizer (Pender, 2001). A voluntary choice of chemical fertilizer is evident in the study area indicated that the adoption of chemical

fertilizer is low. Since farmers were not coerced to apply chemical fertilizer, the users of chemical fertilizers are very low.

Most of farmers do not use improved seeds in the study areas because poor quality of improved seeds, high price and climate not suitable. However, few farmers are using improved seeds because they believe either that improved seeds are increase production or through coercive persuasion, with most fear that they might be denied aid and food for work or employment opportunities in varies development activities and fear from labeling antidevelopment.

The supply of improved seeds are more limited because there is only one supply improved seeds in the woreda i.e. agriculture and rural development office. The deliveries of improved seeds are also another problem. Hence, farmers do not get improved seeds at a right time. Farmers have the chance to consume the improved seeds and sow the local seeds.

The study shows in Rayaazebo woreda, most farmers constructed water harvesting through coercive persuasion, with the fear that they might be denied food aid and employment opportunity in various development activities and fear for labeling to anti development. However, most of the constructed water-harvesting ponds do not hold water or they are out of function. Factors that contributing for not holding waters or out of functions are: they were constructed inaccessible place and, at the center of farms, expensiveness of cements, and the stolen of plastic etc. The failure of ponds to holds water or out of functions in Rayaazebo woreda show that farmers do not participate voluntarily in planning intervention. In theory, different development workers support the ideas of farmers' participation from the technology identification to technology evaluation in the implementation of extension services. Development agents and local government leaders in woreda Rayaazebo were preoccupied with achieving the target sets for constructing water harvesting ponds for farmers and as the results, the constructed ponds

did not give its functions because they have design problems, people believe that ponds reduce the size of farm land.

Farmers resisted constructing ponds in their farmlands in the study area because small ponds cannot water for teff and sorghum. They are forced to construct ponds by local government leaders and to get food aid. Pond has never been established to what extent the water harvesting ponds are able to increase food security during potentially bad times. They note that in a year with minimal rainfall, when water and food are most needed, the ponds intended for irrigation and backyard gardening will most likely dry up before harvest is made (Rami, 2003).

A farmer must construct water harvesting and purchase the treadle pump to get package credit in Rayaazebo woreda. However, farmers do not have interest to construct ponds and to purchase treadle pumps. However, Development Agents forced farmers to purchase treadle pump through denied credit and do not permit to participate in food for work and food aid. The participatory approach is therefore considered as essential if extension is to be more client-oriented (Dejene, 2000:6). However, these principles are not followed in the current extension system. What is being practiced is top-down (Dejene, 2000; Woldeab, 2003). The present agricultural extension system acknowledges in theory that participation of stakeholders in the package implementation process, but what has been practiced is different from what is being believed in principle.

An integrated approach to water harvesting is lacking in the study area. Health and safety are issues concerning people lives that have not been adequately addressed where ponds are built.

Although credit service is available, the number of customers still limited. In Rayaazebo woreda, half of the respondents took credit for the

last two years. There are problems with credit repayment. The major factors that aggravated for the credit repayment problems are crop failures, low price of agricultural products and non-flexible schedule of credit institution. The lending institutions in Rayaazebo woreda have made high interest rate and do not look out for the welfare of its customers, particularly with respect to repayment schedule and high rate of repayment rate. Administrative agents took different measures on credit defaulters. Most borrowers were forced to pay their loan or they were taken to court though there were crop failures in the study area. In addition to this, the study show that borrowers settle their debts by either selling their property including their oxen and renting out farmlands for the two- three years and borrow from moneylender at high interest rate.

When the technology is relatively hitherto unknown in specific locality, extension is an important instrument for the dissemination agricultural technologies. In Rayaazebo woreda, government agents are playing the most important in the dissemination of the new technologies to diffuse to farmers. The ways of contact development agents with farmers are: during social gathering, farm visit, travel fields, formal extension meeting in the farmer-training center, and home visit.

Development agents have weak technical capacity to demonstrate agricultural package and offer adequate technical assistance to farmers. Two-third of the sample farmers in Rayaazebo indicated that the accountability of development agents is not for farmers rather it is to the officials. The service given by the development agents are not satisfying for farmers' interest because farmers do not get service at the right time and place. As the result, they do not have good attitude for extension agents working in the woreda.

Extension service in Rayaazebo woreda starts with technology identification and packaging rather than with understanding the

farming system and then identifying technology packages that fit farmers' circumstances. Technology packages lack agro ecological specificity in Rayaazebo woreda. They are not adequately tested for their local adaptability before they are widely promoted. Farmers do not easily understand the importance and recommendation levels of the new technology because most of the transfer of technology are more technical and sophisticated, do not base on the farmers' knowledge and they are not compatible to the environment.

The existing extension system is top down and rigid. The extension systems do not promote demand driven system. Furthermore, local leaders and development agents persuade farmers in to compliance of top down extension programs base on the coercive and misleading measures rather than increasingly focus on fostering development awareness of local people through communicative interventions.

6.2. RECOMMENDATIONS

Based on the finding and conclusions, the following recommendations are drawing.

- Critical moisture stress combine with inappropriate technology transfer and poor quality of agricultural inputs could not sustain in the adoption of technology. Thus, development of small irrigation like river diversion, underground water, high quality varieties and moisture stress resistance of improved seeds should be proposed in the study area. In addition to this, organic fertilizer is appropriate in the semi- arid area because it has the capacity to retain moisture.

- Active involvements of farmers are crucial for smooth implementation and sustainability of any development program. Farmers should be involved at all stage of planning, designing

implementation, monitoring and evaluation of introduced program. They help them to take corrective measures.

- Direct and indirect enforcement of farmers to implement the extension package should be eliminated as it violated farmers' right to decide for them selves.

- Technology have to introduced to areas where they are based the society knowledge, culture, experience, agro ecology specification and on demanded driven bases.

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Appendixes

Appendix one: Questionnaire for households

Dear respondent, I am doing research as part of the MA program I am studying in Addis Ababa University. The topic of my research is Farmers' Response to Agricultural Extension Package in Raya Azebo Woreda This questionnaire is designed to obtain information about your response, attitudes, and factors influencing in the adoption of technology. Hence, I would like to thank you in advance for giving me your valuable time to fill in this questionnaire

Household questionnaire

Part one: ***Identification and basic information regarding household head***

1.1. Household identification numbers----------
1.2. Date of interview----------
1.3. Tabia name----------
1.4. Name of household head ----------
1.5. Sex male=1 female=2
1.6. Age ----------
1.7. Religion Orthodox =1
Muslim=2
Protestant =3
Others Specify----------
1.8. Marital status Single=1
Married =2
Divorce =3
Widowed=4
Separated=5

1.9. Education status Illiterate =1
Read and write =2
Church school=3
kuran school =4
Other (specify) ----------
1.10 .Is the head capable to work or economically active? Yes=1
No =2

1.11. If inactive, why? Sick=1
Aged=2
Disable =3
Other (specify)

1.12. Number of permanent household members at time of survey

Male ----------
Female ---------
Total----------

Part two. Household Composition

2.1 Household composition, education and occupation. (Please fill in the codes given after the Tab.)

No	**Name**	**Sex**	**Age (Year)**	**Marital Status**	**Relationship to HH-head**	**Years of schooling**	**Major occupation**	
							Primary	**Secondai**

2.2. Household Assets

2.2.1. Number of buildings owned by household: _____

Building No.	Type of roof	Type of floor	Initial cost (Birr)	Year of construction	Present value (Birr)

2.2.2. Assets and investments:

Type of asset	Did you or any member of the household own any of these assets? 1=yes; 0 =no	How many do you have today?	What is the value of the assets today?	What was the value of these assets at time of purchase (Birr)
Ploughs				
Harrows				
Shovels				

Transportation equipment				
Draught animals				
Spike				
Hoe				
Water hose				
Watering can				
Pump (petrol/diesel				
Knap-sack sprayer				
Bucket				
Borehole				
Others				

2.3. Land owned (allocated to household)

Land use	Code	A rea	
		Timad	ha
Homestead	1		
Rain fed cultivated	2		
Irrigable cultivated	3		
Fallow	4		
Private pasture	5		
Private tree planting	6		
Others	7		

2.4. Livestock owned: number and value owned during the year 2005/2006

Type of animal	**Code**	**Season**		**Remark**
		No	**Value (Birr)**	
Cattle	**1**			
Calf	**2**			
Young bull	**3**			

Heifer	**4**			
Cow	**5**			
Draft oxen	**6**			
Sheep	**7**			
Goat	**8**			
Horse	**9**			
Donkey	**10**			
Mule	**11**			
Poultry	**12**			

Part three: Cropping information

2.1. Please list details for agricultural production during the 2005/2006 farming season

Crop type	area	Seed		Irrigated? 1=yes, 0=no	Inputs	
		Amount	cost (Birr)		Herbicide/pesticide	
					Amount (kg)	Cost (Birr)

Continued

Amount harvested		Quantity consumed				Sales	
Grain (Kg)	Straw (Kg)	Grain		Straw		Grain Kg)	Straw (Kg)
		Kg	Cost (Birr)	Kg	Cost (Birr)		

Crop code list: 1=maize; 2=sorghum; 3=groundnuts; 4=soybeans; 5=teff; 6=cotton; 7=chickpea; 8=horse beans; 9=wheat; 10=rough pea; 11=potato;; 12=rape; 13=spinach; 14=tomato; 15=onion; 16=pumpkin; 17=carrot; 18=lettuce; 19=sugar cane, 20=cabbage; 21=others

Part four: extension and training

4.1 Extension

4.1.1. Do you practice production and productivity enhancing activities?

1) Yes 2) No

4.1.2. If yes, what are the major activities implemented to enhanced crop production and productivity in your locality?

1) Improved seeds 5). Organic fertilizer

2). Irrigation schemes 6) Pesticides

3). Irrigation technologies 7). Herbicides

4). Chemical fertilizer 8). Farm implements

9). others (specified) ----

4.1.3. Who introduced these agricultural technologies to your locality?

1) Government

2) Non -government organization

3) Cooperatives

4) Others (specified) ----------

4.1.4. Are you user of extension service?

1) Yes 2) No

4.1.5. If yes, since then ----------

4.1.6. Are there agricultural development agents in your locality?

1) Yes 2) No

4.1.7. If yes, in what way do you contact with them?

1) Through social gathering

2) Farm visit

3) Field days demonstration sites

4) Formally organized extension meeting

5) Home visit

6) Others (specify)

4.1.8. What type of services do extension agents gives for you?

1) ----------

2) ----------

3) ----------

4.1.9. Are you well acquainted with extension service?

1) Yes 2) No

4.1.10. What types of technologies or ideas you have adopted since then?

1) ----------

2) ----------

3) ----------

4) ----------

5) ----------

4.1.11. How do you find extension service?

1) Good
2) Bad
3) In different

4.1.12. If you are not participating of the program, why? Reasons

.....
.....
.....
.....
.....

4.1.13. What are the major disadvantages of extension package?

4.2 Training

4.2.1. Is there any training given to you within three years?

1) Yes 2) No

4.2.2. If yes, indicate type of training you received

Type of training	Yes no	Prioritized according to importance
Fertilizer application		
Chemical application		
Credit and saving		
Storage		
Harvesting		
Transportation of crop		
Weeding		
Planting		
Irrigation		
Soil and water conservation		
marketing		
Others (specify)		

4.2.3. How do get the training?

1) It is good
2) There is not difference
3) Not important

Part five: agricultural inputs, adoption and credit service

5.1 Water harvesting

5.1.1. Do you cultivated crops by using irrigation?

1) Yes 2) No

5.1. 2. If yes, what are the sources of irrigation?

1) River diversion
2) Spring lakes
3) Water harvesting structures
4) Others

5.1.3. If your answers are for the above questions is water harvesting structure, what are major water harvesting structures that you practice?

1) Ponds
2) Roof water harvesting
3) Dug wells
4) Other

5.1.4. Why you are involved in this intervention?

1) It increase crop production
2) In order to participate in food –for- work
3) Forced me to participate
4) Fear from labeling antidevelopment,
5) Others (specify)

5.1.5. Did the ponds hold water? Yes 1 No 2

5.1.6 If your response is No for the above question, what are the reasons that make ponds not hold water.

.....

.....

5.1.7. If you do not use water-harvesting structures, what are the reasons?

Type reason	Yes	no
Not profitable		
The area is black cotton soil		
Makes vulnerable to the eruption of disease		
No space to dig hole to collected water		
Land is not convenient to for water harvesting		
siltation		
Others (specify)		

5.3 Fertilizer

5.3.1. Did you use fertilizer in the past two years?

1) Yes 2) No

5.3.2. If yes where did you get?

1) Agricultural bureau
2) Cooperative
3) Other trade firms
4) From other farmers
5) Others (specify)

5.3.3. What are the reasons for use of fertilizer?

1) The government obliged me to use
2 In order to participate in food for work programs and to get aids
3) It increases crop production
4) Fear from moral punishment
5) Other (specify)

5.3.4. If you are forced to accept to use fertilizer, how do you get your production?

1) It is increased

2) It is decreased

3) No change

5.3.5. By what amount do you use?

No	type of crops	amount used per timad
1	teff	
2	maize	
3	sorghum	
4	chick beans	

5.3.6. Do you think that the amount of fertilizer you used on the recommendation rate?

1) Yes 2) No

5.3.7. If no, what are your reasons?

1) Lack of capacity to purchase
2) Limited supply
3) Delayance
4) Using large quantity of fertilizer caused for over growth and hence decreases productivity
4) Other (specify)

5.3.8. If yes for how long have you used them? ----------

5.3.9. If no, what are the reasons do not apply fertilize?

1) No profitability
2) Too expensive
3) Lack of cash
4) High repayment fertilizer
5) It is not available
6) No suitable for the environment

5.3.10. If yes, can you mention inorganic fertilizer applied for the major crops during the previous two years?

Types of crops	Amounts of fertilizer in kg	Amount of production in quintal

5.3.11. What amount of arable land actually fertilized with inorganic fertilizer during the previous two years? 1) Half hectare

2) Full hectare

3) Two hectares

4) More than two hectares

5.3.12. Do you think that your crop production and productivity increase by application of fertilizer?

1) Yes 2) No

5.3.13. If yes, to what extent your crop production increased currently as compared to before the introduction of fertilizer

Type of crops	Cultivated land before your adoption	Cultivated land after your adoption	Amount of crops produced before your adoption	Amount of crops produced after your adoption
teff				
Maize				
Sorgum				
others				

5.4 Credit service

5.4 .1.Did you receive credit for the last two years?

1) Yes 2) No

5.4.2. If yes please indicate the amount of credit you took by the purpose and source

Types of input	Amount of credit	Source of credit
Fertilizer		
Improved seeds		
Dairy package fattening		
Farm implements		
Pesticides		
Herbicides		
others		

5.4 3. If you are getting agricultural inputs on credits, what is the condition of interest rate during the past two years?

1) Very high
2) It is high
3) Moderate
4) Low
5) Very low

5.4 4. If it is very high the interest of credit in the credit institution, what is your alternative source of credit?

.....
.....
.....
.....
.....

5.4 5. Have you ever faced problems associated with credit repayment?

1) Yes 2) No

5.4 6. If yes for the above question, what are the major reasons?

1) Crop failure
2) Low price of agricultural production
3) No flexible schedule of repayment
4) Other (specify)

5.4. 8. If no the above questions what could be your source of repayment?

1) From non farm income
2) Selling grains
3) Selling small ruminant
4) Selling cattle
5) Others

5.4. 9. If you are not repaying your loan on time as the result of crop failure, what measures taken by the credit institution?

1) Suspending the inputs credit for the current crop seasons
2) Repayment collection by coercive measures
3) Taking to courts
4) Others (specify)

5.4. 10. Did you use the credit for the purpose you took to?

1) Yes 2) No

5.4. 11. If no, why?

.....
.....
.....
.....
.....

5.4. 12.What methods do you have for credit repayment when there is a danger of crop failure and market problems. 1) Renting out land

2) Borrowing from relatives friends

3) Borrowing from money lender

4) Other specify

5.4. 13. What are the criteria to get credit?

.....
.....
.....
.....
.....

5.5 Improved seeds

5.5.1Did you use improved seeds in the past two years?

1) Yes 2) No

5.5.2. If yes what are the source of seeds?

1) Owned saved seeds
2) Formal seeds
3) Relief seeds
4) Others

5.5.3. What are the reasons for use of improved seeds?

1) The government obliged me to use
2) In order to participate in food for work programs and to get aids
3) It gives more production
4) Fear from moral punishment
5) Other (specify)

5.5.4. By what amount do you use?

No	type of crops	amount used per timad
1	teff	
2	maize	
3	sorghum	
4	chick beans	

5.5.5. Do you think that the amount of improved seeds you used on the recommendation rate?

1) Yes 2) No

5.5.6. If no, what are your reasons?

1) Lack of capacity to purchase

2) Limited supply

3) Delayance

3) The amount of improved seeds recommended is so high as compared to the local variety

4) Other (specify)

5.5.7. If yes when you used? ----------

5.5.8. What kinds of seeds mostly used?

1) Improved seeds

2) Local seeds

3) Mix local and improved seeds

5.5.9. If no, why not you used?

1) No difference from local variety
2) Poor quality
3) High price
4) Vulnerable to disease
5) Low productivity as compared to local variety
6) The climate is not suitable
7) Not germinated
8) Others Specify

5.5.10. Do you think that the supplies of improved seeds are adequate?

1) Yes 2) No

5.5.11. If no what are the major reasons?

.....
.....
.....

5.5.12. Have you ever faced problems associated with input supply?

1) Yes 2) No

5.5.13. If yes, what are the major problems?

1) Lack of competitive
2) Availability variety does not meet the farmer preference
3) Low quality
4) Delay of delivery
5) Others (specify)

5.5.14. What is the current condition of market price of improved seeds?

1) Very high 3) Affordable

2) High 4) Low

5.5.15. Do you think that your crop production and productivity increase by application of improved seeds? 1) Yes

2) No

5.5.16. If yes, to what extent your crop production increased currently as compared to before the introduction of agricultural technologies

Type of crops	Cultivated land before your adoption	Cultivated land after your adoption	Amount of crops produced before your adoption	Amount of crops produced after your adoption
teff				
Maize				
Sorghum				
others				

Part six: Attitudes of farmers towards extension package

6.1 The services given by the development agents are satisfactory.

Agree

Disagree

6.2 The development agents and agricultural research organization motivates us in the evaluation of the performance of technologies in the demonstration sites

Agree

Disagree

6.3 The agricultural technologies transferred to the community with out the knowledge of the community about their weakness and strength.

Agree

Disagree

6.4 Improved agricultural technological packages have not been adequately tested locally before they are promoted on large scale

Agree

Disagree

6.5 Development agents have weak technical capacity to demonstrate agricultural packages Agree

Disagree

6.6 Your production is increasing since your participate in the agricultural packages

Agree

Disagree

6.6 How do you feel the following statement?

No	statement	Dis agree	agree
1	The existing Extension system has flexible and a bottom up approach		
2	Accountability of extension agents has not been to farmers		
3	Farmers have benefited much from agricultural technology		
4	Extension system promotes demand driven system		
5	Technologies increased production		
6	Farmers participated in extension package gain more production than non participant		
7	Farmers receive quality of extension service at a right time		

Appendix Two: **Points of Discussions with *agriculture and rural development experts***

1. When agricultural extension packages started in this woreda?
2. Describe the major objectives and its focus.
3. Do you think that this program success in the achieving food security and poverty reduction?
4. Describe the successful activities of this program
5. Explain briefly the weakness and strength of extension package
6. Explain how participant farmers have been selected
7. Who are the major actors in the process of implementing the extension programs? And describe their roles in the implementing process?
8. What are the major problems that influence in the adoption of technology?
9. Discuss the status of extension agent and farmers relation
10. Attitudes of farmers to the extension package programs

    Technology adoption
    Technology successfulness
    Inputs
    Credit facilities
    Water harvesting

11. What are the major problems for the success of extension package (improved seed; fertilizer, water harvesting; credit facilities)?
12. Describe the names of inputs suppliers in this woreda
13. Did farmers use the technology inputs based on recommended rate? If not, why?
14. What type of technologies appropriate to this area? Why?
15. Explain why the major problems why farmers reluctant to accept the new technology?
16. Describe the main source of inputs in this area

    Credit improved seeds
    Fertilizer

17. What criteria need to get these inputs?

18. Describe the type of action taken on farmers that could not participate in the extension package and not settle the inputs loans either due to crop failures or due to any other problems

Appendix Three*: Points of Discussions with *Peasant association leaders

1. Are the available technologies profitable in your locality?
2. Do you believe that farmers are actual participate in this package?
3. To what extent farmers in this area involving in the agricultural extension package
4. What do you believe that the attitudes of farmers towards:

Technological successfulness
Extension agent
Input
Credit
Water harvesting

5. Did extension program contributing in alleviating the house hold food insecurity?
6. What are problems associated with adoption of technology?
7. How don you see the profitability of extension package?
8. What intervention measures do you recommended to success the adoption of technology?
9. What type of technologies appropriate to this area? Why?
10. Explain why the major problems why farmers reluctant to accept the new technology
11. Describe the type of action taken on farmers that could not participate in the extension package and not settle the inputs loans either due to crop failures or due to any other problems

Appendix Four*: Points of Discussions with *Check list for Extension agents

1. How long have you been working as agricultural extension agent?
2. What level of education do you have?
3. What are the sources of training and updating of technical information?

4. What are the most common tools of communication with the farmers, and why?

5. Are you satisfied with your work?

6. How do you evaluate your performance? Do you think the performance measure increase your efficiency?

7. Describe the problems under mine your performance from your experience in undertaking the extension package

8. What major problems for their profitability and acceptance

Water harvesting

Inorganic fertilizer

Credit

Improved seeds

8. What do you think the perception of farmers about extension program?

9. What are the contributions of extension program in alleviating the households food insecurity in this area?

***Appendix Five*: Points of Discussions with for farmers**

1. Do you participate in the extension package? When?

2. Which intervention you accept to introduce? Why?

3. How do you communicate with extension agents?

4. Do you believe that agricultural technology increase crop production? How?

5. Did you take credit for purchasing agricultural inputs? How was the repayment and interest rate?

6. What are your sources of repayment? How do you repay when crop failure occurred?

7. How do you see the success of the following?

Water harvesting

Inorganic fertilizer

Credit

Improved seeds

***Appendix Six*: Points of Discussions with for focus group discussion**

1. Do you believe that agricultural technology increase crop production? How?
2. Did you take credit for purchasing agricultural inputs? How was the repayment and interest rate?
3. What are your sources of repayment? How do you repay when crop failure occurred?
4. How do you see the success of the following?

Water harvesting

Inorganic fertilizer

Credit

Improved seeds

DECLARATION

I, Kiros Asefa, declare that this thesis is my original work and has not been presented for any degree in any university, and all the sources of materials used are duly acknowledge.

Kiros Asefa Mesele

April 2007

Addis Ababa University

This thesis has been submitted for examination with my approval as a university Advisor.

Woldeab Teshome (Phd)

April 2007