

ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

PARTICIPATION OF FARMERS' IN FARMER RESEARCH GROUPS:
THE CASE OF ADAMA WOREDA

BY: DEREJE BEKELE

JULY 2009

ADDIS ABABA, ETHIOPIA

**PARTICIPATION OF FARMERS' IN FARMER RESEARCH
GROUPS: THE CASE OF ADAMA WOREDA**

BY

DEREJE BEKELE GEMECHU

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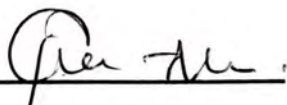


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SCHOOL OF GRADUATE STUDIES
DEPARTMENT OF SOCIOLOGY

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Acronyms

AWAO- Adama Woreda Agricultural Office

CSA- Central Statistical Agency

DAs- Development Agents

DF- Degree of Freedom

EARO- Ethiopian Agricultural Research Organization

EF- Expected Frequency

ESPEDD- East Shewa Zone Planning and Economic Development Department

FFL- Farmer-First and Last

FGD- Focus Group Discussion

FPR- Farmer Participatory Research

FRGs- Farmer Research Groups

FRS- Farmer Research School

FSR- Farming System Research

FSRE- Farming Systems Research and Extension

FSP- Farming System Perspective

Ho- Null Hypothesis

H₁- Alternative Hypothesis (Research Hypothesis)

KCTE- Kotebe College of Teacher Education

IAR- Institute of Agricultural Research

IKS- Indigenous Knowledge Systems

ISNAR - International Service for National Agricultural Research

JICA- Japan International Cooperation Agency

MARC- Melksaa Agricultural Research Center

MoARD- Ministry of Agriculture and Rural Development

NGOs- Non-Governmental Organizations

OARI- Oromia Agricultural Research Institute

OF- Observed Frequency

PAs- Peasant Administrations

PPS- Probability Proportional to Size

RED- Research and Extension Division

RDD- The Research, Development and Diffusion

RPF- Resource-Poor Farmers

RRF- Resource-Rich Farmers

SNNPR- Southern Nation and Nationality Peoples Region

SPSS- Statistical Package for Social Scientists

TOT- Transfer of Technology

USD- United States Dollar

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Abstract

The aim of this study was to identify the determinants and patterns of farmers' participation in Farmer Research Groups in Adama Woreda. Statistically significant association between socio-economic characteristics and farmers' participation in Farmer Research Groups were tested.

The specific objectives were to: (1) determine the relationship of the socio-demographic and economic factors with farmers' participation; (2) describe the patterns of participation in Farmer Research Groups by farmers and researchers and (3) identify constraints to farmers' participation in Farmer Research Groups.

The respondents were selected through a combination of probability proportionate to size and systematic sampling, and 120 farmers (60 participants and 60 non-participants in Farmer Research Groups) and 20 researchers were included. The respondents were selected from 'Awash', 'Batu Degago', 'Ulaga Melka Oba' and 'Wake Miya' peasant administration.

Focus group discussions, in-depth interviews with key informants, and case studies were also employed to collect qualitative primary data. Quantitative primary data, on the other hand, were collected through questionnaire administered by enumerators. Secondary sources were also adequately referred from recorded archives to support primary data. The data were analyzed by using both descriptive and inferential statistics like mean, frequency, percentage, chi-square, phi-coefficient and point-biserial correlation.

The findings of this study showed that socio-economic and cultural factors such as age, household size, educational attainment, size of farm land, and gender are significantly related to farmers' participation in Farmer Research Groups in Adama Woreda. Based on this finding, it can be concluded that younger farmers relatively participated more in Farmer Research Groups. Besides, those farmers who had larger households, large size of farm land and exposition to formal education tend to be more involved in the Farmer Research Groups.

In addition, the study indicated that the majority of Farmer Research Group members in Adama Woreda have been involved in consultative and collaborative type of participation.

There are constraints to farmers and researchers in participation in the Farmer Research Groups in Adama woreda. Expectations for subsidized inputs, farmers' reluctance to work with researchers on the site due to the underestimation of their indigenous knowledge in the research process and inadequate motivation of researchers to use participatory approach have been the most commonly manifested problems among the participants in Farmer Research Groups.

CHAPTER ONE

INTRODUCTION

1.1. Background of the Study

One of the major development challenges facing most developing countries is their inability to adequately feed their ever-increasing population. Ethiopia is one of the developing countries that have remained in low economic status for years. Chronic food insecurity has been a defining feature of the poverty that has affected millions of Ethiopians for decades. The vast majority of these extraordinarily poor households live in rural areas that are heavily reliant on traditional agricultural technologies. An indicator of this condition is low agricultural production.

The problems associated with agricultural production in Ethiopia are low production, diseases and pests, low and poor performing breeds/seeds, management problems and lack of capital (EARO and JICA, 2004). The solutions to these problems can only be found through appropriate research. Most agricultural researches have been conducted using the “top-down” approach instead of the participatory “bottom-up” approach that ensures farmers’ participation in the development of technologies that are meant to solve their problems (Abera and Fasil, 2004).

The wide scale dissatisfaction with the performance of “top-down” approach of agricultural research has made organizations working to change the livelihood of rural

communities to look for alternative paradigms. This has led agricultural research to move from such approach to other approaches appreciating stakeholders' involvement (farmers).

Accordingly, it is increasingly being recognized that a demand-driven process, where the end users participate in the design and implementation, rather than in just the final testing of any new technology, can better serve the rural communities (Selener, 1997). Furthermore, it is widely believed that participatory research leads to the empowerment of rural communities through the recognition of their 'indigenous' or 'traditional' knowledge and the awareness that they can contribute to their own development.

Previous studies suggest that effective agricultural research is very crucial to agricultural development in developing countries (Chambers and Jiggins, 1998). Researchers' interaction with the farmers has been enhanced by the use of participatory methods since the mid 1980's by encouraging direct involvement of farmers in data generation and evaluation, choice and assessment of technology, and direct management of experiments in the field (Collinson, 2001).

Participatory diagnosis in farming systems research is important for an understanding of farmers' priorities, management strategies and resource constraints. It is particularly vital for the identification and subsequent shaping of solutions, including improved technologies (Collinson, 2001). The full benefits of participation are gained only when farmers have an active role in setting the course for research (Merill Sands et al, 1989; Ashby, 1990; Roling, 1989).

Participatory research is a principle of successful innovation. Technologies developed through this approach are usually appropriate to farmers' technical level and culture (ibid). Such technologies are also relevant to farmers' needs, easily and readily adopted by participating farmers and their colleagues, thus increasing their productivity and ensuring sustainability.

Starting from 2004, MARC (Melkassa Agricultural Research Center) and JICA (Japan International Cooperation Agency) have implemented one of the approaches of farmer participatory research known as Farmer Research Group (FRG) in Adama Woreda (EARO and JICA, 2004). The goal of FRGs is to strengthen verification, transfer, adoption and technology development through active involvement of farmers (ibid). Since 2004, 40 FRGs with 1,000 farmers (male and female) have been established and carried out by 60 researchers from 18 disciplines (FRG, 2008). The researchers conducted both on-station and on-farm experiments in a participatory manner with the farmers. There was also FRGs which had been implemented in Holeta, Adami Tullu, Debrezeit, Bako agricultural research centers in addition to those in Melkassa Agricultural Research Center.

In this paper an attempt has been made to identify the determinants and patterns of farmers' participation in FRGs in Adama Woreda.

1.2. Statement of the Problem

By the time they leave universities, scientists have been deeply conditioned to believe that they know more than farmers, that their knowledge is superior and they should be the people who determine what research to be done and how it should be conducted [-----] information is extracted from the farmers and their farms and analyzed by scientists to diagnose and prescribe for the farmers [-----] the key decisions about what to try and what to do remain with the scientists (Chambers and Jiggins, 1987:39-45).

The quotation above clearly depicts that agricultural research has been dominated by scientific researchers for years. However, there is now a growing evidence that agricultural research can be most productive and effective in helping farmers when both farmers and researchers actively participate in technology generation, evaluation and dissemination processes.

The necessity of agricultural research services in stimulating agricultural development and modernization has long been a critical issue for Ethiopian governments since the 1930s and even before (MARC, 2004). Institutes of Agricultural Research in Ethiopian have recently started Farmer Participatory Research approach known as Farmer Research Groups to address the major problems inherent in previous research approaches. The proponents of FRG approach argue that as Farmer Research Group approach has also only serves to extract information from farmers. The key decisions about what to try remain with the scientists and the result of on-farm researches are simply the validation of technical recommendations by researchers.

The researcher observe that the FRG approach in its practical implementation have actually further led to exclusion rather than inclusion because they have not adequately considered, understood, or addressed the power relations and socio-economic characteristics of farmers. For example, only local elites or authorities in the communities may be involved in research and development initiatives (which could be in part because it is easier to reach them), and poorer or marginalized farmers may be absent. That in turn increases the gap between farmers of different socio-economic characteristics.

Participation is often determined by rules, norms and perceptions of communities and societies, and these factors may disadvantage women or other social groups. It is, therefore, very important to speak with different farmers (poor, women, and men, religious and social class, young and old) in order to understand their different level of participation in research.

The socio-economic characteristics that enhance or hamper the participation in FRGs and patterns of farmers' participation in FRGs are not given sufficient attention. Such experiences attract this researcher's interests to examine the determinants and patterns of farmers' participation in FRGs.

Therefore, this study attempts to address two important issues. The first issue is to identify the socio-economic factors that are related with farmers' participation in FRGs. The second issue is to investigate the patterns of farmers' participation in FRGs. The problem is examined through case study of FRGs in Adama Woreda in Oromia Region, East Shewa

Zone where Farmer Research Group approach has been extensively introduced by MARC and JICA.

1.3. Objectives of the Study

The overall purpose of this study is to identify the determinants and patterns of farmers' participation in the Farmer Research Groups (FRGs) in Adama Woreda, East Shewa Zone.

Specifically, this study is conducted:

1. To determine the relationship of the socio-demographic and economic factors with farmers participation in FRGs;
2. To describe the patterns of participation in Farmer Research Groups by farmers and researchers
3. To identify constraints to farmers and researchers participation in FRGs.

1.4. Significance of the Study

Studies on determinants and patterns of farmers' participatory research in general and farmer research groups specifically have not received serious consideration in Ethiopia.

Hence this study is intended to:

1. Provide some fresh insights on methods of improving farmers' participation in Farmer Research Groups and coordination between farmers, researchers and implementing agencies.

2. Identify socio-economic and cultural factors determining farmers' participation and patterns of participation in FRGs. This study may come up with suggestions that prospective rural development agencies may utilize when implementing agricultural technology development activities with farmers' active involvement. The study also plays vital role by identifying the constraints farmers face in participating in Farmer Research Groups hence, contributing for sustainable rural development.

1.5. Methodology

1.5.1. Target Populations

Data were collected from target populations: participant and non- participant farmers in FRGs of Adama Woreda of East Shewa Zone and Farmer Research Groups researchers in Melkassa Agricultural Research Center. There are thirty seven peasant administrations in the Woreda. Out of these twelve peasant administrations have Farmer Research Groups.

The data of this study were gathered through interviews of 120 respondents, 60 from FRGs participants and another 60 from non-participants in FRGs. Additionally, data were collected from 20 researchers, 8 key informants and 12 focus group discussants purposively selected. The data collection took place over two months of fieldwork from the first week of February to the last week of March 2009.

Secondary data were also collected from existing and relevant literature and publications.

Vital information was also collected from the reports by MARC, FRGs, Ministry of

Agricultural and Rural Development research results and related reports, maps and census data.

1.5.2. Research Design Used

To achieve the objectives of this study, a combination of data collection methods were employed. In view of that, the thesis draws on survey. Two groups of respondents', FRGs participant and non-participant farmers were surveyed purposively by criteria of participation and non-participant in FRGs. The second group of farmers was incorporated as control group for the study. Additionally, case study was also employed for this study.

The explanation of how respondents were selected, sample size, reliability and generality of the data collected from selected peasant administrations to draw a general picture of farmers' participation in FRGs in the Adama Woreda is given below.

1.5.3. Sample Selection Procedures

Four peasant associations were selected by probability proportional to size (PPS) based on the number of participant farmers in Farmer Research Groups from the peasant associations. The data were collected in the four selected peasant associations which have large size of FRGs participants, namely: 'Awash', 'Batu Degago', 'Ulaga Melka Oba', and 'Wake Miya'.

The two groups of farmers were selected from the four peasant associations using the following procedures:

Selection of Participant Farmers in Farmer Research Groups

Selection of this group of respondents was done by taking lists of members of FRGs of four peasant association as sampling frame, from Melkassa Agricultural Research Center. Since this group of respondents was intervention group because of the treatment (participation in FRGs), and to enable comparison with non-participants in FRGs, the samples were selected using systematic sampling. The sampling interval for selecting the samples was determined as follows:

$$\frac{\text{Total Number of farmers in FRG from the PAs}}{\text{Total number to be interviewed}} = \text{Sample Interval}$$

Total number to be interviewed

Hence, the sample intervals to select 60 FRGs participant farmers from the four peasant associations were obtained as the followings:

$$\text{FRG member farmers in PA (1)} = \frac{77}{15} = 5.133 \approx 5$$

15

$$\text{FRG member farmers in PA (2)} = \frac{60}{15} = 4$$

15

$$\text{FRG member farmers in PA (3)} = \frac{110}{15} = 7.33 \approx 7$$

15

$$\text{FRG member farmers in PA (4)} = \frac{80}{15} = 5.33 \approx 5$$

15

Selection of Non-participant Farmers in Farmer Research Groups

This group of respondents was selected using systematic sampling technique. Sixty farmers were sampled from the four peasant associations by taking households in the peasant associations as sampling units. The lists of households of each selected PAs were used as sampling frame for sampling. To avoid danger of periodicity, the pattern that coincides with the sampling interval was avoided by reshuffling the lists. The sampling interval for selecting the sampled using systematic sampling was determined as follows:

$$\frac{\text{Number of household heads in PA minus FRG participant farmers}}{\text{Total number to be interviewed}} = \text{Sample Interval}$$

Total number to be interviewed

Hence, the intervals for each of the four peasant associations were obtained as follows:

$$\text{HHS of PA (1)} = \frac{226}{15} = 15.06 \approx 15$$

15

$$\text{HHS of PA (2)} = \frac{180}{15} = 12$$

15

$$\text{HHS of PA (3)} = \frac{230}{15} = 15.33 \approx 15$$

15

$$\text{HHS of PA (4)} = \frac{200}{15} = 13.33 \approx 13$$

15

Where: PA1 stands for Awash, PA2 for ‘Batu Dagago’, and PA3 for ‘Ulagaa Melka Oba’ and PA4 for ‘Wake Miyaa’ peasant associations. The lists of households in were obtained from their respective peasant administration offices. Those households, from which there were FRGs participant farmers, were rejected from the list as the target of the above sampling design is to select non-participant farmers in FRGs.

Table -1: Sample Size Determination Using Systematic Sampling Technique

Peasant			
Associations	Participant in FRGs	Non-participant In FRGs	Total
Awash	15	15	30
Wake Miya	15	15	30
Uлага Melka Oba	15	15	30
Batu Degago	15	15	30
Total	60	60	120

1.5.4 Variables Treated in this Study

In this study, farmers’ participation in Farmer Research Groups is treated as dependent variable while socio-economic characteristics such as:

- Age
- Household size

- Educational attainment
- Marital status
- Size of land
- Sex

are treated as independent variables.

1.5.5. Determination of Data Collection Tools

Structured Interview Guide and Questionnaire

A structured interview guide was used in generating data needed in the study (Appendix A). The first part of the structured interview guide dealt with the respondents' personal information, socio-economic information, patterns of participation and constraints to participation in FRGs. Questionnaire was (Appendix B) used to gather data from researchers in FRGs.

1.5.6. Focus Group Discussion

Two focus group discussions were held to collect data about factors that may mitigate farmers' participation. The researcher chose focus group discussions because they allow participants to interact with and build off the ideas of one another generating richer and more detailed data than a single interview with one person. Thus, the research method chosen brought farmers together for discussion and brought valid information about how participation occurred in FRGs, and the factors that may constrain their participation in FRGs.

The two focus groups were formed based on their socio-economic status in the study area. The first group consists of six participants that can be called resource-poor farmers. The second group also comprised of six resource-rich farmers. Both groups' discussants were participant in FRGs.

Each focus group participant completed a participant profile describing their identities as farmers, the type of farm operation and other characteristics of their farm. The participants ranged in age from 25 to 54 years.

1.5.7. Case Studies

Case studies were conducted to collect information on how participation occurs and factors mitigating participation in FRGs. Four FRGs participant farmers, three male and one female, were purposely selected. Their composition is believed to have brought the diverse attitudes and perspectives about participation in FRGs.

1.5.8. In-depth Interviews

In-depth interviews were held with eight key informants: four Development Agents (DAs), one FRGs coordinator in MARC, two farmers and one researcher: to collect information about local tradition, attitude and indigenous knowledge of farmers, and constraints mitigating farmers' participation in FRGs. The informants were purposely selected for their knowledge, experiences, and public and government responsibilities in the study area.

1.5.9. Administration of Data Gathering Tools

The draft structured interview guide was subject to review for content validity by the researcher. Their inputs were incorporated into the final draft. Pre-testing was thereafter conducted using the test-retest method, at an interview of one day.

The structured interview guide was first written in English language and later translated into Afan Oromo before the final interview of the respondents. Additionally, questionnaire was administered to 20 researchers of the FRGs by MARC. A structured interview guide was prepared and administered by four development agents (DA's) who were selected for their experience and familiarity with their respective peasant associations. Those household heads that were not around were substituted by nearby farming household heads.

1.5.10. Data Analysis Procedures

Both qualitative and quantitative data were analyzed using the following procedures. As to qualitative data, the main interest was to group data into themes or categories created as part of interview guide or those emerged during conversation with informants. In this respect data obtained from key informants and focus group discussions were analyzed qualitatively.

After collecting the data using structured interview guide and questionnaire, the quantitative data were statistically analyzed and interpreted in relation to the objective of the study. The levels of measurement of the variables treated are nominal, ordinal and

interval-ratio. Descriptive statistics like frequency counts, percentages, mean (when necessary) and range were used in treating the data. Inferential statistics like chi-square, phi-coefficient and point-biserial correlation analysis were used to test.

The status of the respondents level of participation (participation or non-participation) in FRGs was classified in groups and with respect to each socio-economic variable, a contingency table was drawn up. The chi-square test of association was used to test the hypotheses having variables measured at nominal level of measurement.

$$\chi^2 = \sum (f_e - f_o)^2 / f_e \text{ ----- Equation 1}$$

Where;

χ^2 = Chi-square

f_e = Expected frequency

f_o = Observed frequency

The use of chi-square test of association helps to decide whether variables are associated or not associated in a population. It was employed due to the fact that we make no assumptions at all about the shape of the population and the decision to reject the null hypothesis can be made with greater certainty. The test also determines if a conspicuous discrepancy exists between the observed and expected frequencies. It was employed in this study to test whether the explanatory variables were related among the participants and non-participants.

Additionally, for variables found to be associated by using chi-square, phi-coefficient was used to see the strength and direction of the association between variables. For variables

that could not be computed using chi-square, yet nonetheless, essential in findings of the study, point-biserial correlation was used for analysis.

$$\phi = \chi^2 / N$$

Where;

ϕ =Phi-coefficient

N= sum of frequencies

χ^2 = Chi-square

1.6. Scope and Limitations of the Study

The problem is examined through case study of FRGs in Adama Woreda in Oromia Region, East Shewa Zone where Farmer Research Group approach has been extensively introduced.

The following were the limitations of the study:

1. Survey timing within the calendar year was good, but not ideal. The main agricultural season of FRGs in the study area runs from May to October, although there are some agricultural activities in other months too. Main activities undertaken by FRGs are supposed, for the most part, to occur during the agricultural season, i.e., from May to July. Given the survey timing, the researcher had extensive information on participation in FRGs activities from February to April 2009, but missed any activities that occurred in June and July, 2009.

2. Since the respondents were paired groups, equal numbers of non-participants and participant farmers in FRGs were taken as if their proportion were equal in the population. And the comparison between the control and treatment groups was facilitated by taking samples of equal size. The actual, number of household head farmers is larger in the population than the farmers who were participants in FRGs in the study area. For both groups equal sample size was taken. But the samples taken may not be representative in both groups in the same manner.

1.7. Definitions of Terms

1.7.1. Conceptual Definitions of Terms

Contract participation: type of farmer participation in research in which scientists' contract with farmers to provide inputs, land or services. The farmers' role is passive and participation is not an explicit objective (Merrillsands, 1989; Biggs, 1989).

Consultative Participation: type of farmer participation in research in which scientists consult farmers about problems and then develop solutions. Farmers involve mostly in the diagnosis and later in the evaluation of proposed solutions (Selener, 1997).

Collaborative Participation: type of farmer participation in research in which scientists and farmers collaborate as partners in the research process with more intensive and continuous interaction (Merrillsands, 1989; Biggs, 1989).

Collegiate Participation: type of farmer participation in research in which scientists work to strengthen farmer's informal research and development systems in rural areas. The emphasis is on increasing the ability of farmers to carry out research on their own, as well

as request information and services from the formal research system (Merrillsands, 1989; Biggs, 1989).

Educational attainment: the level of education or the number of years of formal schooling of the respondents.

Family income: the estimated gross annual income of every earning member of the respondent/s family.

Farm size: the size of farm land in hectares.

Farmers' Indigenous Knowledge Systems: the theories, beliefs, practices and technologies that all peoples in all times and places have elaborated without direct inputs from the modern formal scientific establishment (Monu, 1997).

Farmer Participatory Research: “the collaboration of farmers and scientists in agricultural research and development” (Farrigton and Martin, 1988: 48)

Household size: numbers of persons who composes the household and who stay in the house in the year of study.

Participation: farmers' involvement in FRGs activities

1.7.2. Operational Definitions of Terms

Concepts Variable Indicators Level of measurement

Concepts	Variable	Indicators	Level of measurement
Household	household size	number of residents in household	Interval-ratio
Education	educational attainment	whether attended formal education or not	nominal
Farm	farm size	size of cultivable land owned by respondent in hectares	interval-ratio
Income	income of family	total income from all sources (on-farm, off- farm and non-farm activities) in year 2000 E.C by family members	interval-ratio
Children	number of children	the number of child /children living with respondents in 2001 E.C	interval-ratio
Participation	Participation in farmer research groups	involvement in farmer research groups	nominal

1.8. Organization of the Paper

The thesis is divided into five chapters. The first chapter provides a background of the study, statement of the problem, the objectives, hypotheses, significance, and methodology, scope and the limitations of the study and definition of terms.

The second chapter presents the literature relate to conceptual and theoretical issues of participation, agricultural research and socio-economic characteristics.

The third chapter attempts to present description of the study area. In contains geographical location, socio-economic condition, agricultural practices, and Farmer Research Group backgrounds are discussed in the chapter.

The fourth is about data analysis and discussion of results. It contains analysis and interpretation of data and discussion of results. The last chapter presents conclusions and recommendations.

CHAPTER TWO

LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

This part of the thesis deals with conceptual and theoretical issues of participation, agricultural research and farmer participatory research.

2.1. The Concept of Participation

It may be hard to give simple definitions of participation as the practice and assumption or theories differ considerably.

2.1.1. Debate on Participation

Three important shifts seem to have characterized the debate on the concept of participation. In the 1970s, “popular participation” was seen as an important component of rural development and basic needs strategies. In the 1980s, it became associated with discourse of grassroots self-reliance and self-help, with non-government organizations (NGO’s) often having to fill in the void left by retreating states as a consequence of neo-liberal reforms. The 1990s saw participation being advocated on a larger scale, being moved beyond the boundaries of project or grassroots interventions to other spheres of social, economic and political life. Participation then came to be seen as a tool towards important policy objectives such as “empowerment” and “good governance”, while maintaining, at least in theory, a role as an end in itself (Oakley, 1991).

The term participation is used, for example, to refer to farmers paying for irrigation facilities, but also to farmers exerting decisive influence on the activities of research and extension institutions (Leewis and Van den Ban cited in Elias, 2004). Hence, we can have normative, descriptive or literal meanings.

Literally speaking for some people, to participate means to 'take part in' or to 'be involved in'. In this sense, everything people do is 'participation'. However, such a literal definition does not help much to inform interventions on 'how' to involve stakeholders in innovation process.

The descriptive meaning also has some literal essence. For example, participation is everything that interventionists label it to be. However, participation is often defined in normative and prescriptive terms, indicating that certain criteria must be met in order for something to count as 'participatory'. For example, participation includes a process through which stakeholders' influence and share control over development initiatives and the decisions and resources, which suffice them. In absolute terms farmer participation implies local people can to a large extent, identify, and modify their own solutions to suit their needs. It means that outsiders such as researchers and development agents focus on enhancing farmers' capacity to innovate, to experiment, to develop their farming system in a sustainable way, and to increase their control over resources and decision-making affecting their farms.

2.1.2. Sociological Explanation of Participation

There is no doubt that participation in social activities is central to social well-being. The dangers of non-participation were seen as sociologically significant with the advent of modern, industrial society; anomie or social disaffection was closely aligned with suicide rates (Durkheim, 1893/1933 cited in Shortall, 2008). It is still a common phenomenon; the quality of life of socially isolated individuals who do not participate in social activities is compromised, and Shortall (2008) goes as far as arguing that the quality of society is compromised by non-participation.

The agricultural technology development program this research examines is heavily committed to enhancing participation and avoiding the 'exclusion' of any group. There seems to be an inherent presumption that the default position is to participate and there is a problem if individuals or groups of individuals do not participate. However, as Fiorina (1999) cited in Shortall (2008) argues, perhaps it is time to abandon the notion of participation as part of human nature. He argues it is not; rather it is an unnatural act. He further argues that people participate when motivated to do so and this means that those with more extreme views tend to be the ones motivated to participate. Hence the transition to a more participatory democracy has increasingly put politics into the hands of unrepresentative participators who have more extreme views than the norm (ibid).

While participation is seen as an indication of social inclusion and social engagement, it is not the case that non-participation equates with social exclusion (Hayward et al 2004 cited in Shortall, 2008). Non-participation can represent a valid and legitimate choice, and often

one made from a position of power (ibid). Nor does participation mean equal participation. Research has indicated that different groups experience a different quality of participation and the voices and views of some groups are given greater weight than the voices of other groups (Shortall, 2008; Edwards et al 2000). Most of all, the question of power differentials has to be negotiated in any group in which individuals participate, particularly when trying to advance economic and social activities.

In Northern Ireland, rural development documents state a particular commitment to redress the under-representation of women, small farmers and Protestants in local initiatives (Shortall, 2008). The usual response is to target resources at 'pre-development' or proactive work with these groups to try to increase their representation in partnership structures. In some areas where Protestants predominate, development workers have been appointed specifically to this end. Each of these identified excluded groups will now be examined in turn. It is suggested that not all of these groups are excluded and Protestants are very civically engaged and actively choosing non-participation in development structures. Women are excluded, and small farmers are choosing not to participate.

Current strategies that label all three groups as socially excluded can lead to misunderstanding of the extent of these groups' civic engagement and how non-participation can be an active choice. It is acknowledged that these three groups are not distinct and obviously overlap.

2.1.3. Benefits of Participation in Development

Oakley (1991) integrated some arguments on the usefulness of participation to the functioning of development projects. The following are the more substantive arguments:

1. **Efficiency:** implies a greater chance that resources available to development projects will be used more efficiently. Participation can, for example, help minimize misunderstanding of people disagreements and thus the time and energy, often spent by professional staffs explaining or convincing people of a project's benefits can be reduced. Participation is also cost-effective since if rural people are taking responsibility for a project, then fewer costly outside resources will be required and highly paid professional staff will not get tied down in the details of project administration. Participation, therefore, allows for more efficient use of the resources available to a project.

There is, however, another side of the coin; arguments to justify the resource efficiency of participation in development project can be met with accusations that this cost effectiveness often results in governments and agencies making fewer funds available for development work and indeed transfers the burden of project costs on to the local people.

2. **Effectiveness:** Participation will also make projects more effective as an instrument of development because participation allows these people who are beneficiaries to have a voice in determining objectives, support project administration and make their local knowledge, skills, and resources available and must result in a more effective project. A major reason why many projects

have not been effective in the past in achieving objectives is because local people were not involved. Effectiveness and participation can help to ensure this.

3. **Self-reliance:** Participation helps to break the mentality of dependence, completion of objectives, prompts self-awareness, boosts self-confidence, and causes participation in “good thing” as it breaks people’s isolation and lays the groundwork for them to have greater independence and control over their lives.

2.1.4. Encouraging Participation

There are many ways to increase the level of participation in project, these are:

1. Use small groups
2. Begin with one activity, which is of interest to all.
3. Use active rather than theoretical methods by involving everyone, and ensuring that everyone is involved or has a chance.
4. Provide meaningful data and information like simple graphics, models, number and chart.
5. Facilitate access to more information by taking the group to the library, government offices, and field trip where they can increase their knowledge.
6. Creating political awareness, where people are willing and mentally be able to help themselves. There is a need to create awareness that appeals to them as one of the most powerful forces for action and collective action necessary to achieve progress against oppression.

7. Making arrangement for careful selection and effective training that are needed for people's participation (Oakley, 1991).

Most of the time, people participate by being informed of what has already been decided or has already happened, or they have been consulted or asked questions such as "We have certain projects, do you like to join?" or "We can provide some help, do you want it? Instead of these, "How do you consider the problems you are encountering?" and "What would you like to implement to solve your problems?" Extension agents define the problems and do the information gathering and controlled analysis.

2.1.5. Constraints in Participation

According to Oakley (1991), there are three components of non-participation in development intervention in rural areas: the structural obstacles, the administrative obstacles, and the social obstacles. The first component looks at the political environment within a particular country constituting fundamental obstacles. In a country where prevailing ideology does not encourage openness or citizen's comments, genuine participation might be difficult to achieve. Furthermore, a central political system that lays less emphasis upon local mechanism for administration and decision-making can greatly reduce the potential for authentic participation; the legal system within a country often has an inherent bias. In addition, many rural people are unaware of their legal rights and of the legal services to benefit them.

The second component gives emphasis to the bureaucratic set up of a government. Centralized governments encourage centralized administrative structures which, by their

nature, create major obstacles to peoples' participation over decision-making and resource allocation. Resource allocation, information, and knowledge are the basics which people will require if they are to play effective part in the development activities. Similarly, the planning of development programs and project is often centralized and planning producers discourage local involvement.

The third component considers the social environment around the beneficiaries. The most frequent and powerful factor to constrain the participation of people in development projects is a mentality of dependence, which is deeply and historically ingrained in their lives. The lack of leadership and organizational skills, and consequent experience in running projects or organizations leave most rural communities incapable of responding to the demands of participation.

2.2. Models in Agricultural Research

Three models of participation of farmers in agricultural research: The Research, Development and Diffusion (RDD), Farming Systems Research and Extension (FSRE) and Farmers-First and Last (FFL) models in agricultural research are reviewed.

2.2.1. The Research, Development and Diffusion (RDD) Model

This model has been labeled differently as the "Horizontal Model of Research and Development" (Ashby, 1987) and the "Transfer of Technology (TOT) Model" (Chambers and Jiggins, 1987). The Research, Development and Diffusion Model looks at the process of agricultural research and development from the point of view of the originator of an innovation who bases his innovation on a presumed receiver's needs. The initiative of

identifying problem areas is, therefore, taken by the researcher of the innovation who focuses on the design and development of a potential solution. This is followed by the dissemination of the solution to the receivers. Thus, in this model, the receiver is a passive partner so far as the identification of the problem or the design and development of the solution to the problem is concerned. In practice, what actually occurs is a chain of activities through which farming ideas and practices are developed and tested in the research plots and then channeled to extension services for dissemination to farmers (Monu, 1994).

The Research, Development and Diffusion model has been credited with the miracle of the 'Green Revolution'. However, it is this very 'success' that generated the criticism against the RDD model. While the 'Green Revolution' technologies led to dramatic increases in crop yields, most of the beneficiaries were large-scale resource-rich farmers. The small scale resource-poor farmers fell behind further. In addition, these technologies were not sensitive to the environment. It has been argued that the results of the adoption of the 'Green Revolution' technologies reveal the inadequacy of the RDD model especially as it applies to the resource-poor farm families.

Although there have been several criticisms of the RDD model (Roling, 1989; Merrillsands and Deam, 1997; Monu, 1982), perhaps the most thorough and comprehensive review of this model has come from Chambers and Ghildyal (1985) and Chambers and Jiggins (1987).

First, unlike the practice within industry, the RDD model does not differentiate between output-oriented science and client-oriented technology. In industry, scientists are trained in market research. In addition, the scientists are encouraged to use methods which would enhance responsiveness to user concerns. On the other hand, the RDD model is output-oriented and leads to a situation where scientists develop the technology and then expect the extension service to sell it to be researched. The scientists then design and conduct the experiments under controlled conditions on experimental farms and laboratories and pass on the results to the extension service for transfer to farmers. Since resource-poor farmers are not part of the pressure groups which influence the research agenda, most of what is researched and the recommendations emanating from the research are often inapplicable to their situation.

Agricultural scientists who operate within the RDD model are committed to the model because of the education and training they receive, funding and influence of government and commercial organizations, the research methodology associated with the RDD and the professional and personal rewards and incentives the scientists receive (Chambers and Jiggins, 1987).

The training is modeled on “learning from above and teaching to below” and this is reinforced by the curriculum which is concerned with scientific method and detail. The training contains very little about technology development and how to learn from farmers.

Other sources of reinforcement for the RDD model are government and commercial funding and influences. Government and commercial organizations are more likely to give

support to export cash crops and/or commercial food crops. This emphasis on commercial production directs attention to regions that have the natural resources (irrigation, rainfall, good soil) to support increased yields and to focus on resource-rich farmers who could more readily take advantage of the technologies developed.

The research methodology of the RDD model supports commercially oriented, resource-rich farmers. The RDD research methodology studies only a few variables which affect the farming system at a time. This type of methodology fits more the simplified cropping patterns of the resource-rich farmers (e.g., mono cropping). This type of methodology is unlikely to yield a comprehensive knowledge of the resource-poor farming systems. The scientist's support for the RDD model is also reinforced by the personal and professional rewards received by the scientists. Rewards are based on output and not service. These are calculated in terms of publications in academic journals or how useful the findings are for commercial organizations.

In addition to the above, Chambers and Jiggins (1987) suggest that a comparison of the physical, social and economic conditions which exist on research stations with those of the resource-poor farmers would indicate that the technologies produced by the RDD model are likely to be inappropriate for resource-poor farmers. In most cases, the research efforts have been concentrated on the individual (mostly the male head of the family) as the unit of analysis. This ignores the fact that in Africa, women contribute a greater portion of the labour required in agriculture. Indeed, in certain areas women are completely in control of food production.

Furthermore, using the farm family as the unit of analysis (rather than individuals) allows us to examine the distinct roles and multiple goals of individuals within the farm family, in addition to the recognition that farming is only one of several strategies within the farm family economy. It also enables us to analyze how the farm family adjusts to different demands in order to satisfy its multiple goals which may compete with one another at times.

Finally, the RDD model fits well with the principles of bureaucratic organizations which characterize most of the agricultural research institutes/centers in Africa. Such organizations are normally characterized by close adherence to formal procedure, a centrally administered control system with a hierarchical structure within which one's authority is a function of his/her position and organizational rank. Organizational procedures are specifically designed to limit varied responses to individual or group demands since such variations are seen as interfering with the rational functioning of the organization.

2.2.2. Farming Systems Research and Extension Model

The Farming Systems Research and Extension (FSRE) approach was largely developed in reaction to the RDD model.

The concept FSRE explicitly recognizes the value of the farmers' experience and their traditional experimentation as inputs into strategies for improving the productivity of existing farming systems (Gilbert and Winch, 1980:14).

In this approach, there are four successive stages in the research process: description, design, testing and extension. The description or diagnostic stage is undertaken to understand the constraints, flexibility and needs within the farming systems. This information is then fed into designing, testing and extending improved technologies and strategies. Norman and Gilbert (1982) have identified five attributes of the FSRE approach:

1. The objectives of the farm families are incorporated into the research process. This involvement of the farmers ensures the use of evaluation criteria that will be relevant to them.

2. Efforts are made to take into account community and social needs. For example, satisfying the short-run needs of individual farm families could lead, in the long-run, to the degradation of natural resources and increased inequalities in welfare distribution. In addition, by involving farmers, the approach draws on the pool of knowledge in the group and thereby enables the researcher to start with the strength of the system, thus minimizing the time spent on 'rediscovering the wheel'.

3. The strategy recognizes the location, and specifics of the technical and human element. This means that for research purposes, the farm population is divided into homogeneous sub-groups. This allows the researcher and indeed the extensionist to deal with a group of farmers with similar farming activities, social customs, and access to support systems, comparable marketing opportunities and resource endowment.

4. The process used is dynamic and interactive, with links in both directions among farmers, researchers and extensionists.

5. Finally, unlike the Research, Development and Diffusion approach, the FSRE approach is concerned with the entire farming system. Thus, it can deal with technical and non-technical or institutional issues.

The FSRE approach is, thus, more holistic than the RDD model. Through system analysis, three subsystems are delineated. These are the Research Subsystem (the information technology generating system), the Extension Subsystem and the User Subsystem (farmers). These subsystems are envisaged to be in interaction with each other throughout all the stages from description or diagnosis stage to the extension stage.

Clearly the FSRE model has a number of advantages over the RDD model. As Acker and Sungusia suggest:

The farming systems perspective (FSP) identifies farmers' most (pressing) problems and best expansion opportunities and the appropriate technology to solve those problems and better exploit those opportunities. By this process it focuses attention on to recommendations most likely to be rapidly absorbed by local farmers, enhancing the cost effectiveness of research and extension efforts (1986:172).

However, the available evidence indicates that the practitioners of the FSRE model have fallen short of their theoretical model. Although scientists have succeeded in working with farmers in diagnosis and testing “[----] information is extracted from the farmers and their farms and analyzed by scientists to diagnose and prescribes for the farmers [-----] the key decisions about what to try and what to do remain with the scientists” (Chambers and Jiggins, 1987:45).

Secondly, the FRSE model assumes a multi-disciplinary collaboration. This cooperation between social scientists and agricultural scientists is hard to come by. As Rhoades (1983:2) have observed:

Difference in perception and role definition between biological and social scientists result in a mutual respect that is miserably low...the upstart of this disciplinary tribalism (is) that social and biological scientists tend to line up on opposite sides of the fence and throw spears.

Perhaps this 'tribal warfare' could be partly attributed to the fact that the conventional methods of social investigation have not produced the relevant, useful and timely information required. In the desire of social scientist to have a comprehensive database, the agricultural scientist could be frustrated with the endless process of socioeconomic data collection.

It is further argued that like the RDD, the FSRE lack "explicit focus on resource-poor farmers" since resource-rich farmers is seen as better informants and better collaborators. These resource-rich farmers who have resource for experiment with the technology being developed are also seen as the most effective group for diffusion. This means that most of the on-farm trials that are undertaken use resource-rich farmers as collaborators whose conditions are very different from the resource-poor farmers, who form the majority of African farmers.

2.2.3. Farmers -First and Last Model

Chambers and Ghidyal (1985) and Chambers and Jiggins (1987) argue that in order to increase farmers' participation in the research process and to make the research more relevant to resource-poor farmers (RPF), a change in the formulation of the FSRE model is required. Their model is referred to as the Farmer-First and Last (FFL) model. The model starts:

[----] not with scientists and their perceptions and priorities, but with RPF families and theirs'. It begins with a systematic process of scientists learning from and understanding RPF families, their resource needs and problems. The main focus of research and learning is the resource-poor farm, rather than the research station and the laboratory. Research problems and priorities are identified by the needs and opportunities of the farm family rather than by the professional preferences of the scientists. The research station and the laboratory have referral and consultancy role, secondary to, and serving, the RPF family. The criterion of excellence is not the rigor of on-station or in laboratory research, but the more rigorous test of whether new practices spread among the resource-poor (Chambers and Ghigyal, 1985:45).

According to Chambers and Jiggins (1987), the ecological and social complexity and diversity of resource-poor farmers' farming system demand two simplifications, namely, large-scale surveys and massive multi-dimensional data analysis and reduction of dependence on multi-disciplinary teams. In order to effect these simplifications, the scientists should "...directly encourage and enable RPF families themselves to identify priority research issues" (Chambers and Jiggins, 1987:112).

The eight major elements of the model which, together, lead to what Chambers and Ghilyal describe as reversals of explanation, learning and location are:

1. Research priorities and conduct are determined mainly by the needs, problems, perceptions and environment of farmers.
2. The crucial learning that takes place is the scientists learning from farmers.
3. The role of the farmers is that of a client and professional colleague at the same time.
4. The role of the scientist is that of a consultant and a collaborator.
5. The main research and development location is the farmer's fields and conditions.
6. The physical features of research and development are mainly determined by farmers' needs and preferences.
7. The explanation of non-adoption of innovation is sought in farm-level resources, failure of scientists to learn from farmers and research station constraints.
8. The evaluation of the innovation is done through adoption by farmers.

The FFL model has been criticized to be "extreme farmer-centric" (Farrington and Martin, 1988:21). It is argued that scientists and the scientific method have a more important role to play in the technology development process than suggested by the FFL model. However, others would argue that this "farmer-centric" view is justified, if only to emphasize the importance of the involvement of resource-poor farmers in the research process.

Despite the fact that the FFL model has provided a number of excellent suggestions to improve farmer participation in the research process, all the recommendations cannot be adopted in a wholesale manner (Baker et al. 1991). According to Frankenberger (1992), farmer-articulated demands tend to relate to short-term priorities. Thus an exclusive focus on farmer priorities could lead to over-concentration of research on issues related to short-term benefits, and to the neglect of those issues that would deal with long-term benefits, hence sustainable option systems.

Secondly, it should be recognized that even among resource-poor farm families, there are inter-and intra-differences in household priorities in terms of gender roles, geographical location of villages. These differences must be taken into account in deciding which and how farmers would be involved in the research process.

Finally, the attempt by the FFL proponents to give greater control of the research process to farmers is likely to be resisted by most national agricultural systems which are used to the RDD model. Thus, an educational program is needed to convince the researchers in these institutions. In some cases compromise may be needed to gain acceptance of greater farmer involvements in the research process.

2.3. Theoretical Background of Farmer Participatory Research

The term farmer participatory research was coined by Farrington and Martin in 1987 (Selener, 1997). The approach has also been called farmer-back to-farmer research, farmer-first and last research and participatory technology development by different proponents of the approach (Selener, 1997; Monu, 1997 and Chambers and Jiggins, 1989).

A basic tenet of this approach is that agricultural technology must emerge from the farmers' needs as they identify them. Farmers conduct experiments and evaluate the appropriateness of a technology on the basis of their own criteria.

Farmer participatory research emerged as a response to the generation of inappropriate technologies by scientists at research stations whose work was based on the Transfer-of-Technology Model (Chambers and Jiggins, 1989). Those working in this field began to develop a series of new research approaches that would result in technologies that would be beneficial to, and therefore adopted by, small farmers (ibid).

The Transfer-of-Technology model was predominant in the 1950s, and 1960s. The fact that small farmers did not adopt the technology packages developed at research stations led researchers to conclude that farmers were backward or ignorant, and that the key to success lay in creating a better system of extension service (Selener, 1997). Thus, the training and visit system of Agricultural Extension was widely implemented (ibid).

In the 1970s and early 1980s, non-adoption, still a problem, was attributed to constraints occurring at the farm level. Farming Systems Research arose as a response, emphasizing research at the farm level to diminish constraints to the adoption of new technologies.

Finally, in the 1990s, some researchers came to believe that the problem was not the farmers, but the inappropriate technologies they were being encouraged to adopt. This marked the emergence and gradual evolution of farmer participatory research, and approaches aimed at creating appropriate technology for small farmers (Chambers and Jiggins, 1989).

Both farmers' and researchers' knowledge are crucial in coming up with technologies that fit local environment and circumstances. Chambers and Ghildyal (1985) put that the criterion of excellence is not the rigor of an on- station or in-laboratory research , or yields in research station or resource-rich farmer conditions, but the more rigorous test of whether new practices spread among the resource-poor.

For technical, environmental, political, and socio-economic reasons, the agricultural sciences have had little to offer small, resource-poor farmers (Selener, 1997). Farmer participatory research has emerged in response to this situation as a viable solution to the problem of developing appropriate technology.

Farmer participatory researchers view the lack of interaction between researchers and farmers as one of the principal weaknesses in the methods earlier developed. To correct this deficiency, proponents of this approach propose in collaborative work with farmers to

identify their most urgent agricultural problems and development of appropriate technologies at the farm level. As a result, researchers learn about an array of interrelated matters at the farm level that need to be considered in the development or adaptation of technologies. This process involves tapping into the farmers' own agricultural knowledge (Trauger, 2008). In the process, researchers come to appreciate and respect small farmers.

The challenge for development workers, researchers, and farmers is to design and use research methodologies that ensure the development and adoption of improved agricultural technologies to create sustainable agricultural production that will benefit the resource - poor farmer.

One of the principal tenets underlying farmer participatory research is that farmers act rationally in using resources available to achieve their production needs. Farmers manage a complex set of biological processes which transform these resources into useful products, either for home consumption or sale.

Decision about crop and livestock production, and the methods and timing of cultivation, husbandry and harvesting are determined not only by physical and biological constraints but also by economic, socio-political, infrastructural and policy factors that make up the larger milieu within which farmers operate.

In undertaking a farmer participatory research project, researchers assume that farmers possess indigenous knowledge of their farming systems and their environment and have a capacity for experimentation that must be used and strengthened for technology development

(Selener, 1997). Monu (1997) portrays indigenous knowledge systems as consisting of: "The theories, beliefs, practices and technologies that all peoples in all times and places have elaborated without direct inputs from the modern formal scientific establishment".

Indigenous knowledge has been regarded as backward and irrational by researchers who rely on science based knowledge. However, the fact that scientists are unaware of the scientific value, principle or explanation for a practice does not mean said practices or knowledge do not work well for farmers, nor that they lack a scientific basis. It just might be that no one has conducted a research on traditional farming practices.

According to Chambers and Jiggins (1987) this is due at least in part to the dependence of officials and experts on scientific knowledge to legitimize their superior status and in the process pull down indigenous technical knowledge. Scientists often do not allow farmers to participate in the generation of new technical knowledge and agricultural practices. Thus the task of scientists involved in farmer participatory research is to engage farmers in research so that the latter will gain confidence and knowledge (ibid).

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2.4. Types of Farmers' Participation in Agricultural Research

In a summary of the findings of study by Merrill- Sands 1989 and Biggs 1989 identified four distinct types of farmers' participation:

- a) **Contract participation:** Scientists contract with farmers to provide inputs, land or services. In this approach, the farmers' role is passive and participation is not an explicit objective. The investigating researchers manage the trials themselves so as to maintain tight control over the variables. Multi-location testing is a good example of contract participation. Although this mode cannot by itself be considered as client-oriented research, it may form an important component of such efforts.
- b) **Consultative Participation:** Scientists consult farmers about problems and then develop solutions. This type of participation has been likened to the "doctor-patient" relationship. Researchers use formal and informal surveys to define farming systems and diagnose priority problems. They then design experiments to test various solutions or to better understand identified problems. The emphasis is on adapting technology to the socioeconomic as well as the agro-ecological conditions facing the farmers. They involve farmers mostly in the diagnosis and later in the evaluation of proposed solutions (Selener, 1997).
- c) **Collaborative Participation:** Scientists and farmers collaborate as partners in the research process. This approach, which involves more intensive and continuous interaction. Researchers actively draw on farmers' knowledge and experimentation in seeking solutions to identified constraints. Regular meetings are held between farmers and researchers to understand current farming practices, set priorities

among research problems, develop potential solutions, monitor progress and jointly review results.

- d) **Collegiate Participation:** Scientists work to strengthen farmer's informal research and development systems in rural areas. The emphasis is on increasing the ability of farmers to carry out research on their own, as well as request information and services from the formal research system. This mode of participation is often used with large-scale commercial producers, but less common with resource-poor farmers.

These various types of farmers' participation are not mutually exclusive. Different modes are appropriate for different institutional settings and for different research problems and objectives. Researchers can use them together or sequentially (Biggs 1989; Sarvaes and Arnst 1992).

2.5. Patterns of Participation in Participatory Research

Participatory research has received an increasing level of attention as a means of enhancing the relevance and impact of research. Parkes and Panelli (2001) (cited in Jakku, 2007; 65) note that participatory research involves "forms of inquiry where researchers and the researched population form collaborative relations in order to identify and address mutually conceived issues or problems through cycles of research".

Participatory research can take a variety of different forms in terms of who participates, how and when, and who decides about what, how and when. In any given participatory research activity, usually more than one form is employed (ibid).

2.6. Socio-Demographic and Economic Characteristics

2.6.1. Age

Many studies about participation on social and economic activities have emphasized the relationship of participation with age (Delos Reyes, 1990). In the different stages of life, there is the tendency for an individual to categorize activities appropriate to the age level. Age is one of the intermediate variables through which culture and world views operate on the behavior of people (Seyoum, 1990, cited in KCTE, 1998).

Delos Reyes (1990) pointed out that young people participate more in social activities than do their adult counterparts especially where gain is seen at a distance. The adults tend to be involved with economic rather than social activities, as the priority changes with age and responsibilities in life.

2.6.2. Household Size

The study conducted by Gomez (1999) cited in Abaynesh (2002) showed that farmers with bigger families had a greater tendency to adapt to the recommended cultural practices. A greater proportion of low adapters had smaller families. Bigger families mean having more members to do farm work and more people to facilitate adoption of innovative practices. Household size was found to be an important factor in participating in farming activities. In another study, Bascug (1981) cited in Abaynesh (2002), household size was found to be related to securing capital for farm operation.

2.6.3. Educational Attainment

Education is the process of “becoming someone”, it involves facts, concepts, knowledge, attitude, values and experiences. Education starts with awareness creation through skills transfer to active participation. It improves culture and makes change faster. Education also motivates people and enables them to do things for themselves (KCTE, 1998).

Education is a factor that symbolizes qualities to take part in organization. Highly educated persons are more active than those with low education (KCTE, 1998). It was found that the higher the educational attainment, the higher participation in every stage of development project could be expected.

Education offers a highly reliable correlation with participation because it helps develop a sense of civic duty, political competence, interest and responsibility as well as personal characteristics of self-confidence, dominance, interest, responsibility and articulateness (Gregorio, 1990 as cited by Abaynesh, 2002).

Numerous studies have shown a significant relationship between education and participation. Apinantara (1980 cited by Thau, 2001) for instance, found that members with high educational attainment tended to participate more in association activities. Education or educational attainment has been shown to be related to participation in extension activities (Thau, 2001).

2.6.4. Farm Size

Farm size affects the household labor allocation patterns and land use pattern (Thau, 2001 cited in Abaynesh, 2002). Farm size or land size is a base for agricultural production and it is one of the factors that determine participation in production. In general, farmers with small lands suffer from low income (Fujimto, 1993 cited by Thau, 2001).

Small farm owners often engage in intense cropping patterns and uses family labor very effectively to meet household food needs. Attachment to the land is generally strong and this usually results in broader contribution to community improvements, rural development and economic progress. But this holds only true if the small holders have equal access to water, credit, additional land, knowledge related improved agricultural methods and other requirements for successful farming operations (Leymann, 1993).

2.7. Conceptual Framework

The conceptual framework is designed to analyze farmers' participation in farmer participatory research in the Farmer Research Group approach. In planning for rural development, the proponents of Farmer Participatory Research (FPR) generally, take FPR as a process where "The farmer acts as a subject who investigates, measures, and studies in collaboration with researchers" (Ashby et al. 1987 cited in Selener, 1997:49).

The framework highlights the information necessary and the process by which participant and non-participant farmers in FRGs are assessed.

In order for agricultural research to properly address farmers' biological and socio-economic constraints, the Ethiopian Agricultural Research Systems have been trying to promote participatory research approaches to develop technologies with farmers' active involvement (MARC, 2008).

In the context of rural development, change in ways of adapting technology depends on the patterns and extent in farmers' participatory research in the agricultural technology development program such as the Farmer Research Groups, and farmers in the study area in general. The farmers' participation and patterns of participation in Farmer Research Groups may be determined by many factors, such as:

1. Socio-demographic and economic characteristics (age, household size, educational attainment, farm size, and sex).
2. Type of the participatory research, and criteria of recruitment for participation.

CHAPTER THREE

DESCRIPTION OF THE STUDY AREA

This part introduces the geographical and socio-economic settings of the study area. It contains the description of location, topography, climate, household, and access to land, and agricultural practices in the study area.

3.1. Location, Topography and Climate

Adama Woreda is one of the districts in Oromia Regional State located in southern part of East Shewa Zone in south of Adama town to the north of Awash River where the river forms a natural boundary between East Shewa and Arsi Zones. The woreda covers a total land area of 96020 hectares (AWAO, 2007).

The topography of the woreda is almost plain bisected by rivers, and small hills. In general, the altitude in the woreda ranges from 1400 to 2300 above sea level. Awash is a major river, with a potential for irrigation development in the Woreda. The river has been exploited in both traditional and modern irrigation (including the new irrigation implemented this year (2008/9) by Wonji Sugar Factory to produce sugarcane).

In general, the Woreda's 92 percent climate can be termed as 'Weine-dega' (moderate). According to the Woreda agricultural office's documents (WAO, 2008) there is insignificant percent of Dega (wet) climate in the Woreda. According to East Shewa Zone

Planning and Economic Development Department (2002:19) the Adama Woreda always gets insufficient amount of rainfall. The annual rainy season is from June to September while April and May are months of short rain. Accordingly, farmers in the study area prepare land for new crops to be planted during the months of April, May and June.

The agro-ecological zone of Adama Woreda is not yet established. On the other hand, informants¹ divide the agro-ecological zone of the Woreda on the basis of soil types and cropping patterns. As a result of agricultural extension and research intervention by Melkassa Agricultural Research Center, farmers focus on horticulture (fruits and vegetables), crops (lowland pulse, sorghum, millet, maize, and teff). According to the Adama Woreda Agricultural Office (2008), there are three types of soils categorized as red, brown and black in the Woreda.

3.2. Household Organization and Function

Household in the study area is almost a production, reproduction and consumption unit. The production practices, property management, rearing of children and consumption are based on the household structures. Household in the Woreda tends to assume the form of nuclear family. As a result, most households consist of spouses, children and in some cases hired laborers.

3.3. Access to Land an Overview

Land is the socio-economic foundation for any agrarian country like Ethiopia. Before the fall of Haile Selassie's regime, land in the Woreda, as elsewhere in Ethiopia, had been owned by land lords. Although there was communal land ownership, according to

informants², land was not equally shared among the corporate groups. A few individuals possessed the largest portion in a corporate group by virtue of political and economic powers.

The systems of landownership in the study area are: communal and private land ownership. Grazing land, mountains and other uncultivable land under communal land ownership, whereas the privately cultivated land under private ownership, though land is a state property by law.

3.4. Agricultural Practices: An Overview

Agriculture in Adama Woreda is a combination of crop, vegetable, fruits production and animal husbandry. Each household has an initial endowment such as land, cattle and other household property from parents. On the basis of these resources, each household plans, manages and conducts agricultural practices independently and/or with co-operation of other households and hired labour on contractual and reciprocal basis.

Agricultural activities (crop production) could easily be described in seasons. The informants³ of this study divided agricultural activities into rainy and dry seasons. But it is difficult to establish a clear-cut line of the three agricultural seasons from the various natures of different crops. The three agricultural seasons have guided the rhythm of social life.

3.5. Calendar of Agricultural Operation

Agriculture in the Woreda is almost rain-fed and some rely on irrigation from the Awash River. The crucial task is carried out in **Kiremt** (rainy season). It is a period when intensive cultivation, sowing, weeding and other activities are performed. If the rain starts in May, intensive cultivation and sowing will be started and continued until early September. This is the time that makes households very busy.

The second period, which extends from September to late January, is **Mahier** (harvesting season). It is a period when harvesting, collecting, threshing, and storing are performed. These seemingly separate tasks are done in most cases side by side. The very difficult task is harvesting and threshing. These start in early September and end in early January.

The third season is **Bega** (dry season) when both agriculture laborers and oxen take a relative annual rest. It starts from almost late January and continues to early May. But people said that it is not a period of rest in the strict sense of the term. A number of socio-economic activities are performed. Agricultural implements are supervised, readjusted, prepared, and minor cultivation of the plot in the mornings and evenings are carried out. Old houses are maintained or replaced by a new one in this time. The new households construct their independent house. A plan action of about the process of cultivation, contractual labor agreement, the arrangement of access to inputs and, contractual agreements for access to land are done in this period.

3.6. Farmer Research Groups Background

Farmer research groups (FRGs) in Adama Woreda is one of FRGs which have been established jointly by Ethiopian Institute of Agricultural Research (EIAR), Oromia Agricultural Research Institute (OARI), Melkassa Agricultural Research Center (MARC) and Japan International Cooperation Agency (JICA) for five years from 2004-2009. The FRGs of Adama Woreda has been operating in thirty seven peasant administrations. They are funded by JICA. The program components of FRGs are classified into four major categories, namely:

1. Creating sustainable livelihoods
2. Increasing production and productivity of food crops
3. Establishing drought coping farming system and
4. Enhancing the income of vegetable growing FRGs.

The concept of FRG as farmers' participatory research approach was first introduced to Adama Woreda by Melkassa Agricultural Research Center (MARC) and Japan International Cooperation Agency (JICA). When it was introduced, different people gave different meanings to FRG. For instance, some said FRG is a group of people who does just similar activities to what researchers do in their ordinary job, while others said it is a group of people who focus on "transfer-of-technology" (Elias, 2004:30).

As time went by and awareness improved, many development workers and researchers came to recognize that FRGs could play a significant role in rural development in general and in participatory technology development process in particular.

FRGs in Adama Woreda have group identifications such as, name and type of activities in which the group is engaged and group categories of sex, education and socio-economic status. While forming the groups, care has been taken in proximity, diversity of actors (male and females) and interest of farmers.

The process of FRGs formation and establishment involves various steps which are summarized as follow:

1. Situation analysis: Where existing scenarios are assessed and opportunities as well as gaps identified.
2. Forming groups: Based on the result of the situation analysis, groups are formed on particular problem area. Membership in a particular group is mainly dependent on the interest of the farmer to work on a problem the group is formed to solve.
3. Planning and designing activities: The groups sit together to analyze activities, set time table, establish group norms, design experiments and share responsibilities.
4. Implementation: The group implements activities planned in previous stages.
5. Monitoring and evaluation: The group follows up, monitors, and evaluates the implementation of the planned activities.
6. Sharing results with others: The group will share its experience with other farmers and FRGs.

Farmer Research Groups were composed of farmers from the same social class to avoid difference in interest, resources, vision and risk taking behavior of different classes.

On average the number of member farmers in a given FRG is 25 farmers in the study area (FRG, 2008). The group size is believed to facilitate innovation process in general and daily routine in particular. The functions of FRGs are often framed to on-farm activities such as observation, discussion, analysis, taking appropriate action on on-farm activities. This is done through organizing workshops, seminars, trainings and field days.

Strong leadership is crucial in forming and maintaining a cohesive farmers' group with consistent and innovative objectives. Hence, farmers are encouraged to elect their leaders i.e. chairperson, and secretary. Apart from their day-to-day duties and functions, these committee members serve to play a major role in creating liaison with external supporters and facilitators.

For group work frequent meeting is critical and this has to be manifested in the rules and regulations of the group. Meeting dates, time, and place should be notified in advance and all group members need to be informed.

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION OF RESULTS

This chapter presents data analysis, interpretation and discussions of the results of the study.

4.1. Socio-Demographic and Economic Characteristics of Respondents

The summary of the distribution of respondents by socio-demographic and economic characteristics such as age, sex, educational attainment, household size and marital status is presented below. The respondents are classified in terms of their association with the Farmer Research Groups (FRGs) as participants or non-participants to facilitate comparison between the two groups.

Table - 2. Distributions of Respondents by Sex and FRGs Affiliation

Sex	FRGs AFFILIATION					
	Participant		Non- participant		Total	
	Frequency	%	Frequency	%	Frequency	%
Male	49	81	48	80	96	80
Female	11	19	12	20	24	20
Total	60	100	60	100	120	100

From the total respondents the majority (80 percent) are males while the remaining 20 percent are females. The percentage of male and female in FRGs participant and non-participants is also almost the same with percentage in the total respondents.

Table -3. Distributions of Respondents by Age Group and FRGs Affiliation

Age Group (in year)	FRGs AFFILIATION					
	Participant		Non- participant		Total	
	Frequency	%	Frequency	%	Frequency	%
20-30	12	20	9	15	20	17
31-40	8	13	18	30	26	22
41-50	24	40	6	10	30	25
51-60	10	16	12	20	22	18
61-70	6	11	15	25	29	18
Total	60	100	60	100	120	100

Table- 4. Distribution of Respondents by Household Size and FRGs Affiliation

Household Size	FRGs AFFILIATION					
	Participant		Non-participant		Total	
	Frequency	%	Frequency	%	Frequency	%
1-3	1	2	13	22	14	12
4-6	42	70	33	55	75	62.5
7-9	14	23	14	23	28	23
10-12	3	5	--	--	3	2.5
Total	60	100	60	100	120	100

Source: Author's Survey

The respondents' household size ranged from 1 to 12 persons. Seventy five percent of them have from 1 to 6 family members. The average household size of the respondents is five.

Table-5. Distribution of Respondents by Educational Attainment and FRGs

Affiliation

Educational Attainment	FRGs AFFILIATION					
	Participant		Non- participant		Total	
	Frequency	%	Frequency	%	Frequency	%
No formal Education	14	23	34	57	48	40
Attained Formal Education	46	77	26	43	72	60
Total	60	100	60	100	120	100

Source: Author's Survey

In terms of their educational attainment, sixty percent (60%) of the total respondents have gone through schooling while the remaining 40 percent of the respondents have not attained formal education. Seventy seven (77%) of FRGs participant respondents have formal education. The remaining 23 percent of FRGs participants have not gone through formal schooling and therefore do not have formal education. Fifty seven percent of non-participants of FRGs have no formal education while the remaining 43 percent have formal education.

Table -6. Distribution of Respondents by Marital Status and FRGs Affiliation

Marital Status	FRGs AFFILIATION					
	Participant		Non- participant		Total	
	Frequency	%	Frequency	%	Frequency	%
Single	2	3	6	10	7	6
Married	47	79	38	64	85	71
Widowed/er	4	6	5	8	9	7
Divorced	7	12	11	18	19	16
Total	60	100	60	100	120	100

Source: Author's Survey

The majority (71%) of respondents are married. The remaining 16, 7, and 6 percents are divorced, widowed and single respectively.

Table -7. Distribution of Respondents by Size of Farm Land and FRGs Affiliation

Size of Farm Land (In hectares)	FRGs AFFILIATION					
	Participant		Non- participant		Total	
	Frequency	%	Frequency	%	Frequency	%
Landless	--	--	4	6	4	3
0.25- 0.50	1	1	4	6	5	4
0.51-1.00	2	4	7	12	10	8
1.1-2.00	4	6	12	20	14	12
2.1 – 3.00	24	40	14	24	38	32
3.1- 4.00	17	29	11	19	29	24
>4.1	12	20	8	12	20	17
Total	60	100	60	100	120	100

Among participant respondents, there was no who was landless while 6 percent of non-participant respondents were landless. On other hand, 73 percent of all the respondents owned relatively large farm land (more than two hectares) while the remaining 24 percent had small farm land (two hectares or less). It is observed from the Table- 7 that the average land holding of the respondents was 2.683 hectares.

According to informants⁴, the farmers in the study area have different mechanisms that allow them to use the land through different forms of local arrangements. Sharecropping (*Irtaa*), rent (*Kiraa*), purchase (*Bittaa*), gift (*Kennaa*) and inheritance (*Dhaala*) are different forms of access to land. But the most important forms of access to land are share cropping, and to some extent rent and purchase. Those who have shortage of land could plough land by using one of these accesses to land.

Sharecropping is a local form of contractual agreement to plough and use land usually on annual basis. This is a widely practiced form of access to land in the study area. And those who have no oxen or weak oxen use to share crop out their land to those households who have more oxen but less land or no land. Such form of land arrangement is made between the one who share crops in the land and the one who share crops out the land. Informants⁵ said that they could plough more than their personal land holding.

4.2. Socio-Demographic Characteristics of Researchers

Table - 8. Researchers Characteristics (N = 20)

Characteristics	Frequency	%	Characteristics	Frequency	%
Age			Research Experience		
20-30	3	25	1-5 years	8	40
31-40	9	45	6-10years	10	50
41-50	4	20	11-15 years	1	5
51-60	2	10	16-20years	1	5
Total	20	100	Total	20	100
Mean =37 years			Mean = 8years		
Educational Attainment					
Diploma	4	20			
First level Degree	5	25			
Second Degree	6	30			
PhD	5	25			
Total	20	100			

Source: Author's Survey

The majority (70 percent) of the researchers are below 40 years of age with a mean of 37 years. Eighty percent (80%) have obtained first degree and above in different disciplines and 60 percent have above 6 years of experience in agricultural research with an average of 8 years for all.

4.3. Relationship of Variables

4.3.1. Socio-Demographic and Economic Characteristics

The socio-demographic and economic characteristics of the respondents such as age, household size, educational attainment, marital status, sex, size of farm land and their relationship with farmers' participation in FRGs were determined by chi-square⁵, phi-coefficient (when necessary) and point-biserial correlation analysis. Participation refers to whether the farmers are engaged or involved in the FRGs in the study area.

Age of Respondents. The point-biserial correlation technique is used here to test the relationship between age of farmers and their participation in FRGs.

Table - 9. Point-Biserial Correlation Analysis for Age and Participation

AGE GROUP	PARTICIPATION STATUS									
	Participants					Non- participants				
	X	X ²	f1	f1x	f1x ²	X	X ²	f0	f0x0	f0x0 ²
20 - 30	25	625	12	300	7500	25	625	9	225	5625
31 - 40	35	1225	8	280	9800	35	1225	18	630	22050
41 -50	45	2025	24	1080	48600	45	2025	6	270	12150
51 - 60	55	3025	10	550	30250	55	3025	12	660	36300
61 - 70	65	4225	6	390	25350	65	4225	15	975	63000
Σ	--	11125	60	2600	121500	--	11125	60	2760	135000

Source: Computation by the author's

$r_{pb} = -0.158$ see Appendix D

The results of correlation analysis show that there was a significant negative relationship between age and participation in FRGs ($r = -0.158$). Hence the strength of correlation is weak as the value -0.158 is near to zero; the value, nonetheless, is telling that farmers below the mean age (45 years) participate more in FRGs.

The fact that Farmer Research Groups (FRGs) participant farmers were relatively younger than non-participants shows us they are at their better productive years both economically and biologically. This tells that in different stage of life there is the tendency for an individual to categorize activities appropriate to the age.

Household Size The point-biserial correlation technique is also used here to test the relationship between household size of farmers and participation in FRGs.

Table - 10. Point-Biserial Correlation Analysis for Household Size and Participation

HOUSEHOLD SIZE	PARTICIPATION STATUS									
	Participants					Non-participants				
	X ₁ (midpoint)	X ₁ ²	f ₁	f1x ₁	f1x ₁ ²	X ₀ (midpoint)	X ₀ ²	f ₀	f ₀ x ₀	f ₀ x ₀ ²
1 - 3	2	4	1	2	4	2	4	13	26	52
4 - 6	5	25	42	210	1050	5	25	33	165	825
7 - 9	8	64	14	112	896	8	64	14	112	896
10 - 12	11	121	3	33	363	11	121	--	--	--
Σ	--	--	60	357	2313	--	--	60	303	1777

Source: Computation by the author

$r_{pb} = 0.231$ see Appendix D

The correlation analysis shows that the household size of farmers and participation in FRGs were positively correlated ($r = 0.231$). The strength of correlation is to some extent moderate. Farmers who had larger household size were engaged more in the Farmer Research Groups. The implication of this is that the more number of household members in the household, the more farmers getting involved in the FRGs. This could also be deemed as a way of increasing their opportunity to have varied and more productive roles.

Educational Attainment For this variable, the chi-square (χ^2) test of association was used to see whether association exist or not between educational attainment of respondents and participation in FRGs. Additionally, phi-coefficient (ϕ) of correlation was used to see the strength and direction of association between educational attainment and participation.

Table -11. Summary of Distribution of Respondents by Educational Status

<i>Participation Status</i>	<i>Educational Status</i>		
	No Formal Education	Has Formal Education	Total
Participant	14(24)	46(36)	60
Non-participant	34(24)	26(36)	60
Column Total	48	72	120

Source: Source: Author's Survey

Null Hypothesis – (H₀)

Educational attainment and participation in FRGs are not related.

Alternative Hypothesis – (H₁)

Educational attainment and participation in FRGs are related.

Table - 12. Computation of the Value of χ^2

Observed Frequency (O)	Expected Frequency (E)	(O - E)	(O - E) ²	$\frac{(O - E)^2}{E}$
14	24	-10	100	4.1666
46	36	10	100	2.777
34	24	10	100	4.1666
26	36	-10	100	2.777
$\Sigma O=120$	$\Sigma E=120$	--	--	$\chi^2=13.887$

Source: Computation by the author's

Degree of Freedom: d.f. = (2-1) (2-1) = 1

χ^2 (critical) = Tabulated value of χ^2 for 1 d. f. at 5% level of significance = 3.841

Decision: Reject the null hypothesis (education and participation in FRGs are not related).

Since, the null hypothesis is rejected⁶, the alternative hypothesis is accepted⁷. So, educational attainment of farmers and participation in FRGs are dependent (related). Strength of association between educational attainment and participation in FRGs as calculated value of Phi-coefficient⁸ ($\phi = 0.116$) indicates that there was association between educational attainment (attending formal and not attending formal education) and participation in FRGs.

From data in the contingency Table-12, we can deduce that those farmers who had formal education tended to be more participants in FRGs while those who had no formal education tended to be more non-participants. The role of educational attainment in

participating in rural development projects could be expected. And numerous studies have also shown a significant relationship between education and participation.

Marital Status For this variable, the chi-square (χ^2) test of association was used to see whether association existed between marital status of respondents and participation in FRGs.

Table-13. Summary of Distribution of Respondents by Marital Status (In frequency)

PARTICIPATION STATUS	MARITAL STATUS				Total
	Single	Married	Widowed	Divorced	
Participants	2(4)	47(42.5)	4(4.5)	7(9)	60
Non participants	6(4)	38(42.5)	5(4.5)	11(9)	60
Column Total	8	85	9	18	120

Source: Author's Survey

Null Hypothesis- (H₀)

Marital status and participation in FRGs are not related

Alternative Hypothesis- (H₁)

Marital status and participation in FRGs are related.

$$\text{Degree of freedom} = \text{d.f.} = (4-1) (2-1) = 3$$

$$\chi^2 (\text{critical}) = \text{Tabulated value of } \chi^2 \text{ for 3 d.f. at 5\% level of significance} = 7.815$$

Table - 14. Computation of the Value of χ^2

Observed Frequency (O)	Expected Frequency (E)	(O-E)	(O-E) ²	$\frac{(O-E)^2}{E}$
2	4	-2	4	1
47	42.5	4.5	20.25	0.476
4	4.5	-0.5	0.25	0.0555
7	9	-2	4	0.444
6	4	2	4	1
38	42.5	-4.5	20.25	0.476
5	4.5	0.5	0.25	0.0555
11	9	2	4	0.444
$\Sigma O=120$	$\Sigma E=120$	--	--	$\chi^2= 3.951$

Source: Computation by the author

Decision: Failed to reject the null hypothesis (marital status and participation in FRGs is not related).

Since, the computed value of $\chi^2 = 3.951$ is less than the table value (7.815), this research failed to reject the hypothesis that marital status and participation are independent⁹. Therefore, there is no evidence to support the hypothesis, "Marital status of farmers and participation in FRGs are related in the study area".

Sex For this variable, the chi-square (χ^2) test of association was used to see whether association existed or not between sex and participant in FRGs. Additionally, phi-coefficient (ϕ) of correlation was used to see the strength and direction of association between gender and participation.

Null Hypothesis – (Ho)

Sex and participation in FRGs are not related

Alternative Hypothesis – (H1)

Sex and participation in FRGs are related

Computation of the value of chi square (χ^2) is presented in Table-15:

Table - 15. Summary of Distribution of Respondents by Sex (In frequency)

<i>Participation Status</i>	<i>Sex</i>		<i>Total</i>
	Male	Female	
Participants	49(48.5)	11(11.5)	60
Non-participants	48(48.5)	12(11.5)	60
Column Total	97	23	120

Source: Author's Survey

Table -16. Computation of the Value of χ^2

Observed Frequency(O)	Expected Frequency (E)	(O-E)	(O-E) ²	$\frac{(O-E)^2}{E}$
49	48.5	0.5	0.25	0.00515
11	11.5	-0.5	0.25	0.022
48	48.5	-0.5	0.25	0.00515
12	11.5	0.5	0.25	0.022
$\Sigma O = 120$	$\Sigma E = 120$	--	--	$\chi^2 = 0.0543$

Source: Computation by the author.

Degree of Freedom: d.f. = (2-1) (2-1) = 1

χ^2 (critical) = Tabulated value of X^2 for 1 d.f. at 5% level of significance = 3.841

χ^2 (obtained) = 0.0543

Decision: Failed to reject the null hypothesis.

Since, the computed value of $\chi^2 = 0.0543$ is less than the tabulated value of $\chi^2 = 3.841$, it is insignificant (or falls in the acceptance region).

The data about sex and participation do not provide any evidence against the null hypothesis: sex and participation in FRGs are not related which may therefore be rejected.

Size of Farm Land For this variable, the chi-square (χ^2) test of association was used to see whether association existed or not between size of farm land owned by respondents and participation in FRGs. Phi-coefficient (ϕ) correlation was used to see the strength and direction of association between the variables.

Table - 17. Summary of Distribution of Respondents by Size of Farm Land

<i>Participation Status</i>	<i>Relative Size of Farm Land</i>		
	Small Land	Large Land	Total
Participants	7(17)	53(43)	60
Non- participants	27(17)	33(43)	60
Column Total	34	86	120

Source: Author's Survey

Null Hypothesis- (Ho)

Size of farm land and participation in FRGs are not related.

Alternative Hypothesis- (H1)

Size of farm land and participation in FRGs are related.

Computation of the value of χ^2 is presented in Table - 18

Table - 18. Computation of the Value of χ^2

OBSERVED FREQUENCY(O)	EXPECTED FREQUENCY (E)	(O-E)	(O-E) ²	$\frac{(O-E)^2}{E}$
7	17	-10	100	5.88
53	43	10	100	2.33
27	17	10	100	5.88
33	43	-10	100	2.33
$\Sigma O = 120$	$\Sigma E = 160$	--	--	$\chi^2 = 16.42$

Source: Computation by the author

Degree of Freedom: d.f. = (2-1) (2-1) = 1

χ^2 (critical) = tabulated value of χ^2 for 1 d.f. at 5% level of significance = 3.841

χ^2 (obtained) = 16.42

Decision: The null hypothesis (Size of farm land and participation are not related) is rejected.

Since, the computed value of $\chi^2 = 16.42$ is greater than 3.841, the null hypothesis is rejected and the alternative hypothesis size of farm land and participation in FRGs are related is accepted. The result of phi-coefficient (ϕ) of correlation¹⁰ ($\phi = 0.10$) and the defined contingency table indicated that farmers who had large sizes of farm land tend to participate more in FRGs than those who had small farm land. From this, it can be concluded that size of farm land that the farmers owned had relationship with participation

in FRGs. Farmers who had large size of farm land tended to participate more in FRGs than those who had small farm land. This may happen because of the fact that farm size or land size is a base for agricultural production and it is one of the factors that determine participation in production. FRGs in the study area demands land for on-farm experiment, which is provided mostly by farmers.

4.4. Description of Types of Participation in Farmer Research Groups

Table- 19 shows the distribution of types of farmers' participation by farmers and researchers.

Table - 19. Distribution of Respondents by Type of Participation

Types of Participation	Farmers (n1=60)		Researchers (n2=20)	
	Frequency	%	Frequency	%
Contract Participation	12	20	3	15
1. Farmers provided land				
2. Management of the farm activity	12	20	3	15
Consultative Participation				
1. Problem identification	18	30	7	35
2. Diagnose priority problems	18	30	6	30
3. Evaluation of proposed solution	15	25	6	30
Collaborative Participation				
1. Continuous interaction with farmers	9	15	3	15
2. Monitoring of progress research	6	10	3	15
3. Investigating productivity and system of farming	6	10	3	15
4. Research observation	3	5	3	15
Collegiate Participation				
1. Participation in seminars and discussion sessions	3	5	1	5
2. Carrying out research on your own.	1	1	1	5

Source: Author's Survey

Under classification of contract participation, 15 percent out of the 20 researchers indicated that in some of the researches conducted, they requested farmers to provide land and other inputs they used for experiment. Twenty percent of the farmers indicated they provide land and participated by managing the farm activity (experiment) with strict instructions from the researchers. The management practices included watering, pest and diseases prevention and control, and security.

In consultative participation, 30 percent of the farmers indicated that they participated in identification of farming problems and development of solutions to address the problems with the researchers while 35 percent of the researchers said the same thing. The diagnosis and identification of priority problems and felts needs followed a similar pattern with equal percentage of farmers and researchers (30%) indicating the same. Another consultative participation element was the evaluation of the perceived effectiveness of proposed solutions jointly by farmers (25%) and researchers (30%).

It is observed from Table-19 under classification of collaborative participation that 15 percent of the farmers indicated they were involved in intensive and continuous interaction with the researchers on execution of the research program. The researchers discussed with farmers on what, why, and how of the research. This element was indicated by 15 percent of researchers and farmers respectively. Farmers were also asked whether they look the relationship between farming system (experiment) and level of productivity. This made the farmers to investigate in their own ways if the experiment affected productivity. This occurred in few conducted researches. And, the proportion of respondents that indicated this was very low- 10 percent of farmers and 15 percent of researchers. About 10 percent

of the farmers indicated that researchers involved them in monitoring of research progress and review of research results. Here farmers participated in monitoring if the researcher accomplished his aim and if the results and performance of the experiment thus far were good. Five percent of the farmers participated in observing the experiment, taking, recording and safekeeping of research data for the researcher. The farmers were trained to do this by the three researchers who indicated to do so.

Under the classification of collegiate participation, only five percent of the farmers responded that they were invited to participate in seminars on research. Only one researcher invited farmers to a seminar on research.

Both group of respondents (farmers and researchers) are distributed in all types of farmer participation in research (Table- 19). From this, we can learn that FRGs in the study area employs together all the four types of farmer participatory research: contract, consultative, collaborative and collegiate participations. However, participation in all of these has different meaning as far as extent of farmers and researchers' participation in research process is concerned.

The contract participation fit with The Research, Development and Diffusion (RDD) Model. In this model of agricultural research, the farmers are passive partners so far as the identification of the problem or the design and development of solutions to the problem is concerned. Contract participation is the least participatory because farmers are not allowed to influence the research agenda. As far as what is researched and recommendations emanates from the researchers.

Farmers' participation in contract participation takes place by providing land for researchers and activities defined by researchers in the sense of being formally or informally contracted to provide services and support. There is a likely that resource-rich farmers who have resource (land) for experiment in the technology being developed are seen as more participants in this type of participation.

The fact that, the FRGs participant farmers and researchers involved more of in consultative and collaborative participation (Table-19) goes with what Chambers and Ghildyal (1985) called Farmer-First and Last Model. Indicators of these are research priorities are determined mainly by the needs, problems and environment of farmers, the main research and development location in the farmers' fields and conditions. However, reversals of explanation some elements of the model like: researchers learning from farmers is in question in the study area.

The ideal type of farmers' participation in research, collegiate participation, not yet developed as such in FRGs in the study area. Farmer Research Group approach provides great potential for catalyzing the participation of farmers as partners in research and development activities. These indicate that there are great potentials for farmer participatory research in FRGs of the study area. However, achieving such potential requires investments in managing and facilitating group dynamics that broaden the scope of participatory research from a functional consultative type to a more collegial and empowering type.

4.5. How Participation Occurs in Farmer Research Groups

Two informants¹¹ to this study said that in principle, the recruitment of farmers in FRGs was to be made by involving all farmers to ensure that all farmers have a chance for participation. They actually said that, the mandates of selecting participant farmers were given to all development agents, kebele administrators and the community. But in practice the recruitment of farmers to FRGs was conducted by development agents (DAs) and kebele administrators without involving the community. This limited selection of members of FRGs by community members. Another two informants¹² agreed that equal chance of selection of farmers did not happen. They confirmed that community members did not have a chance to discuss and chose the participants in FRGs. Some of the farmers did not see participation as their right. They said that the DAs, kebele administrators and researchers defined the problems in agricultural production and decided what to do and who have to participate.

On the other hand, one key informant¹³, a development agent, has confirmed that the attention of DAs and kebele administrators was to get “good” and convinced farmers, and that was why they did not involve all farmers in the recruitment of FRGs participants.

The focus group discussants¹⁴ agreed that most of the farmers did not know how the participant farmers in FRGs were selected. But the discussants uncovered that some farmers did not have interest to participate in the FRGs for various reasons, although they were not requested to participate. This goes with the finding of this research discussed in chapter four that some farmers having certain characteristics tend to be participants and

non-participants in FRGs. This supports the debate that attempts at increasing participation in rural development programs can overlook the extent to which some groups¹⁵ are integrated in other social processes and sometimes actively choose not to participate (Shortall, 2008). Shortall (2008) further argues that non-participation can represent a valid and legitimate choice.

On the other hand the key informants¹⁶ from non-participants of FRGs informed that non-participation in FRGs comes from the underestimation of the role of FRGs to solve their agricultural problems. This is due to low self-esteem of the reliability of farmer's indigenous knowledge in relation to innovative work of scientific researches. The following cases can illustrate more how non-participation and participation of farmers FRGs occurred.

Case- 1 Beyene Megersa (real name)

Beyene, 45, was a non-participant farmer in FRG from 'Awash' Peasant Administration. He was first informed about FRGs by DA in his peasant Administration. The DA asked him whether he would like to join FRGs. He decided not to participate because scientists' experiments do not make sense to him. Additionally, he believed that he lacks knowledge and skills to employ the scientific method which enables him to work with scientific researchers in farmer research groups.

However, one of the key informants¹⁷ did not support the above arguments, as he does not know farmers who refused invitation for participation in FRGs. The following case, of

Girma can illustrate more how recruitments of the participant farmers in FRGs were conducted.

Case- 2 Girma Gemmechu (real name)

Girma, 38, was one of FRG participant farmers in 'Ulaga Melka Oba' Peasants Administration. He was an active participant in the peasant Administration politics. He heard information about FRGs from officials of the Woreda Agricultural Office administrators in the year 2004. His political participation has helped him establish good relationship with the development agents. He has got information about the establishment of Farmer Research Groups in the woreda by virtue of his linkage with them. The DA recruited him to participate in FRGs and he accepted.

Unlike the above participants, there was also a farmer who was recruited without discussion in advance. The case of Lemi is one of the best examples.

Case- 3 Lemi Tola (real name)

Lemi, 41, was a farmer from 'Wake Miya' Peasant Administration, near Melkassa Agricultural Research Center. He is known in the area as a hard working and successful farmer. He had experience in participating in on- farm experiment conducted by Melkassa Agricultural Research Center before the introduction of FRGs in the area in 2004. Fortunately, he was recruited by a researcher that he knew in the past. He was simply told to participate in the FRGs by the development agent and he eagerly accepted. He still believes that he was probably recruited by

his hard-working quality in the farmer research activities conducted by Melkassa Agricultural Research Center on his farm before 2004.

The recruitment of farmers to FRGs has been issues of argument in the focus group discussions. Focus group participants agreed that some farmers were selected by their virtue of contact with development agents and kebele officials. They agreed further that there were other interested farmers who would participate if they were given a chance. They maintained that the first FRGs participant farmers' recruitment seemed to have focused on those farmers who had contact with local power structure.

Therefore, as the cases, focus group discussions and key informants indicated, opportunity for participation in FRGs was more determined by attachment of farmers with DAs, researchers and local political authorities. Hence, recruitments of farmers into FRGs were done by the will of agricultural officials and the DAs. Development agents and those holding local political authorities invite those whom they know. This goes with the finding of Valeara (1993 cited in Abaynesh, 2002) that "Most development projects implemented and directed by government and non-governmental agencies reached only the privileged member of rural people".

4.6. Constraints to Farmers and Researchers Participation in FRGs

In what follows, the researcher illustrates constraints that mitigate farmers' participation in FRGs from data obtained from survey, focus group discussions and in-depth interviews.

Table -21 and 22, highlights constraints to farmers' and researchers' participation in FRGs

Table - 21. Distribution of Farmers by Constraints to Participation in Farmer Research Groups

<i>Constraints to Participation in FRGs</i>	<i>Frequency</i>	<i>%</i>
1. Expectation for subsidized inputs for participation in FRGs	47	78
2. Undermining the role of their indigenous knowledge in research	45	75
3. Inadequate knowledge and skills in farmer participatory research methods	45	75
4. Extra time is required to participate in farmer research groups	28	46

Source: Author's Survey

The constraints identified by farmers are expectation for subsidized inputs for participating in FRGs (78%), undermining the role of their indigenous knowledge in research with learned researchers (75%), their inadequate knowledge and skills in participatory research methods (75%). Other is extra time required to participate in FRGs (46%).

Table - 22. Distribution of Researchers by Constraints to Participation in FRGs

<i>Constraints to participation in FRGs</i>	<i>Frequency</i>	<i>%</i>
1. Requires extra funding and inputs	16	80
2. Farmers do not have the formal training to enable them participate	16	80
3. Inadequate skills of researcher in using farmer participatory research	15	75
4. Extra time required by researchers	12	60

Source: Author's Survey

The constraints indicated by researchers are extra funds and inputs required (80%), farmers not having the formal training to enable them participate (80%), and inadequate skills of researchers in using FPR (75%). Other are that extra efforts and time required by researchers to implement FPR (60%).

According to focus group participants, farmers' expectation for free inputs from FRGs is the factors which determine their motivation in participating in FRGs. They said that the problem occurs because of their expectation when they join FRGs. The key informant from DA said it is due to expectation for subsidized inputs that the number of participants was initially high when FRGs were formed, then declines as members dropout and motivations

decline especially when they see that FRGs objective is putting more value to knowledge and skills through their participation in FRGs. It is obvious that poor farmers may need to see their economic situation improved if they are to participate. Which may in turn, lead to the less participation of resource-poor farmers.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

Based on the summary of the major findings of the present study, the researcher draws the following conclusions:

1. The finding of the present study revealed that, farmers' participation in Farmer Research Groups (FRGs) relies on their socio-demographic and economic characteristics such as: age, household size, educational attainment, and size of farm land.
2. The study also found out that, there are elements of farmer participatory research (FPR) in FRGs of Adama Woreda. Most farmers and researchers are involved more in consultative and collaborative than in contract and collegiate type of participations. These indicate that there are potentials for farmers participatory research in the study area that could be improved and built upon.
3. The present finding also indicated that, constraints to farmers' participation in FRGs are expectation for subsidized inputs, undermining the role of indigenous knowledge in research with learned researchers, inadequate knowledge and skills in participatory research methods and extra time required to participate in FRGs. If these could be addressed, FPR would be enhanced and sustainable agricultural development be ensured.

4. The constraints indicated by researchers are need for extra funds and inputs, farmers lack of the formal training to enable them participate, inadequate skills of researchers in using Farmer Participatory Research and extra efforts and time required by researchers to implement Farmer Research Groups.
5. Farmers' interest to participate in Farmer Participatory Research is determined by whether they are sincerely conscious that their indigenous knowledge and resource capacity are integrated in research conducted.
6. The DAs, kebele administrators and researchers decide on how participation in FRGs occurred.

5.2. Recommendations

Based on the conclusions drawn above, the researcher forwards the following recommendations:

1. The researcher proposes research institutes and universities to design and implement policies which will encourage and motivate researchers in using Farmer Participatory Research. This may include extra funding and payment for giving Farmer Participatory Research training and workshops for farmers and researchers.
2. The researcher also recommends research institutes in collaboration with extension agencies should conduct training and workshops for farmers to create awareness in order that their indigenous knowledge and resource capacity are integrated in research conducted to build and increase their capacities, skills and knowledge to participate actively in FRGs.

3. The researcher recommends that if we are to develop technologies that would be relevant and adaptable to farmers, The Ministry Agriculture and Rural Development should design the way farmers' involvement in the research process move closer to the "collegiate". If that, a meaningful involvement of farmers in the research process can be achieved and strengthen the farmers local capacity to conduct informal research and development at the individual and community levels.

4. The researcher also asks agricultural research institutes and NGOs to consider the socio-demographic and economic characteristics of farmers such as: age, household size, educational attainment, and size of farm land while implementing Farmer Research Group approach.

5. The researcher also suggests agricultural research institutes to give equal opportunity of being involved in Farmer Research Groups for farmers.

3. The researcher recommends that if we are to develop technologies that would be relevant and adaptable to farmers, The Ministry Agriculture and Rural Development should design the way farmers' involvement in the research process move closer to the "collegiate". If that, a meaningful involvement of farmers in the research process can be achieved and strengthen the farmers local capacity to conduct informal research and development at the individual and community levels.

4. The researcher also asks agricultural research institutes and NGOs to consider the socio-demographic and economic characteristics of farmers such as: age, household size, educational attainment, and size of farm land while implementing Farmer Research Group approach.

5. The researcher also suggests agricultural research institutes to give equal opportunity of being involved in Farmer Research Groups for farmers.

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APPEDIX-A

ADDIS ABABA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

DEPARTMENT OF SOCIOLOGY

STRUCTURED INTERVIEW GUIDE FOR FARMERS

PART I: GENERAL REMARK

This instrument focuses on Farmer Research Groups participant and non-participant farmers' experiences and opinions about farmer research groups. The main purpose of this study is to identify the determinants and patterns of farmers' participation in farmer research groups in Adama Woreda. This can help give plausible recommendation for its improvement.

So, frank and sincere response is highly appreciated for it will contribute to the validity of the data to be obtained. There is no right or wrong answer and what is required is to show the level of the respondents' personal opinion to each item.

Their answers are confidential and, no need to write their name.

Appreciate their devotion of time and participation!!!!!!!!!!!!!!

FARMER RESEARCH GROUP AFFILIATION

Participant

Non-participant

Name of investigator (data collector) _____

Name of the Peasant Association _____

Name of FRG _____

Instruction: Mark \checkmark in the Given Box for the Interviewed Response

PART I: SOCIO-ECONOMIC INFORMATION

1. Sex:

1. Male

2. Female

2. Religious affiliation:

1. Orthodox

2. Islam

3. Protestant

4. Catholic

5. Others (please specify) -----

3. Age _____

4. Educational attainments:

1. Never attended school

2. Read and write

3. Primary education

4. Junior secondary

5. Senior secondary

6. Post secondary

5. Marital status:

1. Single

2. Married

3. Widowed

4. Divorced

6. Household size _____

7. Source of income:

1. Sale of animal live stock
2. Sale of vegetable
3. Sale of fruits
4. Sale of cash crops
5. Others, specify _____

8. Income level per year (in Birr) _____

9. Do you have any income-earning endeavors besides farming activities?

1. Yes 2. No

10. If 'Yes' for question 8 what is/are your income source/s?

11. Do you have farm land?

1. Yes
2. No

12. Do you have land for renting?

1. Yes
2. No

13. Size of farm land (in hectares)

1. None
2. 0.25-0.5
3. 0.51_1.0
4. 1.1_2.0
5. 2.1_3.0
6. 3.1_4.0
7. >4.0

14. Do you have experience in using land by different forms of access to land in addition to your own?

1. Yes
2. No

!!!!!!! AFTER THIS POINT FOR FAMER RESEARCH GROUPs PARTICIPANT FARMERS ONLY

16. When did you join Farmer Research Group?

- 1. This year
- 2. Last year
- 3. Two years ago
- 4. Three years ago
- 5. Four years ago

17. What is your role in farmer research groups?

18. Do you participate in farmer research group meeting?

- 1. Yes
- 2. No

➤ If yes, how actively you participate in the meetings?

- 1. Listening
- 2. Giving opinions
- 3. Voting
- 4. Giving proposals
- 5. Others, specify _____

PART II: PATTERN OF PARTICIPATION

2. A: How Participation Occurs

1. How you joined Farmer Research Group?

- 1. By self initiation
- 2. By others initiation

2. If your answer above question is **2 (by others initiation)** by whom?

- 1. Extension workers (DA)
- 2. Research institution/project
- 3. Senior members of FRG
- 4. If other (please specify) -----

3. How did your membership FRG occur?

- 1. You go to FRGs
- 2. Somebody from FRGs come to you
- 3. If others (please specify) _____

PART III: Type of Participation in Participatory Research in by Farmers

(INSTRUCTION: MARK "X" UNDER YES OR NO OPTIONS FOR EACH QUESTIONS IN THE TABLE BELOW)

No	ITEMS	Yes(1)	No(2)
1	Do you provide land (inputs) for researchers?		
2	Do you participate in management of the farm activity with researchers		
3	Do you participate in problem identification?		
4	Do you participate in developing solution for problems with researchers?		
5	Do you participate in diagnosing priority problems with researchers?		
6	Do you participate in evaluation of proposed solution with the researchers?		
7	Do you have intensive and continuous interaction with researchers on execution of research programme?		
8	Do you participate in monitoring and joint review of research results with researchers?		
9	Do you participate in investigating the relationship between productivity and system of farming?		
10	Do you participate in FRGs meeting?		
11	Do you participate in research observation?		
12	Do you participate in seminars and discussion sessions with farmers to strengthen capacity to carry out research on your own?		
13	Do you carry out research in your own?		

PART IV: CONSTRAINTS TO PARTICIPATION

1. Do you have adequate knowledge and skills in participatory research methods?
1. Yes 2. No
2. Do you expect payment for participation in Farmer Research Group?
1. Yes 2. No
3. Did you get any incentives from Farmer Research Groups before?
1. Yes 2. No
4. If 'NO', for the above question does lack of remuneration have an effect on your motivation of participation in Farmer Research Group?
1. Yes 2. No
5. Does the time you spend in participating in Farmer Research Group take time from other farm activities?
1. Yes 2. No

6. If 'Yes', for the above question is there situation in which you was absent from Farmer Research Group activities?
1. Yes
2. No
3. I don't know
7. Do participation in Farmer Research Group result in economic benefits?
1. Yes
2. No

Thank You!!!!

QUESTIONNAIRE TO BE FILLED BY RESEARCHERS

Instruction: Mark \checkmark in the Given Box for Your Response

PART I: SOCIO-ECONOMIC INFORMATION

1. Sex:

1. Male
2. Female

2. Age:

1. Below 25
2. 26-35
3. 36-45
4. 46-55
5. 56 & above

4. Educational attainments:

1. Certificate
1. Diploma
2. Degree
3. Masters
4. PhD

5. If other (please specify) _____

5. What is your specialization? _____

6. Your experience in research?

1. < 5 years
2. 5_10 years
3. 11_15 years
4. > 15 years

7. How long you after you joined Farmer Research Groups?

1. One year
2. Two years
3. Three years
4. Four years
5. More than four years

8. What is your role in farmer research groups? _____

9. Do you participate in farmer research group meeting?

1. Yes

2. No

PART II: Type of Participation in Participatory Research by Researchers

(INSTRUCTION: MARK "X" UNDER YES OR NO OPTIONS FOR EACH QUESTIONS IN THE TABLE BELOW)

No	ITEMS	Yes(1)	No(2)
1	Do farmer provide land (inputs) for research to you?		
2	Do farmers participate in management of the farm activity with you?		
3	Do farmers participate in problem identification?		
4	Do you participate in developing solution for problems with you?		
5	Do farmers participate in diagnosing priority problems with you?		
6	Do farers participate in evaluation of proposed solution with the you?		
7	Do you have intensive and continuous interact with farmers on execution of research programme?		
8	Do you participate in monitoring and joint review of research results with farmers		
9	Do you let farmers in investigating the relationship between productivity and system of farming?		
10	Do farmers participate in research observation?		
11	Do farmers participate in seminars and discussion sessions with farmers to strengthen farmers' capacity to carry out research on their own?		
12	Do farmers informal research?		

RESEARCHERS CONSTRAINTS

1. Does the organization you are working for motivate you to use farmer participatory approach?

1. Yes 2. No

2. Do the research activities in FRGs require extra funding?

1. Yes 2. No

_If 'Yes' do you get extra funds?

1. Yes 2. No

_If 'No' do lack of extra fund hinder the research process?

1. Yes 2. No

3. Do the farmers in FRGs have formal training about participatory research?

1. Yes 2. No

4. Do you have adequate skills of using participatory research?

1. Yes 2. No

5. Is extra effort required in research with FRGs?

1. Yes 2. No

6. Do you think farmer research group approach is best?

1. Yes 2. No

7. Are you interested in farmer participatory research approach?

1. Yes 2. No

8. Do farmers have interest to participate in FRGs?

1. Yes 2. No

10. Do farmers participate in farm management activities?

1. Yes 2. No

If 'Yes' in what kind of activities?

1. FOCUS GROUP DISCUSSION GUIDELINE

PART I: DISCUSSANTS PROFILE

Group _____

Number of Discussants _____

Sex Male Female

Ages _____

Farming experience in Years _____

Experience in Participating in FRGs in Years

Part II: Constraints to Effective Participation in Farmer Research Groups

1. Do researchers encourage FRGs participants for innovation?
2. Do researchers have motivation in working with farmers in FRGs?
3. Do farmers have adequate skills and knowledge in research methods?
4. Do farmers get any inputs for activities in FRG?
5. Do the FRG activities conflict with other farm activities? _____
6. From experiments conducted in on-station and on -farm which do farmers prefer?

2. Interview Guide

This interview Guide is for Development Agents, Researchers and Woreda Agricultural Officials

These questions were used as guide only. It is not expected that every question were relevant to each of the interviewed.

Guiding Questions

1. Does FRGs target resource-poor farmers' agricultural needs as well as resource rich farmers?
2. Do FRGs activities build on farmers' knowledge and skills?
3. Do FRGs activities consider both the subsistence and cash crops?
4. Has considerations been given to how farmers other roles and responsibilities may constrain their participation in FRG activities?
5. Do farmers have land tenure, or access to sufficient land area to participate in FRGs.
6. Do female researchers involved in research activities?
7. Is training and technology suited to farm productivity?
8. Are there legal barriers to the participation of farmers in FRGs?
9. What socio-cultural factors inhibit farmers' participation in FRGs in the area?
10. Do strategies developed to take account of the socio-cultural constraints'?
11. Are there adequate resources to carry out FRGs activities?

APPENDIX- D

Calculated Value of Point-Biserial Correlation for Age and Household size

$$\text{Age} \quad r_{pb} = \frac{\bar{y}_1 - \bar{y}_0}{s_y} \sqrt{pq}$$

$$s_y = \sqrt{\frac{N \sum fx^2 - (\sum fx)^2}{N^2}}$$

$$s_y = \sqrt{\frac{120(294175) - (5855)^2}{(120)^2}}$$

$$s_y = \sqrt{\frac{35301000 - 34281025}{14400}}$$

$$s_y = 8.416$$

$$r_{pb} = \frac{43.333 - 46}{8.416} \sqrt{0.5 \times 0.5}$$

$$r_{pb} = -0.158 \text{ for age}$$

Household Size

$$r_{pb} = \frac{\bar{y}_1 - \bar{y}_0}{s_y} \sqrt{pq}$$

$$s_y = \sqrt{\frac{N \sum fx^2 - (\sum fx)^2}{N^2}}$$

$$s_y = \sqrt{\frac{120(4086) - (660)^2}{(120)^2}}$$

$$s_y = \sqrt{\frac{490320 - 435600}{14400}}$$

$$s_y = 1.949$$

$$r_{pb} = \frac{5.95 - 5.05}{1.949} \sqrt{0.5 \times 0.5}$$

$$r_{pb} = 0.231 \text{ for household size}$$

Appendix- E

End Notes


1. Gadisa and Aman
2. Kebebush, Aman , Gadisa
3. Alemayehu and Mohammed
4. Gadisa and Mohammed
5. Chi square is test of statistical significance
6. In chi-square decision to reject the null hypothesis can be made with greater certainty
7. If we reject null hypothesis, the research (alternative) hypothesis will be supported.
8. Phi-coefficient (ϕ) = $\chi^2 / N = 20.41/120 = 0.116$
9. Since we failed to reject the null hypothesis, there is no need to examine column percentages.
10. The value of phi coefficient >0.30 indicates strong relationship between variables
11. Aman, Gaddisa
12. Girma, Aberash
13. Alemitu
14. Alemayehu, Mohamed, Hailu, Tekle, Alemu and Tadele
15. Alemayehu, Mohamed, Hailu, Tekle, Alemu and Tadele
16. Gaddisa and Aman
17. Alemitu and Aman

DECLARATION:

I, the undersigned, declare that this thesis is my original work and that all sources of materials used have been duly acknowledged.

Dereje Bekele

Student Name



Signature

1/7/2009

Date

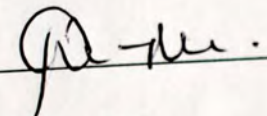
Addis Ababa

Place

Confirmation by Advisor

Meye Negusse

Name



Signature

17/07/09

Date