EFFECTIVENESS OF FARMER FIELD SCHOOL IN PROMOTING COFFEE MANAGEMENT PRACTICES: THE CASE OF JIMMA AND SIDAMA ZONES

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DEDICATION

I dedicate this thesis manuscript to my wife SHEWAYE ZELEKE and my sons, MESGANAW BABUR, MAHLET BABUR and MEKLIT BABUR for their affections and love in my academic success.

STATEMENT OF AUTHOR

First, I declare that this thesis is my confidence work and that all sources of materials used for the thesis have been duly acknowledged. This thesis has been submitted in partial fulfillment of the requirements for an MSc degree at the Haramaya University and is deposited at the University Library to be made available to borrowers under rules of the Library. I solemnly declare that this thesis is not submitted to any other institution anywhere for the award of any academic degree, diploma or certificate.

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LIST OF ABBREVIATIONS

AESA	Agro- Eco logical System Analysis
AfFOResT	African Farmers Organic Research and Training
AIDS	Acquired Immuno Deficiency Syndrome
BOARD	Bureau of Agricultural and Rural Development
CABI	CAB, International
CBD	Coffee Berry Disease
CC	Contingency Coefficient
CFC	Common Fund for Commodities
CI	Condition Index
CIP	Coffee Improvement Project
CWD	Coffee Wilt Disease
DA	Development Agent
FAO	Food and Agricultural Organization
FARMESA	Farm level Applied Research Methods for Eastern and South Africa
FDRE	Federal Democratic Republic of Ethiopia
FFS	Farmer Field School
GDP	Gross Domestic Product
HIV	Human Immuno deficiency Virus
ICM	Integrated Conservation Management
ICO	International Coffee Organization
ICPM	Integrated Cocoa Pest Management
ILRI	International Livestock Research Institute
IMP	Integrated Market Productivity
INMASP	Integrated Nutrient Management to Attain Sustainable Productivity
IPM	Integrated Pest Management
IPMS	Integrated Productivity for Market Success

LIST OF ABBREVIATIONS (*Continued)*

JARC	Jimma Agricultural Research Centre
JICA	Japan International Cooperation Agency
NGO	Non- Governmental Organization
ODI	Overseas Development Institute
ORDA	Organization for Rehabilitation and Development in Amhara
PA	Peasant Association
PTD	Participatory Technology Development
SCF	Save the Children Fund
SNNPR	Southern Nations Nationalities and Peoples' Region
STCP	Sustainable Tree Crops Program
T&V	Training and Visiting
UK	United Kingdom
USAID	United States of America International Development
VIF	Variance Inflation Factor
WARDO	Woreda Agricultural and Rural Development Office
ZARDO	Zonal Agricultural and Rural Development Office

BIOGRAPHICAL SKETCH

The author, Ato Babur Damtie was born on January 20, 1962 in Eastern Gojjam at Baso-liben District. He attended his elementary and secondary education at Yejube Elementary School in Baso-liben district and Debza Comprehensive Secondary School at Debre- Markos town, respectively. He joined Alemaya university in 1986 and graduated with B.Sc. degree in the field of Plant Sciences in July 1989.

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EFFECTIVENESS OF FARMER FIELD SCHOOL IN PROMOTING COFFEE MANAGEMENT PRACTICES: THE CASE OF JIMMA AND SIDAMA ZONES

ABSTRACT

This study was conducted to determine the effectiveness of the Farmer Field School approach in terms of examining farmers' selection criteria, their profile and FFS implementation. It was also sought to assess the knowledge, attitude and practice of FFS members and non-members regarding coffee management practices with reference to coffee wilt disease; and to identify factors influencing knowledge, attitude and practice on coffee management practices among FFS participants. A survey methodology was employed in to a sample of 70 FFS members and 70 non-FFS member farmers chosen proportionately with equal number of respondents from the study areas. Secondary data was collected from sources of reports and documents. In addition, supplementary data was collected from Jimma zone research center and agricultural development offices. The above mentioned institutions have been of vital importance, since they were the major facilitators of these FFS activities in both study areas. There was a significant difference in knowledge, attitude and practice level in coffee management practice particularly with reference to coffee wilt disease by FFS compared to non-FFS respondents. About 67% of the FFS respondents had acquired high level of knowledge while 8.6% and 57.1% of the non-FFS respondents had acquired high to moderate knowledge of coffee management practices respectively, especially with reference to the knowledge of coffee wilt disease. It can be observed from the data 81% and 18.6% of the FFS respondents were grouped under high and moderate attitude respectively, while nearly 55.7% and 38.6% of the non-FFS respondents were placed in high and moderate attitude towards promoting coffee management practices. Majority of FFS respondents 85.7% had high level of knowledge (adopted) regarding improved coffee management practices. However, almost 81.4% and 15.7% of non-FFS respondents were found in medium and high knowledge category of the same practice respectively. As far as influencing variables on knowledge, attitude and practice among FFS participants were concerned, farmer's experience and interpersonal trust up on knowledge had significant influence on the effectiveness of FFS on coffee management practices. In this study of the analysis of pooled data, there is no as such significant explanatory variable observed, which had considerable effect on attitude of FFS members in promoting coffee management practices. However, creativity and intercropping on practice had significant influence on the effectiveness of FFS on coffee management practices. It was recommended that mainstreaming FFS, and for building it in to national budget streams and creating social networks for interdisciplinary exchange of knowledge and experience for relevant actors working with coffee FFS should be given priority for long term survival of farmer field schools.

1. INTRODUCTION

1.1. Background

Ethiopia is the home and cradle of biodiversity of Arabica coffee. More genetically diverse cultivars of *C. arabica* exist in Ethiopia than anywhere else in the world, which has lead botanists and scientists to agree that Ethiopia is the centre of origin, diversification and dissemination of the coffee plant (Fernie,1966; Bayetta,2001). Agriculture is the main stay of Ethiopian economy, and contributes to more than 50% of GDP, 80% of exports and 85% employment opportunities. Coffee is the major agricultural export crop, providing currently 35% of Ethiopia's foreign exchange earnings, down from 65% a decade ago because of slump in coffee price in the mid-1990s.

It is an important export commodity which contributes 10% of the gross domestic product of the country. Moreover, greater than 25% of the population of Ethiopia, representing 19.5 million people, are dependent on coffee for their livelihoods, including 10.5 million people directly involved in coffee cultivation and 9 million in the processing, transport, and financial sectors. Coffee plantation grows in different cropping systems including the forest, the semi-forest and the garden in the Western and Southern parts of the country (ICO, 2003).

The Ethiopian coffee commodity chain faces its own complex set of problems, including various constraints on production, processing and marketing. The constraints most commonly referred to include the high incidence of Coffee Berry Disease (CBD) and Coffee Wilt Disease (CWD), with an estimated 50 - 60 % of production potentially at risk; the shortage of improved cultivars adapted to different localities; poor harvest and post-harvest practices reducing coffee quality; and weak linkages between research, extension services and producers. Moreover, the lack of accurate and topical data considerably reduces the scope for informed analysis, the diverse taste profiles of Ethiopian coffees are not fully reflected in the current national classification system, and there are various shortcomings in the marketing system and in the organizational structure at government level (FDRE, 2003).

Jimma Research Center has devoted considerable effort and resources and developed several coffee technology packages. A number of coffee cultivars that combine high yield, disease resistance, and quality characters were developed (Bayetta *et al.,* 1998). In addition, recommendations have been developed on pest and disease management. The improved cultivars produce 12-24 and 6-16 Q/ha clean coffee on station and on farmers' fields, respectively (Bayetta *et al.,* 2000). To facilitate the transfer and utilization of these research outputs, Ethiopia has adopted and experimented with different forms and approaches of coffee extension interventions. However, the small holder coffee sector still suffers from lack of effective and efficient support services such as extension, credit, input supply and the likes. In general, the efforts and resources committed to technology development would be of little significance unless and otherwise they are accessed, accepted , and used by intended users. In this aspect, the communication media and public agricultural research extension and advisory services have played a large part in introducing the new technologies and farming practices to farmers. In comparison, there has been little investment in farmer education, both in the narrow sense of offering farmers structured learning opportunities and in the broad sense of expanding their capabilities to understand, innovate, and adapt to the changing context.

These days, the emergence of new paradigms and approaches of extension are shifting towards to the empowerment of farmers. FFS is one of the models and approaches widely used in different countries. FFSs were conceptualized between 1970s and 1980s and first implemented in Indonesia in 1989 to deal with the wide spread of pest out breaks in rice that threatened the security of Indonesia's basic food supplies (Potinus, 2002). The FFS is a non-formal training programme for selected farmers within a locality, usually a village. FFS thus have a social goal beyond mere changes in pest management techniques that seek to promote the empowerment of farmers by building human and social capital (Gallagher, 2000).

Farmers are no longer positioned as receivers of already developed technological packages, but as field experts, who collaborate with the extension staff to find solutions relevant to the local realities. FFS programs emphasize farmers' ownership, partnership and group collaboration. During the past two decades, FFSs have been held for many crops including cotton, tea, coffee, cacao, pepper, vegetables, small grains and legumes (Potinus *et al.,* 2002).

The FFS model has been extended to several other topics such as livestock production, forestry, nutrition and health (HIV prevention) (Tripp *et al*., 2005). In total, thirty developing countries in the world are currently experimenting with and implementing the FFS approach (Van den Berg, 2004).

The FFS approach was first introduced in East Africa in 1995 under the Food and Agricultural Organization (FAO) special program for food security in Western Kenya (Braun *et al.,* 2006). To date, the FFS networks in Eastern Africa support about 2000 FFSs with close to 50,000 direct beneficiaries. FFS focuses on building farmers' capacity to make well -informed crop management decisions through increased knowledge and understanding of the agro eco-system. FFS participants make regular field observations and use their findings, combined with their own knowledge and experience, to judge for themselves, what, if any, action needs to be taken (Kolb, 1984).

In general the educational philosophy of the FFS rests on foundations of adult non-formal education, and reflects the four elements of 'experiential learning cycle' proposed by Kolb (1984): concrete experience, observation and reflection, generalization and abstract conceptualization, and active experimentation. The long term empowerment goals of FFS seek to enable graduates to continue to expand their knowledge and to help others learn and to organize activities within their communities to institutionalize different practices. What differs FFS approach from other extension methods is that, the role of extension worker is very much that of a facilitator rather than a conventional teacher. Once the farmers know what, it is they have to do, and what it is they can observe in the field, the extension worker takes a back seat role, only offering help and guidance when asked to do so (Mutinda *et al.,* 2004).

The aim of FFS is to build the farmers' capacity to analyze their production systems, to identify their main constraints, and to test possible solutions, eventually identifying and adopting the practices most suitable to their farming system. Knowledge is one of the most important components of behavior and plays a major role in the covert and overt behavior of human beings. Once knowledge is acquired, it helps to develop favorable attitude towards

improved practices and there by motivate an individual to take certain action in accepting an innovation or any practice. The knowledge acquired during the learning process can be used to build on existing knowledge enabling farmers to adapt their existing technologies so that they become more productive, more profitable and more responsive to changing conditions, or to adopt new technologies. In this approach farmers go through a learning process in which they are presented with new technologies, new ideas, and new situations and ways of responding to problems. The knowledge acquired through this learning process is then used to build on the existing knowledge enabling farmers to adopt the technologies to the best advantage of their own situations.

In summary, therefore, FFS is a forum where farmers and trainers debate observations, apply their previous experiences and present new information from outside the community. Hence, this study is designed to evaluate the effectiveness of coffee FFS initiatives in the district of Gera (Western part of Jimma Zone) of Oromia and Dale (Southern part of Sidama Zone) of Southern Nations Nationalities and Peoples' Region (SNNPR). Moreover, it is designed to fill the gap of knowledge of coffee FFS on the growing areas of the country.

1.2. Statement of the Problem

In Ethiopia where coffee is grown, majority of the small holder's livelihood depend on coffee cultivation. In spite of its importance the coffee production is characterized by traditional method of production and the low level of technology use. As a result, despite its importance, role in the national economy and the wealth of genetic diversity and climatic suitability, the national average yield is 450- 472 kg per hectare of clean coffee (Workafes and Kassu, 2000). Coffee management practices including hoeing, weeding, stumping, mulching, pruning and shade regulation are not seriously considered at the grass root level. In addition, lack of effective extension approach in the farmers' condition also contributes to low productivity of coffee. The decline of coffee production is also attributed due to the prevalence of coffee berry disease (CBD) and coffee wilt disease (CWD) as well.

Coffee wilt disease which is caused by the fungal pathogen, *Fusarium xylarioides* which recently re-emerged as a major constraint of coffee production in the major coffee producing areas of the country. It is frequently encountered in most surveyed fields in various habitats ranging from the very low altitude of Bebeka (1,000 mts) and Teppi (1,200 mts) with hot and wet climate to as high as Gera and Gechi (2,000 mts) districts having wet and cool weather conditions in Ethiopia (Girma, 2001, 2004). The symptoms usually appear as characteristic wilting, and infected coffee trees usually occur singly or in group randomly in the fields. The early symptoms of infection on mature and young coffee trees are epinasty of leaves on some branches in the lower tree canopy that turn brownish or dark brownish within two or more weeks, and finally drop-off the branches. The typical partially wilting symptom accompanied by discolored internal tissues would effectively facilitate diagnosis and recognition of infected coffee trees in the field that can easily be detected and rouged out of the field early in the season before the fungus sporulation at the advanced stage of pathogenesis (Girma and Hindorf, 2001).

The dissemination of perithecia and ascospores from a single infected tree to other disease free plots mainly by human activities via slashing and hoeing as well as transporting the infected trees from one field to the other. A common practice in Ethiopia is to cut wilted trees, store them somewhere in the field or near the houses and use for various purposes such as fire wood, fencing around dwelling houses or coffee farms and as a stalk for climbing beans. The socioeconomic survey results estimated that 60% of the farmers in Ethiopia used the wood for fencing, 26% for constructing houses and animal sheds, 10% gave surplus wilted trees to their neighbors for firewood and 2% sold the trees (CABI, 2003).

Annual losses attributed to CWD were 3360 tons of coffee amounting to USD# 3,750,976 in Ethiopia (FAO, 2002, and ICO, 2003). Initially farmers' awareness about coffee wilt disease (CWD) was 17% in Ethiopia which could be contributing to the spread of the disease (CABI , 2003). In this aspect, the current extension approach had not given special emphasis to combat the disease. More over, the farmers were not recognize the causes and mechanisms of transmission of the disease. As a result, the proportion of income from coffee spent on house

hold items decreased from 85.6 % to 81.2 % following the onset of coffee wilt disease (CABI, 2003).

Income from coffee was used primarily on food, schooling and health in order of priority, with some farmers depending on it for almost all of their food supply. Thus following the onset of weak coffee management activities and ineffective extension approach, the farmers are shifted their labor to other non-farm activities such as trade, brewing etc. In addition to the above conditions less attention given by the government, lack of awareness of the disease and lack of effective prevention methods are also the major constraints encountered so far. Between the year 2003 and 2007, FFSs have been implemented for coffee management practices in the Southern and South-western parts of the potential coffee growing districts of the country. The participating farmers were selected to meet FFS initiatives for coffee management practices, particularly to coffee wilt disease in the localities. However, there is no clear information whether those FFS participants were selected democratically or not. Moreover, it is important that these FFSs be evaluated so as to check on their relevance and suitability as a learning process for coffee farmers.

In addition, there was no evidence about the profile of the selected farmers' and its implementation process. There was no detail information whether they were committed or willing to informally share knowledge and skill with other farmers. But, through time farmers have managed their coffee farm using different disease management practices learning through FFS. However, it is not clear if farmers have managed to do this because of learning at the FFS or not. If the farmers have gained knowledge and change their attitude towards improving coffee management practices at the FFS, it is the aim of this study to find out from the participating farmers what exactly they learnt that influenced the coffee management practices.

In general, there was no feedback information and relevant study conducted on how the FFS graduates are applying the knowledge they learn and changes taking places in their attitude and social behavior on coffee management practices. There were also limited perceptions of the FFS approach to all relevant stakeholders in agricultural development from the grass root

level both extension and research experts to the policy makers on the use and contribution of FFS methodology. So, this research paper will likely to assist and sensitize all relevant stakeholders by giving information on the FFS approach, towards promoting and empowering farmers in identifying key entry points for relevant development activities in all coffee growing areas of the country.

The implementation of FFS asks for a totally different institutional support and policy environment. In this regard, the FFS tradition in our country has not given emphasis in specifying the nature of institutional support and policies required for effective FFS at the field level. Currently, different NGOs are trying to implement and scale up small-scale pilot FFSs with relevant disciplines in the grass root level. However, the search for large scale implementation, for mainstreaming FFS, and for building it in to national budget streams has not given due consideration by the policy makers and institutions involved in development process in the country. This requires clear experiences and studies conducted on FFS to assist information for all stakeholders with respect to administrative and management practices at the district and national levels that are consistent with implementing and promoting FFS on the ground.

Hence, this study is designed to make an in-depth analysis of previously established coffee FFSs in the selected districts as well as to identify their effectiveness in promoting coffee management practices as well to fill the knowledge gap.

1.3. General objective of the study

The general objective of this research is to study the effectiveness of Farmer Field School (FFS) initiatives in adopting and promoting coffee production technologies with special reference to coffee wilt disease management practices.

1.4. The specific objectives of the study are:

- to examine the farmers' selection process, their profile and FFS implementation;
- to assess the knowledge, attitude and practice of FFS members and non-members regarding coffee management practices with reference to coffee wilt disease; and
- to identify factors influencing knowledge, attitude and practice on coffee management practices among FFS participants.

1.5. Research questions

- What are the criteria of the farmers' selection, their profile and the process of FFS implementation for coffee management practices?
- What are the knowledge level, attitude and practice of FFS members and non-members regarding coffee management practices with reference to coffee wilt disease?
- What are the factors influencing knowledge, attitude and practice on coffee management practices among FFS participants?

1.6. Significance of the study

In order to increase the living standard of coffee farmers, FFS is the fundamental channel ensuring continued relevancy, establishing greater local involvement in knowledge generation, establishing a means through which more broad based intra and inter-group sharing of knowledge and experience can be achieved.

Besides, the current state-run extension system, the FFS approach is capable of being highly responsive to local needs over a wide range of conditions, and with wide range of crops. The approach made has significant strides in providing the opportunity for farmers to acquire an understanding of important 'systems' concepts and relationships (Simpson, 2002). The

knowledge gained from FFS activities enable participants to make their own locally specific crop management decisions. This approach represents a radical departure from current agricultural extension programme in which farmers were expected to adopt generalized recommendations that had been formulated by specialists/ experts from outside the community.

The coffee FFS have been running for four years from 2003 to 2007. It is important that these FFSs be evaluated so as to check on their relevance and suitability as a learning process for coffee farmers. In this aspect, the study will be useful to policy makers, NGOs, Investors, Coffee processors and traders who may want to improve the coffee sub-sector and the living standard of the people engaged in coffee production and marketing activities. This study will be of particular importance for Ministry of Agriculture and Rural Development, Research centers, State farms, Cooperatives, coffee marketing agencies and others which are responsible for the coffee sector in the country. It is on the basis of this research that these FFS can be spread to other coffee growing areas and can be applied in different situations.

This piece of research can be of benefit to policy makers when they are designing extension systems. It is expected to be evident that FFS is a better cost saving approach of extension especially in countries like Ethiopia, which do not have much money to spend on extension. Farmers can be trained to be facilitators of extension and they can do the job with minimum costs. This also saves the problem of extension agents not being able to reach some farmers because of lack of human and financial resources. Researchers can also benefit from this research by learning that farmers can also perform their own creativity that can bring about meaningful change to their lives. Farmers also can benefit from this piece of research as it gives them the confidence that they can make a positive change in their lives, and they themselves are the ones' to determine what kind of change they want.

1.7. The Scope and Limitation of the Study

The study is conceived to cover the issue of effectiveness of FFS in promoting coffee management practices in two districts, namely Gera woreda from Jimma Zone of Oromia Region and Dale from Sidama Zone of Southern Region. Assuming the total coffee FFSs established in the above regions of the country, the research work had limitations in terms of area coverage, time and available resources. The study had also some limitations of FFS approach in coffee management practices and other crops in the country as compared to other countries which have rich knowledge and wide experience of FFS in different crops.

The main concern of the research is to detect / test the performance / effectiveness of existing FFS initiatives in promoting coffee management practices. However, the research finding could be used to raise FFS awareness among different stakeholders and also serve as background information for others who seek to do further related research and would help serve in formulating and revising agricultural extension strategies and approaches in the coffee growing areas of the country. In this aspect, the scope of the study had limitations to research findings and studies concerning FFS in the country.

2. LITERATURE REVIEW

2.1. Definition of Effectiveness

The meaning of effectiveness explains producing the result that is wanted, or intended for a successful result etc. In this study, 'Effectiveness 'is conceived as the performance of Coffee FFS meeting the goal in promoting and improving knowledge, attitude and practice on coffee management practices, especially with reference to coffee wilt disease.

2.2. Basic Concept of Farmer Field Schools (FFS)

2.2.1. The Farmer Field School Extension Model

FFS are platforms and "schools without walls" for improving decision-making capacity of farming communities and stimulating local innovation for sustainable agriculture **(**Braun *et al*, 2000**).** FFS offers community-based, non formal education to groups of 20-25 farmers through self-discovery and participatory learning principles. Some authors advocate for group sizes of 25-50 **(**Matata and Okech, 1998**)**. The learning process is based on agro ecological principles covering a cropping cycle. The school brings together farmers who live in the same village/catchment and thus, are sharing the same ecological settings and socioeconomic and political situation.

FFS provides opportunities for learning-by-doing. Extension workers, subject matter specialists or trained farmers facilitate the learning process, encouraging farmers to discover key agro ecological concepts practiced in the field**.** During the learning, all the stakeholders participate on an equal basis in field observations, discussions and in applying their previous experiences and new information from outside the community to reach management decisions on the appropriate action to take for increased production. Through farmer field schools, farmers learn about, and investigate for themselves, the costs and benefits of alternative management practices for sustaining and enhancing farm productivity (Gallagher *et al,* 2006). FFS model is a community-based learning system that was introduced in Asia in the eighties

as an imaginative response to the overuse of insecticides in irrigated rice fields in Asia in the wake of the Green Revolution. Farmers in the Philippines and Indonesia attended weekly meetings and taught themselves how to control insect damage. The FFS model is an example of group-based experiential learning (or “learning by-doing”) that encourages farmers in "informal schools" to meet once a week in the same farmer’s field and analyze and discuss their farming operations and then determine which agricultural interventions should be adopted and evaluated on their own farms. Normally, 20 to 30 neighboring farmers gather for group study on a member’s farm once a week for about 14 weeks in a typical growing season. In East Africa, FFS networks, associations and federations have emerged that are farmer-owned and financed (Braun, 2006).

The overall objectives of FFS is to bring farmers together to carry out collective and collaborative inquiry with the purpose of initiating community action and solving community problems (Oduori, 2002). The foundation of FFS method is "farmers first" philosophy, which is in direct contrast to the transfer of technology approach. "Farmers first" concept is essential to empower farmers to learn, experimentation and technology generation and decision-making. To date, Farmer Field Schools have turned out about 4 million graduates. The FFS model has facilitated the spread of Integrated Pest Management (IPM) practices in Asia over the past 15 years, and more recently in Africa.

To summarize, the FFS model is an important institutional and organizational innovation that needs to be studied in depth in different agro-ecological zones, different institutional arrangements and over time. Because of the lack of baseline data and adequate monitoring of ongoing FFS activities at the farmer and community levels, the available evidence suggests that it is premature to promote the FFS model as the “best model” for developing countries. Clearly there is a need for an expanded research program on alternative extension model in developing countries, and yet research on extension is chronically under – funded (Anderson, 2007).

Field schools and other successful programs had the common characteristics of group interaction among farmers, regular meetings, discovery-based-learning in the field and regular

follow up encounters with individual farmers (Paredes, 2001). The FFS methodology is based on farmer participatory environmental education and purposefully seeks to change the paradigm of IPM that often centers on simple rules such as 'economic thresh holds ' and transfer of single element technologies with in a frame work of ongoing use of pesticides (Gallagher, 2000).

In contrast, FFS prioritize group learning and organization for the implementation of knowledge and management intensive alternatives such as biological control, insect traps, good agronomy and other means to crop health. FFS were subsequently adapted for other crops such as legumes, fruits, vegetables and tuber crops, and other technical and social themes such as integrated crop management, community forestry, livestock, water conservation, HIV/AIDS, gender, advocacy and democracy (CIP, 2003).

Through exercised such as AESA, group session practical exercises and the trial plots the facilitator helps the group make use of actual real life situations, as opposed to simulated experiences. All of these exercises apply Kolb's learning cycle (Kolb, 1984) in the way that farmers use concrete observations to reflect on experiences and from there conceptualize the learning points on which actions are defined. In the case of season, or enterprise-long trials farmers go into active experimentations which in turn will lead to another cycle of experiences and observations.

In general the expected outputs of FFS approach are;

- increased farmers' capacity for research, innovation and informed decision-making.
- development of farmers' capacity to define their own research agenda and follow-up activities.
- stimulation of farmers to become facilitators of their own research and learning processes.
- increased responsiveness to farmer-clients demands and needs by organizations in national research and extension and development systems (Ashby *et al.,* 2000).

2.2.2. Adult non -formal education

Field schools assume that farmers already have a wealth of experience and knowledge. FFS harnesses this knowledge through the process of participatory agro ecological analysis and learning by doing. The focus is on effective communication at field level and not marketing of extension packages. Field issues are dealt with-in dialogue with farmers. Therefore, the FFS are oriented to providing basic agro ecological knowledge and skills, but in a participatory manner so that farmers' experience is integrated into the programme (FAO, 2000). One key factor in the success of the FFS has been that there are no lectures – all activities are based on experiential (learning-by-doing), participatory, hands-on work. This builds on adult learning theory and practice. Each activity has a procedure for action, observation, analysis and decision making. The emphasis is not only on "how" but also on "why".

Experience has shown that structured, hands-on activities provide a sound basis for continued innovation and local adaptation, after the FFS itself has been completed. It is also one of the main reasons that farmer facilitators can easily run FFSs-once they know how to facilitate an activity, the outcomes become obvious from the exercise itself (Gallagher, 2003). The group dynamics exercises are part of the non-formal education methods used in the field school to enhance learning and development of capacity for collective action. Khisa (2000**)** has underscored major non-formal education methods used in farmer field schools as sharing, case study, role play, problem solving exercises, panel discussions, small group and large group discussions, brainstorming and simulation games.

2.2.3. Competent facilitator and role

Facilitators must have certain competences. Most important is that the facilitator is skilled in the FFS topic. This can mean having skilled of growing the concerned crop (rice, potato, coffee, beans etc.). Besides the technical knowledge and skills, the facilitator must able to manage the group-building process and strengthen and support the education process in the FFS. Facilitating FFS is complex job that requires a wide range of competences. A key objective is to move towards farmer facilitators, because they are often better facilitators than

outside extension staff. They know the community and its members, speak a similar language, are recognized by members as colleagues and know the area well (Gallagher, 2003).

A facilitator creates conducive environment for farmers to learn by arranging opportunities for farmers to observe, analyze and interpret situations, discuss and to carry out simple exercises. A facilitator according to (Braun *et al.,* 2000):

- recognizes that there is no monopoly of wisdom or knowledge;
- listens to farmers and respects their knowledge, experiences and perceptions;
- gives farmers the confidence to share their knowledge and experiences;
- creates suitable conditions and activities from, which farmers can learn;
- responds to farmers' needs and flexibility in organizing the course and
- increases farmers' knowledge, problem-solving ability and capacity for innovation and skills.

2.2.4. Participative group study/learning

FFS are organized for groups of about 25 persons with common interest. The group of participants is roughly the quantity that can comfortably work together with one facilitator. The groups are often divided in smaller sub groups, so that members can better participate in field observations, analysis, and discussion and presentations. The FFS participants can have different backgrounds; sometimes they are merely farmers, but also students, employees etc. Active participation of the FFS-crop, specific topic and curriculum is fundamental for the success of the FFS. Social learning is a process in which action and reflection play an important role in a study on community- based and co-management development. Schusler (2001) found that engaging in social learning process does not only generate information about different frames, problems, opportunities and areas of agreement and disagreement. A constructive learning process also reveals the opportunities for developing alternative actions, strategies, capacity and possibilities for working together.

Schusler (2001) found that a social learning process can contribute to both common purpose and collaborative relationships. Besides finding common purposes in dealing with environmental problems, social learning also contributes to the development of appropriate structures, collaborative relationships and supportive policy development.

2.2.5. Basic science and learning plots

FFS try to focus on basic processes through field observations, season long research studies and hands on activities. The field is the learning environment. In each FFS there are two main learning plots; the conventional plot and the modern plot. In the conventional plot, farmers work based on 'what they always do'. Decisions and actions are based on habits and traditions. In the modern plot the groups work based on analysis.

2.2.6. The curriculum

The FFS curriculum follows the natural cycle of its subject, be it crop, animal, etc. The approach allows all aspects of the subject to be covered, in parallel with what is happening in the FFS fields (Sones and Duveskog, 2003). FFS follows a curriculum, where crops, livestock, silviculture, land husbandry, socio-economics and education are integrated to form a holistic approach for addressing farmer's needs. The curriculum is based on local conditions, problems and needs of participating farmers. Although the emphasis on any particular discipline may differ, relationships between and among the various farm components and disciplines should not be ignored. Emphasis is put on agro-ecosystem analysis that helps farmers gain ecological insight and integrated management principles with wider alternatives to choose from (Gallagher, 2003).

Several elements of experiential learning are of particular relevance to development and extension including the role of higher order experiences, reflection and dialogue. Those facilitating development processes there by working with farmers to help them step back and

analyze their situations and then together identify ways forward through experiential learning (Percy, 2005)

2.2.7. Agro - ecological system analysis

In general the corner stone of the FFS approach is the agro ecological system analysis (AESA), which is a field, based analysis of the interactions observed between crop/livestock and other biotic and a biotic factors co-existing in the crop/livestock field. The purpose of using AESA is to learn and make regular field observations, analyze problems and opportunities encountered in the field and to improve decision making skills regarding farm management. The analysis follows a cycle of observation, analysis and action. By carrying out AESA regularly in the FFS, farmers develop a mental check list of indicators to be observed when monitoring their farm practices (Gallagher, 2003). Using the framework of agroecosystem analysis, improved farmers decision-making emerges from an iterative process of analyzing problems and situations from multiple viewpoints, synthesizing the analyses, making decisions and implementing them accordingly. It also involves observing the outcomes of the implemented decisions and evaluating their overall impact.

Learning in the field school is experiential and discovery based and agro ecosystem analysis is done in small groups of 4-5 farmers on the activities being carried out in the central plot. Appropriate indicators are used to measure system health during the learning process. The analyses and proposals emanating from the small groups are presented in a plenary for discussion and for reaching a consensus on the next course of action. Since most relationships among agroecosystem components are usually unknown to most farmers, mechanisms for identifying and filling such gaps need to be put in place **(**Bentley, 1994**).** Special topics are included in farmer field schools to cover unknown agro ecosystem relationships e.g. through the use of insect zoos. The topics also develop farmer's research capacity by stimulating comparison of treated (IPM plots) and non-treated plots and by providing regular opportunities for data gathering and analysis through the testing, validation and evaluation of technologies (PTD).

During the learning cycle, participants' capacity for collective action is stimulated through group dynamics exercises. The exercises help to strengthen teamwork spirit and problem solving skills, promote creativity and awareness on the importance and role of collective action and the need for mutual support. They also help the group members to learn about individual's role and behavior that makes teamwork successful in addition to establishing a conducive climate for learning. Group dynamics is built through a process of problem solving exercises, mental puzzles, brainteasers, simulation games, physical exercises etc. Whatever the exercise, participants should find it fun and also as an opportunity to work towards solving a specific problem (Ibid).

2.2.8. Experiential learning of FFS

In experiential learning concrete experience is the centre; however the experience does not have to be real life experience developed especially for learning situation, such as a case study or a role play, or an exercise involving the leaner in actual experimentation on the skills to be learned. In FFS concrete experience through active hands-on activities form the basis of learning. However, simulated experiences are also applied, especially when the proposed learning topics by farmers relate to issues where it is difficult to set up actual experiments. Such topics include, in the agricultural domain, issues such as pasture or larger water shed management or animal health.

The FFS provides a space for people to reflect actively. Participants have the opportunity to conceive solutions to problems with a degree of clarity often difficult to accomplish in the rush and clutter of day-to-day lives. As group members struggle to realize a collective vision/version of their world, they will discover perspectives that reveal new possibilities for resolving their problems (Stringer, 1999).

A learning process that banks on the intelligence, creativity and competence of farmers, extension workers and researchers is required for effective change. This condition is met under farmer field schools. Farmers do not become experts by adopting science-based

technologies or memorized body of knowledge acquired from others, but by becoming better learners. They internalize underlying principles (pest management, crop interactions, soil productivity improvement etc.) in diverse situations and adapt their activities when circumstances change with new situations. Experiential learning or learning by discovery promoted in farmer field schools empowers farmers to become better learners and to cope with new challenges, a fact which has been demonstrated under IPM based FFS **(**Deugad, 1998**).**

Research programmes in agriculture drive the extension or education programme that the research should actually be serving. What farmers need to know to be able to operate sustainably, both environmentally and economically, should drive the research programme. In the FFS approach, research is based on training needs or is a part of the training itself. Through their participation in the field schools farmers can become a part of a wider programme of local, district and national research networks investigating agricultural production problems and developing local solutions for improving the sustainability and productivity of the country's farming systems (FAO, 2000.)

2.3. Differences between conventional extension and farmers field schools.

2.3.1. Information flow

The most important differences between the conventional extension and FFS approach was described clearly after analyzing different studies as follows (Gallagher, 2003).

Conventional extension: Information flows from the extensionist who has knowledge to farmers who are regarded as ignorant.

Farmer field school: FFS create room for farmers to contribute to the learning process through farmer interaction and information sharing.

2.3.2. Follow ups

Conventional extension: There is little, if any, follow up by extensionists to the farmers' fields. Should a farmer have a problem then he/she has to go and ask the extensionists. Farmers did not know why extensionists did not follow up. Some farmers said they do not have power to ask for improvement of service from the extensionists because they are answerable to their employer, the government.

Farmer field schools: Farmers meet every week and follow up the farmers often. In FFS farmers get advice from the farmers in group (Ibid).

2.3.3. Spread of farmers' ideas

Conventional extension: Farmers' innovations do not spread fast because there is little or no opportunity for farmers to share information and ideas. This may take place only once per year at a field day.

Farmer field school: Farmers' innovation spread fast to all group members and even to non-members because the FFS provides a constant forum for information sharing (Ibid).

2.3.4. Field support

Conventional extension: There is not enough field support to the farmers. Each extensionist covers a wide area making it difficult to visit all farmers. The extensionists do not have enough resources, which it makes it even more difficult to visit the few farmers more often. Some farmers said that an extensionist has never visited them.

Farmer field school: Work with groups who in most cases are neighbors to him/ her. This makes field visits easy and besides farmers meet very often at the FFS (Ibid).

2.4. Agricultural Extension in Ethiopia

Agricultural extension began in Ethiopia in the 1950s, and various approaches have been tried over the decades. An integrated development approach in the 1960s and 1970s was followed by the adoption of the Training and Visit (T&V) system, which became the main extension approach used by the Bureau of Agriculture (BoA), although it was later recognized to be insensitive to the varied requirements of small-scale farmers. The present government extension system agreed upon between central and regional levels is based on the package approach and is called the "Participatory Demonstration and Training Extension System" (PADETES). It combines technology transfer and human resource development, and promotes the participation of farmers in the research process (Percy, 1997).

However, extension service needs to gradually reduce its direct involvement in input supply and play more of facilitating linkages with input suppliers. If this is done, the extension service could better be placed to focus on the knowledge transfer and skill development (Berhanu *et al.,* 2006).

In addition, according to Berhanu *et al.,* (2006) current extension service is almost exclusively funded and provided by the government through its woreda level Offices of Agriculture and Rural Development (OoARD), and with NGOs operating in limited and dispersed areas throughout the country. Full budget allocation from the public is a continuation of the tradition to support extension service from national budget that started in 1995 with the launching of PADETES.

However, there are several weaknesses in this approach, such as the promotion of inappropriate technology, insufficient on-farm and adaptive research, continuation of inappropriate promotion criteria for research and extension staff (i.e. based on scientific publications), poor research and extension linkages, and the lack of “real” participation of farmers. This has meant that, because of a range of biases (class, gender, literacy and location), most of the small-scale farmers have derived limited benefits from this program (Misgana, 1998).

2.5. Theoretical studies of FFS

2.5.1. Theory of knowledge

Long (1987) suggested that knowledge can be defined as being constituted by the way in which individual members of a society or social group categorize, code, process and assign meaning to their experiences'. Havelock (1986) strengthen this idea and said that a body of knowledge is, therefore not made up of facts, but rather of the idea and values that govern the assignment of meaning. From these definitions, knowledge appears as the psychological state of an organism, which through processes such as learning, experience and the like has been acquainted to or has mastered some object of its environment.

The FFS approach is generally considered to build on the critical theoretical framework of 'knowledge and human interest' (Habermas, 1971). Three cognitive interests are presented that all human motivation for learning. These are work interactions with others and power. The work domain relate to the need among humans to control physical and social environments, and to predict and control reality. The interaction domain related to communicative action and interactions between humans based on norms and consensual agreements. The motive here is connectedness and inclusion and the interest in knowledge relates to understanding of human actions. The domain of power relates to overcoming the internal and environmental factors that inhibits control over ones lives and a feeling of power and control. It is characterized by self reflective action and critical thinking and relates consciousness about one self and its surrounding.

The Malian FFS study showed that illiterate female farmers did not learn well when presented with theoretical concepts by way of semi-lectures, while the more educated men found this is a good way of learning, especially those sufficiently literate to take written notes. Indeed, there was a noticeable discrepancy in knowledge acquisition between those functionally literate and the rest, irrespective of sex (Sissoko, 2003). This was accomplished by the fact that the facilitators did not use a teaching process that encouraged the participants to reason

through the technological information. Instead it was presented as a given and the participants are simply expected to learn it by heart.

Knowledge generation therefore need be seen as a process and emergent questions are how poor, weak and vulnerable groups can be strengthened to experiment, enhance, share and spread their own knowledge and how they better can articulate their needs (Leeuwis, 2004). Though, having considered extension as mainly an act of transforming technologies to farmers there is now a focus on participations of farmers in the innovation process and facilitation of experimentation among communities.

Collaborative research with farmers and research driven by farmers ensures such grounding in local needs, but also incorporates local knowledge of conditions, including both knowledge of local ecosystems, weather, etc., and local insight in labor availability, fit with the local farming system, local markets, etc. In this respect, one can say that the FFS has a high potential for taking local needs into account. But such locally driven demand is not automatic. FFS-based investments also can be used to promote practices that farmers are not in need of. A typical example is the attempt to focus IPMFFS on rice in Vietnam because the government is keen to improve rice exports, while farmers feel that rice does not pay and are waiting for government support in the production of fruits, vegetables and other higher value products (Linh, 2001).

The building of farmers' management and problem solving capacity requires joint learning through practical FFS work (Hagmann *et al*, 1998). This requires a shift from previous perceptions where farmers were seen mainly 'adopters' or 'rejecters'' of technologies but as not as providers of knowledge and improved practices (Chambers, 1993). Many studies have shown the ability among farmers to innovate and develop their own solutions to problems through FFSs, there by being part of the innovation system rather than just recipients (Scarborough and Kiloug, 1997). The development of solutions under their circumstances requires a new and more farmer oriented approach to problem solving and decision taking

procedures, where farmers are involved in the entire process of searching and applying new solutions which may comprise both social and technical elements (Frias *et al.,* 2005).

2. 6. Empirical studies of FFS in different countries

What is the empirical record of the FFS model? Four recent studies illustrate why FFS is an attractive model and why there is a need for more research on the short-, medium- and long-term impact of the model. The Sri Lanka Department of Agriculture, with support from FAO and a number of donors, ran an IPM program in Sri Lanka from 1995 to 2002 that included 610 FFS projects throughout the country. Tripp *etal*, (2005) carried out a survey of FFS in southern Sri Lanka and found that FFS farmers growing rice who adopted FFS knowledge derived from IPM practices were able to reduce the number of applications of insecticides by 81 percent. But surprisingly, farmers completing the FFS did not adopt other recommended farm practices and the study provided little evidence of farmer to farmer transmission of the principal practices of the FFS. The authors have called for more rigorous impact assessment because of insufficient assessment of FFS programs (and their alternatives) is a significant part of the problem.

The FFS approach makes a very attractive package for donors and NGOs. It offers a well-defined subject introduced through a specific methodology. Courses and participants can be counted. Enthusiastic participants can be relied on to give glowing testimonials. As these experiences accumulate, an impression develops of FFS as a practical and widely applicable strategy, and while donors are unclear about objectives, and hence disorganized in their attempts at evaluation, FFS expands into new areas and makes new claims (Tripp *et al.,* 2005).

The Global IPM facility recently commissioned two experienced field researchers, Van den Berg and Jiggins (2007), to prepare a background paper on the state of the art of published and unpublished studies of the impact of FFSs on IPM in Asia. The authors stated their challenge as finding “a form of adult education that would capacitate the millions of

smallholders to become experts in decentralized pest management through practical, field-based learning methods" (Van den Berg and Jiggins, 2007). The authors admitted that the cost effectiveness of the Farmer Field Schools programs is a matter of "energetic debate" and that the results of many FFS studies reveal that the methodology for impact evaluation is "still under development." The findings of this valuable survey report by Van den Berg and Jiggings are summarized as follows:

• The evaluation of the FFS model combines Integrated pest management (IPM), new technology and farmer education makes it difficult to develop methodologies to study the impact of both of these activities over time.

• Most impact studies of FFS have concentrated on measuring immediate impacts, most notably the effects of insecticide use on crop yields. However, this type of methodology is weak for estimating medium- and long-term impacts such as developing social capital to build producer organizations.

• The immediate impact of FFS on farmers producing rice in Asian countries is the reduction in pesticide use while the achievement of FFS on other continents "remains to be established."

• FFS programs in Asian countries have only covered one to five percent of all farm households (Van den Berg and Jiggins, 2007).

Sierra Leone recently launched an ambitious food security program called "Operation Feed the Nation." After a decade of Civil War, the President of Sierra Leone pledged his support for this program so that "within five years, no Sierra Leonean should go to bed hungry." FAO was invited to help oversee a quick study of the 510 Farmer Field Schools. The study was carried out by the Overseas Development Institute (ODI) and Dunstan Spencer and Associates in early 2006. The study was carried out in three districts over two months and it found that:

• The results of the evaluation were positive but the authors concluded that the overall impact of the FFS cannot be known for certain because of the lack of reasonably accurate baseline data for comparison. A recent FAO commissioned study reports that Farmer Field School (FFS) Networks emerged in Western Kenya during 2000 as a result of exchange visits and communication between farmers, facilitators, trainers and project staff (Braun,*et al.,* 2006). Similar networks have subsequently emerged elsewhere in Kenya, Uganda and Tanzania. These FFS Networks were formed by farmers who graduated from an FFS. FFS networks in

Western Kenya have shown how farmers themselves have been able to build bottom-up producer organizations during and after the completion of donor projects. This self-emergence of FFS networks depicts FFS as an effective approach to organize and empower farmers.

At farm level, the FFS graduates were making conscious changes in their farming practices and tended to employ more of agro ecosystem analysis than their non-FFS graduate counter parts. They were assessing crop health and natural enemy activity before applying insecticides in addition to applying principles of IPM to other crops. Eighty percent of what was learned on coffee management in the FFS was adopted showing farmers satisfaction with the technical options learned during the FFS sessions. However, while alternative pest control measures represented 52% of the innovations made on vegetables, they accounted for 82% of the practices farmers modified and 90% of those they abandoned (Loevinsohn *et al.,* 2000).

The impact of a farmer field school (FFS) on, Peruvian Andes Potato Farmers' knowledge levels on pest management techniques reveals that farmers acquire analytical skills, critical thinking and other knowledge resources to make better and independent judgment. The effectiveness of communication strategies was not explicitly analyzed in the study. However, given the communication components were an integral part of the key operational strategies of the present FFS program, field activities, interactive learning, horizontal knowledge sharing and information dissemination and feedback mechanisms between farmers and extension staff improved. The overall study reflects the effectiveness and efficiency of communication components (Godtland, 2004). This is because of the key factors of success is that there are no lectures. All activities are based on experiential participatory, hands-on work. The emphasis is not only on 'how' but also 'why'.

In countries across the world, FFS alumni have been successful in taking greater control over their lives. In Kenya, Farmer net works and associations have emerged as a follow- up effect of FFS and these units have been successful in breaking manipulative relationships with middle men and there by gained access more lucrative markets for sale of their produce (Global IMP, 2003).

There are currently several FFS initiatives in Kenya, Tanzania and Uganda, funded by various development agencies. Preliminary data suggest that FFS initiatives have led to high level of community empowerment and increased emergence of community based extension systems with institutional innovations such as farmers associations with community self-funded extension. FFS is a relatively expensive intervention method that has limited financial sustainability; several solutions have been perused, such as semi-auto-financed FFS. But there are few studies showing whether these types of schools are effective in comparison to regular FFS (Davis, 2006).

Gallagher (2006) responds by claiming that FFS can be a steeping-stone towards self-sustained groups in some situations. But that originally the FFS itself was not designed to be sustainable, With regard to the financial sustainability Sherwood (Personal communication) argues that the impact of FFS is likely to be bigger compared to cheaper extension methods such as training and visit or mass communication campaigns. Some studies have revealed that although there were changes in farmer practices at the local level, FFS did not appear to have impact at the broader national level. Farmer to farmer dissemination is essential in up scaling. Farmers may be gaining skills and knowledge. But they are not sharing them with their neighbors (Davis, 2006). Gallagher (2006) responds that FFS have been up-scaled in Asia and Africa. FFS should be seen as one element in up-scaling an appropriate response with in demand driven system. Up-scaling of only the FFS-method is not a goal itself.

Pontius *et al*, (2002) described groups of FFS alumni in Indonesia that have at their own initiative formed multitiered associations with other groups, whereby individuals serve as nodes of a communications network, with the aim of sustaining a local IPM movement among farmers throughout the area. These farmer alumni associations were no isolated islands of success but emerged in almost every sub-district, as evinced by the data presented. FFS graduates were elected to new leadership positions of local organizations, for example, water user associations; others became FFS trainers, or developed themselves as field experimenters disseminating their findings at local forums. Hence, despite being small in number, the empowered and organized FFS alumni significantly influenced policies, funding support, and

media, in many cases resulting in amplified impact. A critical mass can be achieved by having several IPM nodes in neighboring villages with clustered FFSs, and supporting some IPM farmers to develop prominent positions (e.g., as FFS trainers).

The FFS approach is sometimes promoted aggressively by donors without sufficient monitoring and evaluation. Adopting it simply because it is popular and worked elsewhere should not be done. The FFS methodology cannot be used as a 'trendy' approach to development. Another danger is that of practitioners and policy makers picking and choosing the aspects of FFS-methodology that they think are useful without paying sufficient attention to the necessary basic principles of the FFS. FFS should be implemented because they suit local conditions and needs, not because they are donor driven (Davis, 2006). FFS seems to attract a specific type of participants (Paredes, 2001). It is not clear whether some farmers are unable to join the FFS-groups, and if so, why or whether FFS are able to reach everyone. Food for training arrangements allows joining in development activities including FFS (Gallagher, 2006).

The follow up activities of FFS like farmer-to-farmer extension method are believed to be too idealistic and hardly found in practice. To achieve sustainable and enduring impact, training in the FFS has explicitly focused on issues of local institutionalization, both in terms of changes in individual behaviors regarding IPM practices, and in the development of supportive organizational structures. The impact of FFS on local organizational development showed two general, yet very distinct, trends which were dependent upon whether or not the FFS were held in locations with any existing structures (cooperatives, village associators, producers group etc.). For meeting basic economic needs (Simpson, 2001) in contexts where there were no existing local structures, the FFS tended to serve as the spark to mobilize capital and identify income-generating projects among participants. In areas with existing local structures, the FFS tended to play a much more limited technical input role, with any formal FFS group identify quickly and disappearing. Critics (Quizon *et al.,* 2000) have increasingly mentioned the issue of financial burden of implementing FFS programs.

Although the calculations of training costs is rife with difficulties, estimates of costs per farmer for FFS training in several East African programs vary depending on whether extension agent or farmers facilitators are used (Dragun, 2001). The value of FFS as an extension methodology has elicited interesting discussions across the globe among skeptics and proponents of the approach.

Many have argued that due to its focus on training small groups of 25 to 30 farmers and the fact that the training takes a whole season to complete, then it cannot become an effective extension methodology to reach millions of small scale farmers with new agricultural technologies (Rola *et.,* 2002) and (Feder *et al.,* 2004). But Leeuwis and Rolling(1998) while comparing FFS approach to the training and visits (T&V) in Zanzibar, concluded that FFS has many promising attributes which gives it much higher chances of effectiveness as an extension methodology in Sub-Saharan African than T&V. In a study to assess whether FFS graduates retain and share what they learn in Philippines, Rola and Jamias (2002) reported that FFS graduates had generally higher knowledge scores than their non- counterparts.

Feder and Quizon (2004) also reported similar findings and concluded that FFS graduates benefited more from the significantly higher knowledge acquisition of better pest management in Indonesia. Mwagi and Onyango (2003) conducted a similar study to found that the adoption of technology on organic and inorganic fertilizer combinations by FFS farmers was significantly higher than those non-FFS farmers. It is important that FFS graduates accrue much more additional benefits which can be difficult to quantify in monetary forms. For example, Mwagi and Murgai (2003) reported that FFS graduates gained superior leadership skills and become more cohesive as a group than non-FFS farmers.

Leewis and Bruin (1998) reported that FFS offers opportunities for developing effective farmer organizations which are key in developing local opportunities like exploring for markets and value adding of their farm produce and again this is an attribute that is difficult to quantify in financial terms. The FFS can motivate farmers to plan collective action, or seek to answer their own research questions through experimentation (Van den Berg and

Cahyana,2004). The IPM program in Indonesia responded for post FFS activities to strengthen farmers' skills of experimentation, strategic planning, and organization (Dilts, 2001). In post-FFS educational opportunities, farmers learned to create knowledge, plan actions to solve livelihood problems, and share their knowledge and plans with other farmers and government officials in village. Moreover, farmers learned how to conduct FFS by themselves, and joined farmer facilitator net works.

The strong correlation between knowledge level and reduction in pesticide use proved that a skill-oriented, knowledge-intensive and hands-on education approach, as used during FFSs, is an efficient system to deliver the complex IPM principles to farmers. Graduates of IPM FFS significantly gained in ecological knowledge concerning pest and beneficial insects of cotton fields. These were anticipated impacts of the FFSs, where the training is structured around weekly field visits to perform crop ecosystem analysis. Farmers attending the schools learn to sample plants in the field and leaves on the plants according to a cross-transect design, to record the number of insects visible and to predict insect population dynamics looking at the climate conditions and food availability for pests. Ultimately, farmers take joint and informed decisions based on the relations among all these factors.

This finding is in agreement with all previous literature on knowledge gains associated with the participation in FFS (Rola *et al*., 2002). FFSs seem to be an appropriate strategy to overcome constrains to IPM adoption identified in the lack of farmers' biological and ecological knowledge, because it allows farmers to develop a deeper understanding of the crop systems and a stronger confidence in the method. In the case of this study, such a confidence was expressed in the decision to take fewer but likely more targeted pesticide applications. Solanki (2001) also reported that knowledge of FFS beneficiaries about breeding, feeding, health care and management practices of dairy animals was higher than the non-beneficiaries.

2.7. Empirical studies of FFS in Ethiopia

The process of farmer experimentation and participatory extension is rather limited in Ethiopia. The experience so far of farmer participation in agricultural research and extension is limited to consultation and concept of giving ownership and decision-making power to farmers has not been promoted. The experiences with FFS in Ethiopia are rather a recent phenomenon and limited only to few organizations. Save the Children UK (a British NGO) introduced the FFS approach in 1999 in one of its area-based development programmes in Northern Ethiopia. Save the Children Fund (SCF), and the Ministry of Agriculture (MoA) have been launching FFSs on the Integrated Pest Management (IPM) in crops. FFS on perennial crops like coffee does not exist in Ethiopia so far and FFS on coffee management practices particularly with reference to CWD was the first of its kind in the country.

In Ethiopia, IPM-FFSs were introduced by Save the Children-UK (SC-UK) and the Bureau of Agriculture and Rural Development (BoARD) in 1999 in the highland cereal farming area, which was studied by Eyasu in preparation of the Integrated Nutrient Management and Soil Productivity (INMASP) project, which started in 2002 in Woisha catchment of Kindo Koisha district of Wolaita zone. The INMASP project, a regional project with Kenya and Uganda, uses the FFS approach to study nutrient monitoring. Dagnachew (2006) reported that SC-UK and BoARD through two other projects diversified their FFS from IPM to ICM, water harvesting, soil fertility management and varietal testing, among other topics. A multi-country project on integrated management of late blight in potato also included FFS in Ethiopia. Fasika (2004/5) reported that participation in FFS can increase understanding of farmers about potato late blight disease and helped them to improve their controlling practices of the disease. It has also demonstrated that FFS can help to improve farmers knowledge and affect their agricultural practice even on knowledge intensive technologies.

Organization for Rehabilitation and Development in Amhara (ORDA) was highly supported by SCF-UK, Woldia office supported FFS in IPM practices. Members of the IPM-FFS are

researching different possibilities against the major insect pests of their localities. To mention some of the farmer findings;

- Chafer grub is the major insect pest in wheat and barley production areas of Lay-gayent. In this regard farmers in the IPM-FFS identified a solution for the problem. As per the FFS finding farmers are treating the seeds in cow urine for 3 to 4 days prior to the date of sowing reduced pest incidence.

- Stalk borer, farmers in Bati are actively involving in controlling the yield loss of Sorghum and Maize and they have seen promising results. Similarly, other IPM-FFS groups of other projects are engaged in solving major problems that they are facing.

On top of this, members of the IPM-FFS are developing confidence, which could be utilized for solving other social and agricultural problems of the community.

2. 8. Conceptual Framework of the Study

The conceptual framework of this study was based on the above literature review on the assumption that FFS effectiveness on knowledge, attitude and practice in promoting coffee management practices are interrelated. They are much influenced by a number of personal, psychological, communicational and economic variables. Among the personal variables such as age, education, family labor and farmers' experience is assumed to influence the dependent variables knowledge, attitude and practice. The psychological variables management motivation, information seeking behavior, creativity, information sharing behavior, achievement motivation, level of aspiration and interpersonal trust are also hypothesized to influence the dependent variables. Similarly communication variables such as extension participation, cosmopoliteness, social participation and economic variables like wealth status, access to farm tools, access to credit, farm size and intercropping are assumed to be the most important explanatory variables that might influence the dependent variables knowledge, attitude and practice.

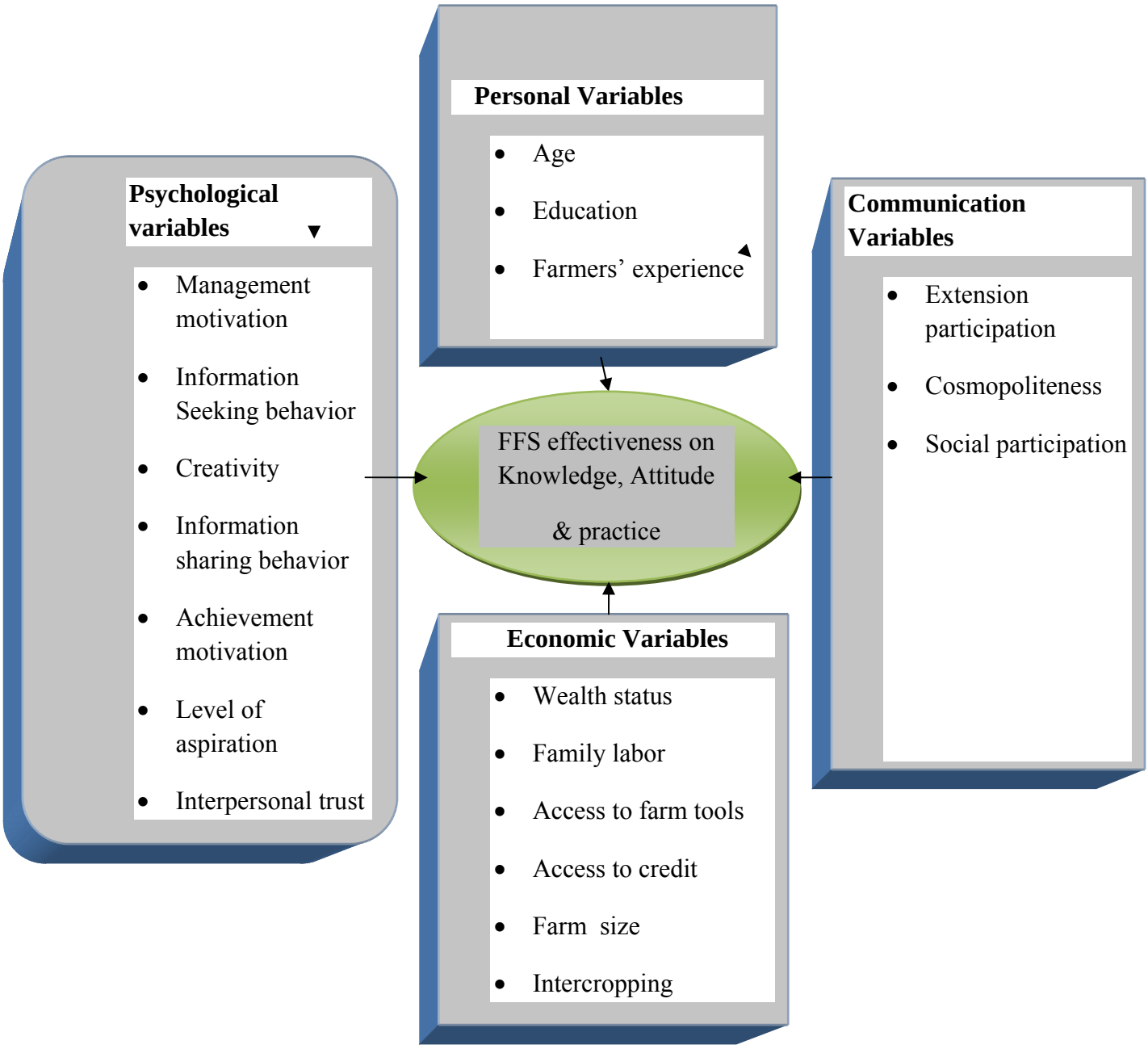
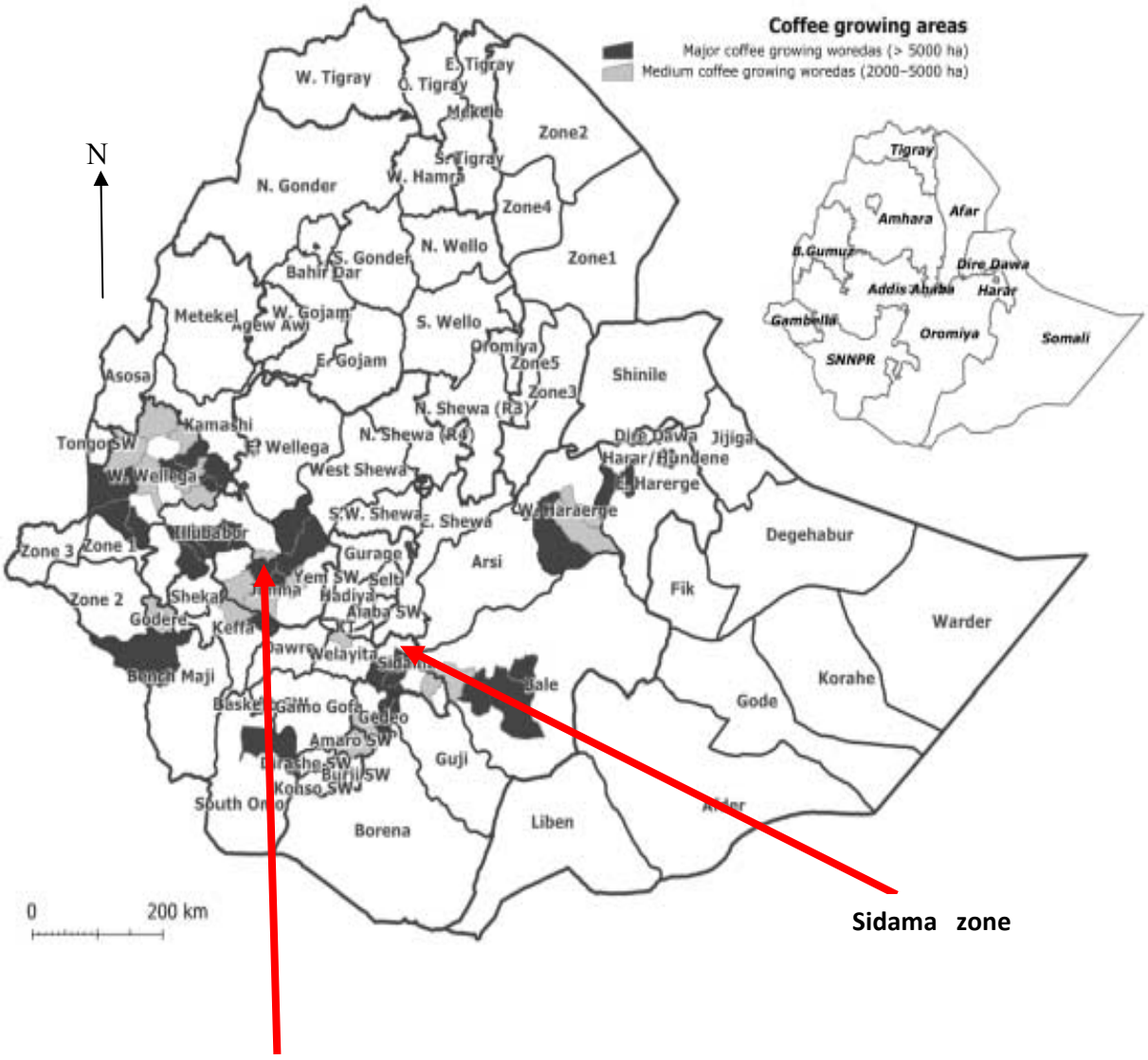


Figure 1. Conceptual diagram of the study
source: own computation

3. RESEARCH METHODOLOGY

The major and medium coffee growing areas of the country are illustrated below in the map.

Figure 2. Map of study areas in the major coffee growing regions of Ethiopia



Jimma zone is found to the Southwest of the Federal Capital, Addis Ababa. Its capital Jimma is situated 350 Km away from Addis Ababa. Its location lies between 7^0 13'- 8^0 56'N latitude and 35^0 52'- 37^0 37' E longitude. The area is characterized by a humid tropical climate of heavy annual rainfall that ranges from 1200- 2000mm. About 70% of the total annual rainfall

is received during *kiremt,* which lasts from the end of May to early September. The area has a relatively higher temperature of about 25^0c – 30^0c from January to April, and having a minimum temperature of 7^0c- 12^0c during the month of October to December.

It is one of the potential coffee growing zone second to West Wellega zone in Oromia regional state. Now a days, it is assumed that more than 350,000 people are engaged in coffee cultivation. In general the zone produce 40,000 to 55,000 tons of coffee annually out of which 28,000- 35,000 tons of washed and dry coffee had been sent to the central market every year, while the remaining ones are consumed locally (ZARDO, 2008/9).

Sidama is also one of the prominent zone in coffee cultivation in the SNNPR. There are about 11 major coffee growing districts in the zone. The total zonal hectarge is estimated to be 721,800 hectares. The total coffee area is about 76,756 hectares of which 49,892 is garden coffee and the remaining 26,864 is plantation. The average production of coffee is estimated to be 537,292 tons of which more than 20,285 tons of coffee is prepared in washed form and the remaining small amount 2,068 tons is sundried (ZARDO, 2008/9). The total population of the zone is estimated to be 2,966,474 of which male 1,498,070 (50.5%) and female 1,468,404 (49.5%). According to 2000/01 data of the zone the total household is assumed to be 519,880 of which male 493,886 (95%) and female 25994 (5%). As far as agroecology of the zone is concerned, Dega 30%, W/dega 60% and Kolla 10% with a maximum temperature of 34^0c and minimum 10^0c. The maximum annual rainfall is 1500 mm and the minimum is about 500 mm.

3.1. Brief description of Gera district

3.1.1. Location of the study area

Location and geography of the area

The study area, Gera district, is located 450 km away from the capital Addis Ababa in South Western of the Regional State of Oromia. Its location lies between 7^0 27'-$7^0$55'N latitude and 36^0 01'- 36^0 24'E longitude. It is located 95 kms Western part of Jimma town, and it is one of the 17^{th} district of the zone with an area of 1443.4 km^2. In its area coverage Gera ranks eighth out of the total district in the zone. It has 29 peasant associations in its rural areas and 1 kebele in the urban settings. It borders Setema district in the west, Goma district in the north, Southern Peoples' Regional state in the south, and in the east Goma and S/chekorsa districts (WARDO, 2008/9).

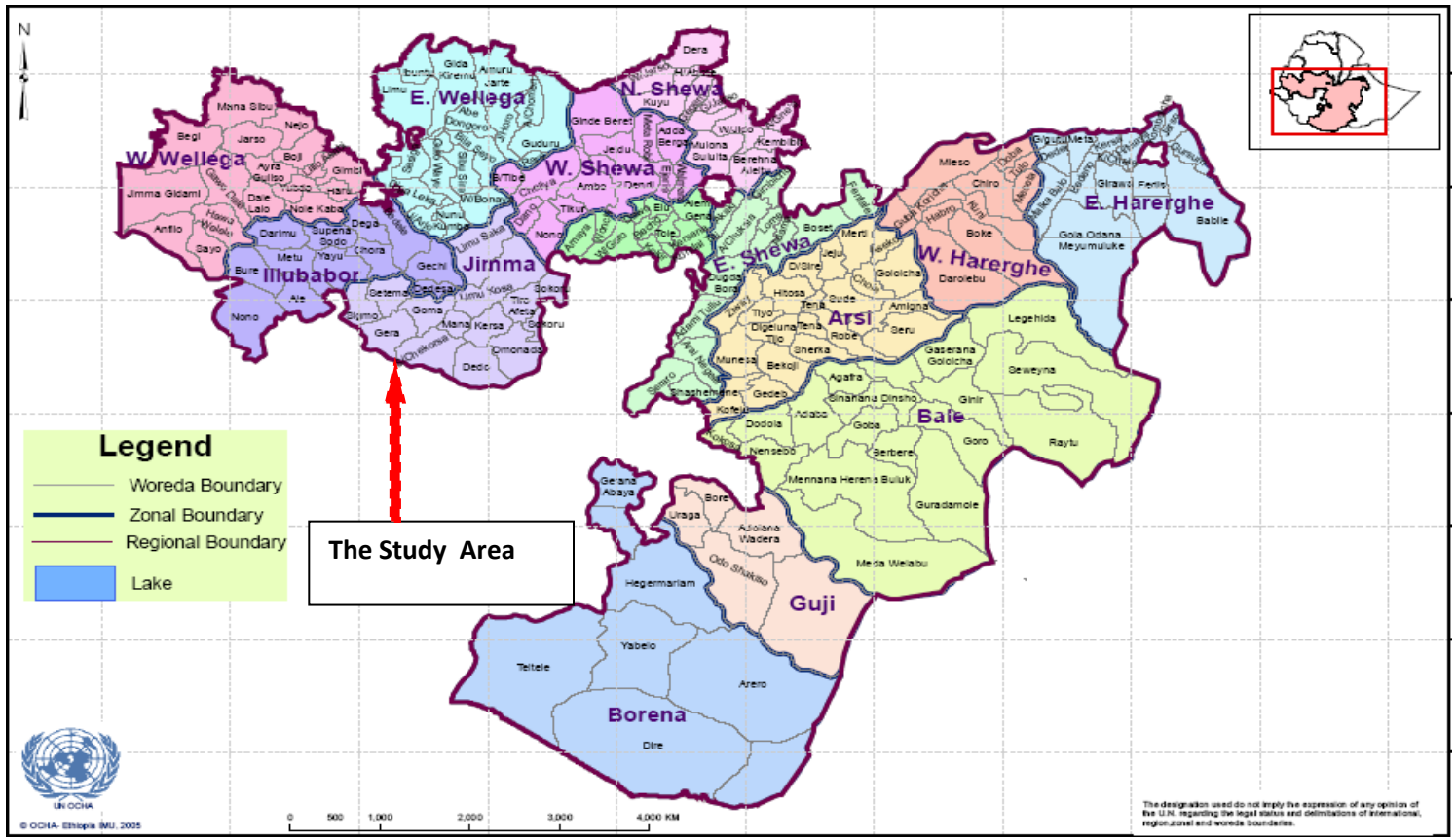
Climate

The sub-tropical (Weyna Dega) is the agro-climatic zone that prevails in Gera district. The district experiences frequent rainfall, and hence moisture stress is not a problem for their agricultural production. It has a bimodal rainfall distribution in the summer and autumn, of which a maximum average annual rainfall is estimated at 1900 mm. The maximum annual range of temperature, which is recorded in winter season, is 25˚c while the minimum annual temperature recorded during summer season is 14^0c (WARDO, 2008/9).

Topography and soil

It lies in the altitude range of 1500 mts and 3000 mts above sea level. Cultivated land is accounted for 36,601 hec (25%,) and forest land 80,830.4 hec (56%) of which most of the coffee is found under forest respectively. Wood land, grass land and others accounted the rest (19%) of the district. Concerning the type of the soil, it is dominated by red-dish clay and forest soil in the gentle slopes and gley-vertic soil type in the lowlands. In general natural forests are the dominant vegetation covers of the district (WARDO, 2008/9).

Figure 3. Map of Oromia Regional State and the Study Area



3.1.2. Socio-economic characteristics

According to the 2004 district based census result, the total population of the district is estimated to be 111,535 of which 49% (54,653) is male while the remaining 51 % (56,882) is female population. Of the total population about 96% and 4 % of the population lives in rural and urban areas, respectively. The major ethnic groups of the district are Oromo, Amhara and Keffa. The dominant religions in the area are Islam, Orthodox Christianity, Catholic, protestant Christianity. The number of total household in the districts' population is about 27,093.

The farming system

The farming system in the district is characterized by mixed farming. The agro-climatic condition is favorable for growing diversified types of crops and rear different species of animals. The average farmland size per household was 0.5-1.0 hectares(WARDO, 2008/9). Coffee, maize, wheat, sorghum, Barley, Pea and soya bean are some of the dominant crops frequently grown in the area. Vegetables like cabbage, pepper, potato, tomato and onion are commonly grown in the District. The land size varies from one PA to another due to the differences in the available land resource and the population size among the PAs. Farmers in the study area use their land mainly to produce coffee, cereal crops, and vegetables and to some extent to graze their animals. Coffee is the main source of income generating cash crop in the area. The total area of coffee coverage in the District is a bout 8557.33 hectares of which 572 hectare is owned by private investors and the rest 7985.33 hectare is owned by small holder farmers.

Agricultural extension activities

In the District, the Office of Agriculture and Rural Development is the principal authority to run extension services for promotion agricultural technology that are developed and released by research centers. At present the extension approach is undergoing a transition from one DA in each PA or village to 3 specialized diplomas graduate DAs in each farmers training centers (FTC). There are about 73 DAs of which 70 are males and the remaining 3 are females. The

main task of the DAs in the locality is to teach farmers' demonstrate, popularize and disseminate agricultural technologies.

Livestock production

Livestock play a significant role in the mixed farming system of the area. Their main contribution is in providing draft power, cash generation, food (example milk), and for prestige. Livestock types kept by the farmers include cattle, sheep, mules, donkey, horses, goats and poultry. Oxen are kept to provide draft power, cows to provide farm households with milk and butter for consumption and sale, donkeys for transporting goods.

3.2. Dale district

Dale district covers a total area of 1,411 sq.km, at about 320 km south of Addis Ababa. The total population of the district is assumed to be 222,068 of which 113,254 females and 108,814 are males. The total household is about 37,027 with an average family size of 6%. As far as agro ecology is concerned 99% of the district is W/dega and the remaining 1% is Dega. The district is subdivided into 76 PAs. The altitude ranges from 1170 masl around Lake Abaya to the west, reaching about 3200 masl in the eastern part of the district. The altitude of Yergalem, which is the district head quarter, is 1765 masl. The mean annual rain fall recorded at Awada research sub- centre in Yirgalem is 1314 mm. Rain fall declines as one move from the high lands in the east to low lands in the west.

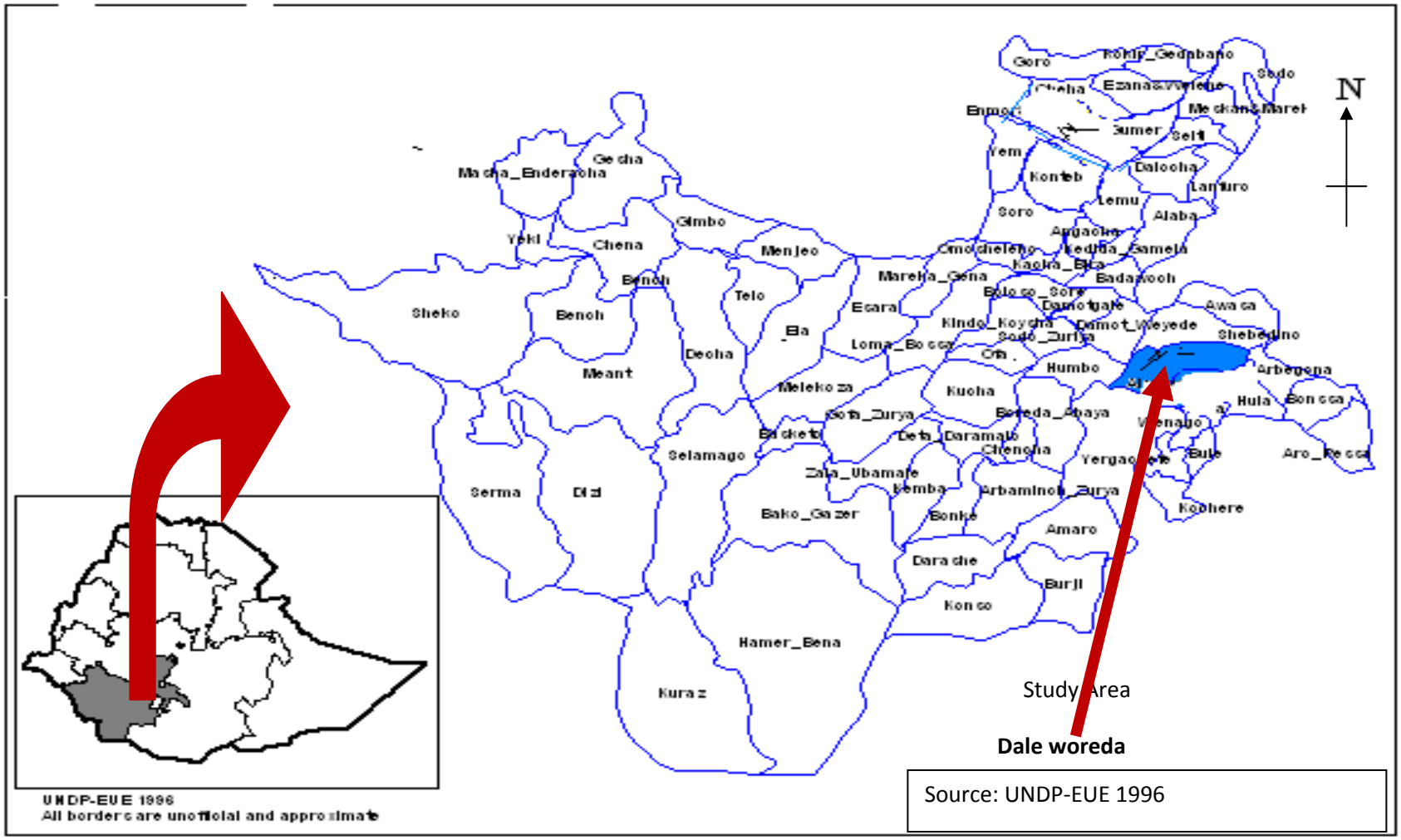
There are two cropping seasons in the area. Belg (short rainy season) from March to April and Maher (main rainy season) from June to September. Belg rains are mainly used for land preparation and planting long cycle crops such as maize and seedbed preparation for Maher crops. The Maher rains are used for planting of cereal crops like barley, teff, wheat and vegetable crops. Meher rains are also responsible for the growth and development of perennial crops such as enset, coffee and chat. Livestock also plays a major role in crop

production in areas of the mid highlands and low lands for cereal production (drought power) in addition to meat and milk; it also denotes prestige and asset to the households.

Farming system

According to IPMS (2005), two main farming systems can be found in Dale district. The garden coffee, enset, and live stock system is found east of the main road transecting Dale from north to south. The terrain is hilly and soils are red (Nitosols). Rainfall is higher and more reliable than in dry mid lands haricot bean/ livestock system. The farming system is composed of garden coffee, enset, and cattle, which are tethered and kept for manure production of dairy products. Other crops in the system are haricot beans (as an intercrop), yam, cereals, fruits mainly avocado and banana. The cereal, enset, haricot beans, garden coffee, and livestock system is the other main farming system in the area. This system is found west of the road transecting Dale from the North to South. Most of the animals are feeding using zero grazing (cut and carry) system, due to shortage of grazing land in the area. The terrain varies from relatively flat to hilly. Black soils (pellic vertisols) are commonly found on the flat areas and red soils on the slopes. Rainfall is lower and more erratic than in the coffee system.

Figure 4. Region, Zone and the study woreda of SNNPR, Ethiopia



Crop production

According to the available statistics, the area under coffee is 15,375 ha and the estimated production is about 88,487.69 quintal clean coffee. There are 59 PAs where coffee is grown. Garden coffee integrated with enset improvement is being promoted predominantly in the area covering with 61.5% of the total coffee land while the remaining 38.5% is plantation in the coffee/ livestock system. Most of the coffee is open and having minimum shade unlike that of the South-western region. A total of 36 PAs are targeted for coffee specialization. The total population currently engaged in coffee cultivation is assumed to be 20,807. The productivity of garden coffee in the area is about (6- 7) quintal/ha and it is some how better as compared to forest and semi-forest coffee in the South-western region. The total area under maize and horticultural crop is estimated to be 3,503 hectares in the district.

3.3. Research design, sample, and sampling procedure

The study has employed a descriptive research design. As far as sampling is concerned, based on the pilot learning of coffee FFSs, Gera district from Jimma zone and Dale district from Sidama zone, totally two districts were purposively selected to undertake the study. The main reasons for the selection of these districts were because they are two of the most important coffee growing areas and high severity of coffee wilt disease in the localities. Hence, all two established coffee FFSs from Gera and all two FFSs from Dale totally four FFSs were taken for further investigation. This technique was used to disperse the observation across the study area and provide equal chance for all the participant farmers to be selected for data collection.

For the purpose of this study, FFS farmers were those who underwent season long FFS training on coffee management practices with particular reference to coffee wilt disease. Those who did not participate in FFS training on coffee management practices were referred to as non-FFS farmers or respondents and were selected to serve as a control group. In this context, all 103 members who were available in four FFSs were the sampling frame of study. In general within each district, 35 FFS members totally 70 respondents were selected based

on the method of probability proportional to size and simple random sampling method was used in selecting the respondents from the sampling frame. From 103 FFS members, a sample of 70 respondents of which all female participants were totally taken across the four FFSs in order to balance the gender dimension in the study. Likewise, within each district, a sample of 35 NFFS members totally 70 respondents were randomly selected across four peasant associations situated far away from FFS communities in order to avoid bias from potential diffusion of knowledge in coffee management practices with reference to coffee wilt disease.

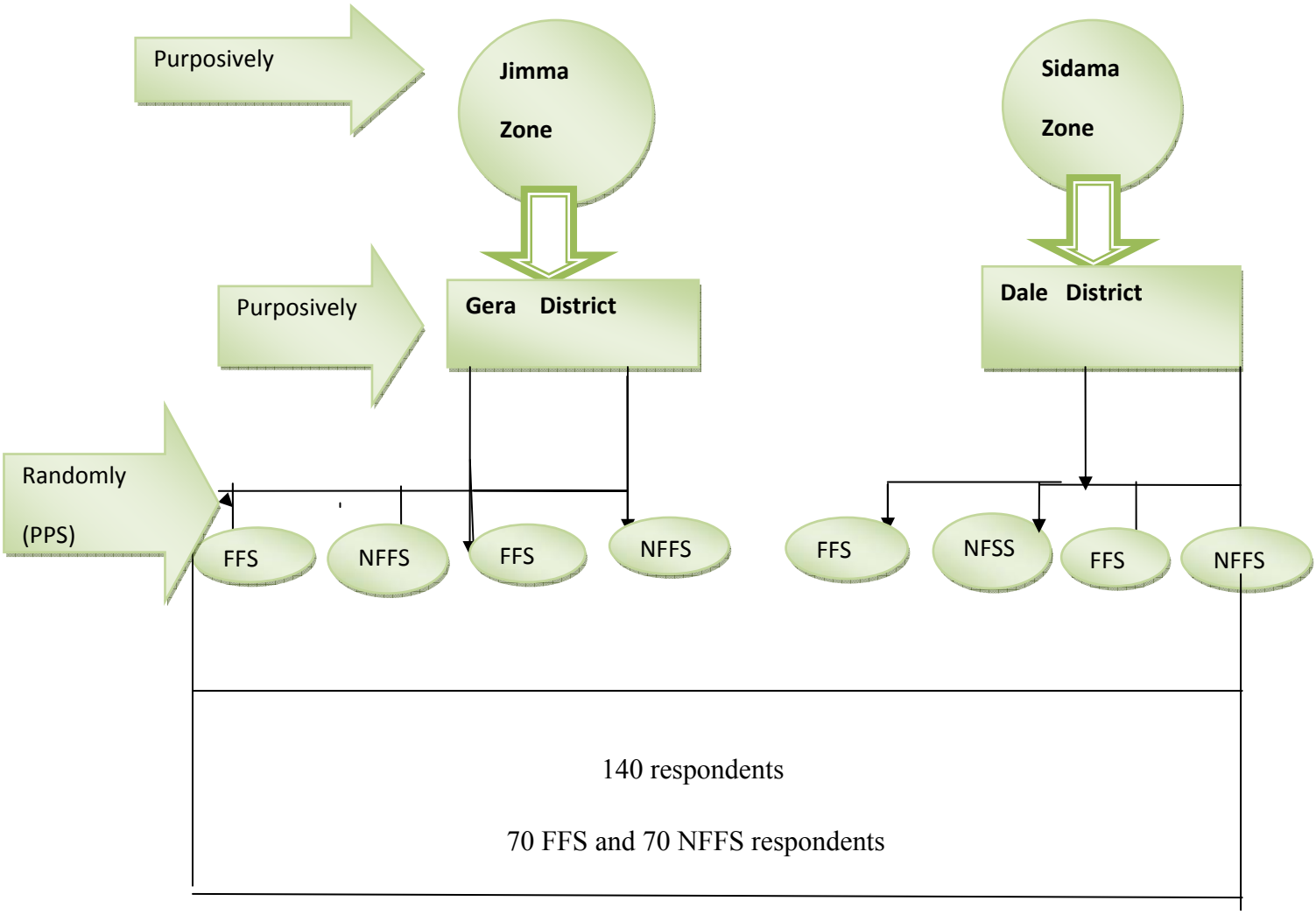


Figure 5. Sampling procedure

In this study, to determine sample size, different factors were considered including research cost, time, human resource, accessibility, and availability of transport facilities. In general, the final sample consisted with equal number of 70 FFS participants and 70 non- participants for a total sample size of 140 across the selected two districts as shown in Table 1.

Table 1: Distribution of sampled respondents by PAs in the study areas, Gera and Dale districts, from Jimma and Sidama zones respectively.

	FFS Members			Non- FFS Members		
Name of District	Name of PAs	FFS graduates	Sample size	Name of PAs	Total HH	Sample size
Gera	Sedi-loya	26	19	Guredako	202	18
	Genji-cala	21	16	Geranaso	184	17
	total	47	35	total	386	35
Dale	Awada	25	15	Sheye	1269	16
	Ferro	31	20	Motto	1502	19
	total	56	35	total	2771	35
Total		103	70		3157	70

Source: own survey data (2008/9)

3.4. Data collection procedure

The study on effectiveness of coffee FFS was intended to be carried out in two stages through qualitative and quantitative data collection methods. The primary data were collected using structured and pre tested interview schedule from coffee FFS and NFFS respondents and other professionals (see appendix, 1). The data were collected totally by two oriented B.Sc and seven Diploma holder enumerators and closely supervised by the researcher in both study areas. The data were also strengthened using semi-structured questionnaire distributed to three extension personnel's of agricultural development offices in the selected districts. Four research personnel from Jimma and Awada Research Centers were also interviewed using semi structured questionnaires. In the second stage, the data were also collected using a variety of tools, methods and techniques; such as key informants and group interviews, focus

group discussions, direct observations, transect walk etc.. Secondary information were collected from sources of reports and documents. In addition, supplementary data were collected from Jimma Research Center and agricultural development offices of Gera and Dale districts as well as from Awada Research Centre. The above mentioned institutions have been of vital importance, since they were the main facilitators of these FFS activities in the study areas. Relevant information's and experiences about FFS in Ethiopia were also collected from FAO office from Addis Ababa and included in this study.

3.5. Method of data analysis

All the data were computed and analyzed using appropriate statistical tools and soft wares to fulfill the objectives of the study. The quantitative data were analyzed using descriptive statistics like frequency, mean, percentage, standard deviation, while chi-square, t- test, Cramer's, correlation and multiple linear regression analysis, was be used to test the magnitude of the relationship and influence among dependent and independent variables. The qualitative data were tape-recorded, described and interpreted to supplement the quantitative data. In this study, data were analyzed using different quantitative and qualitative statistical procedures and methods.

The qualitative data were also analyzed on spot during data collection to avoid forgetting and to be able to fill the gaps in the data. Among the measures of correlation, Karl Pearson's Coefficient of Correlation (r) was applied to analyze the data. The degree of association or correlation between two variables X and Y was answered by the use of correlation analysis (Gomez and Gomez, 1984; Kothari, 2003).

Karl Pearson's coefficient of correlation (r) is also known as the Product Moment Correlation Coefficient. The value of 'r' lies between. +1 and -1 Positive values of 'r' indicate positive correlation between the two variables (*i.e*., changes in both variables take place in the same direction), whereas negative values of 'r' indicate negative correlation *i.e.*, changes in the two variables taking place in the opposite directions. A zero value of 'r' indicates that there is no

association between the two variables. When r = (+) 1, it indicates perfect positive correlation and when it is (-) 1, it indicates perfect negative correlation. The value of 'r' nearer to +1 or -1 indicates high degree of correlation between the two variables (Kothari, 2003).

The existence of a significantly high correlation between two variables tells us nothing about why the correlation exists. In particular, the correlation does not tell us that one variable is the cause and the other is the effect (Browen and Star, 1983).

Multiple linear regression (MLR) analysis was the statistical technique used to analyze the influence among variables (i.e. single dependent variable and single independent variable) with the objective of using the independent variables whose values were known to predict the single dependent variable (Hair, et al 1998). According to Bowen and Star (1982) the regression equation takes the form ;

$$Y= a+b_1x_1+b_2x_2+\ldots\ldots + b_p x_p + e_i$$

Where Y= dependent variable

x= independent variable

a= y intercept

b= slope of the line

e_i = error term

The MLR was made categorical only for descriptive statistics; otherwise actual scores were used which are continuous.

Estimation procedure

Following the completion of the data collection, the responses were coded and entered into SPSS version 16.0 for analysis. Before estimating the models, it was necessary to check if multicollinearity exists among the explanatory variables. If multicollinearity turns out to be

significant, the simultaneous presence of the two variables will reinforce the individual effects of these variables.

According to Gujarati (1995) there are various indicators of multicollinearity and no single diagnostic give us a complete handle over the collinearity problem. For this particular study, Variance Inflation Factor (VIF) and condition index (CI) were used for continues variables. The larger the value of VIF, the more it is troublesome. As a rule of thumb, if the VIF of a variable exceeds 10 (this will happen if R_i^2 exceeds 0.95), that variable is said to be highly collinear (Gujarati, 1995). Following Gujarati (1995), the VIF is given as:

$$\text{VIF}(\chi_i) = \frac{1}{1 - R_i^2}$$

Where, R_i^2 is the coefficient of determination when the variable χ_i is regressed on the other explanatory variables.

A condition index greater than 15 indicates a possible problem and an index greater than 30 suggests a serious problem with multicollinearity. Similarly, the contingency coefficient, which measures the association between various discrete variables based on the Chi-square, were computed in order to check the degree of association among the discrete explanatory variables or the existence of multicolinearity problem. The decision rule for dummy variables if the value of contingency coefficient is greater than 0.75, the variable is said to be collinear (Healy, 1984 as cited in Taha, 2007).

$$C = \sqrt{\frac{\chi^2}{n + \chi^2}}$$

Where, C is coefficient of contingency, $\chi 2$ is chi-square test and n = total sample size.

3.6. Definitions of variables

The important variables investigated in the research are, dependent and independent variables. Dependent variable is a variable that is affected or explained by another variable. An independent variable is a variable that causes change in another (Sarantakos, 1998).

3.6.1. Dependent variables

The general objective of this study is to assess the effectiveness of coffee FFS in promoting coffee management practices. Any learning activity in group was intended to bring about desirable change in knowledge, attitude and practice leading to better on-the-job performance. For the purpose of this study, three major behavioral dimensions were considered, such as knowledge, attitude and practice to reflect the effectiveness of FFS in promoting coffee management practices. Knowledge, attitude and practice were treated as dependent variables in this study.

Knowledge Measurement

Knowledge of FFS members and non-members was measured using a "Teacher-Made Test". The test items included 10 questions related to coffee management practices with reference to coffee wilt disease under Gera and Dale districts.

Out of 10 questions 16 answers were expected. The scoring pattern was assumed 1 score for one answer and 2 score for having a question of two answers and 0 score for wrong reply.

The respondents were asked the question and answers were recorded. At last, these answers were evaluated and their total knowledge scores were calculated. Since the score range was 0-16, the respondents were categorized in to three such as Low (0-5), Medium (6-11), and High (12-16) for further analytical purposes using descriptive statistics and total score was used for correlation and regression analyses.

Attitude Measurement

Attitude was defined as "the degree of positive or negative affect associated with psychological objects like symbol, phrase, slogan, person, institution, ideal or ideas towards which people can differ in varying degrees" (Thurstone, 1946).

The focus of this parameter was on the attitude of FFS members and non-members in promoting coffee management practices. Attitude was defined in this study as the degree of positive or negative feeling of FFS members and non- members in promoting coffee management practices in Gera and Dale districts.

Effectiveness of FFS members, attitude towards coffee management practices was measured using a Summated Rating (Likert type) scale. The scale was prepared with large number of items initially and subjecting them to editing and screening in the light of pre-testing so as to put only the most important items reflecting both positive and negative effect on a five point continuum. The items covered on all aspects of coffee management practices with special reference to coffee wilt disease. Before administration, the scale was tested for its content validity by a panel discussion with the group of experts in the office level so as to screen the most important items of attitude test.

The attitude of a respondent was measured by adding the total scores obtained for ten items in the scale, by attributing 4 score for 'strongly agree' 3 score for 'agree', 2 score for 'undecided', 1 score for 'disagree' and 0 score for 'strongly disagree' responses in the case of positive items. In the case of negative statements the scoring pattern was reversed. The total score was calculated by adding individual scores that each respondent obtained for all statements.

The total scores of attitude varied from 0 to 40. For the descriptive analysis, three categories such as low, medium and high were employed. Since the score range was 0-40, the respondents were categorized in to three such as Low (0-13), Medium (14-26), and High (27-

40) for analysis with the help of descriptive statistics and total score was used for correlation and regression analyses.

Practice Measurement .

Coffee is a perennial crop having vegetative and reproductive cyclical stages. It requires year round management practices. In this regard, coffee management practices were assessed among FFS members and non-members responded whether they adopted or not the different coffee management practices especially with reference to coffee wilt disease. In this aspect in the second objective, it was carried out to see the effectiveness of the FFS in promoting coffee management practices.

Thus, practice was evaluated as the application of knowledge in the real life situation. To test the practice of FFS members and non-members, the scheduled consists of 13 major coffee management practices with particular reference to coffee wilt disease. These major practice scores were assigned as per the responses received where a score 1 was for adopted practices and a zero score for non-adopted practices depending on the farmers knowledge of each practices. Later the answers were categorized in to three such as Low (0-4), Medium (5-9), and High (10-13) for further analytical purposes.

3.6.2. Definition of independent variables and hypothesized relations

The major criteria for the selection of independent variables were evidences from past researches as well as from published literatures. Some of the studies revealed different independent variables as follows. It was noted that the diffusion of knowledge was strongly divided by gender, men diffusing mostly to men and women mostly to women; thus calling for a need for gender considerations in FFS. Age was another critical dimension in diffusion of knowledge. The evaluation pointed out that the older graduates did not necessarily pass over the knowledge acquired from FFS to the youth. Although, not implicitly assessed in the four farmer field schools, it has been pointed out that wealth is an important factor influencing diffusion of practices in East African Highlands and thus any FFS need to take cognisance of

the poor as a criteria in participation in the FFS **(**Sperling and Loevinsohn, 1993**).** Another factor that enhanced diffusion of practices was the use of farmer-farmer diffusion method through organized group visits. The group visits resulted in rapid spread of practices especially those relating to soil and nutrient management.

As it was indicated in different empirical investigations of FFS in different crops, in this study the following independent variables were hypothesized to influence effectiveness of FFS in promoting coffee management practices in the study areas.

I. Personal variables

1. Age: Age has an important role in the production process. It is measured in terms of number of years of age of the respondents. Coffee management practice is a knowledge demanding business; particularly it requires modern knowledge of management, production and marketing. Moreover, it also entails risks, but older people are usually risk averters. Because of this, they tend to be reluctant in promoting improved coffee management practices. Therefore, age is hypothesized to negatively influence on the effectiveness of FFS in promoting improved coffee management practices with the dependent variables.

2. Education: The educational level of the individual is one of the most important factors to receive and utilize new idea and approach to be more productive. It represents the level of formal schooling completed by the respondent at the time of the survey. The education level by the respondent will ensure the effectiveness of FFS on coffee management practices. Hence, this categorized variable was hypothesized to influence positively on the dependent variables. Old farmers had less knowledge of different technologies as compared to young farmers. The reason may be due to their less education (Shinde *et al,* 2000).

3. Farmer's experience: Measured in number of years since the respondent started coffee cultivation under consideration. Experience of the farmer is likely to have an influence on

enhancing new information. Experience will improve the farmers' knowledge in coffee management activities. Legesse (1992) reported that the adoption of wheat technology positively affected by farmer's experience. Therefore in this study also experience of coffee management practice was expected to have a positive relationship with the dependent variables.

II. Psychological variables

4. Management motivation: It is operationally defined as the desire of the farmer to manage in a better way of his coffee farm. Farmers having such behavior will have a tendency to participate in group discussion in FFS sessions. It is measured based on the response of the farmers' total score on different coffee management practices. Therefore this variable was hypothesized to influence effectiveness of FFS in promoting coffee management practices and was assumed to have a positive relationship with the dependent variables.

5. Information seeking behavior: This is defined as the degree to which the respondent is eager to get new and valuable information from FFS and other sources on different roles he/she performs. This is measured in terms of how much information is sought, how frequently and from where the information is sought. This behavior was assumed to have positive relationship with the dependent variables.

6. Creativity: This is operationally defined as the capacity of the farmer using his indigenous knowledge in combination with modern practices in coffee management activities. Creative people show different patterns of attention from those found in uncreative people, and it has been theorized that the secret of creativity is individual differences in attention (Mendelsohn,1976). It is measured based on the total score of different activities of the farmer's knowledge in preventing coffee wilt disease. This variable was hypothesized to be a positive relationship with the dependent variables.

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7. Information sharing behavior: It is the extent to which respondent shared the information with others including family members, friends or neighbors, etc. This variable was also anticipated to have a positive relationship with the dependent variables.

8. Achievement motivation: This was defined as the need in an individual to perform different roles with some degree of excellence. This variable was measured using the scale suggested by Pareek and Rao (1974), with slight modifications. Achievement motivation was expected to have a positive relationship with dependent variable.

9. Level of aspiration: This is a strong desire or an ambition something better in the life. This variable will be measured using the scale suggested by Pareek and Rao (1992) with slight modifications. Level of aspiration was expected to have a positive relationship with the dependent variables.

10. Interpersonal trust: Expectancy held by an individual or a group that the word promise verbal or written statement of another individual or group can be relied upon (Rotter, 1967). Trust individuals will be more likely than less trusting individuals to share information each other. Therefore the variable was hypothesized to have a positive relationship with the dependent variables.

III. Economic factors

11. Wealth status: This refers to the economic position of the farmers and is determined by various economic variables such as amount of coffee plantation in hectare, type of housing and other business activities. Wealth status operationally was calculated by asking the respondents to estimate the values of each material possession according to the current price in the market available in the study areas. In general, the approximations were then combined into different categories i.e., poor, medium, moderately wealthy, wealthy and very wealthy

ranging from less than Birr 50,000 to more than 201,000 according to the local elders response. This variable was expected to have an effect on the dependent variables.

12. Family labor: Family labor is one of the most important factors in coffee management activity. It refers to active labor force of the family who are between the age of 15 and 64 and who can support in doing agricultural production. Hence, this variable would influence the achievement of FFS on coffee management practices. Therefore, it was expected that, family labor supply has a significant and positive impact on the effectiveness of FFS in promoting coffee management practices with the dependent variables.

13. Access to farm tools: Access to farm tools is one of the critical factors that facilitate coffee management activities by the small holder farmers. Hence access to farm tools might motivate the FFS participants to make better gains and was expected to have a positive relationship with the dependent variables.

14. Access to credit: It is a dummy variable, which takes the value 1 if the respondent uses credit and 0 otherwise. Coffee management involves more use of inputs which has great cost implication. Credit is very much useful to purchase inputs such as improved seeds and other inputs. Hence, access to credit was expected to influence the effectiveness of FFS in coffee management practices positively on the dependent variables.

15. Farm size: It is directly associated with higher probability of coffee management practices. It is assumed that the larger farm size the farmer has, the better he/she is initiated for the effectiveness of coffee management practices. This continuous variable was anticipated to have a positive relationship with the dependent variables.

16. Intercropping: It is a practice of growing two or more crops in a given farm. It is the motivation of the farmer to generate more income and to avoid risk in a given coffee farm. Intercropping compatible crops helps the farmer to improve soil fertility and depress weed growth in a given farm. Hence, this dummy variable was hypothesized to have a positive relationship with the dependent variable.

IV. Communication variables

17. Extension participation: This represents the school member's visit to extension agents and research experts for different services and vise versa. This variable was measured through different answers. Group learning might encourage the FFS members to make better gains from the learning in terms of knowledge and attitude change and hence assumed to have positive relationship with the dependent variables.

18. **Cosmopoliteness**: It is the degree of orientation of the respondents towards outside the social system to which he/she belongs. It is measured in terms of visits to outside village and the purpose of such visits. Cosmopoliteness as a dummy variable was assumed to have a positive relationship with the dependent variables under study.

19. Social participation: It is the affiliation of the respondent with formal and informal association in terms of membership as well as degree of involvement in the activities. The involvement of a person in any formal or no formal organization will have a higher exposure for different information and perception than those who did not involve. Therefore this continuous variable was assumed to have a positive relationship with the dependent variables.

4. RESULT AND DISCUSSION

The main objective of this part is to present the results and discussion of the study on the effectiveness of FFS in promoting coffee management practices in Jimma zone Gera District and Sidama zone Dale District. It has analyzed or examined the farmers' selection criteria, their profile and implementation process of FFSs. The study also has evaluated the effectiveness' of FFS in improving farmer's knowledge, attitude and practice on coffee management practices with reference to coffee wilt disease, and identified the factors influencing effectiveness of FFS in terms of knowledge and attitude in promoting coffee management practices. For the purpose of this study, both FFS members and non-members were used as samples.

To support the study with qualitative data regarding FFS effectiveness, a group of members' information's and case studies were gathered through key informant discussion and interviews. The information was collected under Jimma Agricultural Development Office, Gera District Agricultural Office and Jimma Research Center. The study also included Dale District and Awada Research Center in the Southern parts of the country. The information on FFS were gathered with different experts and relevant stakeholders who organize and run FFSs on coffee management practices.

4.1. Farmers' selection process, their profile and FFS implementation

4.1.1. Farmers selection process

FFS usually involves 20-30 participants. Experience has shown that this number is the best for allowing discussion and sharing of experiences and breaking into smaller work groups. Also, this number is large enough to encourage group work beyond the FFS.

In a community meeting, the objectives, principles and procedures of the farmer field school approach are explained and 20-30 farmers with the same interests and commitment to the learning process are identified and asked to volunteer to form the school on behalf of the community. Depending on the envisaged activities for the field school, appropriate criteria can be used for farm/farmer selection and for selection of the school site. Whatever be the criteria used, the farmer participants need to be active, ready to attend all field school activities and be able to share the knowledge gained with other members of the community (FAO,2000).

In this aspect, the community may be involved in developing criteria for selecting participants or present some criteria and ask for feedback. In general, the selection of coffee FFS farmers in the selected districts have considered interest, acceptance among the community, proximity to each other and to the study plot. Researchers and agricultural development experts played a great role in the farmer selection process. The role of local officials and farmers' representatives in farmers selection were some how limited since this kind of FFS experience is new in the locality.

Experience in several countries in West Africa suggests that the following criteria are important for selecting FFS participants. These were some of the criteria used in selecting FFS participants for perennial crops, like cacao and coffee in most of the different countries for different management practices. The farmer's selection criteria suggested for perennial crops by different countries and criteria used in selecting coffee FFS participants are illustrated under this page in Table 2.

Table 2: Farmer's selection criteria of FFS suggested for tree crops.

Criteria suggested	Criteria used in selecting coffee FFS participants
Involved in the day to day management of a given farm	Farmer's whose coffee farm seriously affected by coffee wilt disease
Committed farmer	Coffee farmers who are concerned to the disease in the locality
Considered as a respectable person by others in the village	A farmer who was committed to learn and attend FFS sessions to manage his coffee farm from CWD and other practices
Lives close to the FFS site (5 kms)	Farmers close to the FFS site
Interested in learning	Farmers interested in learning and attend FFS sessions
Willing to attend FFS sessions	Willing to attend FFS sessions
Willing to work in group and share with others	Willing to work in group
Willing to informally share knowledge and skills learned in FFS with other farmers	Willing to share knowledge and skills with other farmers was not considered as a basic criteria initially

Source: STCP a guide for cocoa ICPM FFS.

A number of different procedures can be used to select FFS participants. However, it is important to ensure that the process is transparent and democratic and involves community and farmer organization representatives. The FFS selection process and its effectiveness was further elaborated by Ahmed Hashim (Development agent) of Sedi-loya PA, Gera woreda as follows:

Photo 1 : Ahmed Hashim, DA of Sedi- loya PA, Gera woreda, Jimma zone

Selected case study 1.

The researcher was asking some questions about the effectiveness of FFS in promoting coffee management practices to the DA, Ahmed Hashim in Sedi-loya PA, Gera woreda.

Researcher: What criteria were considered during farmers selection of FFS in your locality?

Ahmed:" Those farmers' farms that are seriously affected by coffee wilt disease, and also those model farmers who are capable of teaching other farmers were selected in participating coffee FFS. More over, the PA leaders have participated in selecting participant farmers in addition to District Agricultural Development and Research offices.

Researcher: What were the differences you observed in knowledge, attitude and practice of FFS members and non-members regarding different coffee management practices with reference to gender equity and other issues?

Ahmed:," Now a days, those FFS members are active in managing their coffee . As far as gender balance is concerned, those female participants were also assigned in different leadership positions after the phase out of FFS. For example, out of three females who were involved in FFS previously, one female is now assigned as a leader in a position of women association at woreda level, and the other female is secretariat member of women association here in sedi-loya kebele. This confirms that knowledge building is effective in FFS as compared to conventional extension approach".

Researcher: What were the FFS contribution on personal and village level in your locality?

Ahmed: " FFS contributed for participant farmers to analyze their traditional way of exercising coffee management activities, and opens the door to start in a scientific way of thinking and problem solving abilities. Moreover, FFS stimulated horizontal flow of information among farmers, sharing of resources and a sense of positive competition in coffee management and other activities in the Sedi-loya PA."

As it was described by Ahmed, those females who have participated and graduated from coffee FFS were assigned in different leadership roles of the community in the locality. Some FFS graduates were also assigned as a leadership in kebele and village level in Sedi-loya PA. Similar findings were also observed in Kenya by Khisa (2001) who reported that the social benefits of farmer field schools have been the recognition of FFS graduates ability in leadership. Some graduates have been appointed in as assistant Chiefs, Councilors and as members of District Poverty Eradication Committees. Other social benefits include employment of FFS graduates by other agencies, stimulation of horizontal flow of information among farmers, enhanced group cohesiveness, improved extension-farmer interactions, recognition of gender roles, improved farmers capacity to offer community services.

4.1.2. Farmers' profile

As it is clearly indicated in Table 3, more than 78% of FFS respondents were in the age of 15-50. This assures that since the members were young, they can easily accept the coffee FFS practice better than elders. Most of the FFS members 90% were men. Moreover, majority of the respondents 74% were educated. This confirms that 2/3 of the respondents in both districts were educated and the selection criteria considered education as one of the main component on the process.

Table 3: Profile of FFS members in the study areas (N=70)

Sr. No	Characteristics	Category	Gera		Dale		Pooled	
			f	%	f	%	f	%
1	Age	15-35	16	45.7	13	37.2	29	41.4
		36-50	15	42.9	11	31.4	26	37.1
		>50	4	11.4	11	31.4	15	21.5
		Total	35	100	35	100	70	100
2	Sex	Male	31	88.6	32	91.4	63	90
		Female	4	11.4	3	8.6	7	10
		Total	35	100	35	100	70	100
3	Education	Illiterate	10	28.6	8	22.9	18	25.7
		Can read & write	9	25.7	6	17.1	15	21.4
		Primary school	5	14.3	7	20	12	17.2
		Secondary school	11	31.4	14	40	25	35.7
		Above	0	0	0	0	0	0
		Total	35	100	35	100	70	100
4	Wealth status	< 50,000	13	37.1	33	94.3	46	65.7
		51,000-100,000	9	25.7	2	5.7	11	15.7
		101,000-150,000	10	28.6	0	0	10	14.3
		151,000-200,000	0	0	0	0	0	0
		> 201,000	3	8.6	0	0	3	4.3
		Total	35	100	35	100	70	100
5	Farm size of coffee land	<0.5 hec	1	2.9	23	65.7	24	34.3
		0.5-1.0	18	51.4	11	31.4	29	41.4
		1.1-1.5	5	14.3	1	2.9	6	8.6
		1.51-2.0	7	20	0	0	7	10
		>2.0	4	11.4	0	0	4	5.7
		Total	35	100	35	100	70	100
6	Intercropping	Yes	14	40	31	88.6	45	64.3
		No	21	60	4	11.4	25	35.7
		Total	35	100	35	100	70	100
7	Farming experience	< 5 years	0	0	0	0	0	0
		5-10 years	28	80	19	54.3	47	67.1
		11-15years	7	20	12	34.3	19	27.1
		>15 years	0	0	4	11.4	4	5.8
		Total	35	100	35	100	70	100

Source: own survey data (2008/9)

The data in Table 3, revealed that there was a considerable difference of wealth status in the respected districts. Considering farm size of coffee, in Gera almost half 51.4% (n=18) respondents were having a coffee land between 0.5 to 1.0 hectares while in Dale 65.7% (n=23) respondents were having a coffee land of < 0.5 hectares, respectively. As it had been observed during data collection, the density of population in Dale (Sidama) were three fold greater than Gera (Jimma) in a kebele level. Likewise, the coffee land holding of a person was very minimum in Dale as compared to Gera in Jimma zone.

Intercropping coffee with enset and other horticultural crops is a very common practice in Dale as compared to Gera. As it was clearly observed in the data almost 88.6% (n=31) FFS respondents in Dale practiced intercropping. Moreover, more than 67% of the participant farmers had coffee farming experience of 5 to 10 years in both study areas.

As it was clearly indicated below in Table 4, most of the participant farmers were selected by research and agricultural development office experts. Moreover, as it was scored by the participant farmers in both study areas, on the average more than 80% of the FFS members were applying their knowledge what they have learned in FFS in their own coffee farm, and were able to control the disease. Their practices were randomly checked by the researcher during data collection period through transect walk in their farm in order to check and compare with NFFS respondents. More than 79% of the FFS respondents share their knowledge with other non-FFS members. Moreover, as it was indicated on the Table more than 93% of the FFS respondents were also socially acceptable by the people in the locality.

In general, there was a considerable difference between two districts in some of the items response of farmers selection and their characteristics in Table 4. The probable reason for the difference may be due to information flow, infrastructure development and population density might be some of the contributing factors which facilitates the FFS respondents in applying the knowledge what they have learned and share their knowledge with other non-FFS members in Dale as compared to Gera district.

Table 4: Farmers selection and their characteristics in the study areas

	Responses on selection process	Gera FFS			Dale FFS			Pooled		
		f	%	χ^2	f	%	χ^2	f	%	χ^2
1	By whom you were selected in participating to coffee Farmers Field school?									
	1. By researchers	11	31.4	2.371**	2	5.7	29.80***	13	18	19.486***
	2. By district Agricultural development office	7	20		11	31.4		18	26	
	3. By PA leaders	6	17.1		1	2.9		7	10	
	4. By district Administrative office	0	0		0	0		0	0	
	5. By researchers & district Agricultural development office	11	31.4		21	60		32	46	
	Total	35	100		35	100		70	100	
2	Did the farmers participating in the FFS have common problems about coffee management practice with reference to coffee wilt disease?									
	0. no	0	0		0	0				
	1. yes	35	100		35	100				
3	Were the respondents capable in terms of applying the knowledge what they have learned in FFS on their own farm?									
	0. no	7	20	12.60***	3	8.6	24.029***	10	14	35.714***
	1. yes	28	80		32	91.4		60	86	
	Total	35	100		35	100		70	100	
4	Are they sharing their knowledge with other Non-FFS members?									
	0. no	10	28.6	6.429**	5	14.3	17.857***	15	21	22.857***
	1. yes	25	71.4		30	85.7		55	79	
	Total	35	100		35	100		70	100	

Farmers selection and their characteristics **(** Cont'd…)

Responses on selection process	Gera FFS			Dale FFS			Pooled		
	f	%	χ^2	f	%	χ^2	f	%	χ^2
5. Were the participant farmers socially acceptable?									
0. no	4	11.4	24.029***	1	2.9	31.114***	5	7	51.429***
1. yes	31	88.6		34	97.1		65	93	
6. were the respondents exercise to identify their problems by group learning?									
0. no	0	0		0	0				
1. yes	35	100		35	100				
7. Approach and organization capacity of the facilitators person to the FFS participants ?									
1. very much friendly	35	100		35	100				
2. serious and un-approachable	0	0		0	0				
8. Do you feel that FFS is the best method and approach for disseminating knowledge on improved coffee management practices in your locality?									
0. no	0	0		0	0				
1. yes	35	100		35	100				
9. Are you satisfied with the process and implementation of FFS approach?									
0. no	0	0		0	0				
1. yes	35	100		35	100				

, * significant at 5% and 1% probability level

source: own survey data(2008/9)

4.1.3. Coffee FFS implementation process on CWD management

Farmer field schools have been used as an important participatory training and information dissemination tool for coffee wilt disease management. The FFS implementation concentrated on areas with high incidence of CWD such as Jimma, Sidama and Gedeo zones. The FFS was also used as dissemination path-ways for the results of the field trials. Initially three pilot FFSs were established in 2004 with a further 21 FFS groups being formed in 2005 and 2006 in Southern and South-western Ethiopia.

4.1.3.1. Training of facilitators and curriculum development

As it was clearly discussed with researchers and agricultural development experts, a three day intensive training workshop was held for extension workers, some selected farmers, researchers, representatives of districts to introduce concepts and practices of FFS approach, management aspects of CWD, improved coffee management practices, adult education, group processes, communication and facilitation techniques. At the end of facilitators' training workshop, participants moved out to the field and developed a tentative curriculum for the FFS activities together with farmers, which basically follows the crop cycle or calendar. Although it primarily focused on IPM in relation to CWD, the curriculum tried to address a broad range of coffee management practices. The curriculum was flexible and regularly up-dated by FFS members to fit to local situations. The training and curriculum development sessions were facilitated by staff from CABI-Africa in collaboration with JARC staff.

4.1.3.2. Community mobilization and selection of study field

From focus group discussions and reports, it was indicated that coffee operational calendar and local practices were identified by the trained extension workers and local community. The study field (0.5 ha coffee farm), was provided by a group member voluntarily. The criteria used in field selection was accessibility to most members, proximity to the field trials (to disseminate the results), tree age and uniformity, and the presence of the disease in the area. The study field was divided into two plots which received two types of treatments such as,

improved management and traditional practices. The improved crop and pest management practices or treatments were determined jointly by researchers and extensionists while the local practices were identified by farmers in collaboration with the extension workers and researchers. Because of the clear differences in the effects of the improved practices on the incidence of CWD as well as on the performance of the coffees, farmers were convinced to try the improved practices/technologies on their own farms. The most important improved coffee management practices applied/adopted during FFS implementation were:

- pruning, stumping and sucker control,
- shade management,
- proper intercropping practices,
- proper weeding and hoeing,
- use of mulch,
- planting leguminous crops, such as desmodium,
- compost preparation and application,
- proper harvesting (selective picking of fully matured beans),
- soil and moisture conservation techniques,
- proper use of chemicals such as fungicides and herbicides.

Moreover, based on the knowledge and experiences of local farmers, extension workers and researchers, seven management options (treatments) were identified to control CWD. The treatments and their application in both study areas were as follows;

- Use of ash: Applying 2 liters per tree once per annum.
- Mulch : Applying once per annum at the end of the rainy season preferably in October.

- Fungicide (copper sulphate + lime spray) : Applying once per month during the rainy season and once every three month during the dry season.
- Fungicide (copper) stem paint: Painting the stem of a coffee tree up to 50 cm above the ground level every month.
- Herbicide (Round- Up): Adding 150 ml of Round- Up in 15 liters of water and spraying as needed based on weed condition.
- Slashing plus hand- weeding : Weeding with hand around the coffee tree and slashing the other parts as needed based on weed condition.
- Slashing (control): Slashing the whole plot as needed.

After three years of running the trials, the participants tended to choose mulch, slashing + hand- weeding and ash in the Southern part of the country. Similarly, mulch was ranked first, followed by ash and slashing + hand-weeding in the South Western part in Jimma area. Currently, all the coffee growing farmers are used the recommended technologies in order to combat CWD in their locality. This is one of the prominent result of coffee FFS during implementation process.

4.1.3.3. Holding regular meeting and facilitation

During interviews with extension experts in both study areas, they replied that FFS is a season long activity with a fortnightly regular meeting. In view of the perennial nature of the coffee crop and its slow response to treatments, the coffee wilt disease FFS were established to run for three years. The groups formed in 2004 held a regular meeting monthly, while the majority of the groups formed later decided to meet fortnightly. More frequent meeting was desired to catch up with the old groups. The FFS groups were facilitated by trained local extension workers and technical research staffs.

Although FFS are not permanent associations, experience of other countries show that based on the interest of the group member and the cohesion among them, they can be transformed

into a more permanent nature serving various purposes. It was interesting to note that one of the FFS groups formed at Gera district added some other dimension to their function and performed impressing activity. The group submitted application to the local cooperative development office, with the assistance of the facilitator and got registered as a cooperative. Then they obtained a loan and collected members' coffee and directly sold in the central market in Addis Ababa. During the following year, the group has started purchasing other farm produces in addition to coffee. However, further management training and support in business skill is still required by the responsible organization in order to perform better. This finding is in agreement with Leewis and Bruin (1998), who reported that FFS offers opportunities for developing effective farmer organizations which are key in developing local opportunities like exploring for markets and value adding of their farm produce and again this is an attribute that is difficult to quantify in financial terms. Above all, the FFS process produced motivated and committed farmers who have already started making remarkable efforts to inform, teach and change other farmers. This finding is also in agreement with the theory of Stringer (1999), as group members struggle to realize a collective vision/version of their world and they will discover perspectives that reveal new possibilities for resolving their problems. Focus group discussion (1) was conducted with those successful FFS members in Gera district, Genji-chela PA, confirms the above fact and presented as follows:

Photo 2: Focus group discussion with FFS members of Genji-chela PA, Gera woreda, *Jimma zone.*

" FFS from coffee management practice to scaling-up for better market".

Focus group discussion 1.

Questions and answers of coffee management practices and market issues were discussed with FFS members in Genji-cala PA, Gera woreda.

Researcher: What was the difference between the conventional extension and FFS approach?

Group:"The difference is like between the Sky and the Earth", because FFS approach gives a chance for the participants to discuss each other and learn from others. Moreover, it is because of FFS that we were gained better knowledge in preventing and managing coffee wilt disease unlike that of conventional extension approach.

Researcher: After the phase out of FFS project, will the group continue or disintegrate?

Group: FFS has opened the door to organize in group and to cooperate each other, not only in coffee management practices but also in marketing activities too. Currently, we are about 30 in number and we have a clear guideline of rules and regulations as far as coffee marketing is concerned. We are now having a capital of more than Birr 100,000 in a bank. We are involved in collecting and preparing good quality coffee from our coffee union members and non-members. Nowadays, we have got legal certification from the responsible organization, so that we are delivering our product directly to Oromia Coffee Union. In the near future, we are intending to increase the number of participant farmers into our union, especially those who are engaged in coffee production in the locality.

Researcher: What are your major problems as far as market information on coffee is concerned?

Group: Previously, market information on coffee was announced by radio early in the morning before we leave to job, but now a days, even the stimulant song of 'coffee' in the radio is neglected, and the scheduled time of daily price announcement has been changed from 7:00 Am to after 9:00AM in the morning. This is not a convenient time for us and all the coffee farmers 'as a whole to listen the daily price information of coffee. Moreover, the woreda cooperative office and other responsible actors could not give serious attention in supporting us in different aspects.

4.1.3.4. Follow up and technical backstopping

Regular follow-up and technical backstopping were provided to the groups and their facilitators by CABI Africa and JARC staff in both study areas. Special topics (identified by the groups and their facilitators) were also addressed by researchers of JARC. Researchers provided detail information on the identified areas and sometimes introduced various improved coffee production technologies. This particularly helped to enhance farmers' knowledge and boost adoption of improved coffee technologies.

4.1.3.5. Holding consultative workshops, refresher courses and field days

Knowledge and technical skills of facilitators were further developed in the course of actual implementation of the FFS activities. Workshops were held for FFS facilitators, some farmers and representatives from districts to enable them share experience and address challenges. Moreover, refresher courses were held for facilitators and FFS hosting farmers. In addition, with the aim of promoting the group activities, dissemination of accepted coffee management practices, field days were organized on FFS sites and different stakeholders took part in the events in both districts.

4.1.3.6. Benefits and limitations of overall implementation of coffee FFS

Overall assessment of the implementation process indicates that the participatory, practical and flexible nature of the FFS approach was appreciated by participating farmers and created motivation and enthusiasm. The group learning exercises enhanced farmers' awareness and knowledge about coffee wilt disease and related management practices. It was observed during group meetings that participants became experts in CWD diagnosis, and are able to identify CWD infection from other diseases. Moreover, group work helped farmers to cooperate in up-rooting and burning infected coffee trees. Members of the group have fully realized how improved management practices perform better in terms of disease management, tree vigor and yield, and thus started practicing on their own farms. The process thus enhanced adoption of various improved coffee production practices.

The experience sharing process also created interest among neighboring farmers to obtain new information and technologies. Involvement in the FFS activities provided an opportunity for extension workers to develop their technical knowledge and facilitation skills. Moreover, the process created better interactions and improved linkage among farmers, extension workers and researchers. As it was explained during group discussion by extension experts and facilitators, some of FFS participant farmers have share their knowledge of CWD management in religious places and conferences to other coffee farmers' in the locality.

Most of the participating farmers during group discussions assured that the new modality of FFS approach helps to get frequent advise and knowledge both from the research experts and agricultural extension experts unlike that of the conventional extension approach. This is in agreement with Godtland (2004) who indicated that the communication components were an integral part of the key operational strategies of the present FFS program, field activities, interactive learning, horizontal knowledge sharing and information dissemination and feedback mechanisms between farmers and extension staff improved. Moreover, the system of implementation is conducted with the full agreement of the participating farmers in the nearby farms. The participant farmers themselves were deciding the convenient training day and time. The system of group learning and discussions helps the farmer to follow up their coffee farm frequently and that practice also leads to competition among participating farmers.

In general, the farmer's selection process, their profile and implementation of FFS was mainly conducted jointly by researchers, agricultural experts and development agents without considering other relevant actors in the process. Moreover; the establishment of social networks starting from the grass root up to the higher level for FFS sustainability and continuity was not given due attention by the responsible offices and funding organizations. Even though it was a pilot testing, which is pioneer to coffee FFS in the country and donor driven, there is a chance too that the FFS may develop an elite' bias, favoring those who are literate and numerate, and leaving out the often majority of illiterate and poor coffee farmers.

4.2. Effectiveness of coffee Farmer Field School in knowledge, attitude and practice

To assess the effectiveness of FFS in improving their knowledge, attitude and practice of coffee management 70 FFS and 70 NFFS members were used in the study. From each study district 35 FFS and 35 NFFS members were interviewed for further investigation. In this study, assessment in knowledge, attitude and practice in promoting coffee management practices was performed using frequency and percentage of respondents. The frequency and percentage of respondents ranged from low, medium to high categories. The differences between frequencies of respondents in the low, medium and high ranges were compared by using chi-square. This was to check the significance level of frequency of respondents that were grouped in different categories (low, medium and high) with in FFS and NFFS sample members separately (see appendix 2). Moreover, the significance difference between knowledge, attitude and practice of FFS and NFFS respondents were analyzed using ' t 'test. In general the summaries of output of the analysis are presented in detail below in this section.

4.2.1. Knowledge

A ' Teacher- made test' was conducted and administered to look at the knowledge of FFS and NFFS participants, as clearly discussed in the methodology part. The answer of the respondents were evaluated and grouped into three levels such as low (0-5), medium (6-11) and high (12-16) based on the score ranges. The means of the knowledge of FFS and NFFS respondent farmers were compared using paired t-test and are presented below in Table 5.

Table 5 : Knowledge test of FFS and NFFS members under the study areas.

Sre.No.	District	FFS Members		NFFS Members		t- value
		N	Mean	N	Mean	
1	Gera	35	11.71	35	6.57	8.398***
2	Dale	35	12.91	35	7.09	11.119***

*** Significant at 1% probability level
Source: own survey data(2008/9)

The data reported in Table 5, clearly indicated that there was highly significant difference between mean score of knowledge of FFS and NFFS members with respect to promote coffee management practices in the selected districts. Based on knowledge difference, the FFS members gained more knowledge as compared to NFFS members. About 32.9% and 67.1% of the FFS respondents had acquired medium to high level of knowledge respectively, while 57.1% and 8.6% of the NFFS farmers had acquired medium to high level of knowledge of the same practices, especially with reference to the knowledge of coffee wilt disease. It was interesting to note that none of the FFS respondents in the sample was reported with low level of knowledge about improved coffee management practices (see appendix 2). The findings of the study are in line with the findings of Solanki (2001) who reported that knowledge of Dairy cooperative members in breeding, feeding, health care and management practices of dairy animals was higher than the non- members.

These findings were also similar with the findings of Bunyatta *et al,* (2005) who found that about 50% of FFS farmers had acquired high to very high knowledge of the technologies disseminated while more than 80% of the NFFS farmers had acquired moderate to very low level of the technologies. There appeared to be some crucial differences in the level of knowledge acquisition among the technologies.

This finding was also in agreement with the findings of Tsion (2008) that training kept the trained farmers more informed and updated on extension packages disseminated by Agricultural Research Centers. However, NFFS members also know something about coffee management practices due to different extension activities conducted in the locality, informal discussion with FFS members and from their life experience. But from the result obtained, it could be seen that coffee FFS kept the farmers more knowledgeable in promoting coffee management practices, especially with reference to coffee wilt disease. This result was also supported the findings of Rola and Jamias (2002) in Phillipines who reported that FFS graduates had generally higher knowledge scores than their non- counterparts.

The above findings was also confirmed by interviewing Ato Nejib Haji, one of the FFS member in Gera district, about the knowledge of FFS members on coffee management practices during data collection period and presented here.

Photo 3: FFS member Ato Nejib Haji, Sadi-loya PA, Gera woreda, Oromia region.

Selected case study 2 about the knowledge of FFS members on coffee management practices.

The effectiveness of FFS in promoting coffee management practice was best illustrated by one of FFS member who lives in Sadi-loya peasant association, Gera woreda, Oromia regional state.

Nejib Haji, a coffee farmer age 45, married and living with his family told about the effectiveness of FFS in the prevention coffee wilt disease and other related coffee management practices.

He said, " Four years back, I was selected as one of the FFS participant in the prevention of coffee wilt disease in the locality. That time was challenging for me in which wilt disease has affected all my coffee farm. I have actively participated in FFS sessions through group learning; because more than 200 coffee plants in my farm were affected by the disease. Through group learning with the help of the facilitator, I already gained knowledge about the life cycle of the disease, how to manage and prevent it. In this aspect, more than 200 infected coffee stands in my farm had been uprooted and burnt for the last three years. This change would never had happened, if I would not have participated in FFS. I have performed practically what I learned in the FFS."

Now a days, replanting activities of coffee seedlings is going on and the transmission of the disease becomes declining, because of doing proper sanitation in my farm. In general, this is the result of FFS; in which knowledge and better practice were gained from it. As you see," I lost my legs in the war front; but now because of working hard in my farm, I have more than five hectares of well managed coffee farm. Hence, in the near future from coffee income I am intending to buy a vehicle for my son".

4.2.2. Attitude

The attitude of 70 FFS and 70 NFFS respondent farmers was measured using Likert type scale with 10 statements. The scale allows measurement of degree of positive or negative attitude towards promoting coffee management practices under Gera and Dale districts, respectively. The disparities between low, medium and high category of FFS and NFFS farmers' attitude was compared by chi- square test (see appendix 3). In addition, the mean scores of FFS and NFFS members' attitude were analyzed using paired samples t- test. The results are presented below in Table 6.

Table 6: Attitude test of FFS and NFFS members under the study areas.

Sre.No.	District	FFS Members		NFFS Members		t- value
		N	Mean	N	Mean	
1	Gera	35	34.31	35	25.00	7.157***
2	Dale	35	33.31	35	31.03	2.176**

, * Significant at 5% and 1% probability level
Source: own survey data(2008/9) .

The mean scores of attitude of FFS members of Gera and Dale districts were significant at 1% and 5% level of improvement due to participatory learning in FFS on coffee management practices, especially with reference to the prevention of coffee wilt disease. This shows that FFS participants had more favorable attitude towards coffee management practices as compared to NFFS participants.

It is evident from Appendix 3, that FFS respondents 18.6% were from moderate attitude followed by 81.4% with more favorable attitude about coffee management practice. Whereas, 38.6% of the NFFS respondents were found to have moderate attitude followed by 55.7% with more favorable attitude and 5.7% respondents were found less favorable attitude about improved coffee management practice. This was in agreement with the findings of Tsion

(2008) who stated that trainings that had been conducted by research centers improve the attitude of trained farmers as compared to that of untrained farmers.

The reflection of such a strong positive attitude by the FFS participants may be due to Participatory learning and knowledge generation in the FFS geared the farmers towards a more favorable attitude as compared to NFFS respondents. It is suggested that FFS respondents have acquired more knowledge through field school about improved coffee management practice so as to make their attitude highly favorable than NFFS respondents.

The attitude of FFS respondents was further elaborated by w/ro Marta Togiso, one of the women who hosted FFS in Awada PA, in selected case study 3 as follows.

Photo 4: FFS host farmer, Marta Togiso, Awada PA, Dale woreda, SNNP Region. Selected case study 3.

The Researcher asked some questions, who was one of the female host farmer of FFS in Awada PA, Dale woreda, Sidama Zone. Her age was 25,and she is having three children. Her education status was grade twelve complete.

Researcher: By whom you were selected to conduct FFS as a host Farmer?

Marta: "I was selected by the Extension agent of Awada PA. The learning activity of FFS on traditional and modern coffee management practices was also conducted on my coffee farm".

Researcher: How was the learning teaching process in FFS as compared to the conventional approach? Didn't you face any problem?

Marta: "It was good and we were protecting our coffee from wilt disease by learning in FFS. We were teaching each other in our local language (sidamigna). Hence, we didn't face a problem and it was effective".

Researcher: As it was known, uprooting and burning of infected coffee tree was prohibited culturally in the locality. How did you challenge and how the change in attitude of a group come up through FFS?

Marta: "Since we were learning in group in FFS, we were discussing the issues together so that the attitude of the participants were changing; and now we are effectively preventing coffee wilt disease by uprooting and burning infected coffee trees. Previously, women and children were using the infected coffee tree as a fuel wood and spread the disease during dragging the wood to their house. But now a days, through learning in FFS the attitude of females have changed and they don't use the infected coffee tree as fuel wood in their house. The FFS approach creates competition among participant farmers. This is one of the unique nature of FFS approach as compared to the conventional extension approach".

Researcher: What is your opinion about coffee FFS?

Marta: 'Through coffee FFS, we have gained knowledge and developed favorable attitude to adopt improved coffee management practices. Hence, we are also interested if the programme continues for the future".

4.2.3. Practice

The practice was evaluated as the application of the knowledge resulted after the FFS graduation as stated by the respondents. The practice of FFS and NFFS members was measured based on their responses on performing and promoting coffee management practices of Gera and Dale districts. The differences between the low, medium and high category of FFS and NFFS members practice was compared using chi-square (see appendix 4) and the means of practice was analyzed using paired samples t- test. The results of the test are displayed below in Table 7.

Table 7: Practice test of FFS and NFFS members under the study areas.

Sre.No.	District	FFS Members		NFFS Members		t- value
		N	Mean	N	Mean	
1	Gera	35	10.63	35	7.03	9.930***
2	Dale	35	11.86	35	7.91	9.669***

*** Significant at 1% probability level
Source: own survey data (2008/9)

The practice wise comparison of knowledge among FFS and NFFS members showed that the mean scores of practices of FFS respondents were significantly higher than that of NFFS respondents. This may be due to the fact that FFS respondents might have attended the coffee FFS participatory 'learning by doing' programmes, thereby comparing the traditional and improved coffee management practices resulting higher knowledge about various practices of coffee as compared to NFFS members. This was in agreement with the findings of Mwagi and Onyango (2003) who stated that the adoption of technology on organic and inorganic fertilizer combinations by FFS farmers was significantly higher than those of non-FFS farmers. Majority of FFS respondents 85% had high level of knowledge (adopted) regarding improved coffee management practices with reference to coffee wilt disease. However, almost 81% and 15% of NFFS respondents found in medium and high knowledge category of the

same practice respectively. The participants had frequent contacts with facilitators, research and extension experts being the member of FFS resulting in to higher knowledge in promoting various coffee management practices in the locality.

4.2.4. Knowledge, attitude and practice test using pooled data

In general for further analysis of the effectiveness of FFS in promoting knowledge, attitude and practice in coffee management practices especially with reference to coffee wilt disease, the data were pooled and combined together. The combined data that consists of three dependent variables such as knowledge, attitude and practice of 70 FFS members were analyzed using frequency, percentage, chi- square as well as paired t- test. The results of the test are presented in (appendix 5) . The summary of paired test is shown below in Table 8 .

Table 8: Pooled data of Knowledge, attitude and practice of FFS and NFFS members (N=140)

Variables	Respondents		t- test				
		N	Mean	SD	SEM	df	t
Knowledge	FFS	70	12.31	2.089	0.25	69	13.638***
	NFFS	70	6.83	2.771	0.331		
Attitude	FFS	70	33.81	5.721	0.684	69	6.026***
	NFFS	70	28.01	6.531	0.781		
Practice	FFS	70	11.24	1.646	0.197	69	13.261***
	NFFS	70	7.51	2.027	0.242		

***Significant at 1% probability level

Source: own survey data (2008/9)

The test above clearly indicated that the mean score of knowledge of FFS members on coffee management practice was significantly higher with probability level of 1% than the mean score of NFFS members. The result of the test confirmed that the FFS approach of coffee was effective in terms of improving knowledge of farmers as compared to the conventional extension approach. In the same way the comparison between attitude of FFS members and NFFS members using paired difference test showed that the attitude of FFS members was significantly improved by the participatory learning of FFS approach as compared to NFFS members. Similarly, the mean score of practice of FFS members on coffee management was found to be significantly improved when compared to NFFS members of the same management practice.

In general, this finding is in line with Loevinsohn (2000) who reported that eighty percent (80%) of what was learned on coffee management in the FFS was adopted showing farmers satisfaction with the technical options learned during the FFS sessions than their counterparts.

In Gera district, NGOs like JICA scale-up experiences of the previous coffee FFS in the locality. They have exercised the FFS approach to extend their outreach programmes, having found this to be consistent with the principles of community empowerment and locally-driven development that they promote. This idea is in agreement with Tripp *et al*, (2005) who reported that FFS expands into new areas and makes new claims. In this aspect, the FFSs were involved in different likelihood approaches such as in horticulture and forestry development activities in the locality. The programme has been implemented by 73 DAs' as facilitators of FFS in their PAs. The FFSs were established by the project in 2007/2008. In all the established FFSs the gender dimension has been taken into consideration and equal number of men and women were participated by the project. A joint monthly meeting of all the facilitators was held by JICA at district level to discuss the strengths and weaknesses of FFS activities and measures for improvement using a common group exercise (what was good, what was not good, things need improvement and how to improve) was conducted. The current status of FFS in the district was clearly indicated in Table 9.

Table 9: Currently established and implemented FFSs by JICA in the district.

Number of PAs	Number of FFSs	Number of farmers involved in FFS currently			Number of DAs involved as facilitators			Number of graduated farmers till 30/12/08		
		M	F	T	M	F	T	M	F	T
30	97	1502	1502	3004	70	3	73	645	255	900

Source: (WARDO, 2008/9).

The photo 5 following this page illustrates one of the FFS session learning and discussing in group about Agro-Ecological system Analysis (AESA) of different horticultural crops. An agro ecosystem can be defined as a geographically and functionally coherent domain of agricultural activity, including all living and non-living components and the interactions among them. It may be an entire region broadly defined by climate, vegetation and other ecological traits. With this basic principle, the participants prepare drawings of their field observations including information on the condition of the seedlings, pests and diseases; natural enemies of insect pests; weather, soil and water conditions in group learning were recorded by farmers each week on a poster using sketches and symbols. The group members were involving together to share knowledge, information and skills on agricultural production and livelihood issues in horticultural development activities.

This type of activity in FFS was contradictory with Khisa (2000**)** who underscored major non-formal education methods used in farmer field schools as sharing, case study, role play, problem solving exercises, panel discussions, small group and large group discussions, brainstorming and simulation games.

The methodologies used in the farmer field schools were weekly meetings, agro ecosystem analysis and experimentation. Each group has made a presentation to the whole participants

on their findings. After group presentations, participants have discussed the recommendations made by each group and agree on one or two actions to take. These can include learning about a topic to understand it better. Some of the experienced coffee FFS members are involved serving as facilitators of some groups; and sharing their acquired knowledge in coffee FFS as being a model to others. By carrying out AESA regularly in the FFS, farmers develop a mental check list of indicators to be observed when monitoring their farm practices. Here as example, a previous coffee FFS member was a farmer group- facilitator, Kassahun Tadesse, age 35 presents the Agro- Ecosystem Analysis (AESA) lesson in group learning.

Photo 5 : One of the JICA FFS session learning in group situation, Genji PA, Gera district, Jimma zone

This practical example confirms (Gallagher, 2003) that a key objective is to move towards farmer facilitators, because they are often better facilitators than outside extension staff. They know the community and its members, speak similar language, are recognized by members as colleagues and know the area well.

The Genji PA, FFS holds about 27 farmer members of whom 11 are females. This was the 3rd FFS established recently by JICA. The other two schools' participants have graduated earlier and established their own horticultural nursery in their homestead/field. In general, AESA is the process during which participants of the FFS observe and analyze the field situation, based on which they make proper management decisions.

Photo 6: FFS members practicing field layout for transplanting seedling of horticultural crops.

Here; the FFS participants have practiced layout activities for transplanting different horticultural seedlings which was grown by themselves before. As the participants replied, through process they will identify growth habit, disease and pest identification and yield difference with in different treatments of horticultural crops. The treatments were varying with using compost, fertilizer and check plot in different replications. All the activities in the field were done by all participants involved, the farmers and facilitators. During work in the field, experiences were exchanged and there was room for informal discussions. This created a bond among all participants involved. As it was discussed with FFS farmers, they felt that the field school improved their knowledge and made more constructive relationships with the extension agents and researchers. More of the extension agents also made positive reference to this new approach working with farmers. This confirms that FFS is responsive to changes in relationships between extension agents and farmers.

Division of labor is arranged and agreed by the group themselves. In this aspect, the ultimate aim of the learning process at the FFSs was an ongoing process that empowered farmers in horticultural activities in the end. This idea is in agreement with Gallagher (2003) who stated that it is also one of the main reasons that farmer facilitators can easily run FFSs - once they know how to facilitate an activity, the outcomes become obvious from the exercise itself.

4.3. Factors influencing effectiveness of coffee FFS in terms of knowledge, attitude and practice

In this section, correlation and regression analysis of independent variables, which are hypothesized to have influence on knowledge, attitude and practice of the coffee FFS respondents are presented. Moreover, the selected independent variables were analyzed using a Multiple Linear Regression (MLR) model to identify factors influencing knowledge, attitude and practice of coffee FFS members in the study areas. In general, 19 independent variables were tested on the FFS members' knowledge, attitude and practice. The independent variables were classified as personal, psychological, economical and communication factors.

4.3.1. Descriptive analysis of independent variables

In Table 10, the mean score, standard deviation and t-test of different independent variables which were expected to have influence on knowledge, attitude and practice of farmers were computed. The t- test for personal variables such as age, education, family labor and farmer's experience were significant at 5% and 1% level respectively in both study areas of FFS members. As far as economic variables were concerned, wealth status, farm size and intercropping were significant at 1% where as the variable access to credit was significant at 10% level. The probable reason for the difference may be due to high population density which results shortage of farm size in Dale as compared to Gera district. Moreover, psychological variables such as creativity and information sharing were significant at 1% level where as information seeking, level of aspiration and interpersonal trust were significant at 5% and 10% level, respectively. The disparity especially in creativity and information sharing variables may be due to the difference in infrastructure development and way of living conditions in both study areas. Likewise, social participation was significant at 1% level among communication variables.

Table 10: Profile of FFS members in terms of selected independent variables

Sre.	Independent variables	Gera (N=35)		Dale (N= 35)		t- value
		Mean	SD	Mean	SD	
	Personal variables					
1	Age of the respondent	37.05	8	45.31	15.76	-2.67**
2	Education	1.74	1.19	1.77	1.22	6.62***
3	Farmers experience	8.74	3.01	11.57	4.99	-3.21***
	Economic variables					
4	Wealth status	79596.9	60006.3	17445	16774.6	5.82***
5	Family labor	2.37	0.66	2.95	0.93	-2.88***
6	Access to farm tools	26.91	2.51	24.89	6.92	1.59^{NS}
7	Access to credit	0.83	0.38	0.2	0.41	1.87*
8	Farm size	1.78	1.92	0.44	0.35	4.08***
9	Intercropping	0.4	0.49	0.89	0.32	-4.69***
	Psychological variables					
10	Management motivation	12.49	1.9	12.49	1.9	1.0^{NS}
11	Information seeking behavior	30.2	4.04	27.40	7.21	2.59**
12	Creativity	1.17	1.38	2.69	1.71	-3.67***
13	Information sharing behavior	29.4	8.49	37.06	10.34	-3.39***
14	Achievement motivation	13.86	1.0	13.54	0.95	1.34^{NS}
15	Level of aspiration	5.8	0.47	5.46	1.04	1.83*
16	Interpersonal trust	5.60	0.78	5.80	1.08	-1.81*
	Communication variables					
17	Extension participation	4.63	1.06	4.94	0.24	-1.33^{NS}
18	Cosmo politeness	0.8	0.41	0.63	0.49	-1.0^{NS}
19	Social participation	12.86	2.45	9.06	1.57	7.62***

^{NS}, not significant, *, **, ***, significant at 10%, 5% and 1% probability level

source: own survey result(2008/9)

The profile of FFS members in terms of selected independent variables were clearly presented in pooled data of Table 11, as follows. In general, there were high standard deviation observed especially in variables of age of the respondent, farmers experience, wealth status, access to farm tools, information seeking, information sharing and social participation of the respondents' in both study areas as compared to other independent variables.

Table 11: Pooled data of profile of FFS members in terms of selected independent variables (N=70)

Sre.No.	Independent variables	Pooled data	
		Mean	SD
	Personal variables		
1	Age of the respondent	41.17	13.09
2	Education	1.76	1.19
3	Farmer's experience	10.16	4.33
	Economic variables		
4	Wealth status	48520.92	53783.36
5	Family labor	2.66	0.86
6	Access to farm tools	25.90	5.27
7	Access to credit	0.51	0.50
8	Farm size	1.11	1.53
9	Intercropping	0.64	0.48
	Psychological variables		
10	Management motivation	12.41	1.88
11	Information seeking behavior	28.34	6.60
12	Creativity	1.93	1.72
13	Information sharing behavior	33.23	10.15
14	Achievement motivation	13.70	0.98
15	Level of aspiration	5.63	0.82
16	Interpersonal trust	5.77	0.82
	Communication variables		
17	Extension participation	4.76	0.79
18	Cosmo politeness	0.71	0.46
19	Social participation	10.96	2.80

source: own survey result(2008/9)

4.3.2. Relationship between dependent and independent variables

The findings on relationship between knowledge, attitude and practice of FFS members (dependent variables) and independent variables (personal, psychological, economical and communication factors) were obtained through Pearson's product Correlation analysis for continuous and discrete variables, χ^2-test and Cramer's V for categorical and dummy variables are presented in table 12 and 13.

As indicated in Table 12, the out put of Pearson correlation analysis of pooled data indicated that, out of fifteen independent variables, four variables namely farmers experience in coffee management practice, creativity, information sharing and interpersonal trust were found to be positively and significantly related with knowledge of FFS members in promoting coffee management practice at 5% level of significance. The probable reason for the relation could be when farmers experience, creativity, information sharing and interpersonal trust increases their knowledge in FFS also increase through group learning and hands on exercise in promoting coffee management practices. Regarding the relationship of attitude and independent variables of pooled data, there were no significant relationships; even though some appeared positively and significantly in both separate data of the study areas (see appendix 6). As indicated in Table 12, farmers experience, creativity and information sharing were positively and significantly related with practice and knowledge of FFS members towards promoting coffee management practices at 1% and 5% level of significance.

The positive and strong relationship of knowledge and practice towards FFS and farmers experience revealed that, the more the knowledge and experience of the farmer the better that the respondent can acquire coffee management practices through FFS. The positive and significant relationship of knowledge and practice of FFS members with creativity of the respondents revealed that when the respondents exposure increase through participatory learning in FFS, their creativity towards coffee wilt disease management also increases, which is in agreement with the creativity of IPM- FFS farmers are treating the seeds in cow urine 3-4 days prior to the date of sowing in Organization for Rehabilitation and Development in Amhara (ORDA) supported by SCF-UK(2006).

Similarly, there was significant and positive relationship for knowledge and practice of FFS members with the independent variable of information sharing. This implies that, FFS favors knowledge and practice through group learning condition by comparing the improved and traditional coffee management practices in the learning plot. Hence, information sharing is one of the main component in FFS among members.

Table 12 : Pooled data analysis on relationship between dependent variables and continuous or discrete independent variables (N=70)

Sre No	Continuous independent variables	Knowledge		Attitude		Practice	
		r	P	r	P	r	P
1	Age	0.122	0.312	0.047	0.698	0.071	0.557
2	Farmer's experience	0.3**	0.012	0.073	0.548	0.381***	0.001
3	Management motivation	0.117	0.333	-0.36	0.769	0.009	0.94
4	Information seeking	0.029	0.813	0.146	0.229	-0.049	0.686
5	Creativity	0.272**	0.023	0.012	0.922	0.512***	0
6	Information sharing	0.247**	0.039	-0.087	0.476	0.353***	0.003
7	Achievement motivation	0.04	0.745	0.183	0.129	0.126	0.298
8	Level of aspiration	-0.142	0.239	0.106	0.384	0.132	0.275
9	Interpersonal trust	0.271**	0.023	0.102	0.4	0.085	0.486
10	Wealth status	-0.133	0.271	0.057	0.639	-0.123	0.31
11	Family labor	0.125	0.301	0.05	0.68	0.172	0.155
12	Access to farm tools	-0.075	0.538	-0.021	0.861	0.118	0.33
13	Farm size	-0.09	0.456	0.156	0.198	-0.047	0.701
14	Extension participation	0.153	0.207	0.035	0.775	0.057	0.638
15	Social participation	-0.015	0.902	0.059	0.626	-0.161	0.182

,*, correlation is significant at 5% and 1% probability level.

Source: own survey data (2008/9)

The FFS members shared information on an informal note continually with their colleagues outside school and they also shared information with non-member farmers who sought advice and they began incorporating some aspects of the new farming system in their fields. During data collection period, participants acknowledged that sharing information by all farmers helped to enhance the farmers' knowledge base. This led to the improvement of their coffee management system as many ideas were put together.

Likewise, for the four categorized and dummy independent variables such as education level, access to credit, cosmopoliteness and intercropping relationship were tested using χ^2-test and Cramer's V. The data in Table 13 indicated that the variable education was positively and significantly related with practice at 10% probability level, while the variables intercropping and access to credit were positively and significantly related with knowledge and practice of FFS members at 10% and 1% probability level respectively. Education was positively and significantly correlated with practice of the FFS participants regarding coffee management technologies. This reveals that as the level of education increased their practice of coffee management through FFS also increased.

Moreover, the relationship of intercropping and access to credit with the dependent variables of knowledge and practice reveals that diseases and pests may not spread as rapidly in mixtures of coffee fields because of differential susceptibility to the pests and pathogens and because of enhanced abundance of efficiency of natural enemies. Intercrops provide insurance against crop failure in times of risk so that this will be addressed through learning in FFS. The probable reason for the relationship of access to credit with the dependent variables implies as access to credit increased, the participant farmers motivate to buy different farm tools to mange their coffee farm there by the effectiveness of FFS participants in knowledge and practice of coffee management also increased.

Table 13: Relationship between dependent and categorized or dummy independent variables (N=70)

Independent variables	Pooled data											
	Knowledge				Attitude				Practice			
				Cramer's				Cramer's				Cramer's
	χ^2	df	P	V	χ^2	df	P	V	χ^2	df	P	V
Education	23.938	24	0.22	0.371	50.445	51	0.495	0.49	27.19*	18	0.075	0.36
Access to credit	13.706*	8	0.091	0.442	16.866	17	0.463	0.491	10.84*	6	0.093	0.394
Cosmopoliteness	5.005	8	0.757	0.267	21.881	17	0.189	0.559	2.162	6	0.904	0.176
Intercropping	13.471*	8	0.097	0.439	17.936	17	0.393	0.506	19.36***	6	0.004	0.526

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

Source: own survey result

4.4. Influence of independent variables on knowledge, attitude and practice among FFS members

4.4.1 Multiple Linear Regression Analysis

The selected independent variables were put to Multiple Linear Regression (MLR) model to identify the factors influencing knowledge, attitude and practice among FFS members. In general, a set of 19 independent variables (15 continuous 1 categorized and 3 dummy) were included in the study to test in MLR analysis. To determine the best subset of independent variables that are good predictors of the dependent variables, the MLR were estimated.

Moreover, the Variance Inflation Factor (VIF) and Condition Index (CI) were used to test the degree of multicollinearity among the continuous and discrete variables. The details of multicollinearity test is attached (see appendix 7 and 8). Likewise, Contingency Coefficient test was computed for dummy and categorized independent variables. To this end, based on the VIF and CI the data had no serious problem of multicolinearity. According to Contingency Coefficient (CC) results, there is a problem of multicolinearity between the independent variables of intercropping and cosmopoliteness. As a result, the most important variable intercropping was selected and entered to the model, because this variable was positively and significantly associated both in knowledge and practice (see appendix 9). Hence, education, intercropping and access to credit those three independent variables were directly taken and entered into MLR analysis. These variables were associated positively with the dependent variables of knowledge and practice previously in pooled data of Cramer's V test.

4.4.2. Influence of the independent variables on the knowledge of FFS members

The results of regression function for the influence of independent variables on knowledge of FFS members in promoting coffee management practice result from this analysis are presented in Table 14. Out of six variables considered in the model, only two variables namely; farmer's

experience and interpersonal trust were found to be significantly contributing to the knowledge of FFS members in promoting coffee management practices (see appendix, 10).

Table 14: Coefficients of regression function for influence of independent variables on knowledge of coffee management practice among FFS members.

No.	Independent variables	Coefficient (N= 70)		
		B	t	Sig.
	Constant	6.580	3.004	0.004
1	Farmer's experience	0.247	1.807	0.076*
2	Creativity	0.004	0.029	0.977
3	Information sharing	0.086	0.703	0.485
4	Interpersonal trust	0.253	2.098	0.040**
5	Intercropping	0.152	1.210	0.231
6	Access to credit	-0.101	-0.821	0.415

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

Source: own survey result (2008/9)

Farmer's experience: The relation between knowledge and farmer's experience was found to be positive and significant at 10% probability level. The out put of regression analysis is in agreement with the hypothesis made in the previous section. One unit increment in the farmer's experience would bring about 0.247 units increment in promoting coffee management practices in coffee FFS. The result revealed that, the farmer's experience and strong interest in coffee management practice is essential in order to improve his knowledge through FFS. Thus, the farmer's experience is one of the driving force to the improvement of knowledge through FFS in promoting coffee management practices to control coffee wilt disease.

Interpersonal trust: As it can be seen from the analysis that interpersonal trust of the respondent increases by one unit, the level of knowledge of FFS members in promoting coffee management practices increases by 0.253 units. Therefore, the results of this study conform to the theoretical expectations concerning the effects of interpersonal trust in increasing the expected knowledge of FFS members. This means that other things being constant, interpersonal trust will lead to a greater readiness to take part in promoting coffee management practices. This

is because an individual's level of trust in the FFS allows him or her to form expectations about the actions of others.

People who are more trusting others in their daily life may experience getting more knowledge than others, because trust gives one the incentive to actually take part in improving knowledge. This study is in agreement with the findings of Derebe (2007) who reported that interpersonal trust has significant and positive influence on adoption of dairy packages and its practices. As far as attitude test is concerned, none of the independent variables used for correlation test was found to be significant in the pooled data.

4.4.3. Influence of the independent variables on the practice of FFS members

The relationship of the independent variables with the practice of FFS members was analyzed and the results are presented below in Table 15. The relationship of independent variables such as farmer's experience, creativity, information sharing, education, intercropping and access to credit with the practice of FFS members in promoting coffee management practice was analyzed using MLR.

Table 15: Coefficients of regression function for the influence of independent variables on practice of coffee management among FFS members.

No.	Independent variables	Coefficient (N= 70)		
		B	t	Sig.
	Constant	8.813	12.642	0.000
1	Farmer's experience	0.173	1.470	0.147
2	Creativity	0.256	2.077	0.042**
3	Information sharing	0.082	0.736	0.465
4	Education	0.177	1.604	0.114
5	Intercropping	0.236	2.101	0.040**
6	Access to credit	-0.055	-0.525	0.602

**, significant at 5% probability level
Source: own survey result (2008/9)

As it can be indicated in Table 15, only two independent variables such as creativity and intercropping of FFS members were found to be significant at 5% level of significance, respectively. The coefficient of determination ($R^2 = 0.406$) was also found to be low implying that only 40.6% of the practice variation was attributed or explained by one or more of the independent variables used in the multiple regression test (see appendix 11). In general there was an indication of the influence of independent variables on the practice of FFS sample respondents as subjected in multiple linear regression test.

Creativity: Creativity was one of the only two independent variables that positively and significantly affected practice of FFS respondents in coffee management practice at 5% level of significance. The result confirmed that when creativity of the respondents increased by one unit the practice of respondents increase by 0.256. As it was discussed earlier in the previous section, creativity is the capacity of the farmer using his indigenous knowledge in combination with modern or improved practices through FFS in promoting coffee management activities.

Creativity can improve the level of understanding and experimentation of farmers in their coffee plots to improve productivity and preventing coffee wilt disease. Farmer Field Schools (FFS) could thus, lead to the enhancement of farmers creativity and empowerment. Moreover, the diversity of coffee management activities implies a widespread creativity of farmers in FFS. By being active participants, farmers gained facilitation skills that enabled them to teach other non-group members. FFS participants also gained creativity, for example they were sterilize their bow sow (coffee stumping tool) with fire in order to prevent the dissemination of CWD during coffee stumping and pruning practices. They also used composting of cheap and available organic materials to produce organic fertilizer to overcome the high costs of chemical fertilizers. The coffee management exercises help to strengthen teamwork spirit and problem solving skills, promote creativity and awareness on the importance and role of collective action and the need for mutual support. In general creativity requires insight, and this may be achieved through FFS that leads the participant farmer's to an innovative solution in promoting coffee management practices.

The result of the study is in agreement with that creative people show different patterns of attention from those found in uncreative people, and it has been theorized that the secret of creativity is individual differences in attention (Mendelsohn,1976).

Intercropping: As it was known, intercropping in coffee provides insurance against crop failure in time of drought or disease and pest damage. The intercrops also enhance opportunities for marketing by ensuring a variety of produce for sale. Moreover, disease and pests may not spread rapidly in mixtures because of differential susceptibility to the pests and pathogens and because of enhanced abundance and efficiency of natural enemies. In this study being intercropped their coffee farm with other crops the farmers' knowledge of practice in coffee management increases by 0.236. The result showed that knowledge of intercropping practice of farmers' plays a vital role in the effectiveness of FFS in promoting coffee management practices.

Constraints

As far as constraints/ challenges of FFS implementation process was concerned, since coffee is a perennial crop, the duration of training given for facilitators was very short (3-4 days) as compared to other countries experience even for annual crops i.e., one year. There should be a season long training given to the facilitators in order to equipped all management practices of coffee and facilitation skill of FFS. Moreover, as it was observed during data collection period, that there was lack of graduation of participants in few FFSs due to limitations of budget and donor driven approach. This issue confirmed that sometimes donor preferences prevailed over the participants' needs. This finding is similar with Davis (2006), FFS should be implemented because they suit local conditions and needs, not because they are donor driven. In addition, there was no replication of FFSs observed so far, because of lack of sustainability and strong social structure that promote the approach. Moreover, there was lack of documentation of the results in the farmers level; but documentation is an important tool for spreading local knowledge and local process of innovation; even though, coffee FFS was a new concept in this country and the experiences presented here will encourage others to further develop these ideas. As it was discussed with research and agricultural development experts, about the

implementation and sustainability of coffee FFS, most of them comment the frequent transfer/ instability of the extensionists and trained facilitators from their PAs retarded the FFS activity in the locality. Moreover, in the office level most of the protection experts were assigned in other disciplines rather than assigned to their field. Even though a lot has been done, the involvement of other stakeholders or actors in the implementation process of coffee FFS in production, processing and marketing activities were not given due attention by the executive offices or organizations. In addition, since the project was donor driven the impact of coffee FFS was not evaluated and its strength and weakness is not studied so far. Most of the key- informants were assured that lack of effective CWD control methods such as resistant varieties, chemicals and laboriousness and ineffectiveness of the recommended uprooting practices were among the challenges encountered in the process. Data collected during the focus group discussion and survey questionnaire based on the major problems of coffee FFS was summarized in Table 16, as follows.

Table 16: Major problems of coffee FFS raised in Focus Group Discussions (FGD)

Major problems	Rank order
Lack of viable institutional framework that will provide and ensure continuity of FFS groups beyond the lifespan of the project	1st
Frequent mobilization of FFS facilitators to other disciplines rather than assigned to facilitate in FFS	2nd
Lack of involvement of other relevant actors in the process	3rd
Lack of FFS experience in the country	4th
Lack of incorporating other activities besides coffee FFS	5th
Lack of budget for continuous training and facilitation skill of extension workers in order to change their mind-set and skills from the conventional approach to a real FFS facilitator	6th

5. SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1. Summary

Farmer Field Schools, like any other approaches, are tools and their effectiveness depends on both the context and the way in which they are implemented. They are, however, a very special tool. They cultivate a critical, holistic and creative way of thinking. The FFS approach can help farmers to get full insight of their production system and help themselves in controlling plant diseases like coffee wilt and depend less on external technical assistance in the long run. FFS assume that farmers already have a wealth of experience and knowledge unlike that of the conventional extension approach. Once the participant farmers discover the reality they integrate the new knowledge into their system and their agricultural practices accordingly. Therefore, both awareness and technical knowledge on how to manage and control CWD and other related coffee management activities were needed for farmers and other stakeholders in the coffee sector.

In accordance with this perspective coffee FFSs were established and conducted between 2003 and 2007 in the major coffee growing areas of the country to combat CWD and raising awareness and knowledge of farmers through participating in the field school. At the end, the participant farmers were acquired knowledge and prevent the disease by indicating that they can benefit from this approach. In view of this, the question that may arise is that how is the effectiveness of FFS approach in promoting coffee management activities particularly with reference to coffee wilt disease in the major coffee growing parts of the country. Therefore, the main objectives of this study were, to examine the farmers' selection process, their profile and implementation process, and also to assess the knowledge, attitude and practice of FFS members and non-members regarding coffee management practices. Moreover, to identify important factors influencing knowledge, attitude and practice on coffee management practices among FFS members.

For the purpose of this study, 70 FFS members and 70 NFFS members from Gera and Dale districts were interviewed. The equal number of 35 FFS members and 35 NFFS members were selected randomly in both study areas employing Proportionate Probability Sampling method (PPS). Both quantitative and qualitative data were collected from the participant and non-participant farmers. Primary and secondary data were also collected and analyzed for the purpose of the study. To generate qualitative data, informal interview with key informants, discussions with FFS participant farmers and experts of research center and agricultural development offices were conducted. The survey result clearly indicated that most of the FFS members were selected by research and agricultural development experts. Majority of the participant farmers were educated and young between the age of 35 to 50 years old. They were actively involved in curriculum development with research and extension experts through implementation process of the project period. The FFS approach were appreciated by the participant farmers' in acquired new knowledge and practice besides forming close relationship among researchers, development agents and farmers.

The knowledge, attitude and practice level of the sample FFS members and non-members were tested in the study. The result of the survey indicated that the knowledge, attitude and practice of NFFS members were found to be lower as compared to FFS members had acquired. It was clearly indicated in the result that most of the NFFS respondents knowledge, attitude and practice level of coffee management practice were categorized in the medium range in both study areas. As far as influencing factors of knowledge, attitude and practice among FFS members were concerned, the study result showed that farmer's experience and interpersonal trust in coffee management practices were the most important independent variables which had significant influence on the knowledge of FFS members.

On the other hand, creativity and intercropping were the only two independent variables which had significant influence on the coffee practice of FFS members. In this study there is no as such significant independent variable observed in the pooled data, which had considerable effect on attitude of FFS members in promoting coffee management practices.

5. 2. Conclusion and recommendations

This study has shown how participation in FFS can increase understanding of farmers about coffee wilt disease and helped them to improve their controlling practices of the disease. The school also played a vital role in creating interest among farmers for further information and knowledge. However, extensive effort and support should be required to improve facilitation skills of extension workers. Continuous training, coaching and experience sharing are needed to help them change their mind-set and skills from the conventional approach to a real FFS facilitator.

Coffee FFS is more than a form of agricultural education and mobilization. It can be seen to represent the practice of new way of looking at equipping farmers' with knowledge about CWD management and helping them to make informed decision. Coffee FFS in this aspect, ensures organizational and institutional innovation to coffee farmers in Ethiopia. This is because group norms and regulations has been formulated by FFS members' themselves to conduct coffee marketing and other different activities in the localities. Hence, integration of FFS- methodology at the basis of formal organization such as local governments and creating social networks for interdisciplinary exchange of knowledge and experience for relevant actors working with coffee should be given priority for long term extension (information) and technology dissemination.

On sustainability of FFS, researchers, the extension workers' and district FFS network members should facilitate for the emergence of local-self financing initiatives for coffee small- holders that would help to sustain the FFS beyond NGO funding. Moreover, establishment of group credit and revolving fund for participant farmers would help to sustain FFS in the long run.

Institutionalizing and mainstreaming FFS into a regular extension system for the purpose of coffee production, processing and marketing. Besides, incorporate other crops and disciplines on which farmers are facing important problems in the locality should be given due attention by FFS executive government and non-government organizations such as; FFS in watershed management, agro-forestry development , water harvesting activities, health issues, etc..

Insufficient training of facilitators and frequent mobilization of experts from their duties to other disciplines may retard the real activities of FFS and discourage farmers to involve in FFS activities. Hence, season long training of FFS facilitators and stable working environment would help them to acquire problem solving skills and improve interaction among participant farmers.

Another approach to enhance sustainability of FFS based extension is to follow the principle of farmer-trainer. The farmer-trainer concept is to encourage FFS graduates to train other farmers and there by reduce dependence of FFS groups on external funding. Farmer-to-farmer field school training is viewed as a promising method to multiplying FFS coverage, with sustainability and effectiveness of the overall field school approach.

Experience has shown that educating farmers will enable the knowledge in the area than training extension workers who eventually leave to work in other areas or look for other jobs elsewhere. Hence, educating and long season training should be given attention to those creative farmers in the locality, so as to make trained facilitators in FFSs other than extension workers.

Private investors, exporters and NGOs who are involved in coffee cultivation, marketing and processing would benefit more from coffee as far as they support and make strong linkage to the existing FFSs. This is because facilitation of the coffee management activities including post harvest practice will be improved by educating farmers through FFS so as to achieve the desirable product of coffee production and quality.

The FFS model is suitable for group learning process and experimentation in the field. The new modality also provides confidence to develop interpersonal trust among participant farmers. Hence, developing or manipulating interpersonal trust among FFS members ensures favorable conditions for the creation of institutional and organizational innovation in the end.

Lastly commitment to participatory approaches, like FFS and initiation of supporting activities and policy dimensions are among the major ones that should be assessed through national extension strategy in up- scaling the FFS approach.

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7. APPENDICES

Appendix Table 1. Interview Questionnaire

Title: Effectiveness of Farmer Field Schools (FFS) in Promoting Coffee Management Practices; the case of Jimma and Sidama Zones, Ethiopia

1**. General Instructions to Enumerators**

- Make brief introduction to each farmer before starting any question, get introduced to the farmers (greet them in the local way) get his / her name; tell them yours, the institutions you are working for, and make clear purpose and objective of study.
- Pleas fill up the interview questionnaire according to the farmers reply (do not put your own reply/ feeling).
- Please ask each question so clearly and patiently until the farmer understands clearly (get your points).
- Please do not try to use technical terms while discussing with the farmers and do not forget the local unit.(use local language for better communication).
- During the process put the answer of each respondent both on the space provided and encircle the chosen answer.
- An observation of the respondent farming practice is essential to fill this interview questionnaire.

Objectives of the research

- to examine the farmers' selection process, their profile and FFS implementation,
- to assess the knowledge, attitude and practice of FFS members and non-members regarding coffee management practices with reference to coffee wilt disease; and
- to identify factors influencing knowledge and attitude on coffee management practices among FFS participants.

General information

Date of interview……

District----------

Peasant Association----------

Farmer's name----------

Name of enumerator……

Education……

Signature……

1. Respondent Characteristics

1. Age of the respondents----------years

2. Sex 1. Male---------- 2. Female----------
3. Marital status 1, single 2, married 3, divorced 4, widowed,
4. Religion: Muslim------- Orthodox-------- catholic--------Protestant------ Others------
5. Education level 0= illiterate

1=can read and write

2=primary school (grade 1+6)

3= secondary school (Grade7+12)

6. Did you participate in coffee FFS programme? Yes_____ N0_____

Household data:/ Family labor/

7. Total people in the household----------male----------female----------

7.1. 14-16 years, Male_____ Female_____

7.2. 17-50 Years, Male_____ Female _____

7.3. > 50 Years, male_____ Female _____

8. How many of the family members contribute farm labour?

8.1 Farm labour-part time.

Male---------- Female----------

8.2 Farm labour-full time.

Male---------- Female----------

2. Economic factors

2.1 Wealth status/house type and other property/

2.1.1 Grass roof house No_____ Estimated current value_____

2.1.2 Corrugated Iron sheet house No_____ " _____

2.1.3 Sheep "_____ " _____

2.1.4 Goat "_____ " _____

2.1.5 Cattle "_____ " _____

2.1.6 Poultry “_____ “ _____

2.1.7 Equines “ _____ “ _____

2.2 Farm size

2.2.1 Farm size or land holding allocated in 2001

Land allocation	Land size in fachassa/hectare
Coffee land	
Other crops land (maize, sorghum, tef, peas , beans etc…)	
Grazing land	
Homestead land and others	
Total	

2.3. Intercropping

2.3.1 Do you practice intercrop in your coffee farm?

A) Yes B) No

SI/No	Type of intercropping	Area size fechassa /hectare
1 2 3 4 5 6	Coffee+ spices Coffee+ fruits Coffee + pulses Coffee+ false banana(enset) Coffee+ vegetables Coffee+ cereals	

2. 4. Access to farm tools

Type of farm tool	Specific name	Availability				
		Very scarce (1)	Scarce (2)	Not as required (3)	Available (4)	Very much available (5)
Coffee sack Hand bow sow Pruning shear Slashing knife Finger hoe Watering can Shovel Flat hoe (Zapa) Mesh wire Chicken wire Hessian cloth						

Can you get the required farm tool on time?

1) Yes 2) No

2.5 Access to credit

2.5.1 Is there any credit service in your area? A) Yes B) No

2.5.2. During which time/ season of the year that coffee farmers need ?----------

2.5.3. Which are the sources of credit?

2.5.3.1 Bank

2.5.3.2 NGO

2.5.3.3 Friends/ relatives

2.5.3.4 Local organizations

2.5.3.5 Service cooperatives

2.5.3.6 Money lenders

2.3.3.7 Others specify

Farmers' selection process, their profile and implementation of FFS;

1- By whom you were selected in participating to coffee Farmer field Schools (FFS)?

A. By researchers (Technical staff).

B. By District Agricultural development office (Experts and DA's).

C. By PA leaders

D. By District Administrative Office

E. Specify if there is any other

2. On farmer field schools program what was the nature of the participating farmers in terms of;

2.1 Age: A- Older B-Younger C) Mixed

2.2. Sex group: A- More men B-Mixed

2.3. Education: A- Illiterate B- Educated and higher experience

2.4 .Coffee farming experience: A- Similar B- Mixed

2.5- Ethnicity A- Similar B- Mixed

3. Did the farmers' participate in the Farmer Field Schools (FFS) have common problems about coffee management practices with reference to coffee wilt disease?

A) Yes B) No

4.Were the respondent capable in terms of;

4.1 – Applying the knowledge what they have learned in FFS on their own farm

A) Yes B) No

4.2 – sharing their knowledge with other non- FFS members

A) Yes B) No

4.3- Were the participant farmers socially acceptable?

A) Yes B) No

4.4-Were the respondent exercise to identify their problems by group learning?

A) Yes B) No

5. Approach and organization capacity of the facilitator person to the FFS participants

A) Very much friendly B) serious & un- approachable

6. Do you feel that FFS is the best method and approach for disseminating knowledge on improved Coffee management practices in your locality? Why?

A)Yes B)No

7. Give your reasons

_____

8. Are you satisfied with the process and implementation of FFS approach, why?

A) Yes B) No

9. Give your suggestions

_____

10. What is different in the process and implementation of FFS than the current extension approach?

_____

11. What can we learn from FFS that could be used to improve the current methods;

_____

Knowledge Test for Coffee Management Practices

No	Knowledge test for coffee management practices	correct	wrong
1.1	Answer how coffee wilt disease is considered as one of the most important disease in our country that has significant economic impact on coffee farmers		
1.2	Name **two** prominent diseases of the coffee plant		
1.3	Name **two** methods of identification of coffee wilt disease		
1.4	Methods of control of coffee wilt disease		
1.5	Name **two** types of dissemination of coffee wilt disease		
1.6	Name **two** types of cover crops used as a mulch and suppress weeds to control coffee wilt disease		
1.7	Disadvantage of stumping activity in relation to coffee wilt disease		
1.8	Name **two** types of coffee pruning practices		
1.9	Best time of shade regulation in coffee plantation		
1.10	Name **two** types of coffee processing types		

Note: Correct answer- score 1 Wrong answer - score- 0

2. Attitude Test for Coffee management practices

No	Attitude towards the coffee management practices	Strongly Agree	Agree	Un decided	Disagree	Strongly disagree
1	In coffee management practices slashing and hand weeding are important activities to control coffee wilt disease					
2	In coffee management practices slashing and hand weeding are difficult activities to apply in the field					
3	Even though infected coffee uprooting and burning requires more labor and money I can do it since my livelihood depends on coffee					
4	Infected coffee uprooting and burning demands high labor and it is not advantageous and affordable.					
5	If I use coffee management practices timely I can increase my income from coffee and improve my livelihood					
6	Following the traditional way of coffee management practice is preferable for me as compared to improved practices					
7	I am motivated for coffee weeding, pruning, shade regulation and prevention of coffee wilt disease management practices since it makes easier for coffee picking and improving the plant vigor					

8	Since coffee wilt disease management practice is laborious and tiresome I prefer to use the traditional way of coffee management					
9	Even though working implements for coffee management costs higher money I can buy and use it since coffee is the major source of income for my livelihood					
10	Though coffee is the major source of income for my livelihood, I will not expend money for buying implements to manage my farm, unless it is given in credit form					

Note: Use 4 score for' strongly agree'3 score for 'Agree' 2 score for' undecided'1 score for 'disagree' and 0 score for 'strongly disagree'/ For negative statements the scoring patterns will be reversed/

3. Practices of coffee Management.

No	Practice learned from coffee FFS	Adopt (1)	Not adopt (0)
1	Proper handling to maintain the vigor of coffee in your farm		
2	Using cover crops in coffee farm		
3	Slashing and hand weeding		
4	Sterilizing the pruning shear, bow sow and other tools		
5	Using compost/ manure in a coffee farm		
6	Uprooting and burning the infected coffee plant		
7	Timely removal of infected coffee plant		
8	Intercropping practice in a coffee farm		
9	Using improved seed/ varieties		
10	Appropriate spacing during planting of coffee seedlings		
11	Picking red cherry		
12	Using raised bed for proper coffee drying		
13	Proper Storing		

14. What are the reasons that you adopt some coffee management practices?

_____

15. What are the reasons that you do not adopt some coffee management practices?

_____

Farmers' experience

No	Farmers experience on coffee management practices	Experience in years
1	Using Improved varieties	
2	Disease management	
3	Shade regulation	
4	Stumping	
5	Pest management	
6	Weeding three times in a year	
7	Hoeing	
8	mulching	
9	Pruning	
10	Picking red cherry	

2. Psychological factors

2.1. How is your desire to coffee management practice?**(Management motivation).**

2.1.1	Poor coffee management practice is one of the factors that decreases yield and quality of coffee	Agree (3)	Not sure (2)	Disagree (1)
2.1.2	How frequent you visit and manage your coffee farm	Mostly (3)	Sometimes (2)	Never (1)
2.1.3	How true it is your time and efforts are directed mostly to coffee management practices such as controlling coffee wilt disease, mulching, pruning, shade regulation etc..	True (3)	Not sure (2)	Not true (1)
2.1.4	In coffee management practice coffee wilt disease should be given priority, because once the plant is infected it will die after a time	Agree (3)	Not sure (2)	Disagree (1)
2.1.5	How true is your effort directed to the preparation of good quality coffee	Mostly (3)	Sometimes (2)	Never (1)

3.1 How much and how frequently do you seek information in the following activities **(information seeking behavior**)

No	Activities	How much new information you wish to get from ARDO and ARC when there is crisis? every season?			Frequency of seeking information		
		none	some	all	never	rarely	mostly
3.1.1	Coffee seed preparation						
3.1.2	Land clearing						
3.1.3	Seed bed preparation						
3.1.4	Seedling planting						
3.1.5	Compost manure utility						
3.1.6	Coffee mulching						
3.1.7	Prevention of diseases						
3.1.8	Coffee stumping						
2.1.9	Post harvest handling (picking, drying,storing)						
2.1.10	Coffee marketing						

Amount of new information wish to get; 0=none 1=some 2=all
Frequency of seeking information: 0=never 1 =rarely 2=mostly

4.1 Creativity: It is the ability to do things in different and better ways than others, and not just following others.

4.1.1. Do you exercise your own creativity in order to gain sustainable yield from your coffee farm year to year?
Yes=1 No=0
If yes, explain that creativity_____
4.1.2. Do you exercise your own creativity in the preparation of compost or decay for your coffee farm?
Yes= 1 No= 0
If yes, explain that creativity_____
4.1.3.Do you exercise your own creativity in preventing coffee disease in your farm?
Yes=1 No=0
If yes, explain that creativity_____
4.1.4. Do you exercise your own creativity in maintaining quality of coffee?
Yes=1 No =0
If yes, explain that creativity_____

4.1.5. Do you exercise any trial in your coffee farm?

Yes= 1 No= 0

If yes, explain that creativity_____

5.1 With whom do you share the information you have about coffee management practices, that you have gained from FFS? **(Information sharing behavior)**

SN NO	Types of information	Whom do you share (you can have more than one response)
5.1.1	Seed bed preparation	
5.1.2	Coffee seedling planting	
5.1.3	Coffee seedling shade mat	
5.1.4	Nursery shade construction	
5.1.5	Coffee seedling disease identification	
5.1.6	Shade regulation	
5.1.7	Plant spacing	
5.1.8	Pruning	
5.1.9	Post harvest handling	

1=neighbors 2=friends 3=relatives 4=other family members 5=others

5.1.10 Do you share information gained from FFS when;

A) Only when people approach you

B) Share information voluntarily when they meet for other purposes

C) Share information when they meet for this purpose

5.1.,11 On what occasions do you share information/ knowledge?

_____
___ _____

_____

5.1.12 Do you share information with female farmers or FHH? Why or why not?

_____
_____
_____

6.1. How is your motivation to achieve something?(**Achievement Motivation)**

6.1.1	How true it is to say that your efforts are directed towards success	True (3)	Not sure (2)	Not true (1)
6.1.2	Success brings relief or further determination and not just pleasant feeling	Agree (3)	Not sure (2)	Disagree (1)
6.1.3	How often do you seek opportunity to excel	Always (2)	Sometimes (1)	Never (0)
6.1.4	Would you hesitate to undertake something difficult	Never (3)	Sometimes (2)	Always (1)
6.1.5	In how many occasions your effort might lead to your failing	Mostly (1)	Sometimes (2)	Never (0)
6.1.6	How many situations do you think you will succeed in doing as well as you can	Mostly (2)	Sometimes (1)	Never (0)

Source preek U. and T.V Rao ,1992

7.1. Level of aspiration

Is your desire or ambition strong to apply good coffee management practices?
(The items should be answered on **yes| no** response)

7.1.1. You are being provided an opportunity to attend a tour for familiarizing you with the new techniques of coffee management practices. Will you spend some money to attend the tour?

Yes= 1 No= 0

7.1.2. Do you feel satisfied with your present method of coffee management practice? Yes=1 No=0

7.1.3. If you do not have sufficient finance, would you like to borrow to make permanent improvement on your coffee farm?

Yes=1 No=0

7.1.4.. Better yield can be obtained from improved coffee varieties. Suppose hybrid seed has been provided to you at some higher rate than the local seed, will you purchase it?

Yes=1 No=0

7.1.5. Coffee management practice requires high labor and it becomes difficult to get labor at peak season, will you properly manage your coffee farm by paying high wage to laborers?

Yes= 1 No=0

7.1.6. Do you give priority of your coffee farm more than other crops for different coffee management practices?

Yes=1 No=0

8. 1. Interpersonal trust

No	Interpersonal trust	Always	Sometimes	Never
8.1.1	When you describe about coffee FFS management practices to another farmer, do you think that s/ he believes you completely?	(2)	(1)	(0)
8.1.2	In your perception ,does the other farmer have good opinion about your capability to explain it-	(2)	(1)	(0)
8.1.3	When the other farmer conveys information regarding coffee management practices to you, do you think that he may try to mislead you?	(0)	(1)	(2)
8.1.4	When the other farmer explains about new coffee management practices, do you think he does not possess the qualification to describe those matters to you?	(0)	(1)	(2)

4. Communication factors

4.1 Extension participation

4.1.1 Do you get advisory service from extension agents on coffee?

Yes=1 N0=0

4, 1, 2 Do you get advisory service from research extension experts?

Yes=1 No=0

4.1.3 How frequently do the extension agents visit you?

0) never 1) annually 2) monthly 3) weekly 4) daily

4.1.4 Do you visit extension agent? Yes=1 No=0

4.1.5. Do you visit research experts? Yes=1 No=0

4.1.6. If yes, when do you visit?

1) During seed preparation 2) during coffee seedling planting 3) during incidence of disease 4) during harvesting 5) any time when there is technical problem

4.1.7 What are other sources of information about coffee FFS management practices?

1) Friends and relatives 2) neighbors 3) PA leaders 4) research center experts 5) District MOA 6) radio 7) Leaflets and printed materials 8) all of the above.

4.1.8. Do you consult development agents and research experts by your initiatives? Yes=1 No=0

4.2. Cosmopoliteness

4.2.1. Do you visit other villages/ towns? Yes=1 No=0

4.2.2. How often? 1) rarely 2) monthly 3) twice a week 4) weekly 5) daily

4.3.3. For what purpose do you visit the village/town? 1) to visit relatives 2)to collect information's 3) to purchase input 4) for making agricultural produce 5) for recreation purpose

4.3. Social participation

In which of the following organizations are you member and leader?

This is important whether the farmer use any of these for to share (give and acquire) knowledge on improved coffee management practices/market information.

Organization	Non participant (0)	Member (1)	Committee member (2)	Leader (3)	Frequency of Participation In activities		
					Never (0)	Sometimes (1)	Always (2)
Idir							
Iqub							
Religious club							
Coffee marketing cooperatives							
Union							
PA leader							
Saving and credit group							
School council							
Others							

Questionnaire

Respondents: **Researchers from Jimma zone and Awada research centers**
Zonal and District level Extension experts of agricultural development office

1. Background Information

1.1 Age _____ Years
1.2 Sex Male_____ Female_____
1.3 Qualification_____
1.4 Position_____
1.5 Experience as extension expert_____ years

2. Opinion towards Farmer Field Schools (FFS) on coffee management practices in relation to coffee wilt disease.

2.1.what were the criteria used for selecting farmers in participating FFS for coffee wilt disease management?

_____
_____
_____

2.2. Was the selection criteria considered gender dimensions?
A) Yes B) No

2.3. Would it be beneficial if women were involved in FFS?
Yes_____ No_____

2.4. If Yes/No give your reasons

_____

2.5. Who developed coffee FFS curriculum?
A) Researchers B) Agricultural experts C) Researchers, Agricultural experts and participant farmers

2.6. Were there different Actors/institutions participated during establishment and implementation of FFS programme?
Yes_____ No_____

2.7. Were all the participants attending the lesson regularly in FFS like group learning, Problem identification, demonstrations and field days?
Yes_____ No_____

2.8. If (No), what were the problems?

_____
_____
_____

2.9. Were there a close contact in between the researchers, extensionists of MoA and participant farmers during implementation of FFS prograamme?

Yes_____ No_____

2.10. The approach and process of Farmer Field Schools (FFS) was preferable than the current extension approach in order to prevent coffee wilt disease and other coffee management practices.

A) Agree B) Disagree

2.11. What was the major challenge in establishing and implementing Farmer Field Schools from the beginning till through process in the locality?

_____

_____

_____

_____

2.12. Do you think that because of learning in FFS, the participants were better managed their coffee farm than other farmers?

Yes _____ No_____

2.13. If (No), what were the problems and limitations?

_____

_____

2.14. Do you think that those farmers participated in FFS have acquired better knowledge, attitude and practice towards coffee wilt disease and other coffee management practices?

A) Agree B) Disagree

2.15. If you disagree what are the assumptions that influence knowledge, attitude and practice of FFS for coffee management practices with reference to coffee wilt disease?

_____

_____

2.16.Have the graduated farmers established their own FFSs?

Yes_____ No_____

2.17.What was the participant members' opinion about FFS practices and lessons learned for the prevention of coffee wilt disease management?

_____

_____

_____

2.18. Participant farmers' role/ practice after the phase-out of FFS?

_____

_____

2.19. Are the uses of practices such as knowledge and attitude on coffee wilt disease now a day's expanding, declining or maintained among FF members?

_____
_____
_____

2.20.Did the participants well organized and worked together after the school stopped?

_____
_____
_____

2.21.In general what was the advantages and disadvantages that you were observed in the established coffee FFSs?

Advantages

_____

Disadvantages

_____
_____

2.22. What do you suggest/recommend for the sustainability of FFS as an effective Methodology in the locality?

_____

_____
_____

_____

Checklist to Guide key Informants and Group Interviews and discussions

Farmers Field Schools (FFS) practices

- How did the FFS get start?

  _____

  _____

- How was the curriculum development of FFS started?
- Who was participating for the development of FFS curriculum?
- How was the process of FFS implementation conducted?

  _____

  _____

- What was the FFS participant members' opinion about control of coffee wilt disease practices?
- Did the FFS participants benefit from prevention of coffee wilt training programe?
  - On personal level

  -On village level

- Participant farmers' role/ practice during FFS?
- Participant farmers' role/ practice after FFS?
- Are the uses of practices such as knowledge and attitude on coffee wilt disease now a day's expanding, declining or maintained among FFS members?
- Did they form or organize anything together after the school stopped?
- Was the present method of coffee management practice particularly coffee wilt disease management improved/declined among FFS members?

  A) Yes B) No

- If your answer is yes/no explain your reason?

  _____

- What are the benefits, major strengths and weakness/ limitations of FFS practices as realized by participant farmers and experts?

_____

_____

_____

Checklist to guide focus group discussions

To FFS groups:

- Opinion regarding FFS in coffee management practices with reference to prevention of coffee wilt disease;
  -Farmers' selection process
  -Curriculum development
  Facilitators role
  -Group learning process and discussions

What was the motivation to join FFS?

- What benefit you got from it?
- In addition to disease management, what new ideas you introduced as a group?
- What benefits you got in working as a group?
- What are the agreements, rules or norms you have for this group functioning?
- After FFS is completed, will you continue to work as a group?
- How this group helps in gathering better price in coffee market?
- Do you share the knowledge and skills to other farmers who are not members of FFS?
- Will you take the leadership in organizing other farmers for better management and bargain in market?
- What are the major problems encountered in FFS? Prioritize/ rank the major problems.

Checklist to Guide Interviews and Discussions with Research Experts

-
- How FFS approach is preferred for the prevention of coffee wilt disease management and when was it started?
- How was the farmers' selection process conducted?
- How and who are involved in the development of FFS curriculum?
- What was the participant farmer's opinion and approach about FFS implementation on prevention of coffee wilt disease management practice?
- How was the duration of training conducted and who gave training for Facilitators?
- Opinion regarding improved practices of coffee wilt disease management, experience sharing process, Field days;
- Participant farmers' adoption practices after the phase-out of FFS?
- Opinion on the linkage of researchers, extensionists, participant farmers' and other institutions or actors during implementation of FFS process;
- Advantages of FFS approach in comparison of the current extension approach;
- Opinion about possibilities and limitations of FFS approach;

Appendix Table 2: Knowledge test of FFS and NFFS members under the study areas

Woreda	Category	FFS mem (N=70)			NFFS mem (N=70)		
		f	%	χ^2	f	%	χ^2
Gera	Low	-	-	24.200***	14	40	24.429***
	Medium	16	45.7		19	54.3	
	High	19	54.3		2	5.7	
	Total	35	100		35	100	
Dale	Low	-	-	13.086***	10	28.6	22.514***
	Medium	7	20		21	60	
	High	28	80		4	11.4	
	Total	35	100		35	100	

***, Significant at 1% level

Source: own survey data(2008/9)

Appendix Table 3: Attitude test of FFS and NFFS members under the study areas

Woreda	Category	FFS mem (N=70)			NFFS mem (N=70)		
		f	%	χ^2	f	%	χ^2
Gera	Low	-	-	7.000***	3	8.6	14.829***
	Medium	8	22.9		20	57.1	
	High	27	77.1		12	34.3	
	Total	35	100		35	100	
Dale	Low	-	-	10.257***	1	2.9	10.857***
	Medium	5	14.3		7	20	
	High	30	85.7		27	77.1	
	Total	35	100		35	100	

***, Significant at 1% level

Source: own survey data (2008/9)

Appendix Table 4: Practice test of FFS and NFFS members under the study areas

Woreda	Category	FFS mem (N=70)			NFFS mem (N=70)		
		f	%	χ^2	f	%	χ^2
Gera	Low	-	-	14.400***	-	-	10.086***
	Medium	7	20		32	91.4	
	High	28	80		3	8.6	
	Total	35	100		35	100	
Dale	Low	-	-	28.257***	2	5.7	8.971*
	Medium	3	8.6		25	71.4	
	High	32	91.4		8	22.9	
	Total	35	100		35	100	

*, *** Significant at 10% and 1% respectively
Source: own survey data (2008/9)

Appendix Table 5: Knowledge, attitude and practice of FFS and NFFS members (N=140)

category	knowledge				Attitude				Practice			
	FFS (N=70)		NFFS (N=70)		FFS (N=70)		NFFS (N=70)		FFS (N=70)		NFFS (N=70)	
	f	%	f	%	f	%	f	%	f	%	f	%
Low	-	-	24	34.3	-	-	4	5.7	-	-	2	2.9
Medium	23	32.9	40	57.1	13	18.6	27	38.6	10	14.3	57	81.4
High	47	67.1	6	8.6	57	81.4	39	55.7	60	85.7	11	15.7
Total	70	100	70	100	70	100	70	100	70	100	70	100
x2	27.457***		50.000***		36.971***		22.000***		30.600***		43.714***	

*** significant at 1% level.
Source: own survey data(2008/9)

Appendix Table 6: Relationship between knowledge, attitude and practice of FFS members and continuous or discrete independent variables

		Gera (N= 35)						Dale (N=35)					
Sre	Continuous independent	Knowledge		Attitude		Practice		Knowledge		Attitude		Practice	
No	variables	r	P	r	P	r	P	r	P	r	P	r	P
1	Age	0.028	0.874	0.168	0.334	0.056	0.751	0.038	0.83	0.04	0.819	-0.123	0.48
2	Farmer's experience	0.044	0.804	0.243	0.16	0.253	0.143	0.331*	0.052	0.03	0.863	0.343**	0.044
3	Management motivation	0.245	0.156	-0.106	0.543	0.022	0.899	0.112	0.521	0.096	0.585	0.036	0.836
4	Information seeking	0.004	0.982	0.255	0.14	0.157	0.369	0.258	0.134	0.133	0.445	0.07	0.69
5	Creativity	0.29	0.091	-0.101	0.563	0.518*	0.001	0.081	0.644	0.191	0.271	0.335**	0.049
6	Information sharing	0.316	0.065	-0.346**	0.042	0.093	0.595	0.039	0.825	0.189	0.278	0.389**	0.021
7	Achievement motivation	-0.177	0.038	0.133	0.447	0.057	0.744	0.343**	0.044	0.215	0.214	0.376**	0.026
8	Level of aspiration	-0.165	0.344	-0.019	0.913	0.131	0.452	-0.061	0.726	0.151	0.386	0.316*	0.064
9	Interpersonal trust	0.02	0.909	0.106	0.544	-0.005	0.979	0.146	0.404	0.443**	0.008	0.056	0.749
10	Wealth status	0.172	0.324	0.005	0.976	0.198	0.253	-0.321*	0.06	0.018	0.917	-0.081	0.644
11	Family labor	0.103	0.556	0.192	0.27	0.336**	0.049	-0.018	0.917	0.01	0.954	-0.176	0.311
12	Access to farm tools	0.075	0.667	-0.09	0.608	-0.074	0.675	-0.052	0.765	-0.026	0.881	0.363**	0.032
13	Farm size	0.102	0.561	0.124	0.476	0.16	0.358	-0.171	0.326	0.343**	0.044	0.223	0.198
14	Extension participation	0.166	0.341	0.123	0.48	0.037	0.831	0.049	0.782	-0.231	0.182	-0.11	0.529
15	Social participation	0.379**	0.025	-0.171	0.327	0.225	0.195	0.124	0.477	0.275	0.11	0.004	0.983

Source: own survey data (2008/9) *, **, *** correlation is significant at 10%, 5% and 1% level

Appendix Table 7: Variance Inflation Factor (VIF) and Condition Index(CI) for continuous and discrete independent variables

Sre No	Variables	Gera (N=35)						Dale (N=35)						Pooled data (N= 70)					
		Knowledge		Attitude		Practice		Knowledge		Attitude		Practice		Knowledge		Attitude		Practice	
		VIF	CI	VIF	CI	VIF	CI	VIF	CI	VIF	CI	VIF	CI	VIF	CI	VIF	CI	VIF	CI
1	Family labor	-	-	-	-	1.23	2.514	-	-	-	-	-	-	-	-	-	-	-	-
2	Farmer's exp	-	-	-	-	-	-	-	-	-	-	1.577	4.507	1.438	3.649			1.363	3.429
3	creativity	-	-	-	-	1.23	8.973	-	-	-	-	1.516	7.114	1.489	6.851	-	-	1.408	6.329
4	Information sharing	-	-	1	7.17	-	-	-	-	-	-	1	9.61	1.112	8.952	-	-	1.105	9.534
5	Achievement motivation	-	-	-	-	-	-	1	28.962	-	-	-	-	-	-	-	-	-	-
6	Interpersonal trust	-	-	-	-	-	-	-	-	1.006	3.052	-	-	1.086	23.31	-	-	-	-
7	Access to farm tools	-	-	-	-	-	-	-	-	-	-	1.071	13.19	-	-	-	-	-	-
8	Farm size	-	-	-	-	-	-	-	-	1.006	13.07	-	-	-	-	-	-	-	-
9	Social participation	1	10.737	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Source: own survey data (2008/9)

Appendix Table 8: Variance Inflation Factor (VIF) and condition index(CI) for continuous and discrete independent variables

No		Pooled data (N=70)					
		Knowledge		Attitude		Practice	
		VIF	CI	VIF	CI	VIF	CI
1	Farmer's experience	1.438	3.649	-	-	1.363	3.429
2	Creativity	1.489	6.851	-	-	1.401	6.329
3	Information sharing	1.112	8.952	-	-	1.105	9.534
4	Interpersonal trust	1.086	23.310	-	-	-	-

Source: own computation (2009)

Appendix Table 9: Contingency Coefficient test for Categorized and dummy independent variables (N=70)

	Education	Access to credit	Cosmopoliteness	Intercropping
Education	1	0.073	0.038	0.033
Access to credit		1	0.226	0.039
Cosmo politeness			1	0.937
Intercropping				1

source: own computation (2009)

Appendix Table 10: Pooled coefficient of Regression function (Influence of independent variable on knowledge and practice of FFs members.

Sre. No	Independent variables	Knowledge (N=70)			Practice (N= 70)		
		B	t	Sig.	B	t	Sig.
	Constant	6.580	3.004	0.004	8.813	12.642	0
1	Farmer's experience	0.247	1.807	0.076*	0.173	1.470	0.147
2	Creativity	0.004	0.029	0.977	0.256	2.077	0.042**
3	Information sharing	0.086	1.703	0.485	0.082	0.736	0.465
4	Interpersonal trust	0.253	2.098	0.040**	-	-	-
5	Education	-	-	-	0.177	1.604	0.114
6	Intercropping	0.152	1.210	0.231	0.236	2.101	0.040**
7	Access to credit	-0.101	-0.821	0.415	-0.055	-0.525	0.602

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

source: own survey data

Appendix Table 11: The MLR model summery

No	Dependent Variable	R	R^2	Adj. R^2	Standard error of the estimate	P
1	Knowledge (a)	0.486	0.236	0.163	1.911	0.008
2	Attitude (b)	-	-	-	-	-
3	Practice (c)	0.637	0.406	0.350	1.327	0.000

***, Significant at 1% level
source: own survey data(2008/9)

a, predictors: (constant), interpersonal trust, information sharing, farmers experience, creativity, intercropping and access to credit of the respondents

c, , predictors: (constant), intercropping, farmer' experience, education, information sharing, creativity and access to credit of the respondents

Appendix Table 12: ANOVA Table

Model	Dependent variable	Source	Sum of squares	df	Mean square	F	Sig.
1	Knowledge	Regression	71.086	6	11.848	3.245	0.008*** (a)
		Residual	230.000	63	3.651		
		Total	301.086	69			
2	Attitude	-	-	-	-	-	-
3	Practice	Regression	75.887	6	12.648	7.179	0.000***(c)
		Residual	110.985	63	1.762		
		Total	186.871	69			

***, significant at 1% probability level

a) Predictors: (constant), interpersonal trust, information sharing behavior, farmer's experience , creativity, intercropping and access to credit of the respondents
c) Predictors: (constant), intercropping, farmer's experience, education, information sharing, creativity and access to credit of the respondents

Appendix Table 13: Conversion factors used to compute man-equivalent

Age group	Male	Female
<10 years	00	00
10-13	.20	.20
14-16 years	0.50	0.40
17-50 years	1.00	0.80
>50 years	0.70	0.50

Source: Storck *et al.* (1991).cited in Desalegn (2008).