EFFECT OF FARMER FIELD SCHOOLS PROJECTS, ON AGRICULTURAL PRODUCTIVITY*;* *THE CASE OF LIBEN CHUKALA DISTRICT EAST SHEWA ZONE OF OROMIA REGION*

A Research Paper Submitted to the School of Graduate Studies of Jimma University in Partial Fulfillment of the Requirements for the Award of the Degree of Masters of Project Management and Finance (MPMF)

BY:

KIDANE BIZUNEH KEBEDE

JIMMA UNIVERSITY

COLLAGE OF BUSINESS & ECONOMICS

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By:

KIDANE BIZUNEH

MAIN ADVISOR:

DERESSE MARSHA (PHD)

A RESEARCH PAPER SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES OF JIMMA UNIVERSITY TO UNDERTAKE A RESEARCH IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTERS OF PROJECT MANAGEMENT AND FINANCE (MPMF)

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DECLARATION

I hereby declare that this thesis entitled *"Effect of farmer field schools projects, on agricultural productivity; the case of LibenChukala District East Shewa Zone Of Oromia region.''* has been carried out by me under the guidance and supervision to my main advisor Deresse Mersha (Ph.D.) and Co advisor EndalewGutu (Asst.Prof).

The research paper is original and has not been submitted for the award of any degree or diploma to any university or institutions.

Researcher's Name	Date	Signature
Kidane Bizuneh	_____	_____
Jimma, Ethiopia		

CERTIFICATION

This is to certify that the research paper entitles *"Effect of farmer field schools projects, on agricultural productivity; the case of LibenChukala District East Shewa Zone of Oromia region.''* submitted to Jimma university for the award of the Degree of Masters of Project Management and Finance (MPMF) and is a record of confide research paper work carried out by Mr. Kidane Bizuneh Kebede, under our guidance and supervision.

Therefore, we hereby declare that no part of this research paper has been submitted to any other university or institutions for the award of any degree or diploma.

Main Advisor's Name	Date	Signature
_____	_____	_____
Co-Advisor's Name	Date	Signature
_____	_____	_____
Internal Examiner	Date	Signature
_____	_____	_____
External Examiner	Date	Signature
_____	_____	_____

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ACRONYMS and ABREVATIONS

AESA	Agro Ecosystem Analysis
AIDS	Acquired Immune Deficiency Syndrome
ATA	Agricultural Transformation Agency
BoARD	Bureau of Agriculture and Rural Development
CAADP	Comprehensive African Agriculture Development Program
CIP	Coffee Improvement Project
CSA	Central Statics Agency
CWD	Coffee Wilt Disease
DA	Development Agent
FAO	Food and Agriculture Organization
FARMESA	Farmer Level Applied Research Method for East and South Africa
FFS	Farmer Field Schools
FSR	Farmer System Research
FTC	Farmer Training Center
GDP	Gross Domestic Product
GoE	Government of Ethiopia
HIV	Human Immune Virus
ICM	Integrated Conservation Management
IFPRI	International Policy Research Institute
ILRI	International Livestock Research Institute
INMASP	Integrated Nutrient Management and Soil Productivity Project
IPM	Integrated Pest Management
JICA	Japan International Corporation Agency
MoA	Ministry of Agriculture
MoLFED	Ministry of Livestock and Fishery Development
MT	Master Trainer
NGO	Non-Government Organization
OBANRM	OromiaBeaureu of Agriculture and Natural Resource Management

OFWE	Oromia Forest and Wildlife Enterprise
SCF	save the Children Fund
SNRMP	Sustainable Natural Resource Management Project
SPSS	Statistical Package for Social Sciences
ToT	Training of Trainer
UN	United Nation

Abstract

The main purpose of this study was to examine the effect of farmer field schools projects, on agricultural productivity; the case of Liben Chukala District East Shewa Zone of Oromia region. The study was conducted for this study to employ both primary and secondary sources of dat. With employing the research design was explanatory, stratified random sampling technique; data was collected by administering questionnaire and exploring documents. The collected information of the approach is analyzed using quantitative and qualitative method of data analysis. The researcher takes a sample of 60 FFS and 60 non FFS. Data was collected using structured questionnaires and it is analyzed using Statistical Package for Social Sciences (SPSS) version 20.0 for windows. The data collected was analyzed using Statistical tools such as mean, standard deviation, correlation, and multiple regression models. The findings show that FFS farmers had high level of knowledge than non FFS farmers. This translated itself into higher average annual agricultural production yields among FFS farmers. It indicates that FFS as an approach is effective in dissemination of improved agricultural technologies in LibenChukala District. However, challenges like little or no technical and financial support for farmers after they graduate from season-long training sessions and poor linkage to other agricultural service providers affected sustainability of FFS graduates. It is recommended that policy and strategic issues related to recruitment of more extension personnel, special funding for follow ups, more engagement with private actors in agricultural production would strengthen FFS farmers to continue applying what they learn through FFS.

Key words: *Farmer Field schools, Agricultural extension, Agricultural technologies, Knowledge, Economic sustainability, Farmer lead learning*

CHAPTER ONE

1. Introduction

These sections provide an overview of the study. It briefly discussed the background of the study, the statement of the problem, the research questions, the objectives, the significance, the scope, the limitation and the organization of the study.

1.1 Background of the Study

Agricultural extension is an important service for agricultural development in countries whose economies are driven by agriculture (Oladele, 2001). In such countries, agricultural extension services face constant pressure to use extension approaches that are effective in disseminating technologies to farmers. Effective extension approach enhances farmers' knowledge and skills necessary for using the technology. One way to identify an effective extension approach is to assess the knowledge gained by farmers about the technologies disseminated and the skills acquired by farmers in using those technologies. In Kenya, where the economy is agriculture driven, the Government has expressed concern in a policy paper "Strategy for Revitalizing Agriculture" that there is no credible extension approach in place and that messages delivered to farmers lack new and useful information to enhance increased productivity (MoA &MoLFD, 2004). Although the extension service has used a variety of approaches in the past, the use of the available agricultural technologies by smallholder farmers remain limited (ILRI, 2002; MoA &MoLFD, 2004). The limited use of agricultural technologies is considered a contributing factor to low agricultural productivity in the smallholder farming systems (sanrem crsp, 2003).

Agriculture is a significant part of Ethiopia's economy. It accounts for 46.3% of the national Gross Domestic Product (GDP), more than 83% of employment, over 90% of the export market and 92% of the raw materials for the industry (IFPRI 2009, MoA 2010).In addition to its central role in providing a livelihood to the vast majority of Ethiopians, agriculture also plays a considerable part in the development of other sectors such as industry, education, health, trade and market. Recognizing the vital importance of agriculture, the GoE has focused efforts on improving production and productivity in the agricultural sector. While these efforts have produced considerable progress, overall production and productivity remains below potential due to inadequate utilization of modern inputs, poor input- output market linkage, reduced soil

Fertility and organic matter, soil erosion, high dependence on rain-fed agriculture, frequent drought, climate change, increased pests and diseases and resource limitations.

Ethiopia's rural development policy and strategies prioritize the transformation of smallholder subsistence agriculture to market-orientated production. Accordingly, the government is investing heavily in agriculture with a focus on public extension services by deploying considerable human and financial resources. For instance, the Ethiopian government has allocated more than 16% of its annual budget to agricultural development and attained an annual mean agricultural growth rate of more than 8% for the last 8 years. This is significantly higher than the agreement among CAADP member countries to allocate 10% of their national budgets to the agricultural development and attain a mean annual agricultural growth rate of 6% (CAADP, 2009).To facilitate the transformation of Ethiopian agriculture, the government has established the Agricultural Transformation Agency (ATA) to support the Ministry of Agriculture (MoA) and other implementing partners to achieve national targets for poverty reduction, food security and growth by removing systemic bottlenecks in the sector.

An effective and efficient agricultural extension system can enhance the agricultural productivity and production of smallholders through the development of innovative, systematic, and farmer-owned agricultural extension. Agricultural extension may also be used as a policy instrument to mobilize communities for necessary behavioral and attitude changes (to create demands on improved technologies/innovations, actively participate in extension programs in FTCs and practice market-oriented production). (Rogers 2003)

Farmer Field Schools (FFS) is a season long training of farmers involving participatory activities, hands-on analysis and decision making (Rola*et al.*, 2002). With the FFS, extension agents play facilitating role to a group of farmers in the field by involving them in interactive learning and field experimentation. This participatory approach is meant to help farmers develop individual analytical skills, critical thinking, creativity and capacity for independent problem solving. FFS adopts an integrated curriculum in which farmers generate learning materials. The FFS participatory approach is designed to empower farmers with knowledge and skills about technologies with the aim of increasing adoption rates and subsequently improving agricultural Productivity (Van de Fliert, 1993). The application of FFS in extension was first introduced in

East Asia in the late 1980s for intensive dissemination of technology on integrated pest management practices in agriculture (Leeuwis*et et al*., 1998).

Japan International Corporation Agency (JICA) is one of the active promoters of FFS projects across the east Africa region, and particularly in Ethiopia. JICA has started promoting FFS projects since 2007. The first was through the Belete-Gera Participatory Forest Management Project in Jimma zone from (2007-2012) in collaboration with Oromia Forest and Wildlife Enterprise (OFWE) in which 8,072 farmers were graduated from 351 FFSs. JICA also proved the effectiveness of FFS for improved seed multiplication during a bilateral project called Quality Seed Promotion for Smallholder Farmers, a project implemented in 2010-2014 in collaboration with Ministry of Agriculture during. In this project trained 258 model farmers through 33 FFS. In both cases, farmers' capacity building and empowerment through participatory learning were remarkable.

The project for 'Sustainable Natural Resource Management through Farmers Field Schools in the Rift Valley Area (SNRM-FFS) of Oromia Region' is one of JICA's supported projects that introduced FFS and tested its efficacy as an alternative extension system in Ethiopia. The project was started in 2013 with the cooperation among Oromia Bureau of Agriculture and NRM (OBANRM) and JICA. The purpose of the NRM-FFS project is to strengthen the Ethiopian government agricultural policy towards sustainable land, soil and water conservation in semi-arid areas of Oromia Region. By working with the farmers directly and giving them the ownership to protect their environment, this technical cooperation project resulted in not only conserve the environment but also improving the capacity of farmers and increase their productivity.

Based on the study the researcher was aimed to assess effect of farmer field schools projects, on agricultural productivity; the case of Liben Chukala District East Shewa Zone of Oromia region.

1.2 Statement of the Problem

Research done by (Quizon et al., 2001) on the impact of FFS approaches for a study of potato farmers in the Peruvian Andes (Peru) was not conclusive in the extent to which FFS enhanced farmer's productivity and socioeconomics. In this study, they argue that in as much there was a significant increase in farmer's livestock productivity under FFS approaches, the studies could not conclusively imply there was impact. (Empirical studies done by Godtland et al.,2004) in

Indonesia on FFS did record concrete impact on livestock farmers in terms of enhanced knowledge, productivity, increased revenue, or improved socioeconomic status. The study indicated that farmers who had adopted FFS approaches had a batter chance in utilizing technologies and enhanced mechanisms of production compared to traditional methods. As a result, meat production, milk production, and number of goat production increased. The study however did not provide data on previous production and data on increased production to substantiate the fact that FFS had enhanced livestock productivity. Hazell and Thurlow (2007) study revealed that farmers under FFS had strengthened friendship and trust, improving farming activities adequately. However, the study also notes that the resultant socioeconomic impact due to FFS was negligible.

ILRI (2005) study focused on the extent to which FFS approach had an impact on crop production in Kenya. The study found out that there was a significant relationship between farmer's revenue, knowledge, and productivity and the use of FFS approaches. However, the study did not consider livestock farming under the FFS. In as much as Land O'Lakes has continued to invest in livestock technological innovations in Machakos, it has not been able to establish the extent to which continued investment in FFS has caused a resultant impact in livestock farming and productivity. This study sought to replicate and confirm the studies by ILRI (2005); Quizon et al., (2001); Hazell and Thurlow (2007) but with a focus on livestock productivity under FFS approaches.

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, the above knowledge gap was to identify effect of Farmer Field schools Projects, on agricultural productivity; the case of Liben Chukala District East Shewa Zone of Oromia region

1.3 Basic research questions

Based on the above statement of the problem the researcher was raised the basic research questions:-

1. What is the perception of smallholder farmers on the effectiveness of FFS in as far as improved agricultural productivity is concerned?

2. What are the socio-economic factors influencing farmer's participation in FFS program in the study area?

3. What are the factors facilitating the dissemination of agricultural technology under FFS in the study area?

4. What are the differences in production between FFS and non-FFS farmers in the study area?

1.4 Objective of the study

1.4.1. General objective of the study

The overall objective of the study was to assess the effect of farmer field schools projects, on agricultural productivity; the case of LibenChukala District East Shewa Zone of Oromia Region.

1.4.2 Specific objective of the study

The specific objectives of the study were;

1. To assess the perception of smallholder farmers on the effectiveness of FFS in as far as improved agricultural productivity is concerned.
2. To identify socio-economic factors influencing farmers' participation in FFS program in the study area.
3. To identify factors facilitating the dissemination of agricultural technologies under FFS in the study area.
4. To compare production between FFS and non-FFS farmers in the study area.

1.5 Scope of the Study

This study is designed to create an understanding of the knowledge and skills of smallholder farmers about the use of various technologies made possible by participating in FFS and non FFS training extension approaches. The comparison of the skills and knowledge farmers acquired on the investigated new technologies was based on the training of non FFS farmers as the benchmark for measuring any extra knowledge and skills acquired through FFS training.

The study has been conducted in Oromia Region, East shewa zone, Liban chukala district. The district has a total of 19 villages and more than 100 FFS groups have been graduated. The district has been selected for the study because it is one of the areas where FFS project was introduced to smallholder farmers by SNRMP project.

A sample of farmers participating in FFS extension approach was obtained randomly from the locations where SNRMP introduced and continues to run FFS extension approach in Liban chukala district of 10 villages The random sample of farmers participating in Non FFS extension approach was obtain from other same locations where FFS extension approach has not been introduced but farmers continue to participate in Non FFS extension approach. The selected technologies are those emphasized in the extension service for enhancing farmer's productivity in smallholder systems.

1.6 Significance of the Study

The information generated from this study could be uses in evaluating whether the FFS relative to NFFS extension approach would more effective in the dissemination of knowledge and skills to farmers on the use of essential agricultural technologies. This information is valuable to extension agents, farmers, agricultural and livestock policy makers, extension delivery systems and researchers in designing effective educational approaches for disseminating new technologies particularly those targeting smallholder farmers. It provides an objective basis for re-evaluation of future development and packaging of technologies for enhanced adoption by the target beneficiaries. The outcome has valuable reference for any future necessary improvements on the FFS extension approach and its` possible mainstreaming into the normal public extension delivery systems.

1.7 Limitations of the study

The initial challenge of the study was conducted the time of data collection coincided with exceptional heavy rains that rendered roads in liben chukala district moderately impenetrable. The poor road network thus adversely affected data collection by delaying the put into effect and also interpretation it exclusive. Other reasons were a sample population of this study is taken from socio economic characteristic of farmers in the area. This might affect the generalization of the research findings to the whole respondents were very difficult to manage because the total population of the district is large as conducting and taking sample from the whole population is not possible and some of the respondents were not willing to fill the questionnaires distributed.

1.8 Organization of the Study

The study consists of five chapters. The first chapter deals with the introductory part which include: background of the study, background of the organization, statement of the problem, research questions, objectives of the study, significance of the study, scope of the study, limitations of the study and organization of the study. The second chapter focused on their view of related literature. The third chapter consists of the research methodology. The results of the different methods used are presented in chapter four. Finally, chapter five presents the conclusions and recommendations.

CHAPTER TWO

2. Review of Related Literature

These chapters include literature review associated to the importance of extension services in agricultural development. It examines the various extension approaches that have customarily been used in the provision of extension services. The evolved participatory approaches that have been introduced are also discussed with particular emphasis to FFS. The chapter concludes by presenting the theoretical, empirical and conceptual framework that will guide the proposed study.

2.1 Theoretical studies of FFS

2.1.1Historical context of FFS

Originally the FFS were developed in Asia, where there are some 200 million agriculture farmers. Food security was endangered and political stability threatened in several countries as a result of severe losses in agriculture production caused by the brown plant hopper (NilaparvatalugensStål) (Winarto, 1995; van de Fliert et al., 1995; Conway and McCauley, 1983). This initial classical FFS for integrated pest management (IPM) on agriculture was subsequently broadened in a second generation of FFS to address other crops and topics.

Research carried out in the Philippines (Litsinger, 1989; Gallagher, 1988; Kenmore, 1980) and confirmed in Indonesia (Untung, 1996) demonstrated that indiscriminate pesticide use in agriculture crops not only induced resistance in N. Lugens but also eliminated its natural enemies, resulting in severe outbreaks. In Indonesia these processes were accelerated by frequent aerial applications of pesticides during the 1970s (Schmidt et al., 1997). The first serious outbreaks of N. lugens in Indonesia in 1975 and 1977 caused estimated losses of US$1 billion. The plant hopper reappeared in the mid-1980s because of continued heavy insecticide use and the rapid breakdown of resistance in new agriculture varieties (Schmidt et al., 1997; Untung, 1996). Indonesia's goal of self-sufficiency in agriculture production, reached in 1984, was reversed in 1985–6 when N. lugens destroyed 275,000ha of agriculture (Röling and van de Fliert, 1998).

For the FAO Inter country IPM Program2 – the innovators of the FFS – the plant hopper outbreak was symptomatic of a major problem in modern agriculture: pesticide dependency

(Matteson et al., 1992). Moreover, the technical recommendations made by the formal research system had limited applicability in farmers' fields, and concepts such as economic thresholds proved irrelevant as decision-making criteria. Some research products (e.g. resistant varieties) had the potential for managing pests but were not fully exploited because farmers opted for the less risky option of pesticides (Matteson et al., 1992).

The FFS were designed to address these problems and to empower farmers in the longer-term so that they could influence policy makers. The main objectives were to improve farmers' analytical and decision-making skills, develop expertise in IPM, and end dependency on pesticides as the main or exclusive pest-control measure. To accomplish this, farmers had to gain an understanding of the ecological principles and processes governing pest population dynamics. The FFS provide an opportunity for learning-by-doing, based on principles of non-formal education. Extension workers or trained farmers facilitate the learning process, encouraging farmers to discover key agro ecological concepts and develop IPM skills through self-discovery activities practiced in the field (Ooi, 1996).

Actors Although NGOs play an important complementary role within national extension strategies, the FAO team felt that the limited scope of their projects prevented them from being the main channel for diffusing IPM extensively (Matteson et al., 1992). The only way to reach a significant number of farmers and ensure continuity and quality of IPM training and extension was to integrate these processes within a national program agenda for each country. In Indonesia, for example, field leaders and pest observers were trained for 15 months in IPM and facilitation skills in regional IPM training centers (van de Fliert et al., 1995). The program's strategy was not to train individual farmers but to establish an IPM capacity in each community and then support its horizontal diffusion (Settle et al., 1998; van de Fliert et al., 1995). FFS for agriculture IPM are designed for 20–25 participants from one community. This number is intended to develop a critical mass, around which collective action and follow-up activities can be consolidated after the FFS activities end. Interested farmers are invited to a community meeting at which FFS objectives and processes are explained, as well as the importance of attendance at weekly meetings throughout the crop cycle.

2.1.2 Historical Background of FFS

The FFS approach was developed by FAO project in South East Asia as a way for small-scale agriculture farmers to investigate, and learn for they the skills required in their paddy fields (Godtlandet al., 2004, Khisa, 2004; Bijlmakers, 2011). The term "Farmers' Field School" comes from an Indonesian term "SekolahLapangan" meaning simply "field school". The first Farmer Field Schools were established in 1989 in Central Java during the pilot phase of the FAO assisted national IPM Program. These Program was prompted by the devastating insecticide-induced outbreaks of brown plant hoppers (Nilaparvatalugens) that are estimated to have in 1986 destroyed 20,000 hectares of agriculture in Java alone reference.

The Government of Indonesia's response was to launch an emergency training project aimed at providing 120 000 farmers with field training in IPM, focused mainly on recording on reducing the application of the pesticides that were destroying the natural insect predators of the brown plant hopper (ibid).Since then FFS methodology has spread in many parts of the world. The model has been adapted to suit various crops other than agriculture and also other fields such as environmental conservation (Dimelu and Okoro, 2011).

In Africa, the FFS were introduced in 1994 in Ghana and are currently being implemented in countries such as Burkina Faso, Mali, Zambia, Zimbabwe, Kenya, Uganda, Tanzania, DRC, the Gambia, Mozambique, Ethiopia, Malawi, Sudan, Nigeria, Rwanda, etc. Also from 1995 the FFS programmes began to broaden the scope beyond IPM and started to cover other types of production and incorporated Socio-ecological conditions. In Kenya, FFS have great history and success. FFS used in Soil and water conservation, Forestry(in ISFP) and Agro forestry, education, health, conflict management and livelihood in organisations supported by GOs, NGOs, Privates sectors and other international organisation(world Bank, EU, JICA etc.).

Farmer Field Schools (FFS) extension approach was first introduced to Ethiopia in 1999 simultaneously by Save the Children/UK and Self Help Development International. Save the Children/UK introduced the FFS approach through a project on an integrated pest management implemented in North Wollo and Wag Humra zones of Amhara Region. The project was implemented in partnership with zonal and woredas offices of agriculture. The project was claimed successful not only with respect to achieving its objective but also in terms of improving the Office of Agriculture field staff's and Development Agents understanding, skills and attitudes towards participatory development. It has developed ways to manage pests using locally

available materials, and has trained farmers through farmer field schools to apply the technique. Self-Help Development International implemented a pilot project on integrated management of potato late blight through FFS approach from 1999 to 2002 together with the Ethiopian Agricultural Research Organization and the International Potato Center, financed by the International Fund for Agricultural Development.

SOS-Sahel Ethiopia in partnership with Hawassa College of Agriculture also applied FFS through a regional research project called Integrated Nutrient Management to Attain Sustainable Productivity Increases in East African Farming Systems (INMASP). This project was implemented from Feb. 2002 up to Aril 2006 in three east African countries namely Kenya, Uganda and Ethiopia. The project employed FFS and promoted participatory technology development that helped farmers to monitor their soil nutrients, and engaged in policy dialogue. Agri-Service Ethiopia also applied FFS pilot project in 2004 to empower the community through involving them in all steps of development activities and thereby improving the quality of extension services.

Ethiopia has one of the largest extension agents, also called Development Agents (DAs), in the world. There are over 45,000 DAs based at the 18,000 Farmers Training Centres (FTC) established across the country. The extension agents and service in Ethiopia is housed within the ministry of agriculture and natural resources management. Three DAs are placed in each kebelle or FTC to provide services in crop, livestock and NRM areas. The extension system is purely government owned. Major problems of the extension system in Ethiopia include top-down and non-participatory approach, primarily supply driven, low capacity of development agents, high turnover of extension staff, and shortage of operational budget and facilities (Berhanu Gebremedihin et al., 2006). There is little engagement of farmers to analyze their own agricultural and NRM production constrains and innovates to find solution for the same.

FFS were introduced in Western Africa in 1995 as a means of spreading agricultural practices such as soil fertility, cassava cultivation, animal health and other issues such as human health. The first example of FFS in East Africa was in Uganda in 1996, which was introduced by FAO-IPM project in the Eastern part of the country. Since then, FFS have developed and dealt with different issues such as diseases and pests control, harvest preservation techniques, management

of pesticides, soil fertility, etc. Since 2008, various organizations have been implementing agro-pastoralist FFS in Karamoja region in Uganda (Sones and Duveskog, 2003).

FFS is a participatory agricultural extension approach based on experiential learning or learning by discovery (FAO, 2003).The first FFS were established in 1989 in Central Java - Indonesia during a pilot season by 50 United Nations Food and Agriculture Organization plant protection officers to test and develop field training methods as part of their Integrated Pest Management (IPM) training of trainers‟ course (Mwaseba*et al.*, 2008). The FFS approach represents a paradigm shift in agricultural extension from top down to bottom up. The training program utilizes participatory methods "to help farmers develop their analytical skills, critical thinking, and creativity, and help them learn to make better decisions" (Kenmore, 2002).

Japan International Corporation Agency (JICA) has been working to introduce an alternative system of extension provision called Farmers Field Schools (FFS). FFS is a system of extension service where farmers are consider as active innovators for their own farm problems. FFS creates a space for a participatory dialogue between farmers and experts to analyze production constrains in their vicinity, propose solutions, test these on small scale, and monitor effects and upscale tested and proven technologies. An agro-ecological based analysis of production constraining factor and participatory technology development are essential elements of FFS.

2.1.3 Principles of Farmer Field Schools

In the field school, emphasis is laid on growing crops or raising livestock with the least disruption on the agro-ecosystem. The training methodology is based on learning by doing, through discovery, comparison and a non-hierarchical relationship among the learners and trainers is carried out almost entirely in the field. Based on these facts there are four basic principles that guide FFS methodology (Bijlmakers, 2011, Khisa, 2004).

The four major principles within the FFS process are:

a) Grow a healthy crop

b) Observe fields regularly

c) Conserve natural enemies of crop pests

d) Farmers understand ecology and become experts in their own field

2.1.4 Essential Elements of FFS

Although FFS has been adapted to suit deferent circumstances and topics, there are six important elements that form the pillar of the model (Khisa, 2004 and Duveskog, 2008). These elements are described below.

2.1.4.1 The group

The group comprises of 20-25 individuals members who have a common interest, forming the core of a Farmer Field School. The FFS tends to strengthen existing groups or may lead to the formation of new groups (Matataet al., 2001;Mweri, 2005).

2.1.4.2 The field

FFSs are about practical, hands-on topics. In FFS, the field is the teacher, and it provides most of the training materials such as plants. Farmers are usually much more comfortable in field situations than in classrooms. In most cases, communities can provide a study site with a shaded area for follow-up discussions and practical (Duveskog, 2008).

2.1.4.3 The Facilitator

FFS needs a technically competent facilitator to lead members through the hands-on exercises. There is no lecturing involved, so the facilitator can be an extension officer or a Farmer Field School graduate (Ajani and Onwubuya, 2010). Extension officers with different organizational backgrounds, for example government, Non-Government Organization (NGO) and private companies have all been involved in FFS as facilitators.

This arrangement is highly observable in places where there is Pluralistic Extension Services (PES).

2.1.4.4 Farmer field day/ visit

Farmers are given an opportunity to hold at least one day at field day for a learning cycle and have exchange visits and tours during the duration of FFS. During the field day farmers explain the technologies they had learned and also entertain visitors including their neighbor farmers (Duveskog, 2008).

2.1.4.5 Program leader

Most FFS program exists within a larger program, run by government or a civil socio organization. It is essential to have a good program leader who can support the training of

facilitators, get materials organized for the field, solve problems in participatory ways and nurture field staff facilitators (Davis, 2008). In Tanzania, most districts have program leaders who are normally called the District Training Coordinators (DTCs).

2.1.4.6 Financing

This is an important element since Farmer Field Schools can be expensive or low-cost depending on who implements them and how they are conducted. A topic under study also dictates the amount of funds required to successfully support the learning process. One important issue in FFS is that of sustainability without outside funding (Ajani and Onwubuya, 2010).

2.1.5 Experiential Learning

Experiential learning is defined as a knowledge creation process through which new experience are being integrated into previous ones and transformed into relevant, durable and retrievable knowledge which is suitable for use in the learners' environment (Talibo, 2011).

In addition, experiential learning is the process whereby knowledge is created through transformation of experiences. The past experiences need to be integrated to what one comes to learn. The major FFS target is capacity building of the farmers through experiential learning through farmer research and experimental plots (Nederlof and Odonkor, 2006); cited by Talibo, (2011) who stated that, people are known to say the following about the discovery-based learning, or farmers' experimentation:

"When we hear, we remember some,
When we see, we remember more.
When we do, we remember the most,
But when we discover, we never forget''

Nederlof and Odonkor (2006) argued that FFS aims to allow integration of local knowledge and scientific knowledge to help building up farmer's better decision making in their farms.

2.1.6 Farmers Perception towards the FFS Implementation

Farmers' perception toward agriculture is probably positive in nature. However, there may be specific negative views, opinions and perceptions which will vary depending on the farmer's personal circumstances and system of farming (Sadatiet al., 2010). Attitude plays a critical role in the innovation decision process. In order to adopt any technology farmers must first develop a positive perception towards such innovation (Helali, and Ahmadpour, 2013). Perception in any

social system is based on culture and technology aspect that define individuals in such society. However these perceptions can be moderated or changed by external factors such as information transfer from change agent and other communication channels which impact on adoption and can eventually influence in developing either positive or negative perception towards newly introduced extension approach (David, 2007).

2.1.7 Factors Influencing Farmers Participation in FFS Training

FFS is a model that advocates a situation where farmers are provided with an opportunity to actively participate in learning and achieve greater control over the conditions that they face every day in their fields. The model gives the farmers a forum for sharing their experiences and knowledge through usual field observation and enables them to apply their experiences related to the crop management practices in making decision under the guidance of a skilled facilitator (Duveskog, 2006).

In order to enhance sustainable agriculture, coordination of information exchange between researchers, extension workers and farmers is of paramount importance. Innovations established by researchers with no involvement of the farmers are not sustainable. Furthermore, it has been observed that various innovations which are proposed by researcher do not make sense to the farmers because the role of farmer's knowledge is overlooked. Nederlof and Odonkor (2006) argue that the FFS aim is to allow integration of local knowledge and scientific knowledge to help building up farmer's better decision making in their farms.

Talibo (2011) observed that in many programs it is better for the facilitator to be a farmer rather than Field Extension Worker (FEW) because farmers know their community well and speak the same language and they are recognized by the members of their social group.

There are manifold factors which are known to influence the rate at which farmers participate in FFS training programs. These factors may differ from one place to another depending on socio-economic, institutional, technological and environmental settings. Therefore, understanding of these factors would lead to proper planning, management and evaluation of most FFS programs currently being funded and managed by public and private institutions. Furthermore, participation of farmer in FFS increase when they receive clear information of innovation

delivered. Rogers (1995) asserted that awareness and knowledge of a new study is necessary before taking decision. However Van den Berg (2004) proves that some farmers may take decision in participating in technology development even if they have little information on those technologies.

Means of information are critically important in technology transfer especially in FFS approach. All innovations have two important aspects namely the source and the target adoption unit. The former involves technology development like research in other development institutions where as the later involves farmers or other consumer of technology. Therefore developed innovations have to be communicated to the consumer or user. Rogers (2003) categorizes communication channels into localities and cosmopolites. Localities involves mainly interposal communication such as visit by extension officer and farmer to farmer contact while cosmopolites may also include some of localities means that mainly deal with information transfer to a large social community at the same time. It includes radio, television and other printed materials.

Means of communication have a great influence on the rate of adoption of innovation. Each innovation is best suited to a given type of communication means. Therefore it's critically important to identify means of communication that will result into improved rate of adoption of a given technology. Also depending on the level of illiteracy of target group and infrastructure, some means of communication do not bring about effective communication in all communities. So it's important to ensure the means of communication selected are suitable to a given community, for example physical contact is a well suited to FFS farmers.

2.1.8Comparison in Production between FFS and Non FFS Farmers

Comparison of productivity among FFS and non FFS members is one of the important aspects in determination efficiency of FFS methodology in improving farmer's productivity and income. Crop productivity is defined as the value of production per unit area (Davis et al., 2010; Nyamaiet al., 2012). FFS members are expected to excel non FFS production performance. This is because FFS members are expected to transfer knowledge and skills gained in seasonal long training sessions to their own main farm after graduation (Truong, 2008).However, there is limited or conflicting evidence as to their effect on productivity and poverty, especially in many places (Davis et al., 2010; Godtlandet al. (2004). This study therefore aims at assessing the

performance of FFS group in order to shed light on the role of FFS in dissemination of technologies.

2.2Basic Concept of Farmer Field Schools (FFS)

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 agriculture 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).

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.

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 agriculture in Vietnam because the government is keen to improve agriculture exports, while farmers feel that agriculture 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).

2.1. Empirical studies of FFS in different countries

2.1.1 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

agriculture 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 evaluation 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 agriculture 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).

In countries across the world, FFS alumni have been successful in taking greater control over their lives. In Kenya, Farmer networks 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).

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 associates, 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.

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 programs 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 KindoKoisha 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-UKandBoARD 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.

Many qualitative evaluations need be reported in aspects of the research process in greater detail to allow users to assess their credibility and applicability. In particular, clear reporting on objectives, on methods of sampling, data collection and analysis should be provided. Greater use of structured abstracts will be facilitating easier access to quantitative and especially qualitative research. Future studies should include data on views and experiences of FFS facilitators and agricultural extension workers

2.2 Conceptual Framework

The conceptual framework (Figure 1) of this study aims at assessing the evaluation of FFS in terms of improved agriculture productivity as a result of acquisition and utilization of improved agriculture technology/knowledge and practices (Anderson and Feder, 2004). They are much influenced by a number of independent variables such Age, Sex, Income, Education , Family size, Farmer experience, Access to market, Access to Credits, Access to extension services Perceptions of smallholder agricultural farmer towards FFS approach/technologies, Knowledge gain through extension services and agronomic practices (Land preparation, planting, weeding, use of improved varieties, fertilizer, pest and diseases control) are assumed to be the most important explanatory variables that might influence the dependent variables knowledge, attitude and practice.

According to Feder*et al*. (2004) knowledge can be broadly defined as the possession of analytical skills, critical thinking, ability to make better decisions, familiarity with specific agricultural practices, and understanding of interactions within the agro-ecological system.

Overall, FFSs seek to improve farmers' problem solving abilities by sharpening their observational skills and decision-making ability, thereby relying on the diffusion/sharing of information or knowledge within farming communities (Ebewore, 2013). In addition, evaluation of FFS is accomplished through innovation and the adoption of new technologies to increase the productivity of smallholder farmers. Based on the conceptual framework, it is assumed that effective FFS will lead to increase agriculture productivity by smallholder farmers.

However, evaluation of FFS is dependent on the appropriate training/competence of extension officers labeled as facilitators; effective participation of farmers in FFS and the extent to which new or improved technologies/knowledge/practices influence farmers' attitudes and overall-

behavioral change; as well as access to required inputs. The factors are based on Tanzanian socio-economic, political, cultural and environmental characteristics which include farmer's socio-economic characteristics and technological factors as access to required inputs which are the independent variables that influence the dependent variable (the evaluation of FFS on smallholder agriculture farmers' agricultural productivity (Mugenda, 2009).

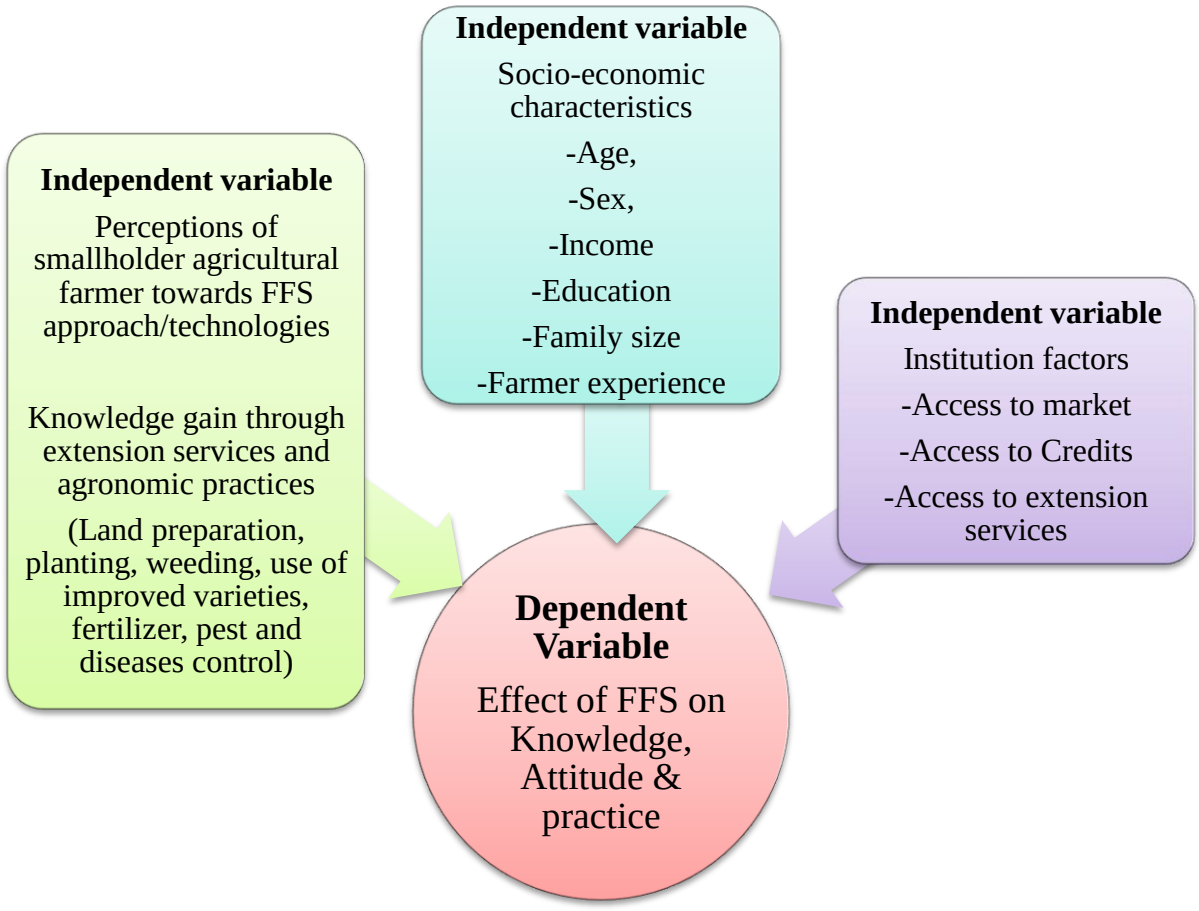


Figure 1: Conceptual diagram of the study

Source: Own computation

CHAPTER THREE

3. Research Design Methodology

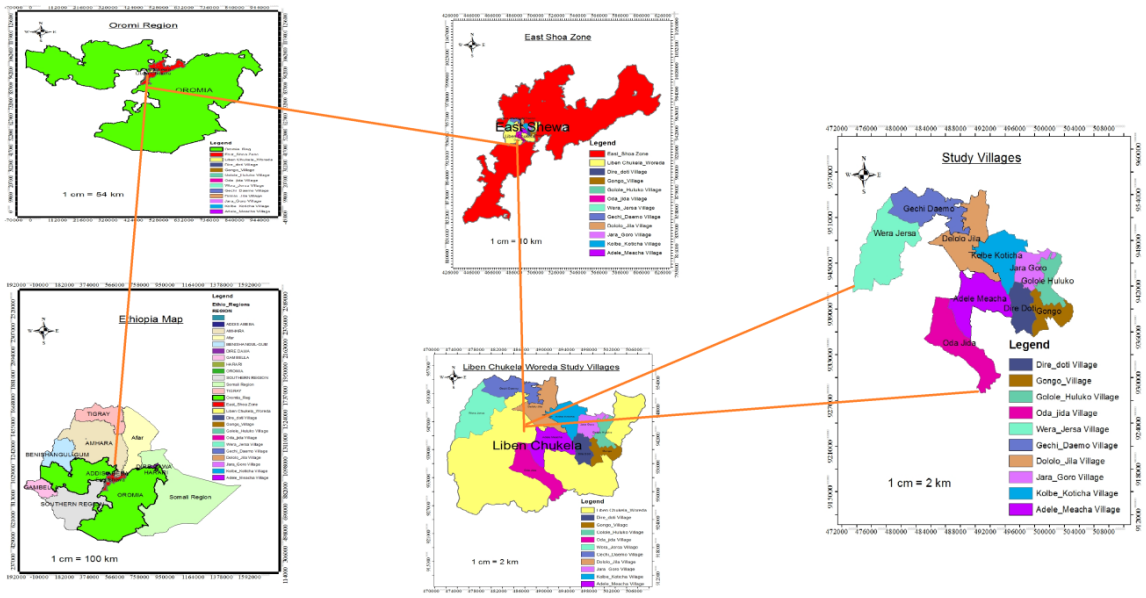
3.1Introduction

This section presents the study research methodology. The section is organized as follows: the description of study area is presented first, followed by research design and approach, source of data, sample size and sampling technique, then data collection tool, validity and reliability, model specification, and finally the method of data analysis is presented.

3.2 Description of study area

LibanChukala is one of the districts in East Showa zone of Oromia Regional State.

It is located in the Great Rift Valley, and therefore is predominantly a semi-arid area with severe shortage of water. The altitude of the area ranges from 1500-3000 m asl. Mt Ziquala (Chukala) with a crater lake on top is the highest point in the district. Adulala is the woreda's town. (Wikipedia). According to CSA (2007) national census report in 2007, the total population for this woreda was 76,351, of whom 39,754 were men and 36,597 were women; 2,930 or 3.84% of its population were urban dwellers.The majority of the inhabitants said they practiced Ethiopian Orthodox Christianity, with 71.05% of the population reporting they observed this belief, while 18.49% of the population were Protestant, and 9.94% of the population practiced traditional beliefs.



Map of the study area.

Source: Liben chukala District Agriculture and Natural Resource Office

3.3 Research Design and Approach

Research design is a master plan specifying the methods and procedures for collecting and analyzing the required data. The choice of research design depends on predetermined objectives that the researchers want to achieve. According to Kotzar et al., (2005), research design is defined as the plan and structure of investigation and the way in which studies are put together. Cooper et al. (2003) also define research design as the process of focusing on the researcher's perspective for the purpose of a particular study.

The study was design to identify the effect of farmer field schools project. The researcher used quantitative data in respect with research variables of extension service delivery. Since it tries to describe the problem and attempts to explain the phenomenon with quantitative research approach. Thus, due to quantitative nature of data, the researcher was use deductive reasoning to examine the cause and effect relationships between evaluations in relation with farmer field schools because deductive reasoning starts from laws or principles and generalizes to particular mean that the researcher generalized the position of farmer field schools depend on extension service delivery. As noted by Kothari (2004), explanatory research design examines the cause

and effect relationships between dependent and independent variables. It is an explanatory research design whereas quantitative explanations are quantitative research approach.

3.4 Source of Data and Method of Data Collection

The researcher used both primary and secondary data. Primary data on socio economic characteristic of farmers, technologies taught under FFS, knowledge of farmers on agricultural productivity levels of farmers was collected. Also farmers' views on FFS as a training approach was measured based on their perception towards the approach using a likert scale ranging from one for agreed to three for strongly disagree. Data was collected using a structure questionnaire administered to 200 respondents. Structured questionnaire was designed in a set of open and close ended questions in respect to all the objectives. A checklist was administered to key informants on the extent on which FFS and non FFS farmers has addressed demand of needed technologies on agricultural productivity knowledge and to what extent FFS has influenced farmers to adopt and make use of knowledge. Secondary sources of data was used from published materials, case studies, impact assessment, manuals and procedures which are available within the organization

3.5 Sample Size and Sampling Technique

A stratified random sampling technique with equal allocation in a survey data was applied, to obtain two strata (FFS and NFFS) on which the differences on the levels of knowledge and skills on the use and application of agricultural productions were evaluated. Ary*et al*. (1979) recommended equal allocation of subjects as most appropriate when characteristics of interest are for a particular stratum, which in this study correspond to examining the effect of farmer field schools projects, on agricultural productivity.

Lists of farmers participating in FFS and NFFS were obtained from the Libenchukala agriculture and natural resource district office in east shewa zone. Using random number generator, 100 FFS members were randomly selected from one stratum and another 100 NFFS members from the next strata. However, only 60 FFS and 60 NFFS farmers were selected for the questionnaire. The FFS farmers were drawn from 10 kebeles where FFS has been operated while NFFS farmers were drawn from 10 locations where FFS has not been introduced to date in order to limit possibilities of exchanged agricultural production messages between the FFS and NFFS farmers.

The stratified random sampling applied ensured a more representative sample for the results to be inferred to a larger population (Ary*et al*., 1979).

The researcher was gathered and integrated the intended information from the respondents. Therefore, In order to determine the sample sizes that represent the study area is calculated using (Yamane Taro, 1967) sampling formula.

$$n = \frac{N}{1 + N * (e)^2}$$

$$n=10000 /1+10000 (0.07)^2$$

$$10000 /1+10000 (0.0049)$$

$$10000 /1+49=10000 /50$$

$$=\underline{200}$$

Where; “n” is the sample size, “N” is the population size and “e” is the level of precision. At 95% confidence level, degree of variability=0.07 and level of precision/sampling error= 7%. (Yamane Taro, 1967)

3.6 Data Collection Tool

The researcher was used the questionnaire that comprise of different questions to be administered directly to respondents. The questionnaire have different sections, ranging from the Bio data of the respondents to questions that help the researcher collect information/data about the subject at hand. There was face-to- face interview between the interviewer (researcher) and interviewee (respondent) for the FFS and non FFS farmers group.

3.7 Validity and Reliability

The questionnaire was being subject to face validity and content validity by the assistance of experts in the research method. Thus the pre-test was done before actual entrance of data collection. Indeed necessary modification was making on the items and unclear questions were modified or remove from index. The content validity of the instrument for the present study was

ensured as the service quality dimensions and items are identified from the literature and were reviewed by professionals and academicians. Pilot tests were then conduct with FFS group who was sees as similar to the population for the study. The purpose of the pre-testing was to refine the questionnaire and to assess the validity of measures in Ethiopian context.

The reliability was measure so as to find out the degree to which the measuring items gave similar results over a number of repeated trials. A test – retest method was use to estimate the degree to which the same results can be obtaining with a repeated measure of accuracy of the same concept in order to determine the reliability of the instrument. Bells (1993) cited in (Eriksson, 2002) states that reliability with regards to the consistency of the results is obtained from the instrument used in the research. The present study is reliable because it used valid strategies and techniques appropriate to the research objectives. It has been tried also to present a detailed evidence of the research plan (i.e. details of the research site, method of sample selection, instruments used) and its implementation in the methodology section to assure the study's reliability.

3.8 Model Specification

Based on the theoretical review and empirical considerations the following model was developing by using binomial logistic regression model. Binomial logistic regression model 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. The mathematical (functional) expression of the model is given as follows:

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$$Yij= \alpha+\beta1X1+ \beta2X2+ \beta3X3+ \ldots, + \beta6Xn. + \varepsilon i$$

Where:

Yi = Dependent variable (FFS on knowledge and practice) (This can be measured through application to own farm)

β1, β2..., β6 = Coefficients of the independent variables showing how they influence Y

Xs = Independent variables

X1=Age

X2=Sex

X3= Family size

X4 = Education level of the farmer

X5= people involved household production

X6= participation in FFS

X7=Farmer Experience

X8=Income Level

X9=Extension Services

X10=Market

X11=Credits

εi= error term

No	Variables	Symbol	Measurements
1	Age	A	Number of Years
2	Sex	S	(Male or Female, 1=Female, 0= Otherwise)
3	Family Size	FS	Ordinal Level
4	Farmer Experience	FE	Number of Years
5	Education Level	EL	Level of Formal Schooling
6	Income Level	IL	Income Per Month
7	Extension Services	ES	School Member's Visit to Extension Agents
8	Market	M	Ordinal Level
9	Credits	C	Ordinal Level
11	Knowledge	K	Scale
12	Practice	P	Year Round Management

The Binomial logistic regression model was to determine the effect of farmer field schools projects, on agricultural productivity among respondents. The important variables were 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).

3.9 Method of Data Analysis

Data collect from the primary sources was organize, coded, processed and analyzed using Statistical Package for Social Sciences (SPSS) version 20 computer program. The quantitative primary data was analyzed to determine basic statistics as frequencies, percentages, mean and standard deviations. Descriptive statistics was use on the socio economic characteristic of respondents. Chi-square was used to compare knowledge acquisition on effective agricultural productivity practices between FFS and non-FFS farmers. Differences in production levels between the two groups were compared by t-test.

Binomial logistic regression was to determine the effective of socio-economic factors on agricultural service productivity among respondents.

A logistic regression technique was employ to examine effective farmer's field school extension service delivery. This technique was employ to find the model which was best fit in describing the relationship between the dichotomous characteristic of dependent and independent variables.

CHAPTER FOUR

4. Data Analysis, Presentation and Interpretation

The point of this chapter is to present and discuss results of data obtained from method involved in this study. As stated in chapter one the broad objective of this study was to assess effect of farmer field schools projects, on agricultural productivity; the case of libenchukala district east shewa zone of Oromia region. Further, as noted in the previous chapters (chapter one and three), in order to achieve the broad objective the study developed the assumption. It took the student researcher distribution 200 questionnaires, of this 152 were returned but 32 of them were rejected as a result of so many omissions in filling. Overall, 120 questionnaires complete responses were returned from the district.

4.1 Demographic characteristics of the respondents

Table 1: Distribution of respondents by demographic characteristics (n = 120)

Variable		Frequency	Percentage (%)
Sex	Male	61	51.8
	Female	59	49.2
	Total	120	100
Age of respondent	18-28	24	20
	29-39	30	25
	40-50	52	43.3
	51-56	14	11.7
	Total	120	100
Marital status of respondent	Married	91	75.8
	Single	11	9.1
	Widowed	4	3.2
	Divorced	14	11.5
	Total	120	100
Education level	Completed Primary Education	27	22.5
	Completed secondary	-	-

	Level IV educational school	-	-
	No formal education	93	77.5
	Total	120	100
Land ownership	Inherited from family	76	62.7
	Rented	25	20.7
	Bought	19	15.8
	Total	120	100

Source: field survey data, 2020

The above table indicates that socio-demographic characteristics of the respondents. Out of the 120 respondents from three wards 61 (50.8%) were males and 59 (49.2%) were females. Of the 120 respondents, 91 (75.8%) were married, 14 (11.5%) were divorced, 11 (9.1%) were single and 4 (3.2%) were widowed. Furthermore, it was established that majority, 93 (77.5%) had no formal education and 27 (22.5%) had Primary school level of education. On land ownership out of the 120 farmers, 76 (62.7%) acquired their land through inheritance, 25 (20.7%) rented and 19 (15.8%) through purchase the land.

In addition, findings show that out of the 120 respondents, 24 (20%) had their ages ranging between 18 and 24 years and 30 (25%) their ages ranged between 29 and 39 years. Also, 52 (43.3%) of the respondents their ages ranged from 40 to 50 years old, while 14 (11.71%) of the respondents had their ages ranging from 51 to 61years old.The above data shows majority of the respondents were it is evident that to identify the FFS and NFFS possesses all the features of participatory extension system. These results are supported by Okafor (2006) who found that the FFS and NFFS is a better extension approach in terms of participatory extension approaches.

4.2 Socio-economic factors influencing farmers' participation in FFS training

The influence of socio-economic factors of respondents on participation in FFS training was determined by measuring their level of satisfaction on knowledge obtained through FFS to the smallholder's socio-economic attributes.

4.2.1 Perceptions of Farmers on FFS Approach in disseminating agricultural productivity Knowledge

Table 2: Perceptions of trained farmers on FFS approach in disseminating agricultural production knowledge (n = 60)

Preferred characteristic of FFS	Response		
	Agree N %	Neutral N %	Disagree N %
FFS training helps provide knowledge on agriculture production	52(86.7)	7(11.6)	1(1.7)
FFS increase contact with extension agents	51(85)	8(13.3)	1(1.7)
FFS increase access of knowledge disseminated on agriculture production	52(86.7)	7(11.7)	1(1.7)
FFS makes farmer more competent in delivery of the knowledge on agriculture production	54(90)	4(6.7)	2(3.3)
Knowledge gained through FFS helps in increasing agriculture production	54(90)	4(6.7)	2(3.3)
Knowledge gained through FFS improve agriculture management	55(91.7)	3(5)	2(3.3)
Usually teach other farmers on good agriculture production practices gained through FFS	48(80)	8(13.3)	4(6.7)
Usually I learn from other trained farmers on good agriculture production practices	45(75)	12(20)	3(5)
Usually I follow what I learn during FFS session	55(91.7)	0(0)	5(8.3)
FFS groups remain coherent for a long time after graduation	15(25)	-	45(75)
FFS continue receiving significant support from the government after graduation	3(5)	7(11.7)	50(83.3)
Extension officer continues with their efforts to provide services to FFS members after graduation	15(25)	-	45(75)

Source: field survey data 2020

The above table shows that the respondents who had attended FFS were asked to indicate their perceptions towards FFS as an approach in disseminating agricultural production knowledge and skills. Respondents were required to provide their opinions based on a likert scale ranging from one for agree to three for disagree on the various predefined aspects. 'Agree' indicates the relative strength of FFS and hence its role in causal to the improvement of farmers' incomes through agricultural productivity. On the other hand, 'disagree' indicated areas in which farmers identified limitation of FFS while a 'neutral' position indicated that FFS that neither positively nor negatively impacted on the economic welfare of the agricultural farmers. In this study, an aspect is considered to have been agreed or disagreed when it was shown by at least 60% of respondents (See Table 2).

The findings in table 2, explain that 86.7 % of respondents agreed that FFS training helped in providing knowledge on agricultural productivity while 85 % agreed that FFS increased contact with extension agents. Also 86.7 % agreed that FFS increased access of knowledge disseminated on agriculture while 90 % agreed that FFS made farmer more competent in practicing knowledge on agricultural productivity. More than 91% agreed that knowledge gained through FFS improved agricultural management, while 80% were of the opinion that the knowledge gained through FFS made them to teach other farmers on good agricultural productivity practices gained through FFS while 75% said that they usually learn from other trained farmers on good agricultural productivity practices, 91.7% maintained that they usually followed what they were trained during FFS.

On the contrary, it was noted in some cases that FFS groups could not remain coherent for a long time as shown by 75% of respondents. Probably this could be due to withdrawal of funding and facilitation extended during training that is not continued after farmers have graduated. Also, 95% of the respondents maintained that FFS did not continue receiving significant support from the government after graduation and 75% said that extension officers did not continue with their efforts to provide services to FFS members after graduation, reasons that could also have lead to disintegration of FFS group. These findings indicates that FFS, as an extension methodology has generally proved to be effective in participatory knowledge development and dissemination among agricultural farmers in the study area. However there are challenges that should be addressed in order to maintain and further achieve positive and sustainable benefits. For example

small financial and technical supports provided to FFS groups are only capable of maintaining them to graduation. This implies that there was no institutional arrangement that was put in place and which could prepare concussive environment in enhancing long term achievement of FFS through follow ups as a means of technological reinforcement.

4.3 Socio-economic factors influencing farmers' participation in FFS training

The influence of socio-economic factors of respondents on participation in FFS training was determined by measuring their level of satisfaction on knowledge obtained through FFS to the smallholder's socio-economic attributes.

4.3.1 Satisfaction on knowledge dissemination through FFS by sex

Table 3: Satisfaction of respondents on knowledge disseminated through FFS by sex (n=60)

Farmer status	Sex of respondents	Satisfied	Not satisfied	n	df	$\chi 2$	P - Value
FFS farmers	Male	21	4	25	1	1.853	0.06ns
	Female	29	6	35			
	Total			60			

ns= Not statistically significant at $p< 0.05$

The above table indicated that from FFS farmers out of 60 respondents 25 male. Out of 25 farmers 21 said were satisfied with knowledge disseminated on agricultural productivity and 4 said were not satisfied with knowledge disseminated on agricultural productivity and women farmers out of 35 farmers 29 said were satisfied with knowledge disseminated on agricultural productivity and 6 said were satisfied with knowledge disseminated on agricultural productivity, and the differences in satisfaction in knowledge transfer between men and women was found not to be statistically significantly different, p= 0.06ns. It is argued that FFS graduates had higher knowledge scores of the control group.

4.3.2 Satisfaction of knowledge dissemination through FFS by education level of respondents

Table 4: Satisfaction of respondents on knowledge disseminated through FFS by education (n =120)

Farmers status	Education category	N	%	$\chi 2$	P - Value
Farmers who did not attend FFS.	No formal education	52	86.7	7.881	0.002**
	Primary education	8	13.3		
	Secondary education	-	-		
	Total	60	100		
Farmer attended FFS	No formal education	39	65		
	Primary education	21	35		
	Secondary education	-	-		
	Total	60	100		

** Statistically significant at $p< 0.05$

The above table 4 Show satisfaction of knowledge disseminated through FFS by education level of the respondents. Of the 60 FFS farmers 39 (65%) acquired No formal education and 21(35%) acquired primary education. While 60 non FFS farmers 52 (86.7%) acquired non formal education, and 8 (13.3%) acquire primary education.

4.3.3 Satisfaction of knowledge disseminated through FFS by age of respondents

Table 5: Distribution of respondent on satisfaction of knowledge disseminated through FFS by age (n=60)

Variables	Farmers status	Age categories	N	df	$\chi 2$	ρ– Value
Satisfaction on knowledge disseminated	Farmer attended FFS	14-24	14	1	1.649	0.324ns
		29-39	26			
		40-50	11			
		51-61	9			
	Total		60			

ns= Not statistically significant at p< 0.05

The above table shows satisfaction of knowledge disseminated to farmers by age of respondents through extension services. The result from chi-square test shows that there was no significant association between age and satisfaction of extension services at (p<0.05). Rogers (2003) indicated that there is inconsistence about the relationship of age and innovativeness found that earlier adopters of agricultural innovations were younger. In this study the dominant age of agricultural production in both wards ranged between 29-39 years farmers and 40-50 years. This study is in line with Matata*et al*. (2010) who found that the leading age group among respondents participating in improved fallow performs among smallholder farmers composed of members with age ranging 20 to 40 years.

4.4 What is the perception of smallholder farmers on the effectiveness of FFS in as far as improved agricultural productivity is concerned

4.4.1 Perceptions of FFS graduates on the effectiveness of FFS

Table 6: Perception of FFS graduates on the effectiveness of FFS (n=60)

Attribute	Agree N %	Undecided N %	Disagree N %
FFS uses experimental learning by doing with emphasis on participatory group approaches to help farmers make decision and solve problem	60(100)	0(0)	0(0)
FFS enable farmers to diagnose their problems, identify solutions and develop plans and implement them with or without support from outside	60 (100)	0(0)	0(0)
FFS enhance acquisition of knowledge, skills and technique on new improved agricultural technologies	58 (96.7)	2(3.3)	0(0)
FFS enhance sharing and diffusing of knowledge amongst participant and neighbors	58 (96.7)	2(3.3)	0(0)
FFS enhance effective utilization and/or adoption of new/improved agricultural technologies and improved farming practices	57(95)	0(0)	3(5)
With FFS, farmers decides a specific needs and come up with an action plan to address such needs together	56 (93.3)	1 (1.7)	3(5)

FFS encourages effective use of participatory approaches whereby each individual is actively involved	57 (95)	3(5)	0(0)
FFSs encourage smallholder farmers to learn through experimentation, building on their own knowledge and practices and blending them with new ideas	58(96.7)	0(0)	2(3.3)
Overall, FFS training emphasizes building on the farmer's ability to experiment and draw conclusion and it empower farmers to improve their socio-economic conditions	59(98.3)	0(0)	1(1.7)

Source: field survey data 2020

As shown in table 6, all (100 %) of the respondents agreed with the statement that FFS uses experimental learning by doing to impart knowledge to farmers. FFS enable farmers to diagnose their problems, identify solutions and develop plans and implement them with or without support from outside, all (100%) of the respondents agreed with the statement.

These findings show that farmer's perception about a new technology is the first step in the utilization process; the agricultural innovation literature suggests that knowledge only translates into adoption if a set of enabling factors and conditions exist, including farmers' positive perception of the technology's benefits knowledge acquisition and utilization. In particular, they encourage farmers to develop their critical thinking and make sound farm management decisions, resulting in adoption of improved technologies.

4.4.2 Awareness of NFFS members on the effectiveness of FFS

Table 7: Awareness of NFFS members on the effectiveness of FFS

Attributes	Frequency	Percent
For the period you have stayed in this village, have you ever heard of FFS anywhere? (n = 60)		
Yes	15	25
No	45	75
If yes, what knowledge do you have of FFS? (n = 15)		
Training farmers on demonstration plots	5	33.3
Providing new technologies to farmers through training	6	40

No knowledge	4	26.7
Do you have contact with extension officers (n = 60)		
Yes	56	93.3
No	4	6.7
Frequency of contact with extension officers (n = 56)		
Once in two weeks	21	35
Once a month	19	31.7
Once in three months	12	20
Less than once in six months	4	6.7

Source: field survey data 2020

This section provides data pertaining to the level of awareness among NFFS members on the effectiveness of FFS on improved agricultural productivity. To determine this, respondents were asked if they had ever heard of FFS in their area. The results in table 7 show that of the 60 respondents interviewed only a quarter (25%) had heard about the FFS. However, of the 25% respondents, two fifths (40%) indicated that they knowledge about FFS and that it is all about providing new technologies to farmers through training, a third (33.3%) said FFS was a means of training farmers using demonstration plots, yet about a quarter (26.7%) stated that they heard about FFS but lack more knowledge on the same.

Additionally, the study investigated the level of contact between NFFS members and extension officers. Based on information obtained by the study as shown in table 7, it is indicated that of the 60 respondent interviewed, majority (93.3%) stated that they had contact with extension officers however; a few (6.7%) do not have any contact with extension officers. Similarly, the study further investigated how frequent NFFS graduates are being reached by extension officers; about a third (35%) reported that they contacted extension officers once every two weeks. Further to the above, 31.7%, 20%, and 6.7% of the respondents pointed out that they had contact with extension officers once a month, once in three months, and once in six months respectively.

4.5 The regression analysis on influence of socioeconomic factors influencing agricultural productivity

Table 8: Regression analysis on socio-economic factors influencing agricultural productivity (n=120)

Predictors	Un-standardized Coefficients		Standardized Coefficients	t	ρ– Value
	B	Std. Error	Beta		
Age of Respondent	-3599.463	1120.803	-.400	-3.212	.002**
Participation in FFS	3033.753	807.461	.403	3.757	.000**
Sex of Respondent	-1019.909	796.351	-.137	-1.281	.203ns
Marital status	3486.377	1595.661	.274	2.185	.031**
Education level	2983.302	1886.880	.488	1.581	.117ns
Total number of people in household	-38.022	180.391	-.042	-.211	.833ns

NB: ** = Statistically significant at p< 0.05; ns=Not statistically significant at p<0.05

R square = 51.2.

According to Kothari (2004) regression refers to the statistical determination of a statistical relationship between two or more variables. Beta values (β) which are the partial regression coefficients (as the optimal linear estimates of the dependent variables) reflects the weight to be applied to an in dependent variable when one or more specified independent variables are included in the equation. And the Standard Error (SE) is an estimator of magnitude of error that can be expected in estimating future values of the dependent variables. The t- value signifies the departure of the partial regression coefficients of independent variables. All t- values are compared to the standardize regression beta (β) value.

Table 8 shows findings of regression analysis on the annual agricultural productivity and socio-economic factors of respondents. The regression modal of annual agricultural productivity and socio-economic factors was statistically significant at (p = 0.002). Results show that age of the respondents, marital status, and farmers participation in FFS had statistically significant negative

(+ β) influence on the annual agricultural productivity (at $p \leq 0.05$: t = -3212, -2.185, and -3.757 respectively). In other words, they were positively correlated with agricultural productivity. On the other hand, sex of the respondent, their education level and total number of people in household had no statistical significance effect on the level of agricultural productivity (at $p \leq 0.05$, t= -1281, 1.581 and -211 respectively).

4.6 Comparison of production levels between FFS and non FFS Farmers

Table 9: Views on trend in agricultural production by attendance in FFS (n=120)

Variables	Responses	Frequency	%
Farmers attended FFS	Increasing	50	83.5
	Remained the same	6	10
	Decreasing	4	6.5
	Total	60	100
Farmers who did not attend FFS	Increasing	11	18.3
	Remained the same	33	55
	Decreasing	16	26.7
	Total	60	100

Source: field survey data 2020

Result in table 9 show distribution of the respondent to their views on production levels between FFS farmers and non FFS farmers on agricultural production. Three factors namely reasons for increased production, agriculturalfarm size (in hector) and annual agricultural production (in Kgs).

Table 9 considered the opinion of both FFS and non FFS farmers in the trend of their agricultural production. Among the FFS farmers, 50 (80.3%) indicated that production level had generally increased, 6 (10 %) observed that production remained the same whereas 4 (6.5%) observed that production had increased. For non FFS farmers, 11 (18.3%) indicated production had decreased 33 (55%) indicated that their production remained the same and 16 (26.7%) felt that production level had decreased. In this case, the results implied that FFS farmers had realized more

production compared to non FFS farmers. This might be due to the application of knowledge acquired during training.

4.6.1 Reasons for increase in agricultural production

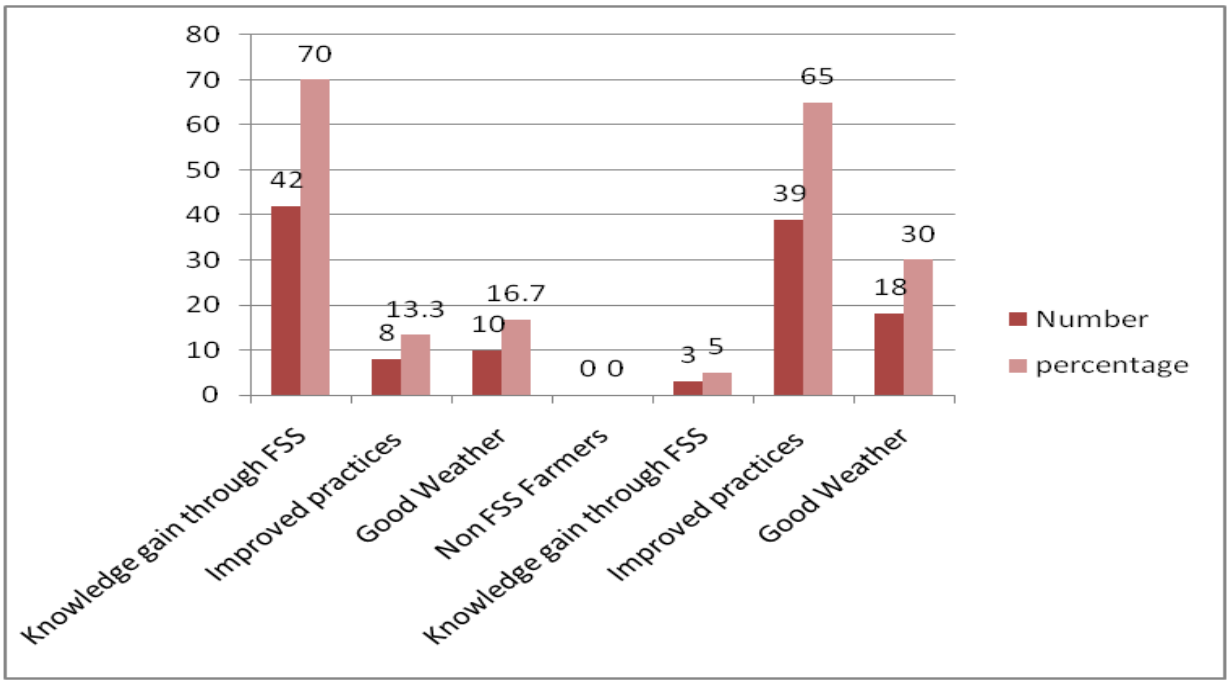

Figure 3: Distribution of respondent according to the reasons for increase of agricultural production (n=60)

Findings in Fig. 3 below show the reasons given by both FFS and non FFS farmers. For FFS farmers out of 60 respondents 42 (70%) indicated that agriculture production had increased due to application of knowledge gained through FFS training, 8 (13.3%) of the respondents felt that the production were increased due to improved practices and 10 (16.7%) of the respondents production increase due to coincidences of good weather.

While For FFS farmers out of 60 respondents 3 (5%) indicated that agricultural production had increased due to application of knowledge gained through FFS training, 39(65%) of the respondents felt that the production were increased due to improved practices and 18 (30%) of the respondents production increase due to coincidences of good weather. This implies that FFS

contributed significantly to the increased productivity in agricultural production in the three wards.

4.6.2 Size of agricultural farms, average agricultural production and cost of production

Table 10: Distribution of farms size, average agricultural production and cost of production between FFS and Non-FFS farmers (n=120)

Variables	Categories	n	Df	Mean	f	Sig
agriculture farm size in hectare	Farmers who did not attended FFS	60	1	2.5	.995	.321 ns
	Farmers attended FFS	60		2.9		
	Total	120		2.7		
Annual agriculture yield in kgs	Farmers who did not attended FFS	60	1	1945	10.959	.001**
	Farmer attended FFS	60		4428		
	Total	120		3187		
Total income earned after selling agriculture	Farmers who did not attended FFS	60	1	789 466	6.107	0.05**
	Farmers attended FFS	60		302 0616		
	Total	120		1 905 041		

ns= Not statistically significant at p< 0.05

**= Statistically significant at p< 0.05

Findings in the above table show that, size of agricultural farms for FFS farmers ranged from a minimum of .50 to 12 hectare. While findings of non FFS farmer' shows that the size of agricultural farm ranged from a minimum of .25 to 10 hectare. Findings from t- test shows that there is no statistical significant difference in size of land between FFS and non FFS respondents (p= 0.321).

Implication of this result presented in table 10 is that there were no statistically significant differences between FFS farmers and non FFS farmers on size of agricultural farm. This furthermore implies that farm size did not influence agricultural production. This is true because productivity depends on technology and improved practices applied in a given field rather than the size of the field.

Furthermore, findings from table 10 show that the annual agriculture ranged from 210 kgs to 25 200kgs with an average of 3187.05kgs. From the findings, yield for FFS respondents ranged from 650 to 25 200kgs whereas yield for non FFS respondents production ranged from 210 to 10 500 kgs. Findings from t- test shows that there is statistical significant difference in agricultural production between FFS and non FFS respondents (p= 0.01).

The implication of this difference is that farmers who attended the FFS had benefited knowledge and skills gained in season-long training sessions for improved agricultural practices compared to those who did not attend FFS training. It further implies that FFS was effective in improving agricultural production in the study area.

Furthermore, findings from table 10 show that the cost of agriculture yields for the respondents who attended FFS training and those who did not attend the FFS. The findings show there is statistically significant difference in cost of production between farmers attended FFS training and farmers who did not attended FFS training (p=0.003).

This implies that economic power of farmers as measured by individual farmer's total annual income is of critical importance in influencing the level of agriculture yield. This is because the more farmers improve their financial positions the more they are able to timely purchase inputs in the required quantity and quality, including acquisition of hired labor at peak periods.

4.7 Factors Facilitating Dissemination of Information to agriculture Farmers

4. 7.1 Access to extension services by categories of farmers

Table 11: Distribution of respondents by access to extension service (n =120)

Access to extension service	Number of contact	Frequency	Percentage	$\chi 2$	ρ– Value
Farmers who did not attend FFS	Every weekly	-	-	10.927	.004**
	Once per month	-	-		
	Twice per year	60	100		
Total		60	100		
Farmers attended FFS	Every weekly	60	100		
	Once per month	-	-		
	Twice per year	-	-		
Total		60	100		

**= Statistically significant at $p< 0.05$

The findings in table 11 indicate that in FFS group 24 (40%), were visited every week, 17 (28.3%) were visited once per month and 19 (31.7%) were visited twice per month. While for non FFS farmers findings show that 9 (15%) of the respondents were visited by extension staff once per week, 31 (51.7%) visited by extension worker once per month and 20 (33.3%) were visited twice per month. The findings show that there is significant difference in number of visits by extension workers between the two groups at 95% level of significant, $p=0.04$, thus $p< 0.05$. The chi-square results, however, reveal that there is significant difference in respondents' contact with extension officers between FFS farmers and non FFS farmers. Thus routine extension services are inadequate except where there are funded project.

4.7.2 Information acquisition from other farmers

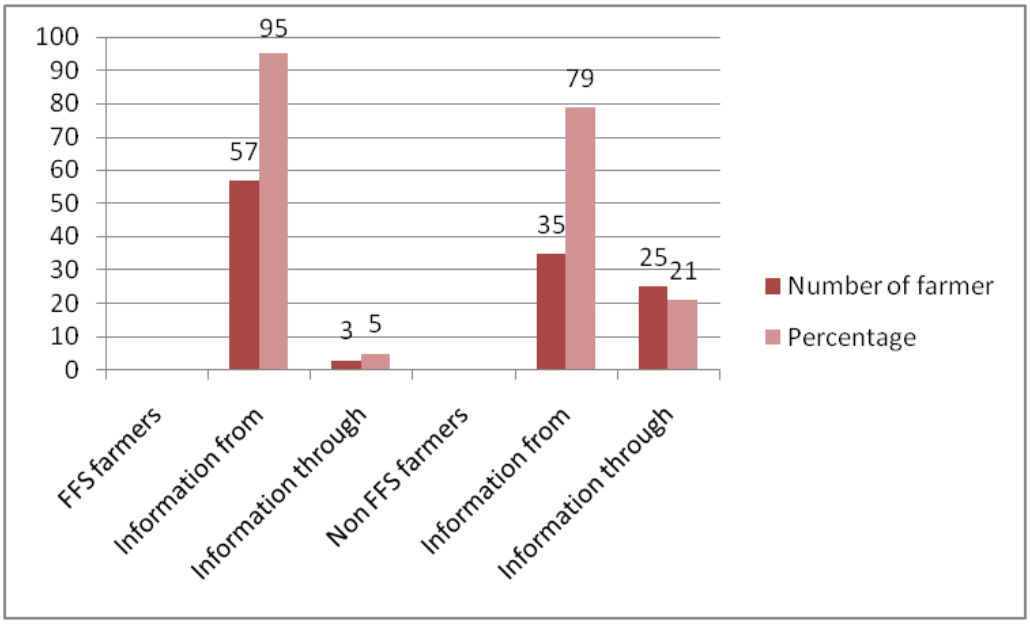

Figure 4: Distribution of respondents based on access to agriculture information (n=120)

Findings in Fig. 4 show distribution of respondents based on access to agriculture information. For FFS farmers out of 60 respondents 57 (95%) access information of agriculture through farmer to farmer contact and 3 (5%) access information of agriculture through media. While for non FFS farmers out of 60 respondents 35(79%) acquire information through other farmers and 25 (21%) access information of agriculture through media. This implies that farmer to farmer contact was practiced by farmers within and without FFS groups. This result indicates that major means of communicating technological information in agriculture production was through farmer to farmer.

4.7.3 Printed materials as a source of information to FFS and non FFS farmers

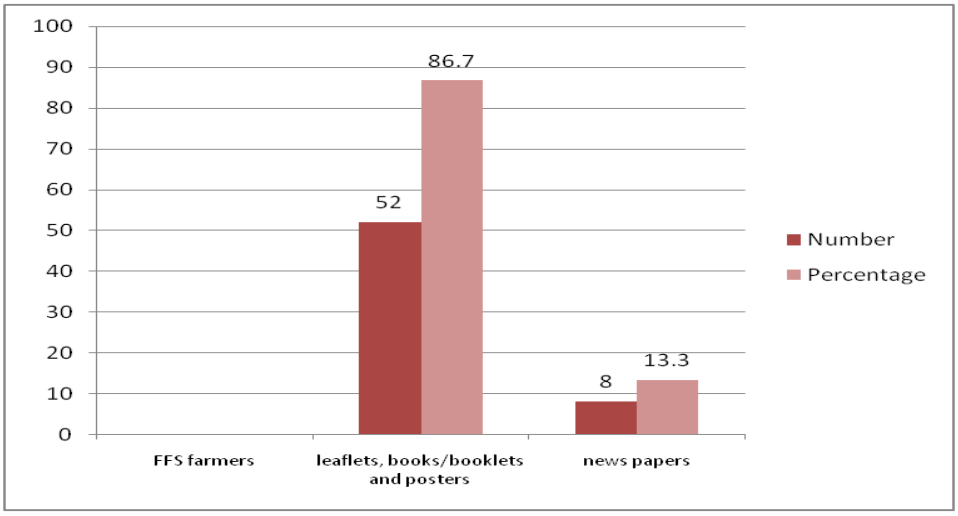

Figure 5: Distribution of respondent based on printed materials as a source of information

Findings in Fig. 5 show distribution of respondents based on access to agricultural information through printed materials. Of the 60 respondents who are 52(86.7%) from FFS group access information through leaflets, books/booklets and posters. While 8 (13.3%) farmers access information through newspaper. Majority of the respondents acknowledged that using printed materials like newspapers, magazine, leaflets and other type of written materials in agriculture.

4.8 Motivation to Participate in the FFS Approach

Table 12: Farmers' encouragement/motivation to participate in the FFS approach (n=60)

Variables	Frequency	Percentage
Farmer to farmer interaction facilitated through FFS	10	16.6
To improve productivity enabled by FFS	21	34.9
Technology disseminated through FFS	15	25.3
Good result from fellow farmers who were previous FFS graduates	14	23.3
Total	60	100

Findings in table 12 show distribution of respondents based on encouragement to participate in FFS approach. Of the 60 respondents from FFS group, 21 (34.9%) said that were encouraged to participate in FFS in order to improve productivity. Another 15 (25.3%) aspired to join FFS due

to technology disseminated through FFS. While 14 (23.3 %) of the respondents were encouraged to participate after seeing good result from fellow farmers who FFS graduates. and 10 (16.6%) said were encouraged to participate in FFS through farmer to farmer interaction facilitated through FFS.

From the Findings, it can be seen that major reason for participation in FFS is the desire for improved productivity which leads to improved farm-based incomes. Participation of extension programs and consequent adoption of improved technologies is the expected profitability of agricultural enterprises a result of such technologies.

4.9 Constrain to Participate in FFS Approach

Table 13: Farmers' constrain to participate in the FFS approach (n=60)

Variables	Frequency	Percentage
Lack of time due to socio economic commitments	22	37.2
Learning priorities are sometimes imposed from out sides the group	20	33.7
No observable benefit from FFS	13	21.7
Inefficient extension services	5	8.3
Total	60	100

Findings in table 13 shows distribution of respondents based on constrain to participate in FFS approach. Of the 60 respondents from non FFS group, 22 (37.2%) said they did not participate due to lack of time and socio economic commitments, 20 (332%) did not participate due to the learning priorities are being imposed from out sides the group, 13 (21.66%) did not participate due to lack of observable benefit from FFS while5 (8.33) did not participate due to inefficient of extension services to manage FFS.

Furthermore imposition of the learning topic from outside the group seems to be one of the constraints in the participation in FFS program. Sometimes learning topic is imposed from the district level in response to political reasons, interest of district agriculture officials or a requirement higher government authority.

This situation is contrary to principle of FFS which advocates full participation and involvement of farmers in the whole learning season (Duveskog, 2006). This is because imposed topic does

not capture farmers' interests there by leading to poor participation and consequent low uptake of technologies developed thereof.

CHAPTER FIVE

5. Summary of Major Finding, Conclusion and Recommendations

5.1 Summary of Major Findings

This study aimed at gaining insights into the effect of farmer field schools projects, on agricultural productivity the case of Liben Chukala District East Shewa Zone of Oromia Region, South East Ethiopia. The conceptual framework was based on the theory that emphasizes on group effectiveness and technology transfer approach as a prerequisite to technology adoption. The knowledge test and skills assessment was based on the FFS curriculum, similar to the one in which the NFFS farmers had also undergone through conventional extension approaches. The hypothesis tested at 5% level of significance was that there is statistically significant difference in knowledge and practice acquired on agricultural extension between farmers trained through the FFS and NFFS extension approaches under smallholder production conditions in the study area. FFS extension approach and some identified moderator variable were the independents with farmers' knowledge and practice as the dependent variables. T-test was used to compare the proportion of FFS and NFFS farmers knowledgeable about use and application of agricultural extension, tests compared Likert-scale rated skills and used to compare agricultural productive levels between FFS and NFFS farmers. Results of this study generally showed that FFS extension approach enhanced acquisition of knowledge and practice about the agricultural extension more effectively compared to NFFS and encouraged a more gender balance in its` training programs. Therefore FFS extension approach is better suited for the training of smallholder farmers who are resource poor. The influence of income levels, age group, formal education, and marketing channels on the knowledge and practice that farmers acquired about agricultural extension, suggest that these factors would accelerate acquisition of knowledge and practice by farmers to some extent, especially for the more complex knowledge and skills. Compared to NFFS participating farmers, the more effective dissemination of knowledge and practice through FFS enabled FFS participating farmers achieve higher agricultural productivity levels. This is attributable to FFS extension approach enhancing the capacity of smallholder farmers to realize increased agricultural productivity. And encourage farmers to market their production through the formal production market channels. The findings of the study are valuable reference to extension agents, farmers, agricultural and agricultural policy makers,

extension delivery systems and researchers in future design of effective dissemination approaches for agricultural extension targeting smallholder farmers. It provides an objective basis for decisions to promoting and adopting FFS extension approach and re-evaluation of future development and packaging of technologies for enhanced adoption by the target beneficiaries.

5.2 Conclusion

This is an important in the understanding of the study's objectives and on the basis of the findings. The results has demonstrated that FFS have had positive impact in disseminating knowledge to agriculture farmers and influence them to have positive perception on FFS as a model for technology transfer. From the study, it is revealed that, the Socio-economic factors like age of respondents, education level, income and marital status had influence on farmers' participation in FFS programs. Farmer groups were found to disintegrate following the withdrawal of funding and facilitation that is not continued after farmers have graduated. Lack of institutional arrangement that is put in place limits the continuation and sustainability of FFS programs as an approach for farmer to farmer exchange of knowledge. FFS have a positive impact on the productivity of agriculture yield as evidenced by productivity variation between FFS and Non-FFS farmers. Agriculture production yields were relatively higher for the FFS trained farmers than those non FFS farmers. Farmers have positive perception towards FFS programs as an approach for dissemination of knowledge to agriculture farmers in the study area. Perceptions of smallholder farmers were the effectiveness of FFS in terms of acquisition and utilization to improved agricultural technology. The study found that all the FFS respondents agreed with the statement that FFS uses experimental learning by doing to impart knowledge to farmers. It also showed that the FFS approach is a very effective tool for enhancing farmer learning in terms of information and skills acquisition and overall knowledge empowerment. According to respondents, FFS encourage effective use of participatory approaches whereby each individual is actively involved and allowed to interact freely and ask questions or experiment. Knowledge empowerment enabled FFS graduates to gain self-confidence with capacity to share their knowledge gained with other FFS and non-FFS graduates in the neighborhood. On the other hand, FFS training and implementation was perceived by respondents (FFS graduates) as being tedious and time consuming despite its effectiveness in enhancing knowledge acquisition, utilization and productivity. Yields might have been higher

than what they are currently getting if there were no constraints revolving around finance (essential for purchase of necessary inputs like improved seeds and fertilizers), labor and time.

5.3 Recommendations

Based on the conclusions drawn from the findings, the following recommendations are made:

Liben Chukala District should maintain FFS training as a model for technology transfer by providing financial and technical supports in order for FFS to be sustainable. FFS initiated programs should take board understanding of socio-economic factors that impact on participation of smallholder farmers in the program.

The government should continue supporting FFS by setting aside funds for follow up to improve and develop farmer's knowledge and skills gained through FFS projects. The government should enhance public-private partnership to ensure farmers access to the necessary agricultural services to enhance crop productivity through FFS. There is a need for extension agents to promote producer groups so that they could be trained under FFS approach to enhance crop knowledge and technologies dissemination among smallholder farmers.

The government, NGOs and other stakeholder should work together to help farmers to access information on agriculture through their FFS groups. In view of this the use of FFS groups, newspapers, leaflet and other written materials as a source of information to other farmers will enable farmers to know more about FFS.

In this regard, smallholders should be given correct and detailed information about the FFS including its requirements so that the majority of farmers if not all can become aware and interested in participating in FFS. Once these recommendations are effectively addressed, it will be possible to realize the benefits of FFS in terms of knowledge acquisition and effective utilization resulting in improved yields and eventually increased household incomes provided the issue of markets is taken care of. Lastly commitment to participatory approaches, like FFS and initiation of supporting activities and policy dimensions are among the major ones that should be accessed through national extension strategy in up- scaling the FFS approach.

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APPENDIX

JIMMA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

COLLAGE OF BUSINESS AND ECONOMICS

Dear Sir/Madam,

Request for participation in a research study was the effect of farmer field schools projects, on agricultural productivity the case of LibenChukala District East Shewa Zone of Oromia Region, South East Ethiopia.

I am Kidane Bizuneh and MA student a degree in Master of Arts (MA) in Project Management and Finance in the University Jimma. I am currently undertaking a research on effect of farmer field schools projects, on agricultural productivity, to participate in providing the required information. All the information provided was use purely for academic purposes only and was treated with utmost confidentiality. Kindly contact me in case of any queries or clarification on any of the questions.

Section A. Respondent general information

Instructions: Tick (√) or fill in the space provided where appropriate.

Part A. Give your Background Information in the Space Provided below			
1.Organization	_____	5.Position	_____
2.Educational Level:	_____	6.Age:	_____
3.Specialization :	_____	7.Sex:	_____
	_____	8.Size of household	_____
4.Experience :	_	9Marital Status	_____

10. What type of land ownership?

A. Inherent [ ] B. Bought [ ] C. Rented [ ]

11. Do you afford to buy agriculture inputs?

A. Yes [ ] B. No [ ]

12. If no, where do you get income for buying agriculture inputs?

A. ……

B. ……

13. Major occupation of the respondent:

A= Crop farmer [ ] B= Livestock keeper [ ] C= Crop and livestock keeper [ ]

D= others (specify)……

Section B: Perception of trained farmers on FFS approach in disseminating agricultural production knowledge

Preferred characteristic of FFS	Response		
	Agree N %	Neutral N %	Disagree N %
FFS training helps provide knowledge on agriculture production			
FFS increase contact with extension agents			
FFS increase access of knowledge disseminated on agriculture production			
FFS makes farmer more competent in delivery of the knowledge on agriculture production			
Knowledge gained through FFS helps in increasing agriculture production			

Knowledge gained through FFS improve agriculture management			
Usually teach other farmers on good agriculture production practices gained through FFS			
Usually I learn from other trained farmers on good agriculture production practices			
Usually I follow what I learn during FFS session			
FFS groups remain coherent for a long time after graduation			
FFS continue receiving significant support from the government after graduation			
Extension officer continues with their efforts to provide services to FFS members after graduation			

Section C: Farmer's perception on FFS approach

1. Are you member of Farmer Field Schools (FFS) group?

A. Yes [ ] B. No [ ]

2. How often do you meet in FFS training?

A. Once a week [ ]

B. Twice per year [ ]

C. More than twice [ ]

D. Not at all [ ]

3. Suppose the schedule of meeting changes, will you adhere to it?

A. Yes [ ]

B. No [ ]

4. If no, give reasons …….

5. If yes, give reasons ……

Section D: Perception of rural extension delivery farmers on the effectiveness of FFS

The following statements attempt to demonstrate your feelings about your involvement in FFS and the tangible benefits you have acquired as a result of your participation. Please write number in the appropriate space to indicate the degree to which you agree or disagree with the item production knowledge (n = 60)

Attribute	Agree N %	Undecided N %	Disagree N %
FFS uses experimental learning by doing with emphasis on participatory group approaches to help farmers make decision and solve problem			
FFS enable farmers to diagnose their problems, identify solutions and develop plans and implement them with or without support from outside			
FFS enhance acquisition of knowledge, skills and technique on new improved agricultural technologies			
FFS enhance sharing and diffusing of knowledge amongst participant and neighbors			
FFS enhance effective utilization and/or adoption of new/improved agricultural technologies and improved farming practices			
With FFS, farmers decides a specific needs and come up with an action plan to address such needs together			
FFS encourages effective use of participatory approaches whereby each individual is actively involved			
FFSs encourage smallholder farmers to learn through experimentation, building on their own knowledge and practices and blending them with new ideas			
Overall, FFS training emphasizes building on the farmer's ability to experiment and draw conclusion and it empower farmers to improve their socio-economic conditions			

1. From your experience, do you get adequate services from extension agents?

A=Yes [ ] B= No [ ]

2. Going back to the time you were undertaking FFS training, do you feel that FFS facilitator was competent in organizing and managing FFS training and related activities?

A=Yes [ ] B=No [ ]

3. In either case, please explain

……

……

4. Was the FFS curriculum relevant to target farmers and their farm families?

A=Yes [ ] B= No [ ]

5. In either case, please explain with reasons

……

……

Section E:Agricultural production level of farmers

1. How many bags of agricultural do harvest per ha. ----- (number of bags)

2. What is the trend of agricultural production have you experienced for the past three years

A. Increasing [ ]

B. Decreasing [ ]

C. Remaining the same [ ]

3. If production increasing what do you think are the reasons?

A. Coincidence of good weather [ ]

B. Improved practices (e.g. improved seeds, fertilizer, and Weeding, pest and diseases control) [ ]

C. Others specify [ ] …….

4. Give the observed production trend do you think you will continue with application of gained Knowledge and skills in agricultural production?

A. Yes [ ]

B. No [ ]

5. If yes give reason/s

. ……

6. What is your recommendation in order to improve technology transfer through FFS approach?

……

Section F: Factors facilitating the dissemination of agricultural technologies under FFS.

1. Do you use Printed materials as a source of information?

A. Yes [ ]

B. No [ ]

2. Where do you acquire agriculture information?

A. newspaper [ ]

B. Agricultural reports [ ]

C. farmers attended FFS training [ ]

D. Others (specify) ……

3. How often do you access extension service?

A. Once per month [ ]

B. Twice per month [ ]

C. More than twice [ ]

D. Others (specify)…….

4. What motivate/encouragement you to join FFS?

A. Farmer to farmer interaction facilitated through FFS [ ]

B. To improve productivity enabled by FFS [ ]

C. Technology disseminated through FFS [ ]

D. Good result from fellow farmers who were previous FFS graduates [ ]

5. What constrain hinder to participate in the FFS approach?

A. Lack of time due to socio economic commitments [ ]

B. Learning priorities are sometimes imposed from out sides the group[ ]

C. No observable benefit from FFS [ ]

D. Inefficient of extension services [ ]

Section G: Access to extension services

1. Are there extension workers in your farming areas? (May be inspectors)

A. Yes [ ]

B. No [ ]

2. If yes, how many times did they visit your farms in the past production seasons of the year 2020? ---------- (number of visits per year)

3. If you were visited by extension workers in the past production seasons, did they advise you on use of improved varieties of common agriculture or other common agriculture technologies?

A. Yes [ ]

B. No [ ]

4. If yes, have you been applying the advice? _____

A. Yes [ ]

B. No [ ]

5. If no, why not?

……

……

6. Main source of improved common agriculture information (tick all those apply):

A. District council extension staff

B. FFS group [ ]

C. Input suppliers [ ]

D. Radios [ ]

E. Demonstration [ ]

F. Neighbors and relatives [ ]

G. Others'_____

Section H: Access to credit

1. Did you borrow money from any of the following sources in the past production seasons of the year 2020?

Source of borrowed Money	Borrowed? 1=Yes 0=No
Government	
NGO/Church	
Informal savings and credit group	
Bank or microfinance institution	
Others (specify)	

Section I: Access to market

1. How do you obtain improved common agriculture? _____

A. Purchase [ ]

B. Gift from friends/relatives [ ]

C. Saved from previous seasons [ ]

D. Given free by AFAP/ NGOs [ ]

E. Research institutes [ ]

F. Extension departments [ ]

G. Other (specify)……

2. If you purchase, where do you buy it from? _____

A. Pass on program [ ]

B. Local market [ ]

C. City market [ ]

D. Extension department [ ]

E. NGOs [ ]

F. Other (specify)……

3. What is the distance from home to where you sale you common agriculture produce?

…… (Kilometers)

Thank You for Your Cooperation