Seed Farmers School (SFS)

Experience of Quality Seed Promotion Project

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I. Introduction

Agriculture is a driver of the Ethiopian economy (FDRE, 2009). It is run by smallholder majority who undertake subsistence mode of life. Despite its importance, agriculture suffers from low productivity. Crops are playing a significant role and it is believed that adoption of new agricultural technologies, such as high yielding varieties, could lead to significant increases in agricultural productivity and stimulate the transition from low productivity subsistence agriculture to a high productivity agro-industrial economy (World Bank, 2008). Among others, seeds are critical determinants of agricultural productivity. Consequently, several improved crop varieties have been developed by the national and international research institutes and disseminated to the farmers through different programs and projects. The diverse crop varieties released that are under production in Ethiopia can be found in the Variety Register developed by the Ministry of Agriculture (MoA, 2012).

In spite of the advances made to develop and popularize options of improved crop varieties to smallholder farmers, quality seeds[1] of appropriate varieties that show satisfactory performance under niche agro-climatic conditions should be made available in sufficient quantities and at affordable prices to raise the productivity of smallholder farmers meaningfully. Availability and use of quality seeds is not a one-time affair and should be governed by the farm-operators' inherent socio-economic and natural scenarios. Thus, for a sustained increase in agriculture production and productivity, continuous development of new and improved varieties along with efficient and adaptive mechanism of quality seed production and supply is required.

To this effect, formal and informal seed systems have been operational in the country. The formal system involves production and distribution of breeder, pre-basic, basic, and certified seeds; mainly by the research system and certified multipliers such as Ethiopian Seed Enterprise, the regional seed enterprises and recently licensed private seed companies. The informal system involves different actors that are engaged in the business without legal certification, i.e., retained seed by farmers, farmer-to-farmer seed exchange, cooperative based seed multiplication, and distribution, NGO based seed (Dawit, 2010). Despite the different establishments in the country, quality

[1] "Quality Seed" in this document mean seeds with better purity, uniformity, and germination capacity regardless of improved or local varieties.

seeds with higher purity and uniformity with vigor are still beyond reach of the smallholder farmers. Low productivity and food insecurity are the overriding strategic issues related with agriculture development intervention.
To address the issue of improved access to seed and food security in an area where agricultural production is taken up mainly by smallholder farmers; there is a need for seed technology development that would entail an improvement of farmers' understanding and capacity to increase yields through diffusion of improved practices and varieties. Use of good quality seed of improved varieties enhances productivity and helps generate higher income and ultimately lead to poverty reduction because of enhanced market participation of smallholder farmers. In addition, quality seeds of improved varieties are crucial to making use and take advantage of the complementary productivity enhancing inputs such as pesticides, fertilizer, and agricultural technology.

Steps have been taken for systematic production of quality seeds by the governmental and non-governmental organizations. Quality Seed Promotion Project for Smallholder Farmers (QSPP) that was implemented by the Ministry of Agriculture in collaboration with Japan International Cooperation Agency[2] (JICA) through Seed Farmers' Schools (SFS), in 3 woredas in Oromia from 2011 to 2013, and one in Southern Nations Nationalities and Peoples (SNNP) and one in Amhara regions that are added from 2012 to 2013. The FFS approach is a group-based learning process. It has been used to bring together concepts and methods from agro-ecology, experiential education, and community development and improve the sustainability of crop yields. Elsewhere, the FFS has produced other developmental benefits that are broadly described as 'empowerment': involving a wide range of self-directed activities including research, training, marketing, and advocacy (Russ, 2001).

Farmer Research Group II project (FRG II) of the Ethiopian Institute of Agricultural Research (EIAR) is another technical cooperation project implemented in collaboration with JICA. QSPP and FRG II projects share common interests and ultimate goal of supporting grass-root level smallholder farmers through the delivery and use of quality seed.

The QSPP tries to improve quality seed availability through Seed Farmers' School (SFS) by granting some selected wheat and tef producing farmers' access to the improved quality seed and practical training leading to farmers'

[2] Japan International Cooperation Agency (JICA) is an official donor agency providing technical cooperation, concessionary loans (ODA loans), and grant aid. JICA endeavors to provide comprehensive assistance for developing countries by making the most of a broader range of aid instruments and a network of 100 overseas offices around the world. Ever since the first cooperation program in 1957, JICA Ethiopia has continued offering support for the nation building.

graduation in quality seed production in the community. There were more than 2000 farmers who participated 32-week long sessions and graduated from SFS during the project period. QSPP conducted a follow-up survey of SFS graduates in June 2013. In December 2013, another follow-up survey, which was commissioned to Melkassa Agricultural Research Center, one of the counterpart organizations of FRG II project.

This document discusses the experiences and efficacy of SFS approach through presenting the results of the two surveys and three seminars after a brief introduction about participatory agricultural development, QSPP and SFS. It then stages key lessons learned and possible measures with recommendation for the sustainable implementation and betterment of SFS as a useful tool to improve access to quality seed and enhance local seed systems for the benefit of smallholder farmers who are tirelessly devoting themselves to ensure food security.

II. Participatory Agricultural Development

II-1. What is and why participatory?

Agricultural development cannot be sustainable unless farmers' participation is made central to the development process. Participatory approach is one in which everyone who is affected by the development intervention has a voice and shares ownership of decision-making so that he/she also shares both responsibility of and benefit from the intervention.

Farmers' participation in agricultural development has the following advantages as Oakley et al. (1991) enumerated.

- It ensures effective utilization of available resources;
- It makes the development more effective by granting farmers' involvement in planning and implementation;
- It increases farmers' awareness, self-confidence and control of development processes; and
- It ensures availability of resources to wider coverage and the flow of the benefits to the target groups, and generates a sense of ownership over the development process among farmers, which is essential for the sustainability after external interventions cease.

Participatory approach is a response to conventional 'top-down' approaches to development, which was dominant at least until 1990s. Decision-making was largely in the hands of external development professionals. It, however, had many flaws and was not effective. It also raised questions about whether 'outsiders' had the right or the knowledge to set the development agenda of local people.

The importance of farmers' participation in agricultural/rural development is a widely shared concept among governments, development partners, and farmers' organizations these days. Various approaches and tools have been practiced in development interventions such as Participatory Rural Appraisal (PRA), Participatory Technology Development (PTD), Farmer Research Group (FRG) and Farmer Field School (FFS) to name a few. Application of participatory approach and the use of participatory tools have now become common practices in developing and developed countries. However, Thompson's statement (1994) 'bureaucratic institutions try to embrace participatory approaches without changing their operational procedures and organizational culture' is still true in some extent in many countries and

organizations. Not all the projects, which have 'participation' in their titles, are necessarily listening to farmers and regarding them as equal partners. It is partly because of the fact that the participatory approach requires flexibility in the process of development intervention, while development projects, particularly those funded by public institutions/donors need decisions being made at the top and/or center with expected outputs within specific timescale. Despite the difficulties of its practices, the importance of participatory approach in development intervention remains unchanged. Our challenges are how participatory approach can be internalized and institutionalized through exploring new ways of doing and learning from the target communities.

II-2. Application in Ethiopian agricultural development

Small-scale farmers have been always the central focus of the agricultural development in Ethiopia. Particularly when the present government adopted an economic strategy known as Agricultural Development Led Industrialization (ADLI) in 1992, there was a shift of focus in development from industry and large farms to smallholder farmers. Under ADLI with its reforms in markets, efforts have been made by the government on transformation from traditional to modern and more productive technologies through intensification of food production and mitigating poverty with improved use of agricultural technologies mainly fertilizer, seed of improved varieties, and other modern inputs.

Agricultural technology development and dissemination in the country, exclusively delivered by public institutions in Ethiopia, are key levers in achieving the agricultural modernization by the government. These interventions were largely based on the technology transfer concept with more or less top-down approach from the beginning. While the extension services was introduced in the country in 1953 by the Imperial Ethiopian College of Agriculture and Mechanical Art, the predecessor of the current Haramaya University, the institutionalized agricultural research in the country started in 1966 as the Institute of Agricultural Research (IAR), which is now the Ethiopian Institute of Agricultural Research (EIAR) (Agajie et al. 2002). The earlier extension program included the Comprehensive and Minimum Package projects in the 1960s and 1970s, which were followed by the introduction of the Training and Visit (T&V) system in the 1980s. The Participatory Demonstration and Training Extension System (PADETES) started in 1993 and expanded to cover the entire country under the National Agricultural Extension Intervention Program (NAEIP) from 1995 (David et al., 2011), which recently achieved deploying nearly 60,000 Development Agents (DAs) and establishing 10,000 Farmer Training Centers (FTCs). The research activities at the earlier period were based on the concept of technology transfer,

with which solutions to the problems were studied and provided by scientists. A large portion of the research was breeding activities of high yielding varieties to ensure the transfer of modern technologies of better production to farmers. The research and extension in Ethiopia in the first few decades were characterized as commodity oriented discipline based, top-down, and transfer of technology and were not necessarily meeting the needs of smallholder farmers, who farmed under complex, diverse and risk prone farming systems.

Because the rate of adoption of introduced technologies was not meeting the expectations, it was recognized, by some people in the research and extension in the country, that the conventional ways of technology development and dissemination did not necessarily meet the needs of farmers, which was location specific in most of the cases. Some attempts have been made in the 1990s onward such as Farming Systems Research (FSR) and Client Oriented Research (COR), Farmer Research Group (FRG), etc. in the research system and Participatory Demonstration and Training, Farmer Field School (FFS) of which SFS is one of the derivatives, among others in the extension system. Many universities started outreach/community education programs, in which students were required to work with farmers on their practical problems. Yohannes (2004) presented detailed accounts of the application of participatory approaches by different institutions in the country. The use of participatory approach tools such as PRA/Participatory Learning and Action (PLA) tools has become common practices in the agricultural development. Deployment of a large number of DAs working at village level FTCs certainly are enabling technologies and technical support to be better accessed by farmers to meet their specific needs possibly through more participation of farmers in the process. Around sixty percent of researchers who participate in the training of the FRG approach claim that they are involved in some kind of participatory research activities. Agricultural faculties of many universities have their curriculum including participatory approaches in courses such as rural development, agricultural extension, etc. Although it is observed that there has been increased awareness and applications of participatory approaches in the Ethiopian agricultural research and extension, there is still much to be done for wider application of participatory research in the country's research and extension. Many participatory activities in the 1990s and 2000s were project based and they had sustainability issues after the projects phased out without many exceptions. The science orientation in the research, lack of flexibility for networking and synergy realization, the difficulty of the knowledge management to deal with location and time specific cases and rigidity of government institutions for farmers to participate in the planning process are some challenges for institutionalizing participatory approach.

QSPP and Seed Farmers School

III-1. QSPP

Quality Seed Promotion Project for Smallholder Farmers (QSPP) officially commenced in February 2010 as a technical cooperation project between the Ministry of Agriculture of the Ethiopian Government and Japan International Cooperation Agency (JICA). The focus of the project was to help improve the Ethiopian seed sector, in particular the informal seed sector wherein the majority of smallholder farmers are involved. The objective of the project is stated in its Project Design Matrix (PDM) as "Use of quality seed is increased in the target *woredas*[3]." Tef and wheat are major cereals grown and consumed in Ethiopia, which were set as target crops for the project. The PDM approved at a Joint Coordinating Committee meeting in December 2012 stipulates four outputs:.

- Quality seed production technology is improved;
- Quality seed production technology is disseminated to seed producing farmers and/or farmers who want to start seed production;
- Quality assurance (mechanism) of seed is strengthened; and
- Sustainable system of quality seed production for smallholder farmers is suggested.

The project period was originally four years until February 2014, but was later extended until August 2014. The figure below indicates the QSPP target five *woredas*.

[3] Project target areas are Dendi、Ada'a、Lume *woredas* in Oromia, Sodo *woreda* in SNNP, and Yilmanadensa *woreda* in Amhara regions.

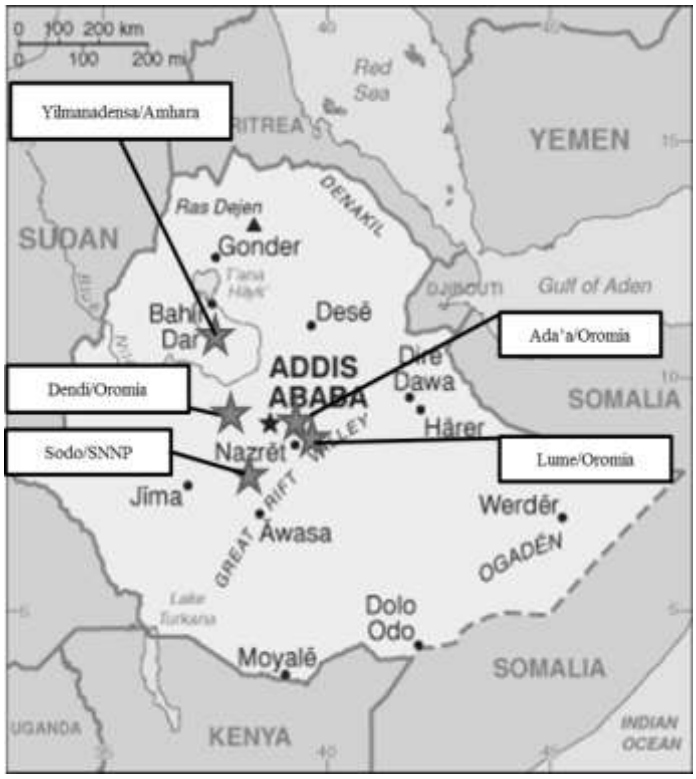

Figure 1. Project target *woredas*

III-2. Farmers' Field School

Farmers' Field School (FFS) is an approach based on farmers' participation in technology development, dissemination, training, and marketing. Since Seed Farmers' School (SFS) is an application of FFS for empowering farmers in seed production and marketing, FFS is briefly explained in this section.

III-2-1. Historical background of FFS

The FFS approach was first developed in 1989 by the Food and Agriculture Organization of the United Nations (FAO) and employed in Integrated Pest Management (IPM) program in Indonesia. Following successful introduction of the approach in Asia, Africa, the Middle East, and Latin America, in 1995 the FFS program began to broaden its scope to cover other types of technical fields and socio-ecological conditions. In Africa, over a dozen countries, including Ethiopia, have introduced this methodology for their agriculture, livestock, and forestry extension and management programs.

III-2-2. Objective of FFS

FFS is an experience based, innovative, participatory, and interactive learning approach, and has following general objectives:

- To build the farmer's capacity to analyze the farming systems and to identify their constraints;
- To test possible solutions suitable for their farming system by using simple comparative experiments which would enhance their knowledge; and
- To enable farmers to adapt existing technologies, or to adopt new technologies so that they become "experts" who are more capable and responsive to changing environment.

III-2-3. Pillars of FFS

FFS consists of three pillar activities titled Agro-Ecosystem Analysis (AESA), Group Dynamics, and Special Topics, each making the FFS different and unique comparing with other extension methods (Figure 2). AESA is the main monitoring and decision-making tool used in FFS, and it is formed by 1) AESA Taking, 2) AESA processing, and 3) AESA Presentation as explained in the table.

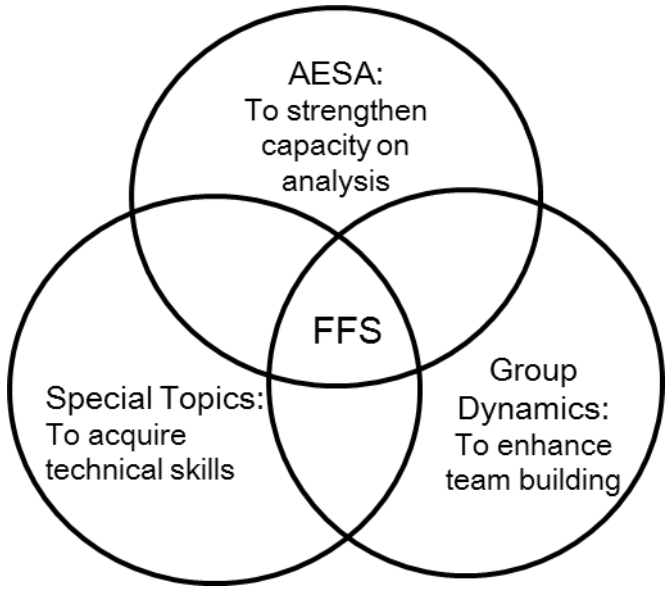

Figure 2. Three pillars of FFS

Table 1. Flow of AESA

Component	Activity and effect
AESA Taking 	**<Activity>** 30 to 32 members of FFS group are divided into 4 sub-groups, and observe targeted enterprise every week. In case crops are their enterprise, they usually observe plant length, any pest, and/or disease, and count numbers of tillers, grains and panicles, etc. **<Effect>** This weekly observation enables farmers to find and realize how the plants grow in details, and differences among plots they manage.
AESA Processing 	**<Activity>** Observation and data collected from the AESA Taking are summarized by each sub-group, which is called "AESA Processing." **<Effect>** This session contributes to gather findings and opinions from all sub-group members. Processing work should not be dominated by a few members but by all members including illiterates and shy women.
AESA Presentation 	**<Activity>** After the AESA Processing, a representative from each sub-group presents their result of AESA Taking and Processing in front of other members. **<Effect>** Farmers become confident enough about their enterprises through these weekly learning processes. The representative is replaced week by week. Even members who are shy at the beginning become confident enough to present later.

Group dynamics is a kind of energizer (icebreaker) such as a joke, exercise, game, dance, etc. to refresh participants. Besides, it enhances relationship among the FFS members, and accelerates team building in the FFS. Moreover, it is expected to help FFS members create a new group and/or organization, such as a seed multiplication primary cooperative, after graduating from the FFS.

Importance in FFS is to create better environment and clearer understanding on technologies that a famer may find it difficult to digest and apply subjects a farmer may find it interesting. SFS members are free to decide which enterprises they want to work on. Practically speaking, it is a common practice for most FFS to choose one of popular crops to improve the productivity or livestock to make it more beneficial. Special Topics are then selected that are of importance or interests for a given enterprise, and are shared among the members. Facilitators of the Special Topics can be farmers, extension officers,

academicians, or anyone. Various kinds of topics can be presented depending on enterprises and/or members' interests as shown in the table.

Table 2. Example of special topics

Enterprise	Special Topics (Example)
Tef Seed Production	• Effect and difference of row sowing • Quality control of seeds
Tree nursery	• Seed bed preparation • Characteristics of newly released variety
Poultry farming	• Cage preparation for chicks

III-2-4. Other elements of FFS

FFS groups usually meet once a week on a specific day set by themselves at their learning site. Core activities during the weekly meetings includes

- Field observation, data collection and presentation of field reports;
- "Special Topic (of the week)" covering technical subjects of farmers' choice related to their enterprise or their interests; and
- Group Dynamics

Table 3 below demonstrates one typical timetable adopted at one of the schools.

Table 3. FFS Timetable and objective of each activity (example)

Time	Activity	Objective	Responsible
8:00- 8:05	Prayer, Roll Call	To thank God. To check attendance	Host team
8:05- 8:10	Brief Recap	To remind ourselves of previous activities	Host team
8:10- 8:40	AESA Taking	To monitor progress and problems and collect growth data on crops in host farm	All
9:10- 9:40	AESA Processing	To analyze and process field data and prepare AESA charts for presentation	All
9:40-10:10	AESA Presentation	To share AESA analysis to larger groups and discuss for collective decision making	All/Host team
10:10-10:30	Group Dynamics	To refresh and energize ourselves, enhance coherence and educate on activities	Host team
10:30-11:30	Special Topic	To learn new knowledge/skills related to enterprise or members' interest	Host team/ Facilitator
11:30-11:35	Review of the day's activities	To evaluate achievements of the day	Host team
11:35-11:45	Planning for next session	To plan activities and learning topics of next week session	Host team
11:45-11:50	Announcements	To share information within SFS	Host team
11:50-11:55	Roll Call, Prayer	To check attendance and To thank God	Host team
11:55-12:05	Reporting	To compile a weekly/monthly report	Facilitator/ Host team

Host Farmer and Host Farm are key elements that make FFS different from other extension methods. The Host Farmer volunteers to provide learning sites, trial plots and meeting places, for sub-groups. Before starting the FFS, facilitators need to seek a candidate farmer who can be a Host Farmer. Usually the Host Farmer is selected from farmers who have a larger farm in the village, because the selected Host Farmer is to allocate some land as the learning site, called Host Farm. As FFS is a participatory method, a learning site and a school are not recommended to be established in the government training centers or demonstration farms where their conditions are well managed and controlled and far from farmers' fields.

III-3. Seed Farmers School

The Seed Farmers School (SFS) is an approach that applies the Farmers Field School (FFS) approach to promote quality seed production and marketing for smallholder farmers specifically designed for farmers in Ethiopia by the QSPP. The following parts explain the key aspects and advantage of the SFS.

III-3-1. SFS approach

QSPP has employed FFS approach to improve local seed production system through introducing improved agricultural machineries and cultivation techniques, and named it Seed Farmers School (SFS). The SFS also encourages

farmers to involve economic activities more rationally in the local market. Under the SFS, the project:

- Targets groups of around 30 member farmers with common interests in seed production on tef and wheat; and
- Provides 32-weeks learning sessions of 3-4 hours each supported by DAs as facilitators (Table 4).

Table 4. Special topics for thirty-two weeks long training developed for SFS

Month	No of SFS	Subject (Today's especial topic)	Detail content
May	1	Quality seed	What is quality seed
	2	Field selection	Crop rotation, isolation distance, filed record, registration
	3	Field note 1	How to record field note (in practice with host farmers field)
	4	Land preparation	Plowing, leveling, and ridging, and land registration
June	5	Land preparation 2	Demonstration of spike tooth harrow
	6	AESA1	Problem analysis, and making PTD design
	7	Preparation of seed and fertilizer	Calculation of supply amount of fertilizer, seed selection by salt water
	8	Sowing seed and fertilizer	Row sowing by row seeder and fertilizer application
July	9	AESA 2	AESA chart, parameters for each growing stage, how to mark plants selected for weekly observation and measurement
	10	Weeding 1	Tips of weeding. Types of weeds
	11	Seed market 1	Difference between seed and grain markets
	12	Cost benefit analysis	Making CBA of seed business
August	13	AESA 3	Recapping to make AESA chart. How to draw the plant
	14	Fertilizer (top dressing)	Fertilizer calculation and top dressing
	15	Group exchange or field day	Visiting each other
	16	Weeding 2 and off types	Identify off type plants from targeted variety and remove from field
Sept	17	Pest and disease control 1	Particularly pests and diseases in the region. How to control them
	18	Ethiopian new year	Holiday
	19	Free topic	Content shall be decided based on the SFS members interest
	20	Business plan making 2	Decide where they are going to sell and how to make a business plan
Oct	21	Field inspection	Field inspection (in practice with a host farmer field)
	22	Stakeholder analysis	Stakeholder in seed and grain business
	23	Promotion	What is promotion? Who is our target?
	24	Cooperative	How to establish cooperatives. strength and weakness of cooperatives
Nov	25	Field note 2	Recap what is field note, and assist non-recorded farms
	26	Lot management	Mother seed, continuous seed production system, lots, etc.
	27	Harvesting	How to mother seed separately. Tips of harvesting
	28	Threshing and cleaning	Proper threshing apart from cow dung
Dec	29	Lab test	How to muse a tag and submit seed sample to laboratory
	30	Storage	3 key concepts of seed storage
	31	Quality seed	What is quality seed?
	32	AESA Analysis	Summarize the results of AESA

Jan	-	Graduation ceremony	Graduation ceremony at woreda level

III-3-2. Implementation structure and roles for running SFS

The table 5 briefs roles and activities that organizations and personnel need to engage for the implementation of Seed Farmers School (SFS) in the case of QSPP in Ethiopia.

Table 5. SFS implementation structure and demarcation

Organization	Position in charge	Activities
Ministry of Agriculture	Director Crop Extension Team Senior Expert	• To coordinate and supervise all SFSs implemented in three regions. • To take in charge of key events such as seminars, ToF, graduation ceremonies or inter-regional activities.
Regional Bureau of Agriculture[4]	Process Owner Senior Expert, Expert	• To take responsibility of SFSs implemented in regions and zones. • To be a trainer in the Technical Trainings (TT). • To prepare extension materials for the TTs. • To deepen degree of understanding on technologies presented and support SFS through participation in ToF and TTs as necessary. • To enhance SFS through implementation of technical backstopping together with C/Ps in zone and woreda.
Zone Agricultural Department	Head, Deputy Head Senior Expert, Expert	
Woreda Agricultural Office	Head, Deputy Head	• To coordinate both governmental work and activities related to SFS. • To supervise SFSs implemented in targeted woredas.
	Senior Expert, Expert DA (Development Agent) Supervisor	• To support facilitators of SFS through the participation in the trainings related to SFS, so that the facilitators smoothly perform at sites. • To represent facilitators in case of their absence. • To assign new facilitator in case of facilitators' long-term absence and retirement. • To strengthen SFS through monitoring and backstopping, and to report these progress to woreda agricultural office. • To assist project to find, reserve, and clean a training venue.
		• As a part of official duties, to monitor SFS in woreda, and report its progress to woreda agricultural office on time.
	DA	• To implement SFS as a facilitator(s) starting from the village orientation to graduation. • To acquire necessary knowledge and skills about facilitation and seed production through the participation in SFS trainings such as ToF and TTs.
Kebele	Village committee Village chairman	• To allow a facilitator and village members to participate in SFS through the briefing from the DA and woreda agricultural office. • To provide a support to SFS member as necessary. • To coordinate schedule of governmental program and SFS.
	Farmer	• To participate in SFS for 32 weeks. • To select a host farmer and a host farm in a group. • To select learning topics (Enterprise) in SFS.

[4] C/P departments in three regional bureaus of agriculture have been selected based on their relevance on SFS. As a result, Agricultural Extension Work Process has been selected in Amhara region, while other two regions, Oromia and SNNP, have assigned Agricultural Input and Supply Work Process.

		• To design a layout of Participatory Technology Development (PTD) • To make three agreements: between project, host farmer, and among SFS members).

III-3-3. Achievement and challenges of SFS

QSPP conducted 69 SFSs in five *woredas of* Oromia, SNNP, and Amhara Regions, and trained more than 2,000 seed farmers of tef and wheat, most important crops in Ethiopia. Achievement and challenges of SFS are summarized in Table 6.

Table 6. Major achievement and challenges of SFS

Major Achievements	Indicators
• Number of graduates (Female/Male)	2,024 （590 / 1,434）
• Number of facilitators trained	54
• Number of SFS implemented (Government-run SFS)	69 (17)
• Amount of C2 seeds produced by SFS	308 ton (Tef: 200 ton, and Wheat: 107 ton)
• Quality of C2 seeds produced by SFS	In the self-evaluation, a great number of interviewees answered that quality was improved comparing with before SFS and after SFS.
• Percentage of SFS groups conducted some group-activity after the SFS graduation.	25%
• Comprehensive extension materials on Tef and Wheat seed production	32 weeks program with 3 languages (English, Amharic, and Oromifa)
• Changes of facilitators' understanding about seed production examined during Technical Trainings.	60.8%(Pre)→76.6%(Post)
• Observed changes in community and farmers evaluated by facilitators	Gender awareness, Personal relationship between farmer-farmer and farmer-government, and adoption rate of new technology.
• Direct implementation cost of SFS	SFS(Project-run):48,00 Birr /SFS SFS(Government-run):11,000 Birr /SFS FTC:30,000～200,000 Birr /FTC[5]
Major challenges	**Indicators**
• Manual or Guideline to implement SFS	Yet to be completed, but under preparation.
• High turn-over rate of facilitators	22% (Out of 69 SFSs in three years, 15 SFSs have been replaced their facilitators after the ToF)
• Percentage of SFS groups who have not conducted any group activities after the graduation.	75%
• Linkage between governmental programs and SFS	17 government-run SFS already implemented. SNNP regional government has directed to assign section/unit to be responsible for SFS.
• Dependency upon foreign master trainers	Not used Ethiopian trainers yet

[5] Final report, Support to the definition of EU interventions to Sustainable Agriculture Growth (SAG) and to horizontal support to RED and FS sector under the 11th EDF, October 2013

Many facilitators have found SFS effective and promising as a training method motivating farmers to learn and adopt new technologies. More importantly, SFS contributed to enhance ties between development agents (DAs) and farmers. Some farmers, during the graduation ceremony, were so happy and decided to present gifts to the facilitators for their efforts and contribution. However, DAs have had challenges in facilitating SFS as per the set schedules because of the lack of transportation, incentives, and transfer of the DAs to other responsibility and/or location. Nevertheless, it is encouraging to observe that many facilitators were able to conduct SFS in the following season best utilizing all the experience and learning in the previous year. Actually, there were 17 Government-run SFSs conducted with minimum inputs from the project in 2013. This portrays that DAs with supports of their supervisors could implement the SFSs.

Considering the need to improve local capacity, the QSPP facilitated a training of facilitators (ToF) for SFS facilitators, which was conducted by Kenyan master trainers, before the weekly sessions start at fields. The quality of the ToF directly influenced the quality of SFS, as this is the training that introduced to the facilitators, basic concept and fundamental activities of SFS as an extension method. Once the weekly session starts, it is a common practice for the master trainers to visit and monitor the SFSs and advise and suggest to the facilitators. The role of the master trainers is quite significant and valuable for the successful implementation of the SFS. Unfortunately, Ethiopian master trainers were very limited in terms of number and quality. QSPP found it difficult to involve in producing master trainers as QSPP's main object was on quality seed production through the enhancement of DAs and farmers' seed multiplication technology but not on master trainers of SFS or FFS. There is a definite need to train master trainers should FFS or SFS be introduced in a wider scale in Ethiopia.

QSPP has witnessed a move of some SFS graduates in forming formal organizations. Some farmers newly joined existing organizations and some formed a new. This illustrates the SFS farmers were appraised well of the need to unite as seed producers and were provided favorable environment to enhance bonds among the SFS members.

Finance is critical in conducting the SFS. Properly secured budget should cover all the expenses including SFS venue construction and necessary materials as well as allowances of all those involved by using Farmers' Training Center (FTC) as one of the venues of SFS can minimize the costs. Farmer facilitators can be another option for economizing the costs of facilitators and sustainable implementation of the SFS.

Managerial works and arrangements were mainly done by QSPP employed staff instead of regional and/or *woreda* officials. For instance, invitation letters of technical trainings were prepared and delivered mainly by the project. SFS is facilitated by DAs, their supervisors, while ToF, and technical trainings must be conducted with full support and supervision of *woreda* and zone agricultural offices. Facilitators are supposed to report the progress of the SFS. However, few facilitators properly reported forcing the project staff to visit the sites and monitor. It is inspiring that SNNP regional authority has recognized the importance of the logistics and administrative works for SFS and instructed every level of administration to be involved in it.

It has been proved that SFS could be functional in the Ethiopian context. DAs are able to facilitate 32-week long sessions at farmers' field and farmers have been able to produce more quality seed using what they have learnt from SFS. There exist many development interventions where SFS can be employed as a tool to maximize the effect of the interventions. One such example would be Farmers Training Centers (FTC). However, FFS and SFS remain as pilot basis and several issues, such as finance, human resources, and logistics, are to be sorted out before the approach is put in full swing.

SFS graduates follow-up surveys

IV-1. Follow-up survey

IV-1-1. Background

QSPP implemented Seed Farmers School (SFS) in three *woredas* (Dendi, Ada'a, and Lume) in Oromia Region in 2011. In the following year 2012, the project expanded the SFS to two more *woredas* of Sodo in SNNP and Yilmanadensa in Amhara Regions. There were 731 SFS graduates in 2012. In order to see the impact of the SFS, QSPP conducted a follow-up interview survey in September 2013 with 95 graduates out of those graduated in 2012. Detail of the number of farmers interviewed is shown in Table 7. The interviewed graduates were residing in 24 villages of the *woredas*.

Table 7. Number of farmers surveyed

Location	Number of farmers surveyed	Rate (%)
Dendi, Oromia	20	21.0
Ada'a, Oromia	20	21.0
Lume, Oromia	11	11.6
Sodo, SNNP	18	19.0
Y/densa, Amhara	26	27.4
Total	95	100.0

IV-1-2. Methodology

Questionnaire was prepared to interview farmers from each *woreda*. The farmers were SFS participants and randomly selected from SFS graduates. Development Agents who facilitated the SFS interviewed the farmers in June 2013. Collected data were then compiled and analyzed by QSPP.

IV-1-3. Results of the survey

Technology exposure and use at SFS

During the 32-week long training, the SFS introduced various kinds of technologies related to field preparation, cultivation, pre- and post-harvest and farm management. Table 8 shows a list of technologies that the farmers have learnt at the 2012 SFS and have used in 2013 season.

Table 8. Technologies learned and using

Technologies	Technology	Rate (%)
Learnt	Row sowing	84.8
	Proper seed rate	75.5
	Land preparation	68.8
Used	Row sowing	82.0
	Proper seed rate	70.4
	Fertilization	65.4

It is promising to learn that more than 70% of the farmers have specified, "row sowing" and "seed rate" as learnt technologies and used them in the following year. The listed technologies are some of the key technologies the project has emphasized during the SFS. In addition, "row sowing" technology has been promoted by the Ethiopian government for better crop productivity, and is an essential technology for quality seed production as well.

QSPP realized that very few farmers recorded their farming practices and management. QSPP introduced and distributed a several-page recording material, called "Field Note," to SFS farmers. The Field Note was for farmers to record their field data, cultivation practices and any managerial information so that they improve the practices for the next season by referring to the practices of previous year. It was made available and several-page papers were distributed to 2012 SFS farmers. Later in 2013, the Note was improved to a notebook type so that five years data could be accommodated. The improved version of the Field Note was distributed to all SFS graduates of 2012 and 2013. Note that 2012 SFS participants were first given the several-page paper type, and later the notebook type Field Note. Filling up field data and cultivation practices on the Field Note was one of graduation criteria and this was checked by DAs before the lists of SFS graduates were submitted to the project and relevant offices. SFS graduation rates in 2012 were more than 90% and this implied the use of the paper type Field Note to be more than 90%. However, later interview to the graduates found out that notebook type "Field Note" was not used as expected by QSPP. One of the reasons of the low use rate might be that the notebook type "Field Note" was distributed to 2012 SFS graduates in June 2013, six months after they graduated from the SFS. The participants of the 2012 SFS were not properly explained about the continual use of the Field Note. The DAs and DA facilitators were not followed up well by the project for guiding and motivating farmers to use the Notes.

Changes in yield and quality

The following Figures 3 and 4 illustrate the changes of tef and wheat yields, respectively. Yield in 2012 was the average yield SFS farmers harvested at 0.1 ha seed producing plot[6] while participating in the SFS. 2013 yield is farmers' expecting yield.

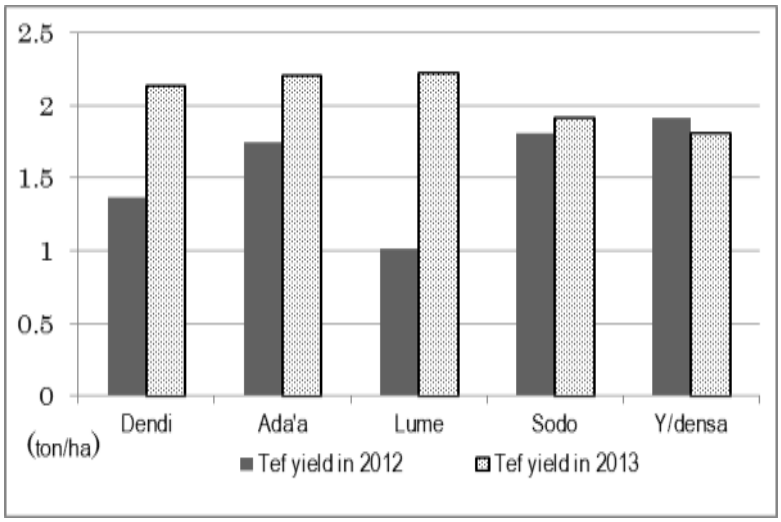

Figure 3. Changes in tef yield (ton/ha)

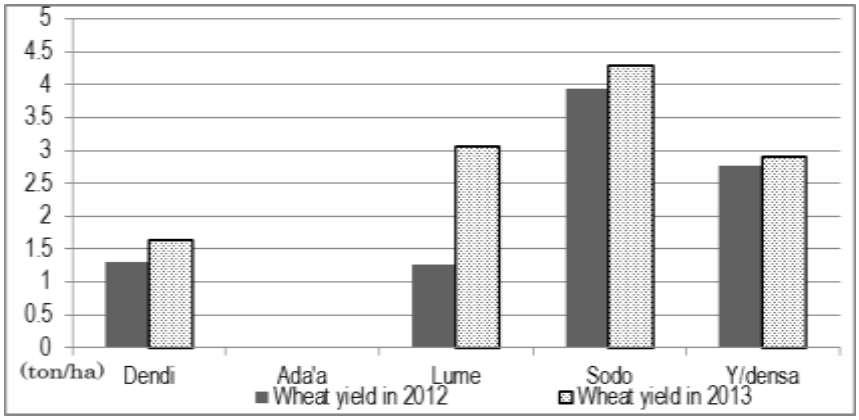

Figure 4. Changes of wheat yield (ton/ha).[7]

Central Statistical Agency of the Ethiopia reported the average yields of tef and wheat in 2012/2013 *Meher*[8] season were 1.38 and 2.11 ton/ha, respectively (CSA, 2013). As for tef yields of SFS graduates, three *woredas* of Ada'a, Sodo, and Yilmanadensa, recorded better yields than the national average at their 0.1

[6] Every SFS farmers were instructed to prepare a seed-producing field of 0.1 ha within his/her fields, and to apply every technologies learnt during the SFS.

[7] There were no SFS members grew wheat in Ada'a *woreda* in 2012.

[8] *Meher* crop season is defined as any crop harvested between September and February.

ha seed production plots for 2012 season and they expected to maintain the increased yields for the 2013 season. Tef yields of Sodo and Yilmanadensa *woredas* were 31% and 39% better than the national averages, respectively. As for wheat, Sodo and Yilmanadensa *woredas* posted superior yields than the national average. In particular, SFS graduates of Sodo *woreda* harvested averagely 3.9 ton/ha, of wheat in 2012, which was 86 points higher than the national average. These illustrates that the SFS farmers have gained practical technologies, which were then demonstrated at their 0.1 ha seed production plots. The yields of tef and wheat in 2013 in Figures 3 and 4 are not actual values but farmers' expected yields. The project has contributed to raise the willingness and confidence of the farmers to produce more seed by providing them with practical technologies.

The project asked the farmers to answer the quality of their produced seed in 4 levels, i.e. very good, good, no changes, or got worse. Very good is 1 and got worse is 4. As there were no laboratory data available on the quality at the time of the survey, Figure 5 below shows farmers' perception on the products' quality.

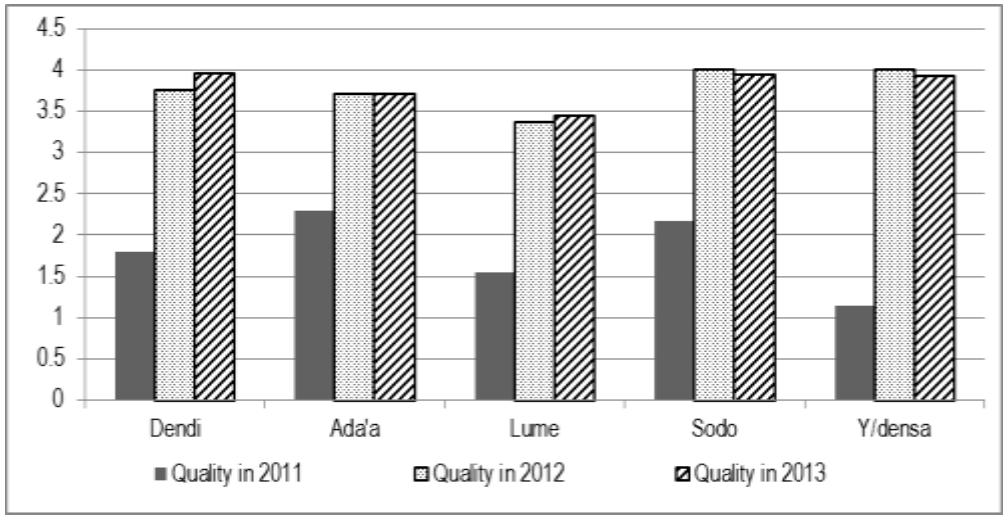

Figure 5. Farmers' perception on the quality of their products

Significant change in the quality is observed between 2011 and other 2 years. The farmers answered their quality has been significantly improved by joining the SFS, and hoped to continue improving.

Use of produced seed

The project asked the farmers how they have used their products in 2012 season from the 0.1 ha seed producing plots.

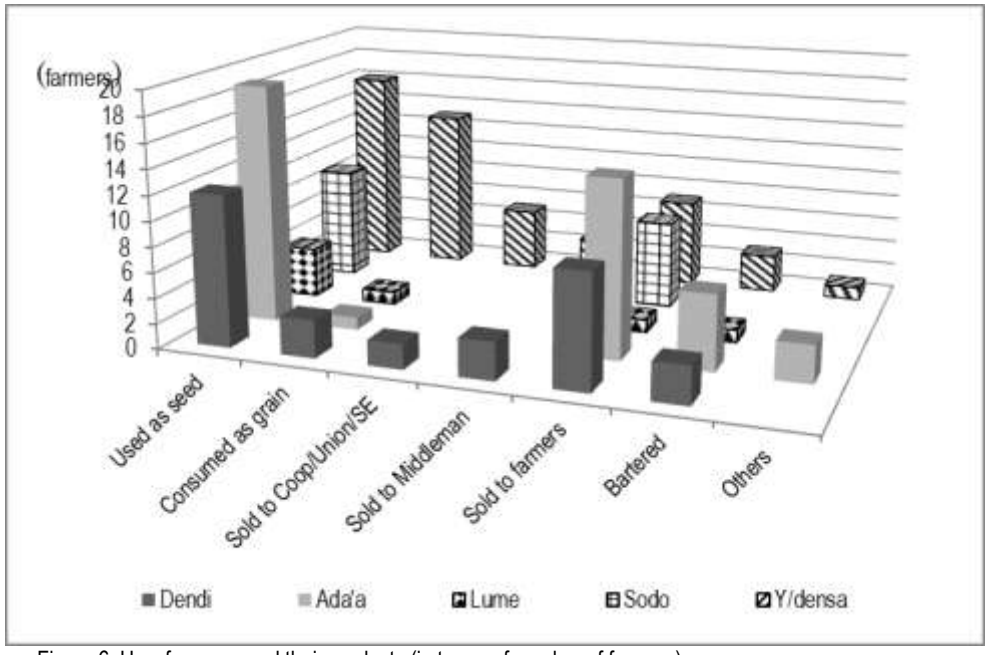

Figure 6. How farmers used their products (in terms of number of farmers)

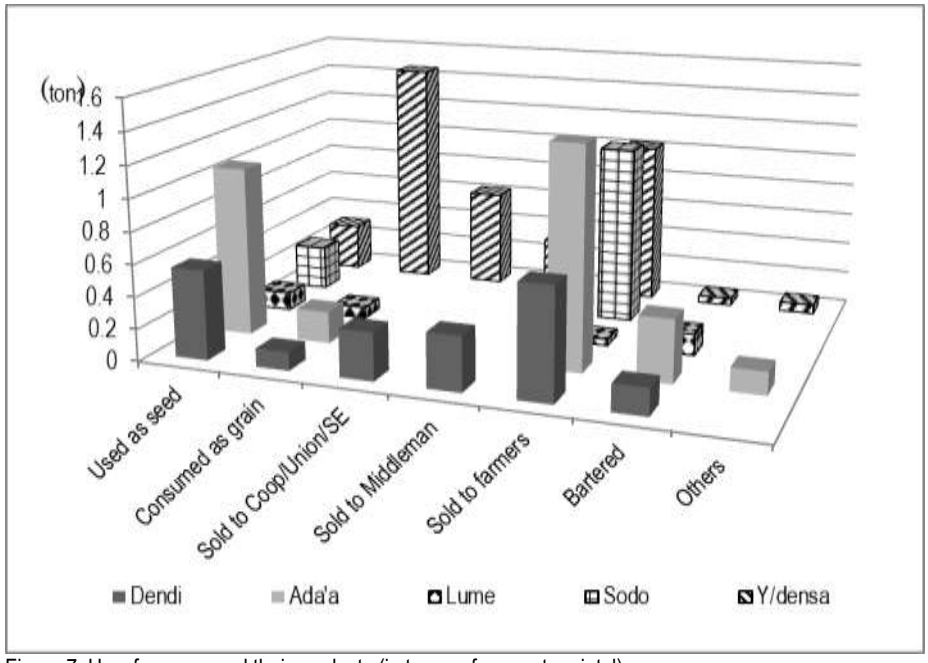

Figure 7. How farmers used their products (in terms of amount: quintal)

Figures 6 and 7 both portray how farmers used their products. (Note that Lume *woreda* has least number of sampled farmers as 11, almost a half of other *woredas*.) Almost all the sampled farmers in five *woredas* used the produce in two ways, used as seed for their own fields and sold as seed or grain to other

farmers. In many cases, they sold their products to their neighboring farmers. Some bartered/exchanged the products. Few farmers sold to cooperatives, unions, intermediaries or seed enterprises, except in Yilmanadensa of Amhara. Many SFS farmers in Yilmanadensa were contract farmers of Amhara Seed Enterprises, and were supplied with seed every year. This could be reasons why the farmers in Yilmanadensa consumed the products as grain since they were sure about the seeds supply for next year.

Seed testing

The survey asked if the farmers wanted their produced seed tested its quality, and amount of money they were ready to pay for it. The Table 9 describes their answers.

Table 9. Farmers' desire on seed quality testing

	Dendi	Ada'a	Lume	Sodo	Y/densa	Total
Number of farmers asked	20	20	11	18	26	95
Want their seed tested?	20	20	11	17	25	93
Ready to Pay	16	20	11	17	24	88
(in percentage)	80.0	100.0	100.0	94.4	92.3	93.4
How much ready to pay						
Minimum (Birr/sample)	5	10	20	5	4	4
Maximum (Birr/sample)	50	150	200	250	30	250
Average (Birr/sample)	23.75	39	48.18	87.35	8.91	41.44

Almost all the farmers want their products tested and are willing to pay some amount. However, the amounts vary among the farmers, which ranges from 4 to 20 birr per sample.

IV-1-4. Summary of findings

There were 731 SFS graduates in the 2012 season, and this survey interviewed 95 graduates who were randomly selected from five target *woredas*. The followings are summaries of the survey findings.

- Majority of graduates positively participated 32-week long SFS, and more than 90% of the participants graduated;
- Important technologies introduced in the SFS were well accepted and adopted by the majority of the participants. In particular, row sowing, which is a critical practice for seed production, was highly adopted by the graduates. However, "Filed Note" was not continually used by the graduates;

- Yields of tef and wheat increased significantly, and the farmers claimed that the quality also improved;
- The farmers also noted that they would be able to keep the increased and improved levels of yield and quality after the graduation;
- Majority of the farmers saved the products for the next season and shared some with neighboring farmers; and
- The majority of the graduates want their seed quality tested even with some payment incurred.

IV-2. Follow-up survey in December 2013

IV-2-1. Background

This study was designed to assess the status and contribution of the efforts made by QSPP and implemented between December 2013 and January 2014. The fieldwork and analysis were carried out by EIAR.

IV-2-2. Methodology

A farm-level survey was conducted from December 14, 2013 to January 3, 2014 in East Shewa Zone (involving Ada'a and Lume *woredas*) and West Shewa Zone (involving Dendi *woreda*) of Oromia National Regional State where QSPP project implementation has taken during 2011-2013. Two villages; namely, Udae and Ejere were selected from Ada'a and Lume *woredas*, respectively, for quality tef seed and another two; Nanoa and Feji, were selected from Lume and Dendi *woredas*, respectively, to represent beneficiaries of quality wheat seed. Udae is located at $08^0$41'N and $039^0$3'E and elevation of 1,861 m whereas Ejere is found at $08^0$48'N and $039^0$17'E and altitude of 2,106 ml. Feji is located at $08^0$02'N and $039^0$8'E and elevation of 2,334 m whereas Nanoa is found at $08^0$46'N and $039^0$16'E and altitude of 2,274 ml. These areas practice multiple cropping of cereals and pulses. Wheat and tef from cereals and chickpea and lentil from pulses are dominant. Barley and Faba beans are also commonly grown. According to the report obtained from development agents, in Nanoa wheat covers 577 hectares of land and tef 171 hectares. In Feji wheat occupies 445 hectares of land whereas tef 800 hectares. In Ejere, wheat takes 865 hectares and tef 615 hectares of land. In Udae, tef land area is 976 hectares whereas wheat land is 591 hectares. The total cultivated land at Nanoa, Feji, Ejere, and Udae is, 1,827, 1,988, 3,226, and 2,957 hectares. The total number of households in Nanoa, Feji, Ejere and Udae are 420 (female headed =36), 371 (female headed=72), 364 (female headed =44) and 635 (female headed = 191). Sixty (30 QSPP beneficiary and 30 non-beneficiary) farmers were randomly drawn from the respective list of total beneficiaries and non-beneficiaries in each village to make 240 (120 beneficiary and 120 counterfactual) sampled farmers. However, during analysis

it was found out that the data for one beneficiary farmer was wrongly collected for a non-beneficiary farmer and hence removed from analysis (Table 10).

Table 10. Distribution of sampled household heads

Technology	Location	QSPP beneficiaries	QSPP non-beneficiaries	Total
Wheat	Nanoa (Lume)	30	30	60
	Feji (Dendi)	30	30	60
	Total	*60*	*60*	*120*
Tef	Udae (Ada'a)	30	30	60
	Ejere (Lume)	29	30	59
	Total	*59*	*60*	*119*
Total		119	120	239

Semi-structured questionnaire was developed and used to solicit primary data from the sampled individual farmers and checklist was used to get general socio-economic information about each village from group of 8-10 men and women farmers. Well-trained diploma and BSc degree holders were used to administer the questionnaires to the identified farmers. The questionnaires were prepared to understand the performance of farmers with respect to use and contribution of quality wheat and tef seeds among farmers. The report was also enriched by secondary data obtained from the Project and various literature sources.

The data collected was organized and entered into computer by experienced technical and data entry experts. Data was cleaned and analyzed using descriptive and inferential methods and transcribed and presented using appropriate Tables.

IV-2-3. Results and discussions

Socio-economic characteristics of sampled households

The statistic on gender of sampled farmers shows that males constitute 81% of the beneficiary groups and 90% of the non-beneficiaries. Table 11 depicts a general comparison of the characteristics of all (both wheat and tef producing) sampled respondents by their categories. Mean values of all of the characteristics displayed in the table seem to be lower for the beneficiaries than for their counterparts. Despite the observed differences between the two groups, the test of mean difference on age, education, sex, and family size showed that the two groups varied in terms of only age with the non-beneficiary farmers being older. There was no distinct variation among the farmers in terms of the other criteria as also indicated by their respective standard deviations. The two household groups can generally be described as those with good years of experience, marginally educated and large family size.

Table 11. Household head characteristics (All sample)

Characteristics	Beneficiaries of QSPP (N=120)		Non-beneficiaries of QSPP (N=119)		*t-value*
	Mean	SD	Mean	SD	
Age of respondent in years completed	41.56	11.09	47.13	12.09	-3.72***
Level of education of household head (years completed)	3.15	4.12	2.53	3.66	1.23
Total family size	6.34	2.30	6.8	2.09	-1.61

****statistically significant at <1% level*

Further analysis of the sampled household heads disaggregated by wheat and tef farming categories shows that age was the crosscutting characteristics distinguishing between the groups. However, different from the results of combined analysis given in Table 11, wheat farmers were found to marginally vary in terms of sex composition (gender). These show that the observed difference between the two groups was real considering age among tef farmers and both age and sex among wheat farmers with the parameters in favor of non-beneficiaries. The implication is that beneficiaries were younger than their counterparts in the case of wheat and tef, whereas the proportion of males to females was higher for the non-beneficiary wheat farmers (Table 12). On the other hand, following the results of the test of mean difference, the two groups have similar characteristics in terms of the other factors considered.

Table 12. Socio-economic characteristics of wheat and tef farmers

Category	QSPP Beneficiaries			QSPP Non-beneficiaries			*t-value*
	N	Mean	SD	N	Mean	SD	
Tef farmers							
Age	60	42.63	11.46	59	49.85	12.46	-3.29***
Sex	60	0.87	-	59	0.93	-	-1.18
Education	60	3.47	3.90	59	2.78	3.93	0.96
Family size	60	6.27	2.35	59	6.88	2.16	-1.49
Wheat farmers							
Age	60	40.48	10.70	60	44.47	11.19	-1.99**
Sex	60	0.58	-	60	0.87	-	-3.63*
Education	60	2.83	4.34	60	2.28	3.40	0.77
Family size	60	6.42	2.26	60	6.72	2.04	-0.76

****, ** and * = statistically significant at <1%, <5% and 10% levels respectively.*
Source: Survey data, 2013/4

Resource ownership of the sampled farmers

Combined analysis of all of the sampled farm households in terms of their resource ownership represented by land, oxen, and livestock showed that the farmers are not statistically different. The lack of statistically significant difference among them was also observed when separate analysis was done on the data disaggregated by wheat and tef farmers as displayed in Tables 14 and 15 below. The small differences in the standard deviations of the resource types also give an indication of a relatively homogenous QSPP beneficiary and non-beneficiary groups in terms of their resource ownership. However, the trend in the mean values of resources owned in the case of tef farmers (Table 15) follows comparable pattern with that of the aggregated categories (Table 13). Generally, the farmers on average had about 2 hectares of land, 3 oxen, 8 TLU, and 5 non-oxen TLU. It should also be noted that there are, though few, farmers who had no land and only one ox.

Table 13. Resource ownership of all sampled farmers (All sample)

Resource type	Beneficiaries of QSPP (N=120)		Non-beneficiaries of QSPP (N=119)		*t-value* (NS)
	Mean	SD	Mean	SD	
Land owned (ha)	1.94	1.17	2.14	1.45	-1.09
Number of oxen owned	2.99[n1]	1.79	2.72[n2]	1.44	1.37
Total livestock (TLU)	8.09	4.70	7.65	4.54	0.73
Livestock excluding oxen (TLU)	5.10	3.24	4.93	3.72	0.37

[n1] and [n2] represent number of household heads to be 115 and 114 respectively; TLU (Tropical Livestock Unit) calculated based on Doppler (1991). NS=not significant

Source: survey data, 2013/4

Table 14. Resource ownership of all sampled wheat groups

Resource	Beneficiaries of QSPP			Non-beneficiaries of QSPP			*t-value*
	N	Mean	SD	N	Mean	SD	
Land owned (ha)	60	2.07	1.23	60	2.17	1.45	-0.42
Number of oxen owned	56	2.68	1.11	57	2.65	1.39	0.12
Total livestock (TLU)	60	7.29	3.93	60	7.50	5.36	-0.24
Livestock excluding oxen (TLU)	60	4.79	2.99	60	4.98	4.59	-0.28

Source: Survey data, 2013/4

Table 15. Resource ownership of all sampled tef groups

Resource	Beneficiaries of QSPP			Non-beneficiaries of QSPP			*t-value* (NS)
	N	Mean	SD	N	Mean	SD	
Land owned (ha)	60	1.81	1.11	59	2.11	1.45	-1.27
Number of oxen owned	59	3.54	2.05	57	3.03	1.28	1.59
Total livestock (in TLU)	60	8.89	5.27	59	7.81	3.54	1.31
Livestock excluding oxen (TLU)	60	5.41	3.47	59	4.88	2.59	0.94

NS = Statistically non-significant difference.

Land use/cropping pattern among sampled farmers

Table 16 presents a summary of land tenure system that has existed between the two groups of sampled farmers notwithstanding of the project target area. The system of land ownership and cultivation that has been practiced by farmers includes own land, rented-in land and shared-in land. However, it was found out that about 2% of the sampled farmers considered in this study did not have their own land in 2013.

According to Table 16, QSPP beneficiaries differed from their counterparts, though marginally (at 10% level of significance) as regards their greater use of land rented-in for crop production purpose. Though statistically not significant, we may make a weak observation that QSPP beneficiary farmers put, on average, more land under cultivation than the non-beneficiary farmers may from the various types save own land.

Table 16. Land tenure system in the target areas (All sample)

Land tenure (ha)	Beneficiaries		Non-beneficiaries		*t-value*
	N	Mean	N	Mean	
Total land cultivated	120	2.79 (2.43)	118	2.59 (1.44)	0.75
Own land cultivated	117	1.76 (1.06)	116	1.94 (1.31)	-1.17
Land rented-in	61	1.87 (2.61)	56	1.24 (1.05)	1.67*
Land shared-in	14	1.05 (0.75)	13	0.85 (0.43)	0.86

Figures in parentheses are standard deviations
*N=118 instead of 119 since one of the farmers did not cultivate his land in 2013 *Significant at 10 percent level.*

Further analysis of the data by disaggregating into wheat and tef target areas (Tables 17 and 18) shows that the difference in land tenure arrangement varied only with land renting practices of the tef target area farmers and not with that of the wheat target area farmers. The implication is that disaggregated analysis could help attribute the *per se* differences to the right sub-group of farmers (compare Table 16 against Tables 17 and 18). Thus, according to the result portrayed by Table 18 for tef target area farmers, the QSPP farmer's rented-in

more (about 2.33) hectares of land whereas their counterparts rented-in less (about 1.21) hectares of land for crop production purpose.

Table 17. Land tenure system in wheat target areas

Land tenure (ha)	QSPP Beneficiaries			Non-beneficiaries			*t-value*
	N	Mean	SD	N	Mean	SD	
Total land cultivated	60	2.59	1.45	60	2.17	1.45	-0.36
Own land cultivated	59	1.87	1.12	60	2.01	1.35	0.62
Land rented-in	27	1.29	0.88	27	1.28	1.18	0.04
Land shared-in	8	1.38	0.83	8	0.88	0.42	1.52

Table 18. Land tenure system in tef target areas

Land tenure (ha)	Beneficiaries			Non-beneficiaries			t-value
	N	Mean	SD	N	Mean	SD	
Total cultivated land	60	2.97	3.12	58	2.48	1.28	1.11
Own land cultivated	58	1.64	0.99	56	1.88	1.27	-1.03
Land rented-in	34	2.33	3.36	29	1.21	0.94	1.73*
Land shared-in	6	0.61	0.32	5	0.80	0.48	-0.76

** Significant at <10% level N=58 since one farmer did not cultivate his land in 2013*

Cropping pattern

Table 19 depicts that all of the sampled farmers, *albeit* their categorical differences, grow a number of crops through the practice of mixed farming. Accordingly, tef, wheat, and chickpea are the most important crops grown by many of the farmers. Results of standard deviations generally showed that both groups of farmers (beneficiaries and non-beneficiaries) allocated land unvaryingly to the different crops. In addition, statistical test of mean difference showed that both groups, save the observed slight differences, are alike in terms of their land allocation to the different crops. Further disaggregated analysis of the data by wheat and tef project intervention areas also showed similar tendencies among the farmers except that the beneficiaries and their counterfactuals differed only in terms of their lentil and grass-pea land allocation respectively in the wheat and tef project areas (Tables 20 and 21).

Table 19. Allocation of land to different crops (All sample)

Cultivated land (ha) (2013)	Beneficiaries			Non-beneficiaries		
	N	Mean	SD	N	Mean	SD
Tef	120	1.26	1.238	118	1.09	0.836
Wheat	116	0.67	0.518	111	0.72	0.416
Chickpea	98	0.56	0.712	86	0.53	0.419
Lentil	47	0.40	0.473	34	0.42	0.213
Faba bean	31	0.28	0.234	31	0.27	0.166
Grass Pea	25	0.45	0.376	25	0.45	0.324
Field pea	7	0.28	0.169	6	0.44	0.314
Barley	13	0.31	0.258	16	0.25	0.137
Maize	8	0.25	0.116	6	0.25	0.000
Fenugreek	6	0.71	0.292	5	0.57	0.326
Bean	1	0.12	.	-	-	-
Sorghum	-	-	-	3	0.42	0.144

N=118 instead of 119 since one farmer did not cultivate his land in 2013

Table 20. Cropping pattern among wheat intervention area farmers

Cultivated land (ha) (2013)	Beneficiaries			Non-beneficiaries		
	N	Mean	SD	N	Mean	SD
Tef	60	1.12	0.796	60	1.11	0.963
Wheat	59	0.74	0.376	56	0.74	0.384
Chickpea	46	0.41	0.235	44	0.45	0.441
Grass Pea	18	0.57	0.379	22	0.47	0.339
Faba bean	18	0.32	0.288	16	0.34	0.197
Lentil*	20	0.21	0.104	12	0.36	0.244
Field pea	5	0.35	0.137	4	0.56	0.315
Barley	9	0.35	0.285	10	0.29	0.156
Maize	5	0.22	0.056	4	0.25	0.000
Fenugreek	4	0.75	0.204	5	0.58	0.326
Sorghum	-	-	-	2	0.37	0.176

**Lentil farmers differ at p<0.05 level. Source: Survey data, 2013/4*

Table 21. Cropping pattern among tef intervention area farmers

Cultivated land area (ha) (2013)	Beneficiaries			Non-beneficiaries		
	N	Mean	SD	N	Mean	SD
Tef	60	1.41	1.553	58	1.07	0.687
Wheat	57	0.59	0.627	55	0.67	0.447
Chickpea	52	0.69	0.938	42	0.62	0.381
Lentil	27	0.55	0.581	22	0.44	0.193
Faba bean	13	0.23	0.118	15	0.19	0.076
Grass Pea*	7	0.14	0.078	3	0.27	0.036
Field pea	2	0.09	0.044	2	0.19	0.088
Barley	4	0.23	0.193	6	0.19	0.068
Maize	3	0.29	0.191	2	0.25	0.000
Bean	1	0.12	.	-	.	.
Sorghum	-	.	.	1	0.50	.
Fenugreek	2	0.62	0.530	-	.	.

**Grass pea farmers different at p<0.05. N=58 instead of 59 since one farmer did not cultivate his land in 2013*

Varietal use among wheat and tef growing farmers

Table 22 depicts combined analysis of the data from the whole respondents. It shows that the farmers in general grow wheat varieties known as Qubsa, Digelu, Kekeba, Dendea, Paven, and Baysa. Considering the proportion of farmers, among the wheat varieties, Qubsa, Digelu and Kekeba are widely grown by the farmers. These crops are grown by 51.9% (involving 49.2% beneficiaries and 54.6% non-beneficiaries), 22.2% (involving 25% of the beneficiaries and 19.3% of the non-beneficiaries) and 16.7% (involving 15% of the beneficiaries and 18.5% of the non-beneficiaries) of the sampled farmers. However, 2.5% of the sampled farmers constituted from 3.3% QSPP beneficiary and 1.7% non-beneficiary farmers did not grow wheat in 2013.

Table 22. Wheat varieties grown by sample of wheat and tef intervention areas

Names of wheat varieties/cultivars	QSPP Beneficiaries		Non-beneficiaries		Total	
	N	%	N	%	N	%
Qubsa	59	49.2	65	54.6	124	51.9
Digelu	30	25.0	23	19.3	53	22.2
Kekeba	18	15.0	22	18.5	40	16.7
Dendeaa	6	5.0	4	3.4	10	4.2
Baysa	_	_	1	0.8	1	0.4
Paven	3	2.5	2	1.7	5	2.1
None	4	3.3	2	1.7	6	2.5
Total	120	100	119	100	239	100

Separate assessment of the farmers' preferences in wheat and tef target areas considering their geometric distribution showed that, in wheat intervention sites, farmers' choices are limited to four varieties, and Qubsa and Digelu have been popular. Table 23 provides that 47.5% (36.7% of the beneficiary and 58.3% of the non-beneficiary groups) of the farmers grew Qubsa whereas 39.2% (45% of the beneficiary and 33.3% of the non-beneficiary groups) grew

Digelu. However, the proportion of farmers producing Qubsa is higher in the case of non-beneficiary farmers whereas Digelu for the beneficiary farmers.

Table 23. Wheat varieties/cultivars grown by farmers of wheat intervention areas

Name of wheat varieties/cultivars	QSPP beneficiaries		Non-beneficiaries		Total	
	N	%	N	%	N	%
Qubsa	22	36.7	35	58.3	57	47.5
Digelu	27	45.0	20	33.3	47	39.2
Kekeba	8	13.3	2	3.3	10	8.3
Dendeaa	3	5.0	3	5.0	6	5.0
Total	60	100	60	100	120	100

Table 24 shows the distribution of farmers who grew tef varieties/cultivars both in wheat and tef intervention areas in 2013. The table portrays that several tef types are grown by the farmers in general. Among the listed varieties/cultivars in 2013, Quncho variety is found popular among the farmers and more than 70% of the beneficiary and non-beneficiary farmers grew it. It is to be noted also that a few non-beneficiary farmers are used to growing Magna and Koledima tef types and some farmers are used to growing mixed (in color, weight and size) seeds (by the name of Quncho variety). This could imply that farmers have either lack of access to the best/pure variety (due to lack of trust on sources and unaffordable price) or the best variety is losing its originality. The farmers' concern for accessible quality seed was also noted during group discussion with farmers.

A separate analysis of the data with respect to varietal choices of farmers drawn from tef intervention project showed that farmers are limited to two varieties/cultivars and Quncho is grown among 98.3% (100% of the beneficiary and 96.6% of the non-beneficiary groups) of the farmers (Table 25). The fact that some (9.2%) farmers are producing more than one tef varieties/cultivars at the same time (Quncho and Enat) may imply lack of access to Quncho (the best available option) variety either in its pure or mixture form (individual and group discussions revealed that most farmers have faced difficulty accessing the variety with desirable physical and agronomic traits). However, the Table shows that few non-project beneficiary farmers grow Enat variety/cultivar only.

Table 24. Distribution of sampled farmers by tef varieties/cultivars in 2013

Variety/cultivar	QSPP beneficiaries		QSPP non-beneficiaries		Total	
	N	%	N	%	N	%
Quncho	81	67.5	85	72.0	166	69.7
Quncho and Koledima	1	0.8	1	0.8	2	0.8
Quncho and red tef	4	3.3	2	1.7	6	2.5
Quncho and Kera kole	12	10.0	6	5.1	18	7.6
Quncho and Enat	9	7.5	7	5.9	16	6.7
Kera Kole	8	6.7	6	5.1	14	5.9
Enat tef	1	0.8	3	2.5	4	1.7
Red tef	1	0.8	2	1.7	3	1.3
Red and Kera Kole	3	2.5	2	1.7	5	2.1
Enat and Kera Kole	-	-	2	1.7	2	0.8
Magna	-	-	1	0.8	1	0.4
Koledima	-	-	1	0.8	1	0.4
Total	120	100	118*	100.0	238	100

**N=118 instead of 119 since one farmer did not cultivate his land in 2013*

Table 25. Tef varieties grown by farmers of tef intervention area

Varieties/cultivars	QSPP beneficiaries		QSPP non-beneficiaries		Total	
	N	%	N	%	N	%
Quncho	53	88.3	52	89.7	106	89.1
Quncho and Enat	7	11.7	4	6.9	11	9.2
Enat	-	-	2	3.4	2	1.7
Total	60	100	58	100	119	100

Farmers' varietal preference and willingness to pay/receive

Table 26 provides the frequency distribution of farmers based on their varietal preferences for wheat. The distribution of both groups of farmers appears to be similar with the exception of Shalo and Beraye varieties/cultivars. However, the two groups are statistically different ($p<0.001$ level), implied that the observed differences are real and cannot be attributed to chance factor. According to the figures, Digelu and Qubsa varieties are the ones grown and preferred most by the two groups. However, Qubsa (the older variety) is relatively preferred less by the project non-beneficiaries. Dendea and Kekeba, the alternative, varieties are grown mostly by few but preferred by large number of farmers. The possible reason, as also noted from the group discussion, for the discrepancy between preference and use of the varieties would be that the older varieties are losing their originality and new varieties with some additional values are coming in the system. It could also show that the preferred varieties are either in short supply or inaccessible to the small

farmers. This may be an indication for accelerated approach in meeting farmers demand and varietal-related or sustained trainings on seed production.

Table 26. Farmers' varietal use and preferences in wheat target area

Variety /cultivar	Beneficiaries* (N=60)		Non-beneficiaries* (N=60)	
	Grown most	Preferred most	Grown most	Preferred most
Dendea	5 (8.3)	8 (13.3)	3 (5.0)	14 (23.3)
Digelu	24 (40.0)	26 (43.4)	19 (31.6)	22 (36.7)
Kekeba	4 (6.6)	9 (15.0)	1 (1.7)	11 (18.3)
Filetema	1 (1.7)		1 (1.7)	-
Qubsa	24 (40.0)	17 (28.3)	36 (60.0)	13 (21.7)
Shalo	1 (1.7)	-	-	-
Beraye	1 (1.7)	-	-	-
Total	60 (100.0)	60 (100.0)	60 (100.0)	60 (100.0)

Figures in parentheses are percentages of farmers
**statistically significant at <0.000 level*

Assessment of farmers' willingness to pay for seeds of the most grown wheat varieties/cultivars revealed that Kekeba, Dendea, Digelu, and Qubsa were the most important commonly identified varieties by the beneficiary and non-beneficiary farmers (Table 27). The difference between the two groups of farmers' willingness to pay for theses varieties is attributed to their priority ordering expressed through the value attached to the varieties. To this effect Kekeba, Dendea and Digelu varieties were given better price of 10.0, 8.67 and 8.42 Birr/kg by the non-beneficiaries whereas Dendea, Kekeba, and Digelu were given better price of up to 10.4, 9.75, and 8.92 Birr/kg by the project beneficiary farmers. On the other hand, considering the distribution of farmers on most grown varieties Digelu seems popular among them. Varieties known as Beraye and Shalo are found in the hands of only two beneficiary farmers. Nevertheless, it is amazing that Shalo is provided extraordinarily high price and identification of the underlying factor may need additional study.

Assessment of farmers' willingness to pay for the most preferred wheat varieties/cultivars revealed that same four varieties as those identified in the list of most grown varieties were identified jointly by the sampled beneficiary and non-beneficiary farmers (Table 28). However, the orderings were different for the non-beneficiary farmers. To this effect, seeds of Dendea followed by Kekeba were offered the highest price/kg whereas Qubsa and Digelu varieties were in the second batch preference of the non-beneficiaries. The beneficiaries were consistent with their decision made in the case of the most grown varieties. Considering the distribution of farmers on most grown varieties Digelu seems popular among themselves, save the variation in the rest of the varieties.

Table 27. Farmers' willingness to pay for most grown wheat seed by varieties

Varieties grown quite often/most		Beneficiaries (N=60)		Non-beneficiaries (N=59)		Total (N=119)	
		Minimum price (Birr)	Maximum price (Birr)	Minimum price (Birr)	Maximum price (Birr)	Minimum price (Birr)	Maximum price (Birr)
Digelu	N	24	24	19	19	43	43
	Mean	7.51	8.92	7.03	8.42	7.29	8.69
	SD	2.08	2.08	1.36	1.54	1.79	1.86
Qubsa	N	24	24	36	36	60	60
	Mean	6.64	7.94	6.61	8.07	6.62	8.02
	SD	1.76	1.96	1.17	1.31	1.42	1.59
Dendea	N	5	5	3	3	8	8
	Mean	9.10	10.40	7.33	8.67	8.44	9.75
	SD	2.97	3.21	0.58	1.15	2.44	2.66
Kekeba	N	4	4	1	1	5	5
	Mean	8.25	9.75	8.00	10.00	8.20	9.80
	SD	2.63	2.63	.	.	2.28	2.28
Shalo	N	1	1	.	.	1	1
	Mean	14.00	15.00	.	.	14.00	15.00
	SD	.	.	.	.	.	.
Beraye	N	1	1	.	.	1	1
	Mean	6.00	7.00	.	.	6.00	7.00
	SD			.	.	.	.
Total	N	60	60	60	60	120	120
	Mean	7.51	8.88	6.81	8.24	7.16	8.56
	SD	2.34	2.49	1.21	1.37	1.89	2.02

Table 29 provides the amount of wheat seed the sampled farmers are willing to buy if the varieties were to be offered at the maximum price. This is an important indicative criterion for determining farmers' demand and capacity in the framework of price differentials among the available options. An average non-beneficiary farmer would like to buy 124.55 kg of Kekeba and 116.92 kg of Qubsa for 8.67 and 8.55 Birr/kg respectively whereas QSPP beneficiary farmers are willing to buy 184.38 kg of Dendea followed by 153.89 kg of Kekeba and 129.71 kg of Qubsa at the maximum price of 10.0, 9.0 and 8.45 Birr/kg respectively. The range of price and quantity relationships can be used as indicative instrument to determine farmers' priorities and capacities when seed related development activities are to be laid out around these farmers.

Table 28. Farmers' willingness to pay for most preferred wheat seed by varieties

Most preferred varieties /cultivars		Beneficiaries (N=60)		Non-beneficiaries (N=59)		Total (N=119)	
		Minimum price	Maximum price	Minimum price	Maximum price	Minimum price	Maximum price
Dendea	N	8	8	14	14	22	22
	Mean	8.69	10.00	8.21	9.29	8.39	9.54
	Std. Dev.	2.37	2.56	1.25	1.143	1.70	1.77
Digelu	N	26	26	22	22	48	48
	Mean	7.55	9.08	7.11	8.50	7.35	8.81
	Std. Dev.	2.06	2.12	1.36	1.50	1.77	1.86
Kekeba	N	9	9	11	11	20	20
	Mean	7.67	9.0	7.23	8.67	7.425	8.82
	Std. Dev.	2.74	2.69	1.17	1.38	1.98	2.02
Qubsa	N	17	17	13	13	30	30
	Mean	7.03	8.45	7.00	8.55	7.02	8.49
	Std. Dev.	1.60	1.87	1.41	1.39	1.49	1.65
Total	N	60	60	60	60	120	120
	Mean	7.57	9.01	7.37	8.73	7.47	8.87
	Std. Dev.	2.10	2.20	1.37	1.38	1.77	1.83

Table 29. Amount of best-preferred wheat seed to buy at maximum price

Variety /Cultivar	Beneficiaries			Non-beneficiaries		
	N	Mean (kg)	SD	N	Mean (kg)	SD
Dendea	8	184.38	110.95	14	96.71	61.80
Digelu	26	79.81	34.01	22	88.41	59.89
Kekeba	9	153.89	77.93	11	124.55	75.02
Qubsa	17	129.71	103.02	13	116.92	88.82
Total	60	119.00	84.43	60	103.15	69.96

Table 30 provides a statistically significant difference in varietal choices and preferences of QSPP beneficiary and non-beneficiary farmers for tef seed. The table shows that farmers have preferences for and experiences with a range of varieties and their distribution is not uniform. In addition, there are less number of preferred than grown varieties. Though the frequency distribution of farmers based on their use and preferences for Quncho and Kera Kore varieties appear to be similar, the beneficiary farmers have better access to the latter variety whereas their counterparts for the former one. Like for wheat, the possible reason for the lack of similarity between preference and use of the varieties would be that the older varieties are losing their originality and new varieties with some additional values are coming in the system. It could also show that the preferred varieties are either in short supply or inaccessible to the small farmers. The disparity and explanations given may also be a useful guide when implementing agricultural development activities that enhance wider adoption

of technologies and seed production and supply among different groups of farmers. Assessment of farmers' willingness to pay for the most grown tef varieties/cultivars revealed that price tags were made only on three varieties (Table 31). Quncho and Magna varieties were associated to better price of 16.42 and 17.0 Birr/kg by the non-beneficiaries whereas they were associated to better price of up to 16.60 and 18.67 Birr/kg by the project beneficiary farmers. Enat variety was in the last category.

Table 30. Farmers' varietal use and preferences in the tef target area

Variety /cultivar	Beneficiaries* (N=60)		Non-beneficiaries* (N=59)	
	Grown most	Preferred most	Grown most	Preferred most
Quncho	39 (65.0)	44 (73.3)	28 (46.7)	40 (66.7)
Kera Kore	10 (16.7)	12 (20.0)	17 (28.3)	15 (25.0)
Quledima	3 (5.0)	3 (5.0)	1 (1.7)	1 (1.7)
Red tef	2 (3.3)	-	10 (16.7)	4 (6.7)
Enat	4 (6.7)	1 (1.7)	1 (1.7)	-
Magna	2 (3.3)	-	3 (5.0)	-
Total	60 (100.0)	60 (100.0)	60 (100.1)	60 (100.1)

Figures in parentheses are percentages of farmers
**statistically significant at <0.000 level*

Table 31. Farmers' willingness to pay for most grown tef seed by varieties

Most preferred varieties /cultivars		Beneficiaries (N=60)		Non-beneficiaries (N=59)		Total (N=119)	
		Minimum price	Maximum price	Minimum price	Maximum price	Minimum price	Maximum price
Quncho	N	55	55	51	51	106	106
	Mean	13.98	16.60	13.76	16.42	13.88	16.51
	SD	3.06	3.18	2.86	2.93	2.96	3.05
Enat	N	2	2	5	5	7	7
	Mean	13.50	14.50	9.40	11.00	10.57	12.00
	SD	2.12	2.12	4.10	4.53	3.99	4.16
Magna	N	3	3	2	2	5	5
	Mean	15.67	18.67	15.00	17.0	15.40	18.00
	SD	0.58	1.15	0.00	0.00	0.55	1.22
Total	N	60	60	59	59	119	119
	Mean	14.05	16.63	13.39	15.92	13.72	16.28
	SD	2.97	3.12	3.15	3.36	3.06	3.25

Assessment of farmers' willingness to pay for the most preferred tef varieties/cultivars revealed that only one variety was identified when farmers were asked to attach value against the most preferred ones. Therefore variety Quncho remained the most preferred one and the price attached to this variety appears to be similar (i.e. about 16 Birr/kg) across the QSPP beneficiary and non-beneficiary farmers (Table 32). However, the highest price attached to Magna and Qoledima varieties may not be overlooked when targeting the farmers' concerns.

Table 32. Farmers' willingness to pay for most preferred tef seed by varieties

Most preferred varieties /cultivars		Beneficiaries (N=60)		Non-beneficiaries (N=59)		Total (N=119)	
		Minimum price	Maximum price	Minimum price	Maximum price	Minimum price	Maximum price
Quncho	N	59	59	58	58	117	117
	Mean	13.98	16.59	13.95	16.30	13.97	16.45
	SD	3.42	3.56	2.792	2.83	3.11	3.21
Magna	N	-	-	1	1	1	1
	Mean			15.00	17.00	15.00	17.00
	SD	-	-	-	-	-	-
Qoledima	N	1	1	-		1	1
	Mean	17.00	18.00	-	-	17.00	18.00
	SD	-	-	-	-	-	-
Total	N	60	60	59	59	119	119
	Mean	14.03	16.62	13.97	16.31	14.00	16.47
	SD	3.41	3.53	2.77	2.81	3.10	3.18

Table 33 provides the amount of tef seed the sampled farmers are willing to buy if the varieties were to be offered at the maximum price. The data in the table shows that almost all farmers from each category have expressed their willingness to attach prices to Quncho. Accordingly, an average non-beneficiary farmer and beneficiary farmer would like to buy 43.57 kg of Quncho and 59.56 kg of the same variety for 16.30 and 16.59 Birr/kg respectively. Only one beneficiary and one non-beneficiary farmer have shown interest in attaching values to Qoledima and Magna varieties.

Table 33. Amount of best-preferred tef seed to buy at maximum price (kg)

Variety /Cultivar	Beneficiaries (N=60)			Non-beneficiaries (N=59)		
	N	Mean	SD	N	Mean	SD
Quncho	59	59.56	56.699	58	43.57	30.794
Magna	-	-	-	1	20.0	.-
Qoledima	1	100.0	.-	-	-	-
Total	60	60.23	56.459	59	43.17	30.681

Farmers' perception about seed quality

Seed production and management

Tables 34 and 35 depict farmers' wheat and tef sowing practices in the QSPP intervention areas. As shown by Table 34, the farmers living in the wheat intervention area of QSPP used higher (around the upper range of the recommended) seed-rates of wheat over the three years period. However, the rates of application of wheat seeds were generally inconsistent between the two groups of farmers. The standard deviation of QSPP beneficiary farmers was highest in 2011 showing greatest variability among the farmers in terms of seed rates. However, the variability was very much reduced in 2012 and later. Though there can be seen some numerical differences in wheat seed rates

between the two categories of farmers in absolute terms, this scenario could not be statistically established, implying that the observed difference is due to chance (not real). On the other hand, for an average farmer, such practice seems to be within the range of the recommended rate of 150 – 175 kg/ha (Bekele et al 2000, Getachew et al 2008).

Table 34. Seed rate practices of farmers in QSPP-wheat-intervention areas

Seed rate of wheat (kg/ha)	QSPP beneficiaries			QSPP non-beneficiaries			*t*-value (NS)
	N	Mean	SD	N	Mean	SD	
2011	59	159.6	90.789	57	145.9	71.797	0.896
2012	60	145.8	86.210	59	150.5	76.469	-0.313
2013	59	153.6	78.699	57	143.4	71.245	0.726

The farmers living in the tef intervention area of QSPP also used higher rates of tef over the three years period (Table 35). The rate of application of tef seeds was generally inconsistent among the two groups of farmers. Like in the wheat area farmers, though there can be seen some differences between the two categories of tef area farmers in the observed values of seed rates, this scenario could not be statistically established. The implication is that the difference is due to chance (not real). On the other hand, for an average farmer such practice revolves around the higher limit of recommended rate of 15 - 55 kg/ha (Seyfu, 1997).

Table 35. Seed rate practices of farmers in QSPP-tef-intervention areas

Seed rate of tef (kg/ha)	QSPP beneficiaries			QSPP non-beneficiaries			*t*-value (NS)
	N	Mean	SD	N	Mean	SD	
2011	48	49.3	40.310	47	44.4	23.893	0.729
2012	60	51.7	50.623	52	41.7	20.924	1.319
2013	60	42.5	44.8	57	37.8	17.453	0.745

Production of quality of seeds (Productivity of seed farm)

According to farmers' response, over the project period, quality seed production was practiced by QSPP beneficiaries only. Thus, this section explains the performance of these farmers in quality seed production. Figures 8 and 9 show the land allocation and level of wheat and tef seed production during the two useful years (2012 and 2013) in that order.

In the wheat target areas, among the interviewed 60 QSPP graduate farmers, 50 farmers (40 in 2012 and 10 in 2013) were found to get involved in wheat seed production. The farmers produced a total of 147 kg wheat seed in 2012 and an estimated amount of 300 kg of wheat seed in 2013 (see Fig. 8), which according to farmers' response are set aside for seed (71%) and for sale (29%) as grain. Productivity of wheat seed that was obtained from 0.06 and 0.1 ha

was calculated to be equivalent to 2,732 kg/ha and 3,925 kg/ha in 2012 and 2013 respectively. The average productivity was higher in 2013.

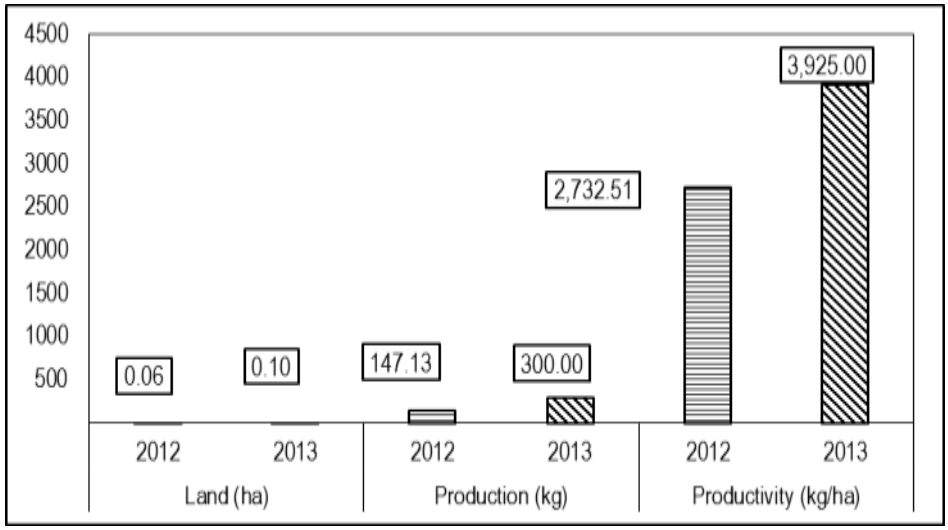

Figure 8. Production of wheat seed by QSPP-wheat farmers

Figure 9 portrays the performance of tef farmers (QSPP farmers). Accordingly, 36 farmers produced a total of 300 kg tef seed in 2012 and 20 farmers produced an estimated amount of 486 kg tef seed in 2013. According to farmers' responses, of the total amount produced 8% is for seed, 23% for sale as grain, and 69% for exchange with grains of other crops with the farmers in the locality. Productivity of tef seed that was obtained from was 0.62 and 1.02 ha was calculated to be equivalent to 2,243 kg/ha and 2,240 kg/ha in 2012 and 2013 respectively. The productivity attained during the two years is comparable.

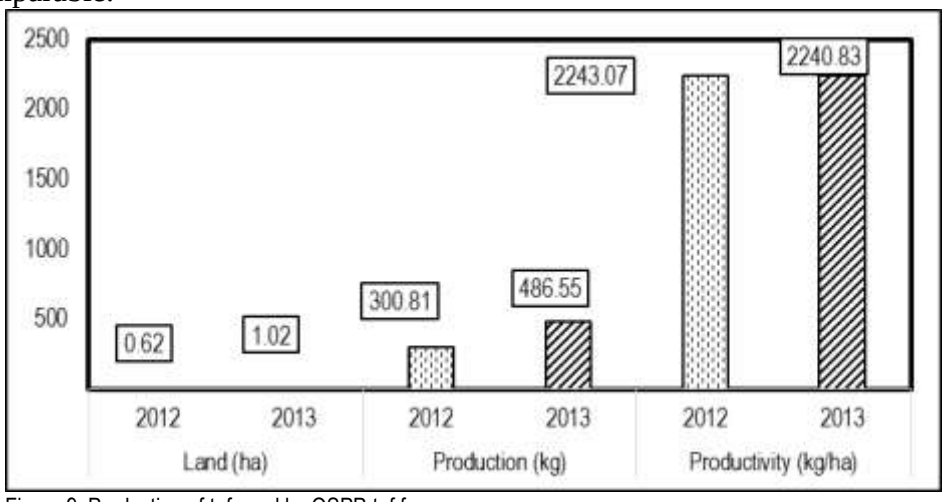

Figure 9. Production of tef seed by QSPP-tef farmers

Farmers' perception of quality of seed sown

Wheat target area

Figure 10 below was developed from farmers' response on the quality of wheat seed they sowed in 2013 cropping season. The figure shows that a greater number of them have used certified seeds (seeds sold through farmers' cooperative) and few have used mixed type wheat seed. Almost all of the QSPP beneficiary farmers (except two) said that they have used certified seeds. Based on the number of farmers certified seeds of Digelu, Qubsa, Kekeba and Dendea varieties were grown by 26, 20, 8, and 3 beneficiary farmers respectively. Nineteen out of sixty non-beneficiary farmers grew mixed seeds of Qubsa, Digelu, and Dendea varieties. Farmers also obtain seeds from EAAPP (East African Agricultural Productivity Program) and Farmers' cooperatives.

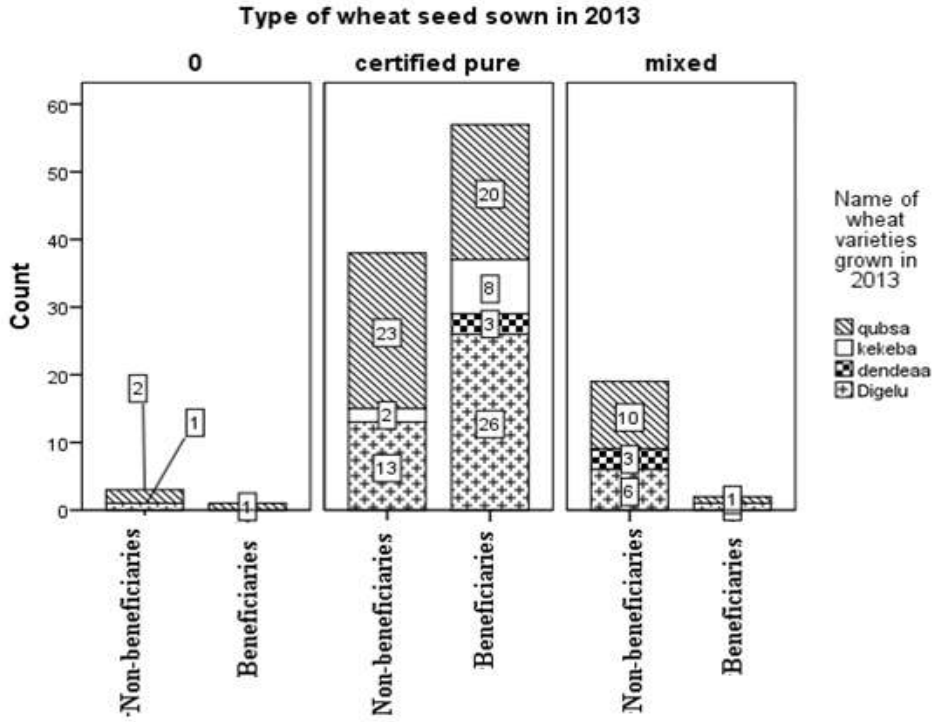

Figure 10. Number of farmers according to wheat seed types used

Tef target area

Farmers' response on the quality of tef seed they sowed in 2013 cropping season is summarized in Figure 11 below. Accordingly, the Figure shows the scenario that a greater number of them have used certified seed and few have used mixed type of tef seed. Almost all (85%) of the QSPP beneficiary farmers said that they have used certified seeds of tef (i.e. Quncho) whereas

non-beneficiary farmers used Quncho that has been obtained from NGOs (such as FAO and Biftu) and from local (traditional) sources. Twelve (about 20%) of the non-beneficiary farmers used mixed Quncho and two farmers could not tell (said we do not know) the type of seeds they have been using. However, it was surprising to note from the farmers' responses that 7 (11.7% of) beneficiary farmers have used a combination of pure and mixed Quncho seeds.

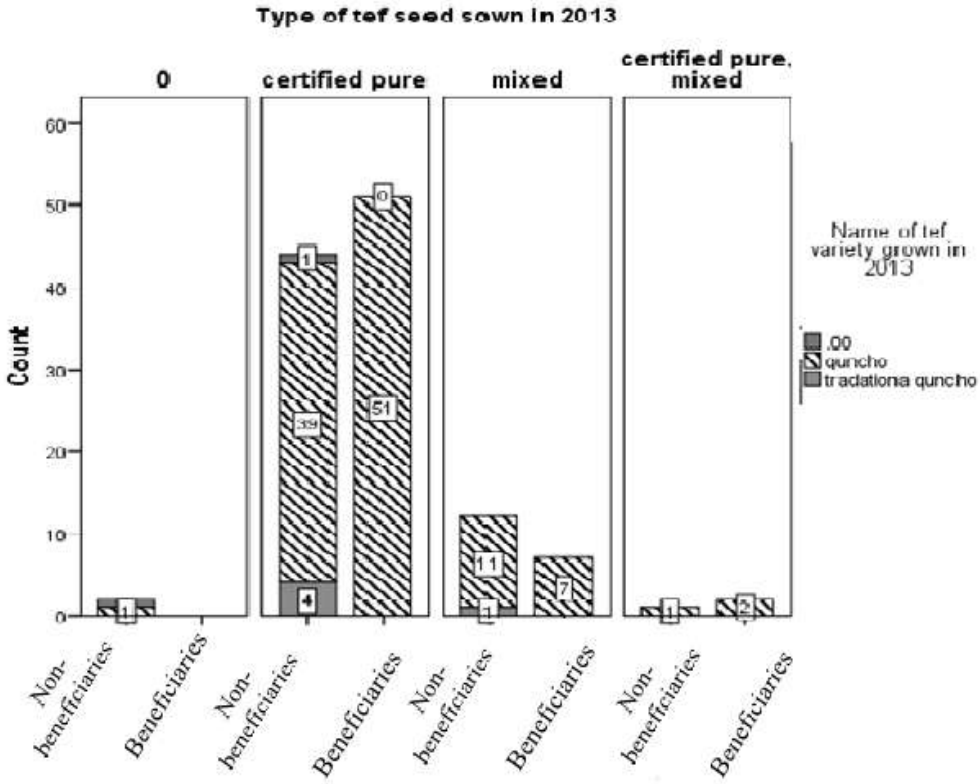

Figure 11. Number of farmers according to tef seed types used

Seed business and production of quality seeds

Farmers' involvement in seed production

QSPP farmers have testified that they acquired their first experience about seed production from QSPP project since 2011. Though there was gap in getting consistent information, it was noted that each project beneficiary farmer has produced quality seed utmost once. However, quality seed business was generally unobserved between project and non-project farmers. This is mainly because the QSPP project is young (three years old) and the first batch (graduates) of beneficiary farmers were able to sow seeds for seed purpose for the first time in 2012 and used the seed thus harvested for grain production and other purposes in 2013. According to the informal communication with some

farmers, most of them have produced seeds once. Most of the farmers have turned back to their practices as they were before in terms of seed production (i.e. they have stopped setting aside land meant for seed production). Several reasons have been mentioned by the farmers as discussed in the previous section. In addition, according to them, further technical support and favorable environment is required for adopting and maintaining sustainable production of seeds even as business among smallholder farmers. Above all, they pinpointed the need for close supervision and advice and creation of reliable/strong link with buyers (guaranteed market). In addition, the survey team was able to note that there was no or limited farm-level follow-up after farmers graduation and the initial input provided to the farmers. However, the impact of SFS in terms of produced seed quality is yet to be verified, and the on-going seed quality testing activity and its results and evaluation is much awaited.

Role of SFS in formal and informal seed systems

Despite the presence of both the formal and informal seed systems in the country, smallholder farmers are usually discouraged by the higher price and inaccessibility of seeds of improved varieties that are supplied by the formal system and/or the lack of pure and trustworthy seeds provided with the informal system. Both of the systems lack focuses on improvement of farmers circumstances (most importantly, skill, market and capacity development). Failure of the formal system to satisfy the seed demand of smallholder subsistence farmers was also reported in Zewdie et al (2008). The informal system has also problem of quality maintenance (Lipper et al 2005).

The QSPP approach would be beneficial to systems in that are suited to farmer's needs; since it creates better access to quality seeds that are cheaper, highly valued by farmers, accessible to farmers, and that it plays an important role by improving farmers skill through training which is the nature of the approach and overcoming quality related deterioration.

Role of extension in quality seed production

The number of contacts with the extension agents was on average 15 per year for QSPP beneficiaries and 13 per year for non-beneficiary farmers. The type of training given by the extension system revolves around agronomy, improved varieties (farmers' call them improved seed), crop protection and seed quality (Figure 12). Both parameters are not statistically significant ($p>0.1$) which implies the services are similar for the two categories of farmers and differences could not be statistically established. In addition, considering the percentage of farmers (around 10%) indicating the type of contact the emphasis of the research-extension on seed quality seems to be low.

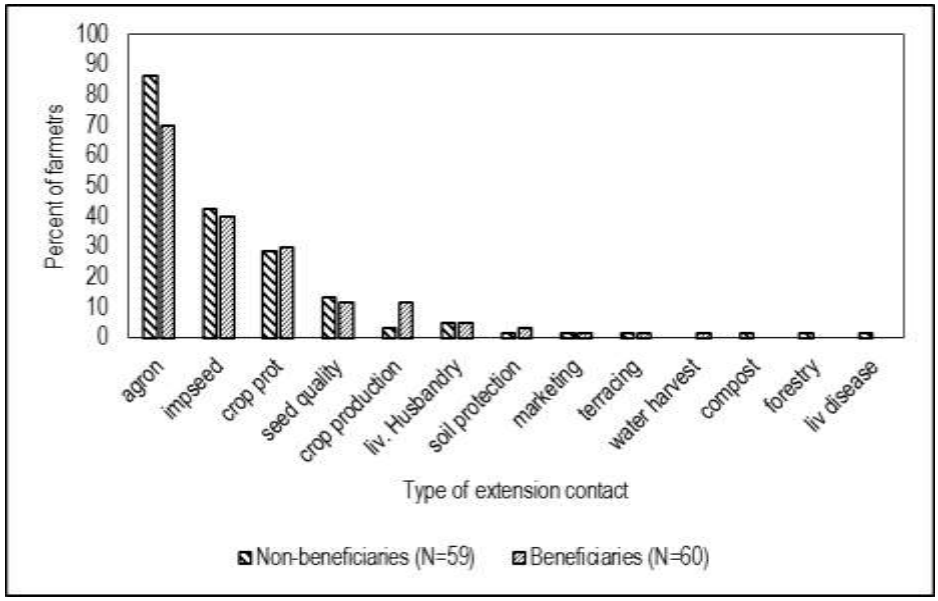

Figure 12. Type of extension contact by frequency (wheat area farmers)

Similar trends were obtained for tef growing farmers. The number of contacts with the extension agents was on average 16 per year for QSPP beneficiaries and 11 per year for non-beneficiary farmers. The type of training given by the extension system revolves around agronomy, improved varieties (farmers' call them improved seed), crop protection and seed quality (Figure 13). Both parameters (number of contacts and type of training) are not statistically significant ($p>0.1$) which implies the services are homogenous for the two categories of farmers and distinctions could not be established. However, the practical role of the contact with regard to seed quality has not been significant.

Assessment of impact of QSPP

Preliminary assessment of the contribution of QSPP was made from production and income side of the beneficiaries and the comparison groups. Simple statistics and covariance analyses were employed to get an indication of the direction of land allocation, productivity, and income gain among the beneficiaries as compared to their counterparts. Since considering the short period of the project the contribution of the project may not be clearly observed, this study was designed to understand the situation on the ground and some of the underlying factors.

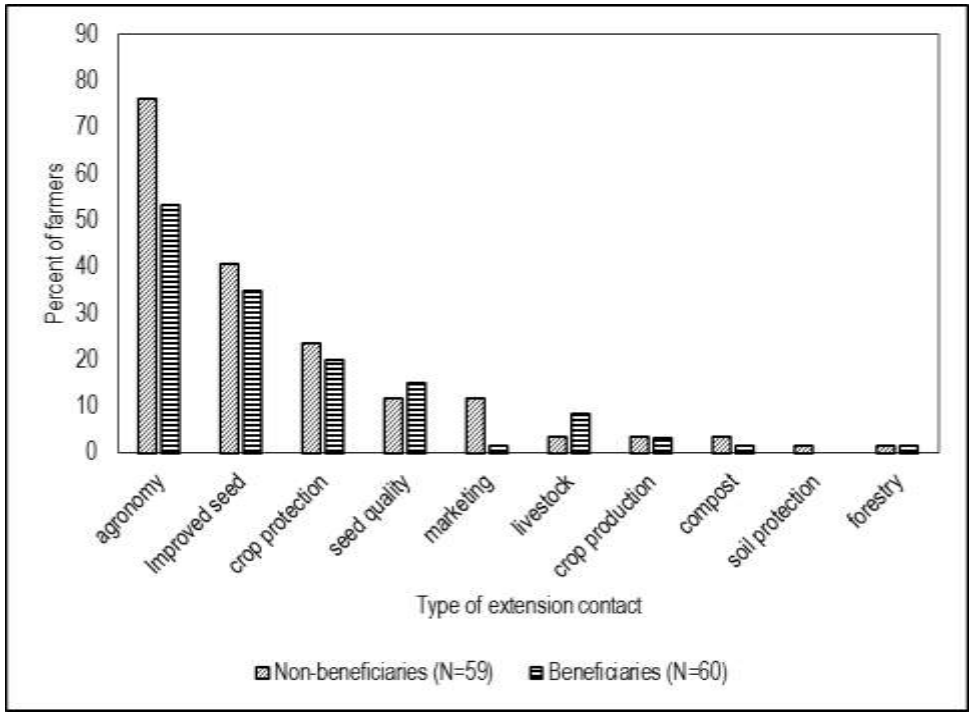

Figure 13. Type of extension contact by frequency (tef area farmers)

Production and income differentials between beneficiary and non-beneficiary farmers

Production of wheat and tef grain

Simple comparison of land allocation and productivity of wheat project areas showed that non-beneficiary farmers allocated a generally higher amount of land for wheat production than the beneficiary farmers (Table 36). However, there was no statistical mean difference between the beneficiary and non-beneficiary farmers' wheat land allocation during the period 2011-2013 and strong judgment cannot be made on their difference. Despite the higher nominal size of land allocated by the non-participant farmers, their productivity has significantly decreased over the three years period. Though there was a reduction in yield between the two groups, the gain from a unit of land has been much higher for the QSPP beneficiary farmers than that of their counterparts. Results of further test of this fact are given in Table 37. However, considering the standard deviation, there was greater variability in the performance of beneficiary farmers than their counterparts with wide upper and lower productivity range.

Table 36. Productivity of wheat among beneficiaries and non-beneficiaries

Particulars	QSPP beneficiaries				Non-beneficiaries			
	N	Sum (ha)	Mean	SD	N	Sum (ha)	Mean	SD
Land allocation to wheat (ha)								
2011	59	39.4	0.67	0.365	57	40.5	0.71	0.355
2012	60	41.4	0.69	0.342	59	43.5	0.74	0.369
2013	59	41.8	0.71	0.373	57	43.0	0.75	0.396
Productivity of wheat (kg/ha)								
2011	59	X	2106.04	1898.667	56	X	1821.09	1139.996
2012	60		1758.08	1521.711	59		1606.65	935.233
2013	59		2400.96	1890.262	57		1798.74	971.304

N = *umber of farmers*

Participation in QSPP of wheat showed that the interaction between user status and productivity and production has little effect on performance of farmers after controlling for the productivity in 2011. The base year, when both the beneficiaries and their counterparts were naturally exposed to more or less similar environment, i.e. the time when the project was about to start. However, the mean productivity after the project showed a big difference in the standard deviation of the project. Participation in the project was statistically significant ($p< 0.05$) indicating the significant effect on productivity of QSPP participants. In the table below, the B (*beta*) value of -459.29 indicates that, given two people (in this case, one beneficiary and one non-beneficiary) with similar productivity before the QSPP project, we can expect the after-project yearly productivity of the non-beneficiary to be 459.29 kg/ha less than that of the beneficiary (Table 37).

Table 37. Parameter estimate on wheat productivity from covariance model

Dependent Variable: Productivity of wheat grain (kg per hectare) in 2013							
Parameter	B	SE	t	Sig.	95% Confidence Interval		Partial Eta Squared
					Lower bound	Upper bound	
Intercept	1077.857	210.242	5.127	0.000	661.207	1494.508	0.193
ProdyWhPhectt2011	0.633	0.069	9.171	0.000	0.496	0.770	0.433
[Beneficiary=0.00]	-459.290	217.704	-2.110	0.037	-890.727	-27.852	0.039

B=Parameter comparing productivity gain, ProdyWhPhectt2011-productivity of wheat (kg/ha) in 2011, [Beneficiary=0.00]. Non-beneficiary category

Simple comparison of land allocation and productivity of farmers in the tef project area showed that unlike the case of wheat target area farmers the beneficiary farmers allocated a generally higher hectare of land for tef production than the non-beneficiary farmers during the period 2011-2013

(Table 38). In addition, the project-beneficiary farmers had registered higher tef grain productivity over the non-beneficiary farmers across the three years period. However, the productivity of beneficiaries is not homogenous among them. It is even much higher than the wheat target area farmers. Results of further test of productivity differences have shown that the two groups are not much different in terms of tef grain productivity (Table 39).

Table 38. Productivity of tef among beneficiaries and non-beneficiaries

Particulars	QSPP beneficiaries				Non-beneficiaries			
	N	Sum (ha)	Mean	SD	N	Sum (ha)	Mean	SD
Land allocation to tef (ha)								
2011	54	70.2	1.30	2.051	53	54.5	1.03	0.755
2012	59	83.3	1.41	2.079	56	54.5	0.97	0.703
2013	59	94.0	1.59	2.595	58	61.9	1.07	0.691
Productivity of tef (kg/ha)								
2011	48	X	2176.94	2291.727	50	X	1597.92	734.765
2012	59		2270.14	2357.069	54		1538.98	776.107
2013	59		2141.74	2184.358	57		1480.29	798.558

Results of analysis of covariance to assess the effect of tef project participation showed that, after controlling for the productivity in tef in 2011, given two people with similar productivity before the project, it cannot be expected the after-project yearly productivity of the nonparticipant [Beneficiary=0 is not statistically significant] to be different from that of the participant (Table 39). This argument was also supported by the low level of partial Eta squared of 0.013. This indicates that a negligible amount of variation explained by the independent variable. The conclusion is that in the case of tef there was no statistically significant mean difference between the two groups. Despite the nominal gain in productivity of tef by QSPP participants, the observed difference is due to chance.

Table 39. Parameter estimate on tef productivity from covariance model

Dependent Variable: Productivity of all types of tef grain (kg/hectare) in 2013							
Parameter	B	SE	t	Sig.	95% Confidence Interval		Partial Eta Squared
					Lower bound	Upper bound	
Intercept	30.81	125.829	0.245	0.807	-219.06	280.68	0.001
ProdyALLGtfhect2011	0.98	0.039	25.410	0.000	0.91	1.06	0.874
[Beneficiary=.00]	-143.82	131.354	-1.095	0.276	-404.66	117.02	0.013

B=Parameter comparing productivity gain, ProdyALLGtfhect2011-productivity of tef (kg/ha) in 2011, [Beneficiary=0.00]..Non-beneficiary category

Therefore, results of the survey depict that QSPP project beneficiaries had a better position in terms of productivity improvement in wheat and not in tef.

Income from wheat and tef production

Figure 14 shows the annual gross income obtained by sampled farmers from wheat production. Initially (in 2011) the two categories of farmers seem to have relatively similar income. However, this relationship has somehow changed in favor of the beneficiaries over the subsequent years. On the other hand, there is great variation in gross income from wheat production between farmers at Nanoa and at Feji; the later registering lower level in the three years. The relatively lower income observed in Feji seems to have been balanced by the gain in Nanoa.

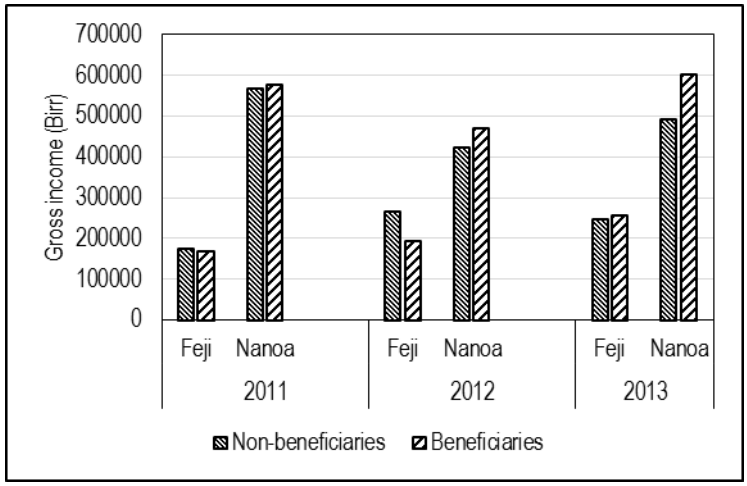

Figure 14. Gross income from wheat production

Results of analysis of covariance to assess the effect of participation in QSPP-wheat showed that, after controlling for productivity of wheat in 2011, there was higher income difference between the participants and non-participants in favor of the former. However, this difference could not be established through statistical test. Test result shows that there was no statistically significant difference between the participants and non-participants to believe that the non-participants income was less than the non-participants was real (Table 40). This argument was also supported by the low level of partial Eta squared (indicating a negligible amount of variation). The conclusion is that in the case of tef there was no statistically significant difference between the two groups. The observed difference is due to chance.

Table 40. Parameter estimate on income from wheat from covariance model

Dependent Variable: Total income from wheat grain production (Birr) in 2013							
Parameter	B	SR	t	Sig.	95% Confidence Interval		Partial Eta Squared
					Lower bound	Upper bound	
Intercept	5188.85	1142.518	4.542	0.000	2924.649	7453.056	0.158
IncWhtG2011	.733	0.053	13.776	0.000	0.627	0.838	0.633
[Beneficiary=.00]	-1859.29	1315.528	-1.413	0.160	-4466.364	747.773	0.018

B=Parameter comparing productivity gain, ProdyALLGtfhect2011-productivity of tef (kg/ha) in 2011, [Beneficiary=0.00]. Non-beneficiary category.

Figure 15 shows the annual gross income obtained by sampled farmers from tef production. Generally, QSPP beneficiaries seem to achieve significant improvement in income over the second period and more in the third year of the project. Despite lower income levels recorded for Ejere, the increasing trend of gross income has been maintained among the QSPP participants over the subsequent project implementation periods.

Similar to the case of wheat, results of analysis of covariance to assess the effect of participation in QSPP-tef showed that, after controlling for the productivity in 2011, there was no income difference between the participants and non-participants. Result shows that there was no statistically significant difference between the participants and non-participants to believe that the non-participants income was less than the non-participants was real (Table 41). This argument was also supported by the low level of partial Eta squared (indicating a negligible amount of variation). The conclusion is that in the case of tef it can be assumed that the observed difference in income could be due to chance.

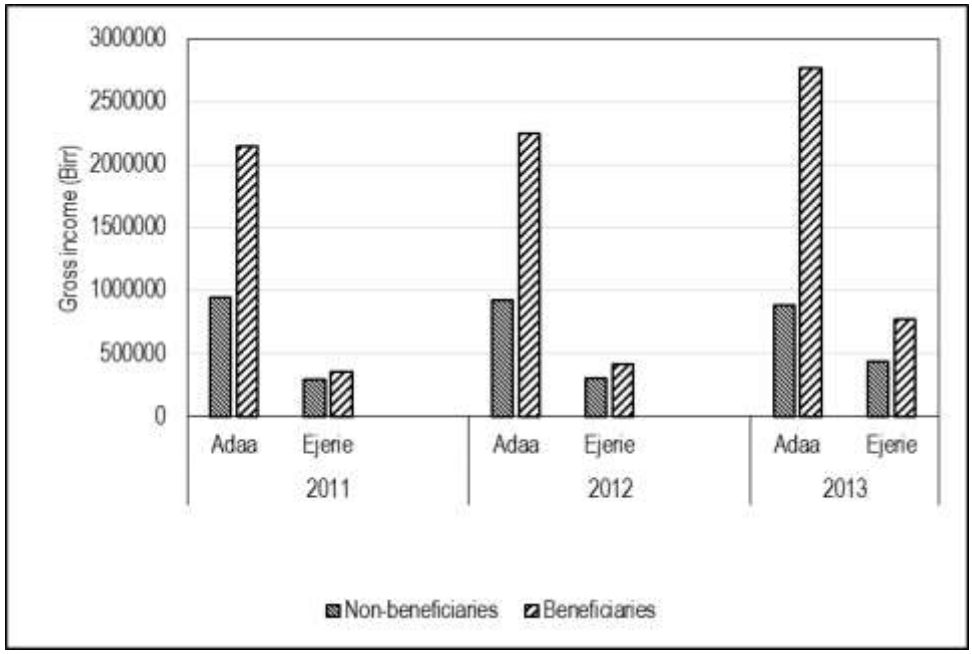

Figure 15. Gross income from tef production

Table 41. Parameter estimate on tef productivity from covariance model

Dependent Variable: Total income from tef grain production (Birr) in 2013							
Parameter	B	SE	t	Sig.	95% Confidence Interval		Partial Eta Squared
					Lower bound	Upper bound	
Intercept	-5264.21	4382.655	-1.201	0.232	-13955.18	3426.76	0.014
IncTefG2011	1.49	0.039	38.699	0.000	1.420	1.57	0.935
[Beneficiary=.00]	-6981.59	5758.619	-1.212	0.228	-18401.15	4437.97	0.014

B=Parameter comparing productivity gain, IncTefG2011-gross income from tef production (Birr) in 2011, [Beneficiary=0.00]. Non-beneficiary category.

In conclusion, notwithstanding the numerically observed differences seen between the two groups of farmers using simple technique, results of analysis of covariance on income gain after controlling for the base year (2011) scenario, depict that both QSPP-wheat and QSPP-tef project beneficiaries did not have a better position in terms of gross income compared to the non-beneficiaries.

Income gain per unit of production

A graphical exposition of the relationship between QSPP and non-QSPP farmers shows that the average annual household income obtained by QSPP farmers from a hectare of wheat land has been relatively better than their counterparts have across the three years (Figure 16). However, locational

differences exist in the case of Feji where the data on QSPP beneficiaries was lower than that on the non-beneficiaries.

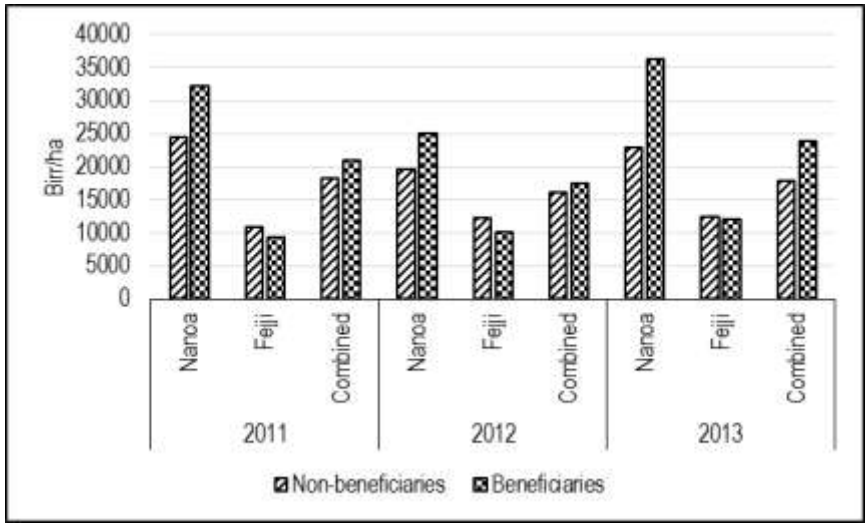

Figure 16. Household income from wheat production per hectare

Analysis of income gain of farmers from wheat production, after controlling for the base year (2011) scenario, resulted in the statistically significant difference between the project and non-project farmers in favor of the QSPP farmers. The result showed QSPP project farmers were in a better position in terms of income from a unit of land. The beta coefficient tells that the reduction of the after-project yearly wheat income/ha of the nonparticipants [Beneficiary=0] by Birr 4592.89 compared to that of the participant (Table 42). This is consistent with the result obtained in the case of wheat productivity.

Table 42. Parameter estimate on income from wheat from covariance model

Dependent Variable: Wheat income per unit of land (Birr per ha) in 2013							
Parameter	B	SD	*t*	Sig.	95% Confidence Interval		Partial Eta Squared
					Lower bound	Upper bound	
Intercept	10778.57	2102.422	5.127	.000	6612.07	14945.08	0.193
IncWhtPrHa2011	.63	.069	9.171	.000	0.49	0.77	0.433
[Beneficiary=.00]	-4592.89	2177.035	-2.110	.037	-8907.27	-278.52	0.039

B=Parameter comparing productivity gain, IncWhtPrHa2011-income from wheat production (Birr/ha) in 2011, [Beneficiary=0.00].Non-beneficiary category

A graphical analysis of the relationships between QSPP project and non-project farmers in the case of the annual tef income obtained from a unit (hectare) of land depicts a consistently better position of the QSPP participant farmers over the three years period (Figure 17), though such an observation could not be

verified by statistical test (see Table 43). Generally, the income calculated for the project participants has not gone down from Birr 29,000 over the three years' time.

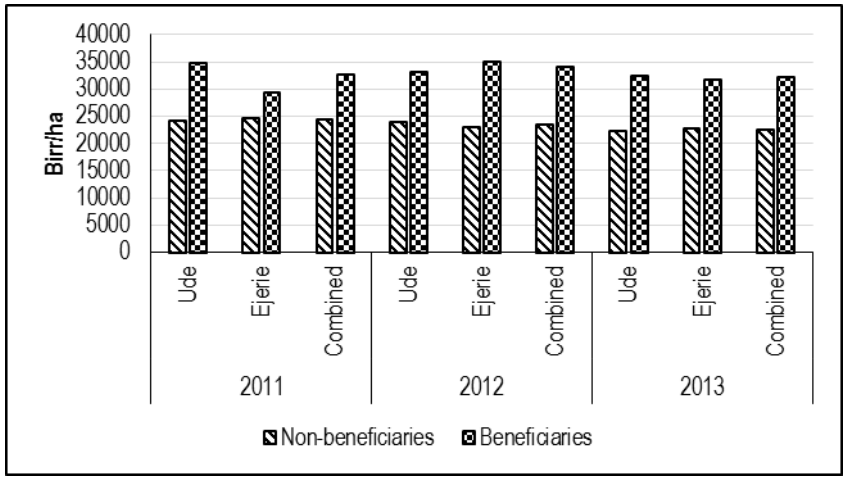

Figure 17. Household income from tef production per hectare

On the other hand, analysis of income gain of tef farmers after controlling for the base year (2011) scenario, resulted in statistically no significant difference in regard of the after-project yearly tef income/ha of both groups (Table 43). The implication is that, the observed higher gain in income from tef of QSPP participants could not be statistically justified.

Table 43. Parameter estimate on income from tef from covariance model

Dependent Variable: Tef income per unit of land (Birr per ha) in 2013							
Parameter	B	SD	T	Sig.	95% Confidence Interval		Partial Eta Squared
					Lower bound	Upper bound	
Intercept	462.16	1887.430	0.245	0.807	-3285.90	4210.22	0.001
IncTfAllPha2011	0.98	0.039	25.410	0.000	0.91	1.06	0.874
[Beneficiary=.00]	-2157.32	1970.315	-1.095	0.276	-6069.98	1755.33	0.013

B=Parameter comparing productivity gain, IncTfAllPha2011-income from tef production (Birr/ha) in 2011, [Beneficiary=0.00]. Non-beneficiary category

Generally, though not statistically significant, the abovementioned analyses show that QSPP project participants performed better than their counterparts in terms of land allocation, productivity, income per unit land and total income gain over the project period (2011-2013). However, considering the covariance test, after controlling for the base year (2011) scenarios of the above parameters, only the QSPP-wheat beneficiaries had statistically significant mean difference in terms of productivity of wheat and wheat income per ha.

The implication of this latter statement is that QSPP-wheat beneficiaries had performed better than their counterparts in these parameters had and the achievement in wheat can be attributed to the intervention of QSPP project.

Challenges

Farmers' concerns about the project

QSPP-wheat beneficiary farmers were asked to give their opinion on QSPP and 55 (91.7%) said that it is very important and the remaining 5 (8.3%) as important. Whereas 76% of tef project beneficiaries said, it is very helpful and the remaining 24% of tef project beneficiaries rated QSPP as moderate. Regarding the kind of support, they needed from QSPP beneficiaries, quality seed supply, fertilizer supply, training, and seed testing were priority. About 28% of wheat area farmers mentioned the lack of follow-up and supervision from the part of the project as important bottlenecks for continuing the activity. Also about 18% of tef project beneficiaries criticized the QSPP of shallow training given, less quality seed supply made and no provision for access to credit.

Considering the farmers response through group discussion and individual interview, QSPP beneficiary farmers did not organize themselves to engage into either wheat or tef seed production for trade. The farmers' business skill is either very limited or largely unavailable. Small-scale business skill development programs/projects are very critical (David and Oliver, 2002).

The information gathered from the farmers was that the first graduates planted seed on less than 0.1 ha plots in 2012 and used the seed obtained for various uses (mainly for next season grain production, home consumption and exchange with other farmers). The second batch also produced seeds on plots allocated for seed in 2013 and their intention is to allocate the seed thus harvested for similar purpose as the previous farmers. For those who sold seeds it was not different from the market price for grains and farmers could not get incentive to sustain production of seeds for seed business purposes.

On the other hand, farmers expressed their grievances that there were no technical and marketing related supports and arrangements made them to continue and/or scale-up the seed business. In addition, they mentioned the failure stories of the existing community based seed production and marketing arrangement that is implemented through farmers' cooperatives. They said the scheme failed to supply pure seeds and they have lost their confidence in the venture.

Farmers' concerns in agricultural technologies, particularly, farmers' variety trait preferences are important to technology adoption and scale-up (Sinafekeh et al 2009). This study attempts to identify the concerns of QSPP beneficiaries with regard to their satisfaction with the seeds they are using after graduating from the project. The beneficiaries' judgment of seed quality improvement after the project was not consistent both within and between wheat and tef target areas.

To this effect, in the wheat target area 21.7% of the sampled farmers said there is no change in wheat seeds in any one of the following aspects: in use of mixture seeds (13.3%), tillering (6.7%), grain color (5%), grain weight gain (1.7%) and gain in each panicle (1.7%). Of the 21.7%, about 23.1% (3 farmers) had at least two negative responses to the questions administered to them.

Whereas in tef target area 43.3% of the sampled farmers said there was no change in tef seeds considering grain color (31.7%), use of mixture seed (26.7%), grain weight (16.7%), gain in each panicle (15%), tillering (6.7%) and germination (3.3%). Of the 43.3%, 56% (14 farmers) had at least two negative responses whereas the remaining had made only one complaint. This shows that fewer number of farmers in wheat and large number of them in tef had complaints.

Constraints affecting farmers' participation in quality seed production

Farmers' assessment of the major constraints affecting farmers' participation in quality seed production are given in Figures 18 and 19. Figure 18 elaborates the percentage distribution of QSPP-wheat participant and their counterparts against the different constraints perceived by them. Accordingly, QSPP-wheat farmers identified ten constraints among which shortage of land, high labor demand of quality seed production, inaccessibility of quality seed of any variety/cultivar, lack of sufficient skill and lack of access to seed credit are chosen by more than 20% of them. Whereas the same proportion of their counterparts identified inaccessibility of quality seed, lack of sufficient skill, shortage of land and high demand for labor. However, the percentage of farmers identifying the constraints was higher for QSPP-wheat farmers than their counterparts, save quality seed and skill requirement. This may be an indication that the Project has some impact on the participants' side.

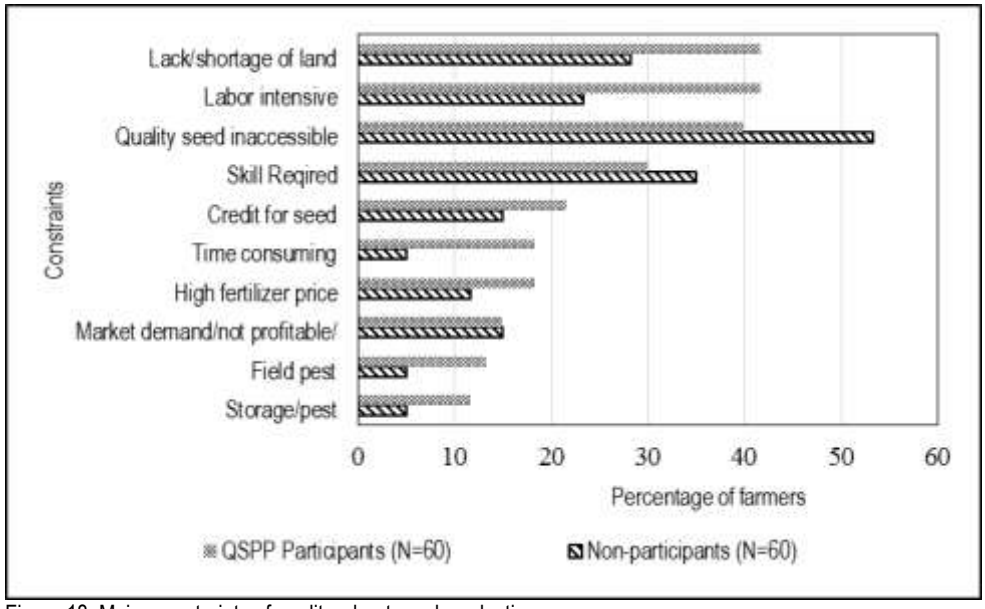

Figure 18. Major constraints of quality wheat seed production

Figure 19 elaborates the percentage distribution of QSPP-tef participant and their counterparts in line with the different constraints perceived by them. Accordingly, QSPP-tef farmers identified twelve constraints among which inaccessibility of quality seed, shortage of land and lack of sustainable demand (no price incentive) are chosen by more than 20% of them. Whereas the same proportion of their counterparts identified inaccessibility of quality seed, lack of land and lack of sufficient skill. However, the percentage of farmers identifying these constraints was higher for non-QSPP-tef farmers than their counterparts, save land shortage and undeveloped demand for seed production.

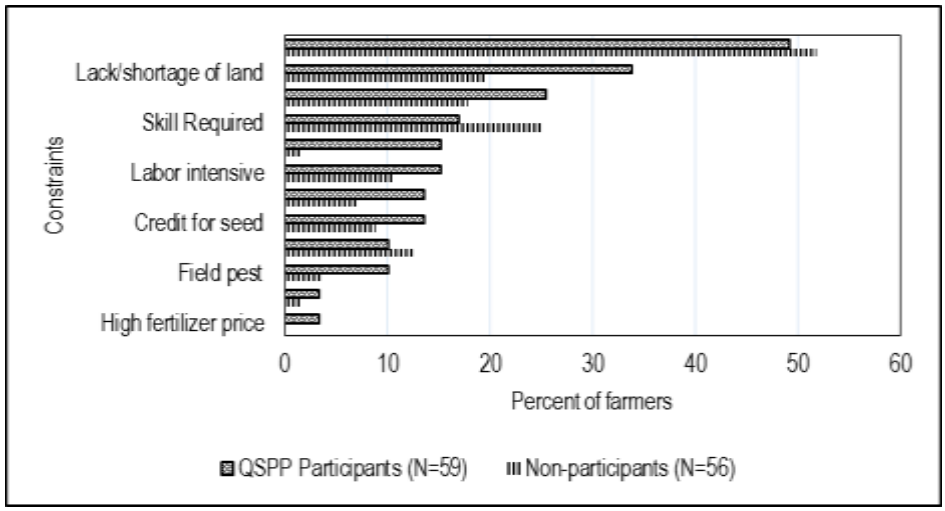

Figure 19. Major constraints of quality tef seed production

IV-2-4. Summary of findings

The survey result highlighted that QSPP in its short period of time (effective two years), has brought some indication about the contribution of the project, particularly to the gain in the productivity of wheat, which is the stepping factor for achieving transformation. The data showed that over the last three years there was a general decrease in productivity of wheat and tef among the farmers. However, the decrease was very much pronounced among the non-participants more than that among the participants.

In addition, the survey results indicated, that despite the trainings and the various assistance received from the QSPP, participating farmers are not engaged in seed business. This absence of engagement in seed business does not have anything to do with lack of conviction about the contribution of the QSPP to their livelihood and the major reasons are lack of confidence and supportive environment (mainly land scarcity, mentoring/technical guidance, market). It is important to note that QSPP beneficiary farmers rent-in land because of land shortage and there are times they could not afford to pay the land rent. Therefore, dealing with the circumstances influencing farmers' decision should receive due attention of development organizations. In this regard, the issue of sustainability of the project benefits should target farmers' confidence build-up in seed business, conducive environment (mainly; market linkage, finance, policy support, and access to good-seed source), and capacity to acquire and allocate resources and post-harvest handling.

In spite of few farmers' criticism regarding inadequacy of training, most of them have appealed for the continuation of the project with a focus on sustainability. This would create an opportunity to work more with farmers through concerted effort involving fruitful participation of extension program in promoting seed business, i.e. small farmers' business skill development.

It was also realized that the existing formal and informal seed systems have become inaccessible and unattractive to the farmers due to lack of access to good (basic and/or true-to-type) seed (availability and affordability) and loss of quality. Farmers are without any alternative, but live the usual way: use of impure seeds and diversify into several varieties. Therefore, QSPP should build on their limited experiences and with the appropriate agricultural development, partners should work on factors influencing adoption of the approach to complement the efforts of the different stakeholders and for a better synergy. Technical and marketing related supports and arrangements may be needed for them to continue and/or scale-up the seed business. Strengthening the existing

extension system on practical training concerning quality seed production and engagement in seed business may also be useful.

Finally, lack of courage, the farmers, as observed, tend to swing between the old and new varieties of wheat and tef in their attempt to taking risk aversion mechanisms. Despite engagement of different non-governmental and community-level organizations in supplying farmers with new/fresh (not recycled) seeds of improved varieties, farmers complain about the quality of available seeds. Farmers' vulnerability may be reformed by strengthening institutional, technical, and organizational governance of the farmers, partnership with regulators for seed quality control and provision of basic seed.

V. SFS Seminars

QSPP organized SFS seminars in three regions of Oromia, Amhara, and SNNP in January, March, and May 2014, respectively. The seminar participants were facilitators of the SFS (Development Agents and their supervisors), experts from *woreda* agricultural offices, managerial personnel of zone and regional agricultural offices, as well as seed enterprises and research centers. The aim of the seminars was to review the activities of SFS and make recommendations to improve the SFS and sustain the achievements brought by the SFS implemented for the last three years. Each seminar was started by brief explanation of QSPP and Seed Farmers School (SFS) followed by group discussions, which the participants were grouped into

- farmers;
- government; and
- donors.

Each group discussed

- achievement/success,
- ways to sustain the achievement,
- shortcomings, and
- countermeasures of the shortcomings from each group's viewpoint.

The groups presented their discussion and results during the plenary session at the end of the seminar. The following tables are summary of the discussions.

The participants of the seminar generally acknowledged the advantage and favorable impact of SFS on seed farmers, and thus recommended SFS to be continued by securing enough budgets at *woreda* level after QSPP's termination in August 2014. They realized a need of networking the graduates and SFSs for sustained production of quality seed and further capacity development of the SFS members and graduates. For farmers, one of the options suggested to sustain seed production and its improvement would be to establish and/or enhance seed farmer's cooperatives and unions. These organizations not only help farmers to improve the production technology and obtain necessary agricultural inputs, but also contribute better post-harvest technological application and quality enhancement.

At the same time, the seminar participants also observed a need to improve logistical works, such as communication among relevant offices and personnel and arranging and conducting necessary trainings, to be performed by relevant offices such as *woreda* agricultural offices. A seminar in SNNP region yielded

a constructive step forward such that regional authority had directed responsible offices and sections in *woreda* and zonal levels to handle and promote the SFS.

Table 44. Summary of farmer group discussion at SFS seminars

(a) Achievement/Success	(b) Ways to sustain the achievement
• Technical knowledge on seed quality, row sowing and rogue-out gained. • Importance of post-harvest, quality control, seed testing, and cultivation recording understood. • Productivity, yield, and income increased, and quality improved. • Facilitation and problem solving skill and self-confidence built. • Women's involvement and participation enhanced. • Linkage between farmers and DAs improved. • Communication and social network enhanced.	• Follow-up activity to farmers. • Promotion of SFS to other farmers and areas. • Ensure the ownership of the SFS • More access to market. • Integrate SFS into regular extension system (institutionalization). • Link farmers better with partners (government, donors, cooperatives, research institutes, private sectors, etc.) • Networking among SFS groups.
(c) Shortcomings/Constraints	**(d) Countermeasures**
• Limitation of farmers such as literacy, financial resources. • Lack of agricultural input materials and its proper use as well as storage facility. • Limited number of farmers could join the SFS. • Only tef and wheat are targeted. • Domination of some farmers in SFS. • Drop out of some members. • Absence of strong sense of ownership among farmers. • Lack of attention from regional and *woreda* agriculture offices. • Lack of interest to become member of cooperatives after graduation. • Long time needed to get profits. • Farmers' expectation for payment while attending the SFS	• Promote cooperatives and saving and credit services. • Integrate SFS in FTC activity. • Share experience among farmers. • Promote adult education. • Close and more follow-ups by SFS organizers. • More collaboration with other programs for financial and technical trainings.

Table 45. Summary of government group discussion at SFS seminars

(a) Achievement/Success	(b) Ways to sustain the achievement
• Good extension methodology introduced. • Created public awareness on seed quality. • DAs and experts technical and facilitation skills improved. • *Woredas*' seed quality control capacity enhanced. • Seed production and sector enhanced.	• Scale up to other areas. • Provide continuous and follow-up support to farmers. • Promote and institutionalize SFS method. • Organize capacity building training for experts. • Conduct more farmer field days to share the experience with other farmers.
(c) Shortcomings/Constraints	(d) Countermeasures
• Shortage and lack of budget, human resources, transportation • Lack of monitoring and backstopping activity. • Lack of coordinating project activity with other programs and regular activity. • Overlap of different programs. • High turnover of DAs and experts. • Dependency on donors for fund and facilities.	• Allocate more budgets. • Improve infrastructure and logistic support. • Align and integrate properly with other programs and project. • Strengthen collaboration among stakeholders in the sector. • Assign activity to specific organization. • Review the role of DAs and have system to motivate DAs.

Table 46. Summary of donor group discussion at SFS seminars

(a) Achievement/Success	(b) Ways to sustain the achievement
• Introduced effective method to empower and train farmers, particularly women, as well as DAs and experts. • Efficient way than using FTC. • Showed tangible impact on yield and income increase. • Provided practical linkage among SFS members and DAs. • Coordination among donors who work in seed sectors was demonstrated.	• Mobilize well-trained project staff. • Support the government to establish SFS/FFS facilitator training program. • Support market linkage and produce teaching materials. • Collaborate and link more with NGOs and other donors. • More public awareness activity for sustainable implementation of the SFS. • Focus on selected achievement for scaling up. • Continue organizing meetings and workshops for stakeholders. • More promotion of success story.
(c) Shortcomings/Constraints	(d) Countermeasures
• Limited budget. • Short project life. • Less coordination among projects. • Selected sites are less accessible. • Limited number of villages. • FFS is not well known. • Limited number of master trainers.	• Secure budget from governmental program such as AGP. • Secure budget for follow-up program. • Implement the second phase. • Create more information and experience sharing opportunities. • Provide vehicles and motorcycles. • More public relation activity. • Develop master trainer training module. • Support non-formal education training.

VI. Discussion and Recommendations

VI-1. Impact of SFS on yield and quality

SFS graduates of the first survey in June 2013 responded positively to almost all the questions. One example is that they replied the SFS graduates had very much enjoyed the SFS in spite of 32-week long schooling. They claimed that the technologies presented during the course of the SFS such as a row sowing were beneficial and practical, thus utilized in their farming after the graduation. As a result, their yield of tef and wheat improved significantly and they hoped it would continue improving. Development agents who facilitated the SFS also confirmed the better harvest by the SFS members. The quality of the products could not be evaluated at laboratories at the time of the survey; however, the majority of the graduates answered the quality of their products improved and satisfied with the quality. Laboratory test carried out in December 2013 by QSPP and newly established *woreda* laboratories justified the farmers' own assessment.

The second survey in December 2013 statistically justified better yield of SFS farmers in wheat compared to non-SFS farmers. The wheat yield difference between the SFS farmers and non-SFS farmers reached as much as 450 kg/ha, which was equivalent to around 4,500 Birr/ha. No statistical justification was established on the production parameters of tef farmers. As for the quality of the product is concerned and according to the quality test results conducted by the *woreda* seed laboratories and the project, there was no deterioration or decline of the quality before and after the SFS. The graduates were content with and convinced that they could keep improving the quality of their products.

It would be fair to note that SFS placed the majority of SFS graduates positive impacts and willingness to continue improving yields and quality. SFS seminars conducted in 3 regions confirmed the contribution of the SFS for that matter.

VI-2. Technology transfer and adoption

As for the adoption of technology introduced during the SFS, the graduates stated "row sowing" as one of the most important technologies for seed production, which the project also intervened through practical supports such as the fabrication and distribution of 100 pieces of row seeders. High adoption rate of the row planting was also a result of synergy with the Ethiopian government's promotion of the row sowing for cereal crops.

The project introduced and distributed "Field Note" to 2012 and 2013 SFS members so that they record their farming practices and plan better for the next season by referring to the recorded data. However, it was found that the farmers were not continually using the Note as expected. There needs improvement of SFS weekly program to emphasize the importance of recording the farming practices using the Field Note and the necessity of the recorded information when the farmers want to market their products as seed. It should be remembered, however, the value of the Field Note would be properly realized by the farmers when seeds are marketed in their surrounding at a reasonable price.

VI-3. Follow-up activities

Successful technical training does not always guarantee the sustained adoption of the technology introduced during the trainings. The second survey discussed the importance of the follow-up activities to the SFS graduates. The project acknowledges the farmers' proclaim on better access to seed market and need of continued follow-up supports. When the two surveys were conducted, there were no market related activities conducted by the project. It was in February 2014 when the project, in collaboration with seed testing laboratories established in five *woredas* and *woreda* officials, started posting results of seed quality in villages. Thereafter the project started "seed market support activity" in Ada'a *woreda* where selected farmers were asked to sell their products with quality test results accompanied to their seeds. The project also produced posters and pamphlets, posted on information boards, and installed at each farmer's residence.

Organizing farmers into seed producers groups is also of great value. As stated in the survey report, some SFS graduates newly jointed existing seed producing cooperatives and some formed new seed cooperatives. Different from grain production, seed production entails strict field inspection, post-harvest processing, and storing that are more effectively performed by groups than individuals are. Follow-up works to SFS graduates from this viewpoint must be boosted. This would certainly help motivate farmers and adopt technologies acquired during the SFS.

VI-4. Conclusion and recommendation

As already presented and discussed, SFS has been proven to be a very effective approach to empower farmers, provided proper ToF and technical trainings are conducted and follow-up activities such as marketing support are followed.

QSPP has nurtured more than sixty facilitators, who are capable in conducting the SFS. Governmental directives and supports are much needed to materialize their valuable work and experience to be sustained systematically. A movement of SNNP region to assign responsible offices for SFS in every level of government structures is a positive and encouraging sign. The experience on the follow-up activities on seed marketing will provide basis for constructive improvement for enhancing the seed sector as well as agricultural extension services.

QSPP conducted 69 SFSs in five *woredas* during the last three years, but the villages in target *woredas* were all categorized as potential areas for tef and/or wheat production. A seed market survey conducted by the project in one of the villages of non-potential area in Dendi *woreda* showed more challenging environment for farmers in securing quality seeds. Introducing SFS to those areas will have certain impacts as the farmers are in more dire needs of quality seeds than their counterparts in potential area where governmental organs and research centers frequently visit and provide the quality seeds. At the same time, SFS graduates in potential areas may target those non-potential areas as one of seed market destinations not necessarily transporting the products to regional centers but *woredas* and villages nearby.

There exist some differences in the understanding of seed quality among stakeholders involved. Some farmers may understand "quality" of seed in a more realistic way but not scientifically as many seed experts and government official have perceived. The different comprehension may impede provision of proper supports farmers require. It would be more helpful for the farmers to upgrade their knowledge and skills systematically on top of their current understandings. From farmers' viewpoint, they acquire seeds of better growth and quality after observing how the crop has been cultivated from land preparation to post-harvest treatment and, needless to say, marketability. The facts that some farmers carry out germination tests at their backyards for seeds bought at a market, which reliability is not known, suggests that they are concerned about the quality. This contradicts with the perceived notion of "farmers are not careful about the quality" among DAs, researchers and policy makers.

As it is often discussed, the farmers' preference on seed variety may easily change, making the seed demand forecasting quite complicated and problematic. Should quality seeds produced by SFS graduates be circulated at local markets, this would be an alternative source of seeds for farmers in neighboring communities other than formal seed sector. Consequently, it may ease the challenging seed demand forecasting, and contribute in reducing

stockpiles of undelivered and unsold seeds in warehouses of seed enterprises and agricultural cooperative unions.

SFS implemented by QSPP has certainly provided an option for smallholders to improve and secure seed of better quality by themselves. SFS upgraded seed production technology of smallholder farmers and improved their yields, thus contributed for the supply of quality seed. At the same time, seeds produced by some SFS graduates, for instance, may be marketed with quality information. This would help convince those who want to buy seeds of better quality. This can be one of the realistic and reasonable applications of Quality Declared Seed (QDS) concept, initially introduced by FAO, to tackle the shortage of quality seeds, which is now recognized in the new seed proclamation in the country (Proclamation No 782/2013).

References

Agajie T., Chilot Y. and Taye B. 2002. "Experiences of participatory research in the National Agricultural Research System of Ethiopia", in Gemechu K., Yohannes G., Kifulu B., Chilot Y. and Asgelil D. (ed.) 'Towards farmers' participatory research: attempts and achievements in the Central Highland of Ethiopia', EARO.

Bekele Hundie Kotu, H. Verkuijl, W. Mwangi, and D. Tanner. 2000. Adoption of improved wheat technologies in Adaba and Dodola *Woredas* of the Bale Highlands, Ethiopia. Mexico, D.F.: International Maize and Wheat Improvement Center (CIMMYT) and Ethiopian Agricultural Research Organization (EARO).

Central Statistical Agency. 2013. Report on Area and Production of Major Crops. 14p.

David J. S., Dawit K. and Dawit A. 2011. "Seed, Fertilizer, and Agricultural Extension in Ethiopial". Ethiopia Strategy Support Program II (ESSP II), ESSP II Working Paper 020.

David S. and B. Oliver. 2002. Business skills for small-scale seed producers: handbook 2. Network on bean research in Africa. Occasional publications series No. 36. CIAT, Uganda.

Dawit Alemu. 2010. The political economy of Ethiopian cereal seed systems: State control, market liberalisation and decentralisation. Working paper 017, Futures Agriculture (www.future-agricultures.org).

FDRE (The Federal Democratic Republic of Ethiopia). 009: Selected Issues Series", International Monetary Fund Country Report No. 08/259, 5, 26 pp

Getachew Agegnehu, AmareGhizaw and Woldeyesus Sinebo, 2008. Yield potential and land-use efficiency of wheat and faba bean mixed intercropping. Agron. Sustain. Dev. 28: 257–263. (Available at http://www.agronomy-journal.org)

Lipper L., C. Romina, C. Paul Winters. 2005. Seed system, households' welfare and an economic methodology applied in Ethiopia, ESA technical paper. Agricultural and Development Economics Division, FAO. 32p

MoA (2012). Crop variety register. Ministry of Agriculture. Animal and Plant Health Directorate. Issue No. 15.

Oakley, P. et al. (1991). Project with People-The Practice of Participation in Rural Development: pp. 2-10. International Labour Office, Geneva.

Russ Dilts. 2001. From farmers field schools to community IPM: scaling up the IPM movement, LEISA magazine. 17/3 [1] (http://www.communityipm.org/docs/Dilts-Scaling_Up_IPM. pdf).

Senafikeh Asrat, Mahmud Yesuf, Fredrik Carlson and Edilegnaw Wale. 2009. Farmers' preferences for crop variety traits: Lessons for on-farm conservation and technology adoption. Environment for Development discussion paper series.

Seyfu Ketema, 1997. Tef *(Eragrostis tef*). Promoting the conservation and use of underutilized and neglected crops. 12. (ISBN 92-9043-304-3). Biodiversity Institute, Addis Ababa.

Thompson, J. (1994). 'From participatory rhetoric to participatory reality: training for institutional transformation', PRA Notes, No. 19, pp 56-59.

World Bank, 2008. Agriculture for development. World Development Reports)

Yohannes G. 2004. "Inventory of institutions engaged in farmer innovation and participatory research approaches in Ethiopia", in Amanuel A et al. (ed.). 2004 'Promotion of farmer innovation and experimentations in Ethiopia (PROFIEET)'.

Zewdie Bishaw, Yonas Sahlu and Belat Simane, 2008. The status of the Ethiopian seed industry. *In*: Marja H. Thijssen, Zewdie Bishaw, Abdurahaman Beshir and Walter S. De. Boef (eds.), 2008. Farmers, seeds and varieties: Supporting seed supply in Ethiopia. Wageningen International.