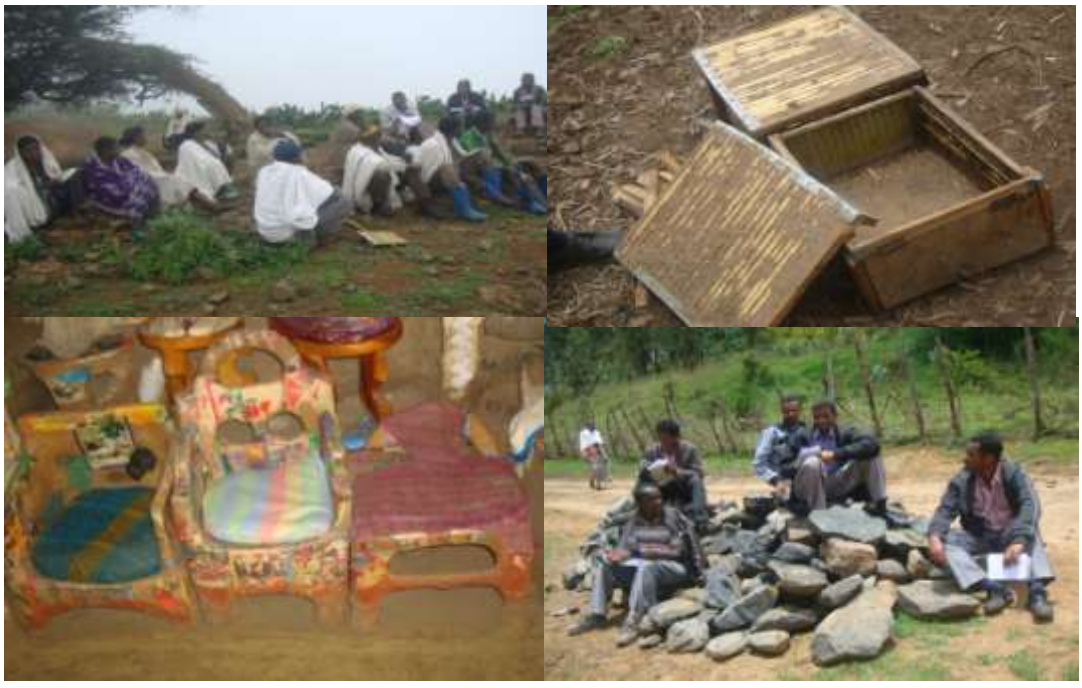
Strengthening resilience to change:

Combining Local Innovative Capacity with Scientific Research (CLIC–SR)

Documentation of local innovation and Participatory Innovation Development (PID)



Alem Birhan Self Help Community Based Development Association (ABSHCBDA)

Enebse Sar Midir District, Amhara Region, Ethiopia

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Acronyms and abbreviations

ABSHCBDA	Alem Birhan Self Help Community Based Development Association
ASE	AgriService Ethiopia
CBI	Community-Based Institution
CLIC–SR	Combining Local Innovative Capacities with Scientific Research
DFID	Department for International Development (UK)
E.C.	Ethiopian Calendar (almost 8 years behind the Gregorian Calendar)
FFS	Farmer Field School
kg	kilogram
PANE	Poverty Action Network in Ethiopia
PID	Participatory Innovation Development

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1. Introduction

Alem Birhan Self Help Community Based Development Association (ABSHCBDA) is a local non-governmental organisation (NGO) established by AgriService Ethiopia (ASE) in 2004 as a farmer-led community-driven development organisation. It is registered and licensed by the Charities and Societies Agency as an Ethiopian Resident Charity (Registration No. 2060). ABSHCBDA implements various integrated programmes/projects in agricultural development, natural resource management, social services, community capacity building and farmer innovation in East Gojjam and West Gojjam Zones in Amhara Region in two districts: Enebse Sar Midir and Bahir Dar Zuria.

ABSHCBDA has an active membership of more than 7000 farmers grouped together within its community-based institution (CBI) structure. In Enebse Sar Midir (ESM) District, each *kebele* (subdistrict) has a CBI branch run by community members, who handle community planning, monitoring, evaluation, training, meetings and seed banking. The association is engaged in reducing poverty and improving livelihoods of poor and marginalised communities through active involvement of community members at each stage of project implementation, thus strengthening the decision-making power of the local smallholder farmers.

ESM District lies in East Gojjam Zone some 400 km from the national capital city Addis Ababa. The district is bounded by South Gonder Administrative Zone to the north, Enarije-Enawiga District to the south, South Wollo Administrative Zone to the east and Goncha-siso Enessie District to the west. More than 90% of the people reside in the rural area while less than 10% live in Mertule Mariam, the district town. The district is one of the most food-insecure areas of the 64 districts in Amhara Region and one of the three districts of East Gojjam Zone classified as food-insecure.

The project **"Combining Local Innovative Capacity with Scientific Research (CLIC–SR)"** is funded by Rockefeller Foundation through the PROLINNOVA International Secretariat hosted by ETC Foundation in the Netherlands and is implemented through the Poverty Action Network in Ethiopia (PANE) as coordinating organisation in Ethiopia. It covers two sites: one near Axum in Tigray Region and one in ESM District in Amhara Region. ABSHCBDA and other local stakeholders are responsible for the field-level implementation in ESM District.

In this district, the CLIC–SR project is being implemented in 17 rural subdistricts. The project encourages farmers to seek, develop and strengthen their own innovations by collaborating with scientific researchers and disseminating their findings so as to have a broad impact on people's lives in the rural areas. It also aims to enhance the capacity of innovative farmers to continue sustainable and meaningful livelihood development on behalf of local farmers. The project focuses on fostering the creativity of local people through building local adaptive capacity and strengthening community resilience to change, including climate change.

The PROLINNOVA (Promoting Local Innovation) network[1] defines "local innovation" as the dynamics of indigenous knowledge, which is the knowledge that grows within a social group, incorporating learning from own experience over generations but also knowledge that was gained at some time

[1] Local Innovation and Participatory Innovation Development: some frequently asked questions. PROLINNOVA Working Paper 30. PROLINNOVA International Secretariat, Leusden, Netherlands. 2009.

from other sources but has been completely internalised within the local ways of thinking and doing. Local innovation is the process through which individuals or groups discover or develop new and better ways of managing resources, building on and expanding the boundaries of their indigenous knowledge. The innovations may be not only in the technical but also in the socio-institutional sphere. Especially in drier areas where livelihood systems are highly vulnerable to climatic risks, successful local innovation often involves new ways of gaining access to or regulating use of the natural resources, new ways of community organisation or new ways of stakeholder interaction.

Even though all community members and other local stakeholders strive to develop innovative ideas to improve the livelihood status of the community, there has been a weakness with respect to documenting the local innovations for wider dissemination. ABSHCBDA strongly believes that proper documentation of local innovation initiatives is vital for scaling out such processes in other areas to improve livelihoods and adapt to climatic and other changes experienced by the farmers.

2. Objectives of the documentation

2.1 General objective

The main objective of documenting local innovation and Participatory Innovation Development (PID) activities is to scale out the local innovations and to scale up the innovation processes by linking the farmers with scientific researchers who can help investigate the economic, social, cultural and political added value for the farmers in our area and for the wider society.

2.2 Specific objectives

This documentation of PID has the following specific objectives:

1. To identify local innovations in ESM District
2. To promote farmers' innovative capacities and encourage them to apply these capacities to reduce poverty
3. To assess the drawbacks and challenges that hinder farmers from being more innovative
4. To motivate other local stakeholders to engage in PID and support farmers at the grassroots level
5. To identify local farmers' innovations that need further investigation or experimentation
6. To **listen to the voices** of local farmers at grassroots level on ways to improve local livelihoods, including adaptation to and mitigation of climate change.

3. Methodology

With these objectives, ABSHCBDA set out to document local innovation and PID-related activities that have been carried out in ESM District by local farmers in the 17 subdistricts where we are operating. For this task, we organised a multidisciplinary team with 7 members having different qualifications (see Acknowledgements). The team members came from various governmental and non-governmental organisations that have experience in working with rural communities at the grassroots.

In collaboration with the village coordinators and local FFSs, the team members identified several innovations developed by local farmers. Because of a shortage of time and resources, the team decided to start by documenting only a few of the many innovations they found. The team members held a lively discussion with community members, which led to the formulation of the following criteria for selecting innovations to document:

- Developed by local farmers
- Adding value to the economic, social and cultural life of the community
- Capable of having direct impact in terms of adapting to or mitigating climate change
- Easily applicable and acceptable by many community members
- Contributing to improving women's lives, such as reducing their work load; much attention was given to gender issues in the documentation process
- Accessibility of the farm by road to allow documentation of the innovation activities.

After visiting and examining various innovations more closely during field visits, the team members selected six innovations for documentation and for spreading within and beyond the district into other parts of the country:

1. Yitay's modified beehive
2. Building irrigation canal across rocky terrain
3. Abere Yirga's row-sowing implement
4. Haricot bean (*bolokie*) pest control
5. Cattle and sheep tick control (curing)
6. Mrs Etye's self-made furniture

4. Brief description of the selected innovations

4.1 Mr Yitay Yalew's modified beehive

4.1.1 Information about the innovator

Mr Yitay Yalew is a smallholder farmer who lives with his wife, two sons and two daughters in ESM District in East Gojjam Zone. He completed Grade 4 primary school and is 38 years old. His family spends 80% of their time on crop and vegetable farming, producing mainly irrigated onions and potatoes, and about 20% of their time on animal husbandry (cattle, poultry and bees). Each year, they usually produce 150 quintals of onions, 8 quintals of teff, 4 quintals of wheat, 2 quintals of beans and 15 quintals of potatoes on the 0.5 ha of own cropland and on cropland rented from other smallholder farmers.

The family has a homestead of 150 m^2 including a woodlot where Yitay planted trees such as eucalyptus. He has two oxen and one cow; he does not have grazing land and the communal forests that could be used for grazing goats and sheep have been closed for livestock. He makes up for this by keeping poultry and honeybees. He produces almost 350 kg honey per year, which enables him to generate a total annual farm income of over 40,000 Ethiopian Birr (ETB)[2].

Despite his great desire to use new and improved technologies, he did not get a chance for experience sharing with farmers outside his district or exposure visits to such farmers and research centers. However, he is an outstanding farmer who gathers information from various sources, which enabled him to discover new and improved technologies and seeds to increase his productivity. He obtains and exchanges the latest information through radio, mobile phone, newspapers and training given by government extension workers, ASE and ABSHCBDA's field officers, as well as from fellow farmers and in community discussions in the context of traditional institutions such as *idir* (burial society) and *senbete* (mutual assistance institution).

4.1.2 Brief description of the innovation

Yitay started constructing his modified beehives in 2000, when he was very creative in developing his own innovation to improve beekeeping by combining different components from various beehives to create a good environment for the bees. The main reason he did this was because he found some drawbacks in each of the three different types of available beehives, namely, the traditional, transitional and modern beehives. These drawbacks reduced the quality and quantity of honey and the reproduction capacity and environmental adaptability of the bees. After critically examining each type of beehive, he constructed a modified hive by combining the good components from each one. He put planks at the left and right side of the traditional beehive, top bars from the transitional beehive and the queen excluder from the modern beehive, and used pieces of thin wire and nails to connect all the parts.

According to his evaluation, his modified beehive is easy to manage. It is easy to clean the inside and outside parts by opening the plank that is attached on the worker bees' side of the hives regardless of the number of bees. This helps to produce good-quality honey and maximises the adaptability of bees since it reduces the opportunity for bee insects to reproduce. It is also very easy to make the hive, using inputs and equipment that are easily accessible and affordable with local knowledge and skills. Furthermore, it enables worker bees to produce honey without having to go up and down within the hive; they can therefore make honey faster than in other beehives. One person can easily harvest the honey without destroying or disturbing the larvae and combs. The modified beehive construction also reduces the probability of being bitten by the bees during harvesting since the harvester can push worker bees away from the honey towards the queen's side of the hive using smoke.

Unlike modern and transitional beehives, it is easy to substitute the honey with combs. A beekeeper can even substitute the combs by himself instead of asking support from another person so that the honey can be harvested on time. In addition, the hive's cover, which is made

[2] At October 2014 exchange rates, ETB 40,000 was equivalent to about €1560; this is far above the average annual income of smallholder farmers in Ethiopia.

from bamboo fastened with wire and metal bands and plastered with cattle dung, regulates the temperature during the cold and warm season and between day and night so that the bees can easily adapt to their environment. It is also possible to have a huge quantity of bees within a single beehive by increasing its size. Furthermore, it is safe to put a number of beehives within a narrow space by stacking one on top of the other up to four beehives, leaving at least 10 cm space between each hives. All these conditions increase the productivity of the bees and the quality of the honey. Yitay reports that he can harvest honey two times per year, in January and June, and he can get a better harvest in terms of both quantity and quality from his modified beehives than from the other beehives. When he compared the three in one season, he harvested 22 kg, 21 kg and 5 kg from his modified, modern and traditional beehives, respectively.

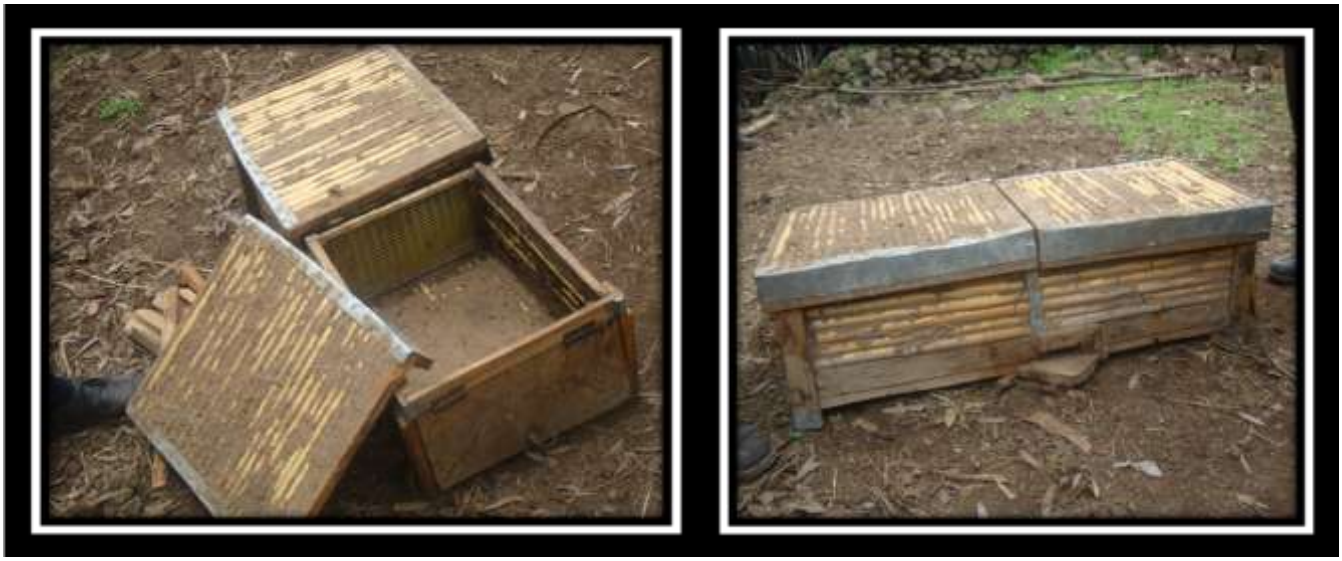


Photo 1: Yitay's modified beehives (Source: ABSHCBDA)

Although he didn't sell his innovation for cash, he made and distributed his modified beehives in exchange for labour for irrigating his fields. He is making modified beehives to take the place of all his other beehives as well as to make it accessible for other farmers. In the future, Yitay plans to sell his modified beehives to farmers for cash at an affordable price, since the hive can be made with few and inexpensive inputs such as bamboo for 5 ETB, 0.25 m thin wire, 0.25 kg nails, 2.5 cm x 4 m metal bands, one fourth of plastic netting (for the queen excluder of the modern beehive), a little mud and 10 normal-sized top-bars. According to Yitay, the hive is very durable and could be used for up to 40 years if managed properly. Therefore, only awareness creation is needed to disseminate it throughout the farming community.

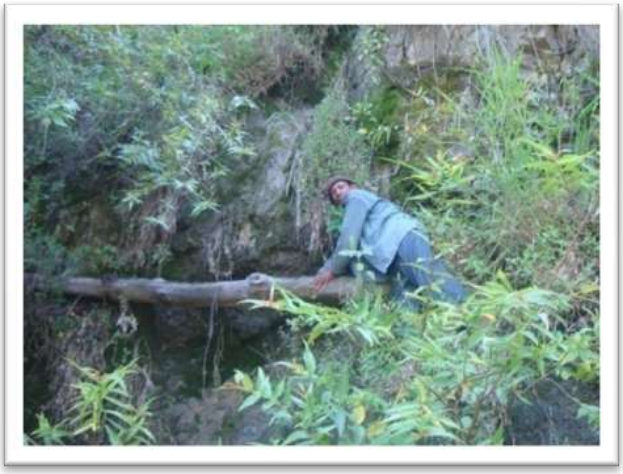
4.1.3 Added value of the innovation

As Yitay explained during an interview, his modified beehive has the following main advantages:

1. It can be made of locally available materials (bamboo, mud, wood etc).
2. It is easier to manage the bees.
3. It leads to increased productivity of bees and quality of honey.

4.2 Building irrigation canal across rocky terrain: path from extreme poverty to prosperity

4.2.1 Information about the innovator



Mr Setegn Chekole lives in Wanza village in Woyin-wuha Subdistrict in ESM District. He had attended adult education launched by the Derg (military committee) regime to eliminate illiteracy in Ethiopia. He is 55 years old and lives with his wife, daughter and five sons. Like most farmers of Ethiopia, he is engaged in mixed farming. He now has 2 ha cropland and 4 ha for grazing, homestead and woodlot, and has access to 4 ha communal forest. He uses half of his cropland to grow cereals and other field crops (teff, wheat, sorghum, beans, peas and maize) and the remaining land to grow fruits and vegetables such as mango, orange, banana, coffee, avocado, lemons, sugarcane, khat, apple, *gesho* (a hops-like plant), papaya and cotton. On the 4 ha of land for grazing, homestead and woodlot, he has planted indigenous tree species, and he grazes his 10 head of cattle, 40 goats and 3 donkeys on the 4 ha of communal forestland. He also has 15 chickens and 3 traditional beehives.

Setegn is a very active farmer who is constantly trying to diversify and improve the livelihood and living standards of his family. He immediately familiarises himself for new technologies and improved seeds, since he has had access to communication media such as radio, mobile phone and newspaper as well as technical advice from ASE and ABSHCBDA and sometimes from government extension workers, particularly for his crop production. In addition, he also obtains information about better vegetable and fruit varieties and ways of cultivation from his fellow farmers and during community discussions within traditional institutions such as *idir* and *senbete*. He has also got the chance for experience sharing and exposure visits organised in Debre Markose for farmers and he was given a model farmer award by the government extension service, which encouraged him to further expand his vegetable and fruit production through irrigation.

4.2.2 Brief description of the innovation

Setegn started constructing his irrigation canal in 1985, during the great famine that resulted from prolonged drought. At that time, Setegn and his family suffered famine and starvation since they had no cereals, cattle, goats, sheep or even poultry. Setegn started to seek a long-term solution for his family's food-scarcity problem. He realised that rainfed agriculture cannot alleviate this problem since their area is frequently affected by shortage of rainfall and seasonal drought. Then he decided to grow cereals and crops using irrigation by taking water across a long stretch of rocky terrain. His land is located above a river, so it is very difficult to irrigate it by taking water from the lower and level land to the mountainous and rugged parts of his farmland. He started construction of his irrigation canal by walking more than 3 km from his land to the upper parts of the river to make his canal with a slope to allow water to flow by gravity to his land. He made a high retention wall using stones, sand, soil and logs collected from the higher mountainous land and from the

river valley, deeply digging into the side of the mountain. Since building the retention wall and canal demanded much labour, he drew upon traditional labour-exchange institutions such as *debo* and *wonfel*. It is very dangerous not only to build the high and long retention wall but also to walk on it without holding onto anything, so he tied himself with a rope to a big tree to prevent himself from falling. Setegn calls this technique *tebkign* (which means "safeguarding me from risk"). Small tributary rivers that run from the top of the mountain down to the main river during the rainy season frequently destroyed parts of his canal, which he had to rebuild each year after the rainy season, usually in September. To reduce the labour force that is required each year, he used the hollowed-out stems of large cactus plants as channels for the water, crossing the tributaries in the air erected on large tree trunks so that the floodwater passes beneath the channels. Setegn also uses cactus stems and large tree trunks to transport water from the bottom of his land to irrigate land further up the mountain.

Photos 2 & 3: Setegn during canal construction; Setegn's fruit-growing site (Source: ABSHCBDA)

In 1985, Setegn started growing potatoes for two years followed by maize and onions for two years in rotation. After selling his produce, he bought a pair of oxen and expanded his irrigated cultivation. After four years of the crop rotation, he started to produce fruits and vegetables in what has become a centre for horticulture: he now grows more than 19 species of fruits and vegetables, including lemon, banana, orange, mango, apple and cassava. He earns more than 3000 ETB per week from fruits and vegetables during the growing season and earns an annual income of over ETB 200,000 (over €7800) from all his farm income sources, including animal production. He has thus not only diversified his sources of livelihood and ensured his family's food security; he can now also support his relatives and neighbors when they are in need. His hard work and creativity have made him a rich farmer.

In addition to producing fruits and vegetables, Setegn planted numerous indigenous tree species around his fruit and vegetable garden to prevent soil erosion and to maintain biodiversity in the area. He is now considered a "model" farmer who is respected in and beyond his subdistrict. Thus far, 11 farmers have started to apply his practices, and his achievements brought attitudinal change among the farmers by showing that hard work is the only way to reduce poverty and gain prosperity. Setegn said: "*When I started constructing my irrigation canal, my neighbours regarded me as a crazy man who spends his labour and time for nothing. Instead of encouraging me, they advised me to go to another part of Ethiopia that is not affected by drought and shortage of*

rainfall and to come back to my home village with some money. But now they accept my style of cultivation through irrigation as a model and they adopt it to diversify their livelihood and they given me high recognition."

4.2.3 Added value of the innovation

According to Setegn, his innovation has the following socio-economic values:

1. It improves the livelihood status of the innovator, who is now making an annual income of over ETB 200,000 from all his farm income sources.
2. It encourages other farmers, since Setegn changed the seemingly impossible into something possible**.**

4.3 Abere Yirga's row-sowing implement to reduce labour and increase production

4.3.1 Information about the innovator

Abere Yirga lives with his wife, daughter and five sons in Zewotre-Enejember Subdistrict in ESM District in East Gojjam Zone. He is a full-time farmer who completed Grade 6 at primary school. They practise mixed farming and spend 75% of their time on crop and vegetable cultivation (teff, wheat, barley, beans, peas, potatoes, onions, tomatoes, cabbage etc) on their 1 ha of farmland and 25% of their time on animal husbandry, keeping 5 head of cattle, 4 sheep, 2 goats and one donkey on his 0.2 ha of grazing land and 0.06 ha for homestead and woodlot. The family also has poultry and four traditional beehives. The subdistrict is one of the most degraded and least fertile parts of the district, and demands great effort for soil conservation and rehabilitation. Because of this, Abere is classified as a middle-income farmer according to the subdistrict's income-based classification of residents: his annual income is less than ETB 20,000 (€780) from all his income sources.

4.3.2 Brief description of the innovation

Although his land is not very fertile and is low in productivity, Abere made his livelihood sustainable by diversifying his income sources. His primary education greatly prepared him for learning about new and improved technologies by exchanging information through modern communication media such as television, radio and mobile phone. Abere also works closely with ASE and ABHCBDA and the government extension service. Like all farmers in the area, he shares information with his fellow farmers and during community discussions. He is the village coordinator of the Addis Alem Farmer Field School, which works with ABSHCBDA. This gave him the chance for experience sharing and exposure visits organised in Debre Markose, Bahir Dar, Addis Ababa and Nairobi for innovative farmers. He is very active and critical man who can select and adopt technologies and crop variety which are applicable and adoptive to his environment.

Abere constructed his row-sowing implement in 2005 E.C. after being advised by government agricultural extension workers about sowing in rows and having returned from an exposure visit in Kenya, which led him to believe that row sowing is more productive than broadcasting seed, as is

commonly done by Ethiopian farmers. He therefore wanted to sow all his cropland in rows. However, he found that this is laborious and needs at least three workers for ploughing the land, sowing the wheat and fertilising it with urea and DAP. But it was impossible for him to hire three labourers per day for farming his land and sowing in rows. Then he began to think of new ways of row-sowing by only one person and eventually he found that it is possible to do this by constructing an apparatus using three empty water bottles to hold the wheat seed, urea and DAP and tying them to a wooden branch using rope, thus modifying a row-sowing technology for teff that he has seen on television.

Photo 4: Abere Yirga's row-sowing implement made with plastic bottles (Source: ABSHCBDA)

Abere put nails through the surface of the plastic bottles to make holes for letting out the wheat seed and fertilisers. The number of holes used in each bottle depends on the fertility of the soil and the size of wheat seed variety. According to Abere, if the land is fertile, the number of holes in each bottle has to be less, so as to reduce the number of wheat seeds and amount of fertiliser in each row, but if the land is less fertile, it is better to increase the number of holes to increase the number of wheat seeds and amount of fertiliser in each row. Abere showed his innovation to agricultural advisors, who appreciated his implement and made comments to improve its design.

Abere's row-sowing implement greatly reduces the labour needed for sowing and applying fertiliser, thus saving the farmer from paying labourers. Furthermore, since the implement distributes wheat seeds and fertiliser better than sowing by hand, it saves seed and fertiliser and enables more effective use of the land. According to Abere, since the implement distributes seed and fertiliser properly, it leads to higher wheat yield. In addition, it can be made from empty water bottles and branches, which are easily accessible for farmers at next to no cost, so anyone can make it. Now the implement has been made and is being used by about 25 other farmers. It needs awareness creation among yet more farmers to extend its application.

4.3.3 Added value of the innovation

According to the assessment by the innovator, the implement has the following main advantages:

1. It reduces daily labour inputs and saves the farmer from hiring 1–2 labourers.
2. It saves time during sowing.
3. It can be made using locally available materials that are easily accessible and affordable for smallholder farmers.

4. It can be easily sent to or made by other farmers.
5. It has no negative impacts on the environment and indeed even has a positive impact, since it uses waste plastic materials for its construction.
6. It is durable and may last for 3–4 years.

4.4 Haricot bean (*bolokie*) pest control by Ediget FFS: *from total destruction to productivity*

4.4.1 Information about the innovators

Ediget Farmer Field School (FFS) started in 1994 E.C. in the semi-arid Eneguzi Subdistrict in ESM District. The group was organised by ASE on a voluntary basis to solve the current and future farming problems in the area by farmers seeking solutions for their problems by themselves. It currently has 14 members (7 men and 7 women) all married and ranging in age from 26 to 60 years. Mr Andarge Ygrem is the chair of the FFS. Four of the women are illiterate and three of them can read and write only. Four of the men attended adult education initiated during the Derg regime to eliminate illiteracy throughout Ethiopia, two of them completed primary school (Grade 6) and one man completed Grade 10. The groups members depend on mixed farming; on average, they spent 70% of their time on crop farming (mostly haricot bean, sorghum and teff) and 30% of their time on animal husbandry, although some of them do not have cattle or beehives. The group members suffer from shortage of land for cropping and grazing; the landholdings per household range from 0.25 to 1 ha cropland and 0.125 to 1 ha homestead and woodland, plus access to about 1.5 ha communal forest. As a result, the average annual income of the group members ranges from ETB 5350 to ETB 16,000 to ETB 32,600 for lowest, middle and highest income, respectively, from all their income sources.

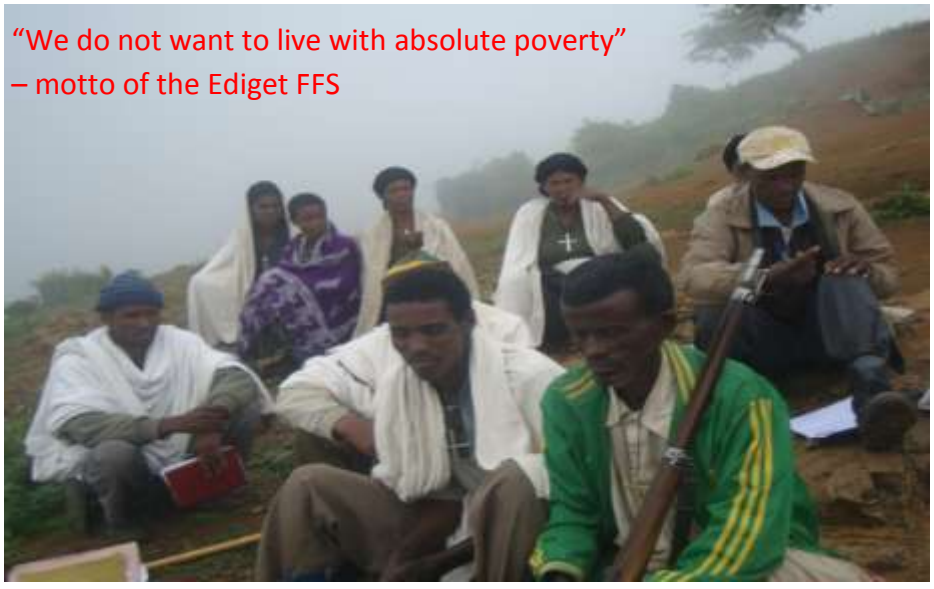


Photo 5: Some members of Ediget Farmer Field School (Source: ABSHCBDA)

4.4.2 Brief description of the innovation

Since its foundation about 13 years ago, members of the FFS took part in information exchange and experience sharing through modern mass media from the government extension service, ASE and ABSHCBDA. They also learned from their fellow farmers' good experience and from their *idir*

and *equub* (informal savings group) members. The FFS chair also thought his group members gained good experiences from exposure visits organised in Debre Markose, Bahir Dar, Addis Abeba, Nairobi and Adet Agricultural Research Centre for innovative farmers. These visits stimulated the FFS members to gradually improve their living standards by diversifying their livelihoods. Now, most members are secured from food scarcity.

They started their farmer-led research with the support of ASE to identify farmers' problems in their area and to solve their problems one by one, depending on order of their severity. A crop pest locally called *tegaday* (guerilla fighter) in haricot bean (*bolokie*) was identified as one of the main farming problems in their subdistrict. Then they considered how they could use local knowledge to solve this problem. They raised and discussed different ideas within the group and decided to try out different locally available plants. The FFS members collected various wild plants that they thought to be poisonous and screened and selected the ones they found to be most effective against the pest: initially plants with the local names of *Antrifa* and *Milas Golgul* and then *Kinbo Dem* and *Domie*. They are dried and pulverized and then dissolved in water for application.

They began their farmer-led research by trial and error, mixing fluids gathered from the leaves and stems of the above-mentioned plants and applying the fluids on the leaves of bean plants sown on a 5x10 m plot of land allocated by the District Land Administration and Environmental Protection Office for their experiment. They divided the land into subplots and applied different mixtures of the pesticide fluids on each plot. In this way, they found a number of different mixtures that reduce or prevent infestation by the haricot bean insect, although the effectiveness varied between mixtures. Solutions from the *Domie* and *Antrifa* plants proved to be most effective.

Photo 6: Some wild plants collected by the FFS group for their experiments (Source: ABSHCBDA)

However, after six years of this kind of experimentation, the group found that the innovation was laborious and difficult to apply over large fields. Furthermore, the group members began to see that their innovation might not be sustainable and environmentally friendly, since it is made from wild plants and their widespread use might cause deforestation and expose local inhabitants and future generations to another serious problem.

The FFS members then began to re-focus their investigations to look at the seasonal variability in weather conditions and the conducive environments and seasons for the breeding of the haricot

bean pests. They generated a new idea: dealing with the pests by changing the agronomic practices for growing haricot beans. They divided their research plot into three subplots and started to sow haricot beans in three different seasons: i) before the rainy season, when the soil has no moisture; ii) after a little rain, when the soil has a little moisture; and iii) during the main rainy season when the soil is full of moisture. After repeatedly checking the plots visually, they discovered that bean plants sown when the soil has a little moisture were totally destroyed by the pest, since its breeding time matches with the early growth stage of the haricot bean when it has only two small leaves – a very suitable growth stage of the bean plant for the pests to consume it. The FFS group found that the insect did not affect haricot bean plants sown when the soil was wetter, since the higher moisture content is not favourable for reproduction of the pest. However, sowing at this time is not so productive, since the bean plants do not grow well enough to support many beans and the rains stop before the plants mature.

The farmers came to the conclusion that haricot bean plants sown before the start of the rains, when the soil has no moisture, are not affected by the pest, since it breeds after the bean plants have produced more than two leaves and are not so readily consumed by the insects. Furthermore, the bean plants grow more strongly and can carry more beans and their growth is not interrupted before the plants mature. All these advantages lead to a doubling in yield compared to the bean plants sown in the wet season. In addition, since the haricot beans mature before the end of the wet season, the farmers can harvest a bean field twice per year, which further increases yield and improves the food-security status of farmers. But they recommend to sow after receiving the forecast that the rains will start immediately after sowing and to increase the number of seeds per hole when compared with other seasons to compensate for the seeds that will perish if the rains don't start immediately.

Photo 6: Ediget FFS members at their research site (Source: ABSHCBDA)

4.4.3 Added value of the innovation

The Ediget FFS group's innovation in haricot bean husbandry techniques to avoid pest infestation has the following socio-economic advantages for the community members:

1. It increases the yield of haricot bean.
2. It is easy to apply and acceptable by the community.
3. It has no cost.

6.5 Cattle and sheep tick control by Addis Alem Farmer Field School (FFS)

6.5.1 Information about the innovators

Addis Alem FFS was established in 1994 E.C. with the support of ASE in Zewotre-Enejember Subdistrict in the "*dega*" (cold mountainous) part of ESM District. This voluntary group set out to identify problems that local farmers face and to find solutions for each problem using their own potential instead of seeking help from others. The group currently has eight female members, of which four are illiterate, three attended adult education and one completed Grade 10; and 22 men, of which 15 attended adult education, six completed primary school (Grade 6) and one completed Grade 10. Mr Abere Yirga is chair of the FFS.

Members of Addis Alem FFS practise mixed farming and spend on average 70% of their time on crop farming, 20% on animal husbandry and 10% on pottery work, distilling *katikala* (liquor) and trading wood. Their subdistrict is densely populated and the most highly degraded in the district; it is characterised by low productivity and land shortage. The landholdings per household of the group members range from 0.5 to 1.25 ha cropland and from 0.06 to 0.25 ha homestead and grazing land; they have no communal forestland. Therefore, members of the group have at the most three head of cattle and five sheep and goats. Some members have no ruminants because of the lack of grazing land.

6.5.2 Brief description of the innovation

The higher areas in this subdistrict are more suitable for sheep rearing since the land is not fertile enough for effective crop production and is prone to soil erosion and snowfall. However, sheep rearing faces a problem of ticks, leading to sickness and death of the animals and production losses. The FFS decided to try to solve the sheep tick problem using local knowledge. It collects and mixes plants with the local names of *Azoareg*, *Geberembuay*, *Timbahoo* and *Mehan Endod* and dissolves them in water. The farmers wash the ticks with this botanical solution so that they can easily remove the ticks from the skin of the sheep.

After seeing the effectiveness of this treatment on both sheep and cattle, the farmers created awareness among farmers in their traditional *idir* and *senbete* institutions about the botanical medicine and ways of applying it. They recommend that farmers apply the fluid only to the tick without dropping it on the skin of the cattle and sheep, since it injures their skin. They also give free service for aged and weak farmers who cannot prepare and use the medicine by themselves. Now farmers in the subdistrict widely use this medicine for removing ticks from their cattle and sheep. This has led to better animal health and reduced the death rate and has consequently raised the income generated from selling animals, leather and skins. It also reduced time, labour and financial expenses for vaccinating the cattle and sheep in modern animal clinics.

Since the farmers prepare the animal medicine from wild plants, it might seem to be an unsustainable technology that aggravates deforestation and contributes to further soil erosion and degradation. But the farmers have turned this into a sustainable technology that positively contributes to reforestation since farmers have started to plant the trees needed for the botanicals on their homestead and woodlot areas.

The group members also contribute to protecting the environment since they avoid industrial pesticides. A good example of the environmental friendliness of their local innovation is for beekeeping, which is being negatively affected by industrial insecticides and herbicides. Their innovation is thus a solution for many interrelated development endeavours. Above all, their work has enhanced their capacity to do research and solve problems on their own.

Based on their research, the FFS members have produced local treatments by collecting and making extracting from different available plants. So far, they have handled the problems of rats, *mesek* (root- and stem-cutting insect), *kishkish* (another insect that attacks beans and cabbages) and Newcastle disease in poultry, among other problems. They use different leaves, roots, apex and other plant parts to formulate the treatment for the specific pest. Integrated Pest Management (IPM) activities are also strongly practised by the FFS to reduce the negative impact of different pests on both crops and livestock. The farmers have thus become the technology generators instead of being regarded as merely adopters of scientific technologies transferred in a top-down approach.

Photo 7: Addis Alem FFS group members (Source: ABSHCBDA)

4.5.3 Added value of the innovation

This innovation in tick control has the following added value in social or economic terms:

1. It saves time and money.
2. It is friendly for the environment.
3. It is not complicated, so any farmer can understand and use it easily.
4. It makes a great contribution to the food-security status of the rural communities that rely largely on animal production.

4.6 Mrs Etye's self-made furniture

4.6.1 Information about the innovator

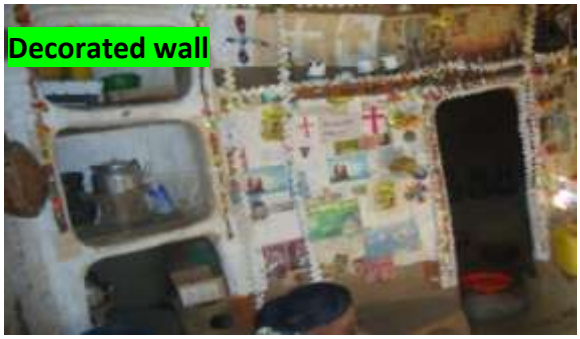
Mrs Etiye Yibeltal lives in Gunaguna Subdistrict in East Gojjam Zone of ESM District. She is a 50-year-old widow who lives with her daughter and son. She is illiterate and spends much of her time tending to her one cow and two sheep on her 40 m^2 homestead and woodlot land, where she planted "*wanza*" (*Cordia africana*) and eucalyptus trees since she has no grazing area. However, she obtains more than 90% of her annual income from crops. She generally harvests about 4 sacks of teff, 3 sacks of wheat and 2 sacks of beans and other crops by renting her 1.5 ha of cropland to her married son. (One sack holds 100 kg.) She does this for various reasons: she lacks oxen and labour force to cultivate her land by herself, and her son needs her support for his survival since he has no land of his own and provides for his family by renting cropland from other smallholder farmers. Etiye therefore earns a small income of less than ETB 3000 (less than €120) per year, which is insufficient for her household needs.

She is poor farmer without access to modern mass communication media such as radio, television, newspaper and mobile phone for obtaining information from different sources about new and improved technologies and seeds that could increase her productivity. Since she is illiterate and aged, she does not aspire to have access to these media. She obtains information through training given by government extension staff, ASE and ABSHCBDA's field officers, from fellow farmers and during community discussions in traditional institutions such as *idir* and *senbete*.

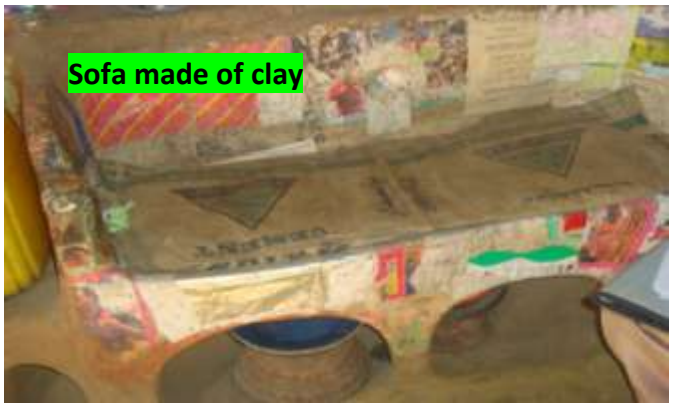
4.6.2 Brief description of the innovation

Most of the time in Ethiopia, women and girls are responsible for keeping the house clean and furnished as required. Etiye has a great ambition to beautify her house, an ambition that was intensified after she saw sofas and other furniture in the town. In 2000 E.C., she started making her own improved furniture by modifying the traditional house furniture known as "*medeb*", which is made from clay, teff straw and stone. According to Etiye, she was keenly interested to acquire house furniture starting from her early childhood but was unable to obtain modern industrially made furniture such as chairs, table, shelves and bed, since these are too costly for her to afford with her limited funds. She observed and copied the design of modern house furniture, making her furniture from easily accessible and inexpensive materials such as bamboo, clay, ash, teff straw and paper, using her own mosaic-making skills and knowledge.

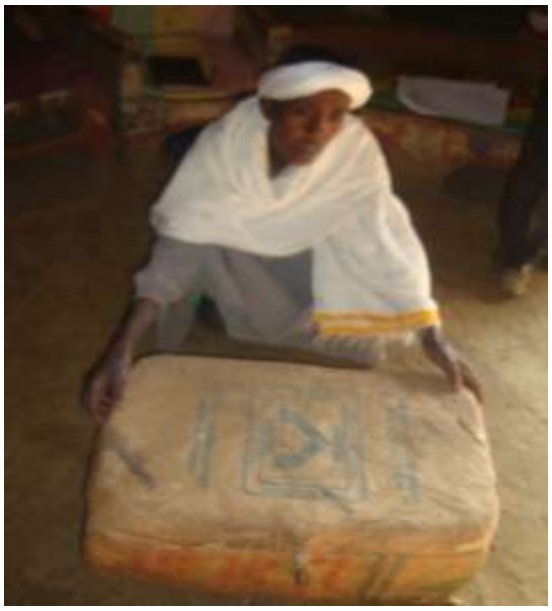
Chairs made of clay



Decorated wall



Etiye did not have an opportunity to share her innovation outside of the district or to receive technical support from research or technical centres and other formal institutions, yet many other people in the community know of her innovation. She has never taken her self-made furniture to the market to sell; she simply shows and teaches her ways of making furniture to her neighbours, which has enhanced her social ties within the community.



"*Once upon a time, I visited a beautiful house in Mertule Mariam town with very attractive and sophisticated furniture. I asked the price of the furniture and they told me it was very expensive. Immediately, a few ideas knocked my mind that encouraged me to furnish my house with locally available materials and start my innovation when I went back to my home".* – Mrs Etiye Yibeltal

6.6.3 Added value of the innovation

Etiye's innovation in making improved traditional furniture has many economic and cultural advantages:

1. It saves time during work since all items and commodities are arranged in their proper place.
2. It increases mental satisfaction to have a beautiful living room.
3. It avoids extra cost for purchasing furniture since it is made from locally available material at no cost.
4. It is easy for other community members to adopt the idea and learn how to make their own furniture.

5. Conclusion

Nothing is static in the world; constant changes will continue to affect our existence directly or indirectly. Many opportunities and challenges may exist through time that may influence human life. In Ethiopia, the livelihood of the majority of the population depends on agriculture. We have observed that farmers are striving forward to improve their livelihood status through agricultural development and are thus contributing to the country's GDP growth. Every one of us in Ethiopia should realise that our country's development rests on the shoulders of small-scale farmers. In most areas, many challenges and drawbacks make these farmers conscious of their situation and they reflect on the various issues to be able to find remedies for their current problems.

Similarly, local farmers in ESM District have begun to carry out various types of research and innovation in their locality in response to changes they have observed and in ways that teach all community members and contribute directly to improved livelihoods. Innovative ideas emanate from these farmers either as individuals or in groups. These farmers' innovations need special attention from the local government bodies such as research centres, universities, colleges and schools, which are, in turn, vital to support farmer innovation in a participatory manner. However, most of the concerned stakeholders still give low recognition and emphasis to the local farmers' innovations and ignore the voices of farmers. Since there are many smallholder farmers doing research and innovation without the help of anybody else, the various stakeholders should work with the local farmers to scale out their innovations to other communities in Ethiopia and to scale up PID in the country. ABSHCBDA therefore invites every person or institution concerned with rural development to work with the local farmers and to promote PID in our area and would like to say: "**Let's listen to the voices of local farmers forever**".