

The background of the entire page is a close-up photograph of a bio-digester burner. The burner is a circular metal grate with a central burner head. A bright blue flame is burning from the burner head, rising upwards. The burner is set within a larger metal structure, possibly a stove or a cooking pot. The background is dark and out of focus, showing some wooden or metal elements.

Scaling-up the adoption of bio-digesters:

Lessons learned from Were Ilu Woreda

Scaling-up the adoption of bio-digesters: Lessons learned from Were Ilu

Woreda

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2020

This publication was produced with the financial support of the European Union. Its contents are the sole responsibility of SNV Ethiopia and do not necessarily reflect the views of the European Union.



Co-funded by the European Union

Biogas Dissemination Scale-UP Programme (NBPE+)



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“Biogas is life” – Semere Eshetie

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Preamble

Bio-digester technology is an important clean cooking and lighting solution. The Government of Ethiopia targets to install 31,400 bio-digesters in Ethiopia in the five-year period (2015-2020).

National Biogas Programme of Ethiopia (NBPE), hosted by Ministry of Water, Irrigation and Energy (MoWIE) started installing household bio-digesters since 2009 as part of the Africa Biogas Partnership Programme (ABPP). Its phase II in Ethiopia was ended as of 31 March 2019. NBPE Phase I and II were implemented in four larger programme regions (Amhara, Oromia, SNNPR and Tigray).

Biogas Dissemination Scale-Up Programme (NBPE+), launched on 27 April 2017, targets to install 36,000 household digesters with funding from the European Union and the Government of Ethiopia. It was designed and being implemented to continue and scale up the activities being implemented under NBPE while expanding it to other regions: Afar, Benishangul-Gumuz, Gambella and Somali. Apart from installation of household bio-digesters, NBPE+ has some other objectives, including piloting 40 larger sized bio-digesters for businesses and institutions.

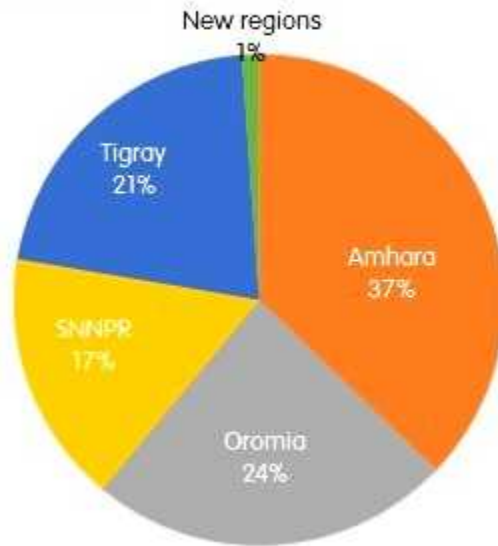
NBPE+ aims to improve the living standards of farmers and their families, in the eight regions while reducing the over-exploitation of biomass cover and reducing Greenhouse Gas (GHG) emissions.

By developing a viable bio-digester sector embedded in an enabling institutional and policy environment, the programme also aims to contribute to increased economic and business development (particularly in rural areas) and the longer term objective of supporting the transition in Ethiopia to a more sustainable energy mix and corresponding socio-economic and environmental benefits.

The document: The project is implemented in more than 300 woredas in the country to benefit 180,000 rural people. Were Ilu is one of the implementation woredas that achieved successful implementation of 150 within a year and interesting learning. This case documents the learnings on sector integration, digester promotion, bio-slurry application, sustaining bio-digester business and expanding reach, and access to credit finance.

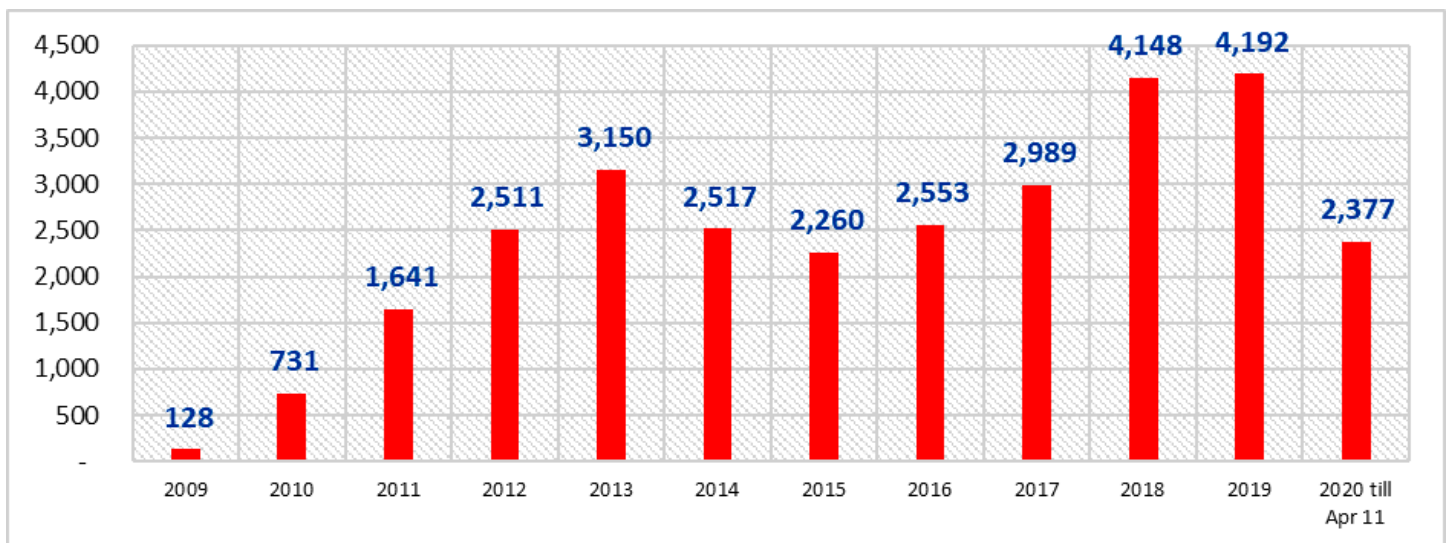
Installation

NUMBER OF DIGESTERS



Region	No. of digesters
Amhara	10,858
Oromia	6965
SNNPR	4853
Tigray	6195
New regions	326

Achievement until April 2020



Introduction

Were Illu is famed as the place where Empress Zewditu was born, and where her father Emperor Menilik II summoned Ethiopian forces to gather before departing to the Battle of Adwa. More recently, Were Illu has built on this fame thanks to its success in constructing 150 bio-digesters within a year, and achieving a high rate of functionality.

In part, the achievement of producing 150 bio-digesters in a year was the result of prioritisation in promoting the technology. The energy experts promoted the bio-digester technology, focusing on the two bio-digester co-products, energy and bio-slurry. The promotion prioritised the latter. Bio-slurry attracted the attention of subsistence male farmers who have been seriously affected by the rising price of chemical fertiliser. On the other hand, women and children were attracted to the source of clean energy for cooking and light for studying. However, finance is a limiting factor for most potential users. To address this, the bureau head, the process owner and the expert in the *woreda* linked micro-finance institutions

(MFIs) with potential users.

To ensure the construction of high-quality digesters, the experts, together with SNV Ethiopia and experts from the National Biogas Programme of Ethiopia (NBPE), trained business-oriented masons and linked them with potential users. The biogas expert, Semere Eshetie, took the initiative to organise interested households (mostly adjacent to each other) into a one-to-four scheme for ease of construction, purchase and transportation of raw materials, as well as to link households with MFIs.

To sustain and scale-up results, the experts performed strong awareness-creation campaigns to bring all government sectors on board and participatory adoption planning involving sectors and the community to ensure farmers' buy-in through the government sectors' team efforts. It was also very important to set up stepwise, process-oriented implementation and follow-up.



Keeping success on the rails

“Unity is strength. Synergy is might.

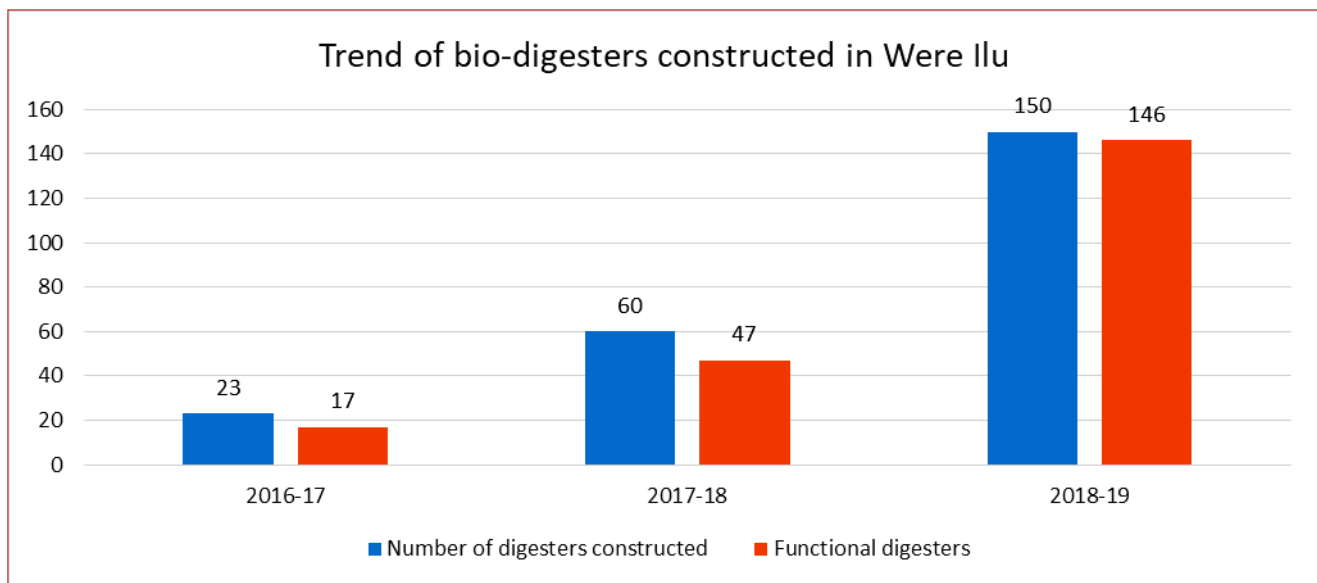
Team work is power.”

Matshona Dhliwayo

Were Ilu *Woreda* constructed 150 digesters in a year, and a total of 233 digesters over three consecutive years. The functionality of these digesters

reached more than 90%.¹ Bio-digester technology was introduced to the *woreda* in 2016/17. The secret behind this success is due to a

number of factors: team work, problem-based promotion, clustering and engaging sectors.



Team work

In 2018/19, Amhara Region Water and Energy Bureau organised a biogas festival in East Gojjam Zone to recognise *woredas* that had performed well in bio-digester construction. At the event, Were Ilu was recognised as the second most successful *woreda* in the region. This result energised the *woreda* energy office team. They critically

evaluated their project implementation methods and set the direction for the following year. The team (Water and Energy Office Head, Energy Team Leader and the Biogas Expert) shared the task.² The first thing they did was read the available guidance documents. They then organised an awareness-creation meeting with sector stake-

holders to gain support. The session brought them supportive companions that made the digester construction project successful. Following self and stakeholder awareness-creation, they turned their attention to the community. As a result of this integrated effort, they produced 150 digesters in a year.

¹ Data collected from *woreda* energy office for the biogas festival (2019).

² The team members allocated time to control the quality of bio-digester construction, and to follow up the functionality of digesters and bio-slurry management. The Water and Energy Office Head dedicated time to visit households, carry out assessments and collect feedback.

Problem-based promotion

“I know how much farmers are paying for chemical fertiliser and what crop diseases are prevalent around Were Ilu. I decided to promote bio-digester technology, focusing on bio-slurry.” Semere Eshetie, Biogas Expert

The community-level awareness-creation process began with audience segmentation, message crafting and setting communication objectives. Model farmers/potential users, *kebele* chairmen, health extension workers and artisans attended these sessions.

The promotion of bio-digesters was targeted at students and parents. Women carry the burden of cooking food for their families, and have little or no access to clean energy for cooking. This leaves them with no alternative but to use fuelwood, despite being aware that it is bad for their health, among other things. Mestawet

Ayale (a housewife), remarked when she began using her digester: “I called it ‘*asarefekegne*’ (‘you relieved me from smoke and collecting fuelwood’)”.

The promotion of bio-digesters to men focused on the benefits of bio-slurry. The challenge for men is to produce surplus from their crops, so that they can sell it and earn cash. Soil infertility and crop diseases make this almost impossible. But with bio-slurry, these problems can be overcome.

For students, the promotion of bio-digesters centred on energy, specifically light. Students have to study at night, but the light source that they use, which burns kerosene, has side effects and has very poor luminosity. Its cost also makes many parents discourage their children from studying at night. Accordingly, bio-digesters are also promoted as an alternative source of light.

The energy experts engaged fast-learning farmers who are benefiting from bio-



Long teff stalks are important for house construction and supplementary feed for cattle

slurry in promotional activities. A model farmer who dressed wheat and faba bean seeds with bio-slurry witnessed that the crops developed resistance to the prominent diseases affecting the crops, and doubled production. The biogas expert demonstrated how they should dress the seeds with bio-slurry. Curious farmers also visited the land of farmers who have bio-digesters. One woman, Asegedech Abegaz, was courageous enough to sell two sheep and use the proceeds to invest in a bio-digester: “I’m now benefitting from the light, energy for cooking, and the compost”, said Asegedech proudly.



Moreover, the cost-benefit analysis of using bio-slurry as organic fertiliser, instead of chemical fertiliser, has at-

tracted many farmers. In short, farmers wished they had money to invest in the technology, and Amhara

Credit and Saving Institution (ACSI) made their wish a reality.

Clustering

Scaling-up demand was the next phase. Prioritising high-potential *kebeles*³, the energy team clustered households in *Kebeles* 07 and 10 under the four-to-one scheme. This arrangement facilitated

loan access, input delivery and construction; accelerated the 'gas in the kitchen' process; solved transportation-related issues; strengthened quality control; and followed-up the func-

tionality of digesters and bio-slurry management. The four households contribute money to buy cement and sand for the construction of their digesters. They also collect dung for initial feeding.

Engaging sectors

"We have been challenged to produce high-quality compost. We are now getting high-quality compost from bio-slurry." Takele Getaneh, Soil Fertility Expert

Engaging sector actors has helped the *woreda* energy team to prioritise *kebeles* and implement their planned activities. Identifying *kebeles* with high potential and securing financial access from microfinance institutions (MFIs), the office launched a period of intensive construction. This increased demand for the

technology. The reality necessitated sector engagement for scale-up, sustaining results and support. Realising the need for intervention, the *Woreda* Bureau of Agriculture engaged in testing the benefits of bio-slurry on farmer-land-based demonstrations. They sowed crops using chemical fertiliser, liquid bio-slurry and

³ Two *kebeles* (07 and 10) in the *woreda* were selected for year III (April 2018 to March 2019) to intensively construct bio-digesters.

compost. The results will be used as an evidence for scaled-up promotion of bio-slurry compost. Gradually, the Bureau of Health has started to realise the benefits

of connecting bio-digesters to toilets in order to promote improved toilets: "We are no longer concerned about emptying as well as collapse of our toilets", said Zehabuwa

Mohammed, a woman who constructed an improved toilet and connected to the digester. Researchers have also become curious about the benefits of bio-slurry.

Way forward

Such experiences need to be documented and used as tools for scale-up. Accordingly, documents need to be widely shared with the concerned authorities and experts. Further discussions on ways of scale-up have to follow, and attention needs to be

paid to sector engagement. The best practices have to be incorporated into the regular activities of sector offices, and joint evaluation of implementation should be strengthened. Research into bio-slurry management needs to be further enhanced

and strengthened. Agricultural experts are concerned about the management of bio-slurry produced by digesters connected to toilets. The regional and zonal energy teams are looking at ways of linking bio-slurry with research institutions.



Bio-slurry for improved bio-digester promotion

The promotion of bio-digester technology is centred on its clean energy benefits (for cooking and lighting). But the technology also contributes to soil fertility improvement; environmental protection¹; waste management and better sanitation; the reduction of water pollution, soil pollution and water-borne diseases²; job creation; and minimising workloads³.

Bio-digester users are benefiting from the proper use of bio-slurry, and saving money by replacing chemical fertiliser with bio-slurry. Through the continuous support of SNV to focus on bio-slurry as a major component of bio-digesters, gradually energy experts have started to realise the benefits of bio-slurry and refer to it while promoting bio-digester technology. Ethiopia's Ministry of Agriculture has also included bio-slurry use in its agricultural extension services as a soil improver and organic fertiliser.

Currently, experts are increasing emphasis on promotion and awareness creation of the multiple benefits of bio-digester technology, particularly bio-slurry as soil improver and seed dresser, in order to accelerate uptake of the technology. Experts at the Water and Energy Office in Were Ilu *Woreda* are promoting biogas and bio-slurry as an entry point for disseminating bio-digesters.

"I dressed the seeds of fenugreek with the liquid bio-slurry. The crop germinated uniformly and has vigorous growth, and the field is not infested by disease. I expect a promising yield from my fenugreek field."

Arega Tadesse, Farmer, Were Ilu
Woreda

Were Ilu *Woreda* is characterised by a mixed crop and livestock farming system. Farmers produce cereals (barley, wheat), pulses (faba bean, lentil, fenugreek, field pea) and horticultural crops (cabbage, garlic, potato). In recent years, the production of faba bean, fenugreek, lentil and garlic have been blighted by pests and diseases, especially wilt disease of faba bean and root rot in garlic. In addition, the chemicals applied to these crops to prevent the diseases were not effective. Furthermore, the price of inputs, such as pesticides and chemical fertilisers, made the lives of these poor farmers miserable. Bio-digester technology becomes the key to address these chronic challenges.

¹ <https://bigadan.com/p/biogas-technology/advantages>

² <https://intercom.help/homebiogas/en/articles/1653449-advantages-and-disadvantages-of-biogas>

³ The power of dung: Lessons learned from on-farm biogas programs in Africa. International Bank for Reconstruction and Development/The World Bank. 2019.

Bio-slurry as a promotional tool

As a result of soil erosion, Were Ilu is a chronically food deficient area⁴. The *Woreda* Agricultural and Rural Development Office (2012) estimates that 40% of the *woreda* is affected by soil erosion. *Woreda* energy experts are aware of this, and alongside *kebele*-level user promoters and BCE owners, have capitalised on bio-slurry to promote bio-digester technology. The promotion focused on the

multiple benefits of bio-digesters and the use of liquid bio-slurry (for seed dressing, applying bio-slurry as organic fertiliser in liquid and composted form), supported by user training, demonstrations and the adoption of best practices. This approach helped users to achieve increased yields, reduce crop diseases and cut down on the cost of chemical fertilisers.



Applying liquid slurry on a cabbage seedling bed using a modified bucket

Use of liquid bio-slurry



Woizero Agerie top-dressed teff with bio-slurry after diluting with water, resulting in a good stand and panicle size

Studies reveal that farm lands in Ethiopia lack important minerals, which affects productivity. Although chemical fertilisers are available, the wise application of bio-slurry as organic fertiliser in liquid and/or compost form, using the slurry as an insecticide and pesticide, and dressing seed with bio-slurry, are economically efficient practices.

During user trainings, farmers are introduced to various features of bio-slurry: its unique characteristics, qualities, management and

uses (as organic fertiliser, pesticide and seed dressing). Farmers are also introduced to a cost-benefit analysis of using bio-slurry compared to chemical fertilisers.

⁴ Asfaw D, Neka M. Factors affecting adoption of soil and water conservation practices: The case of Wereillu *Woreda* (District), South Wollo Zone, Amhara Region, Ethiopia. *International Soil and Water Conservation Research* 2017; 5(4):273–9.

User training

As per the Programme Implementation Document (PID)⁵, user trainings and demonstrations are among the key activities for effective bio-digester promotion. However, most of the time, *woreda* and regional experts do not provide the training properly, and energy experts rarely provide user training, even after bio-digesters become operational. In contrast, the Were Ilu *Woreda* Water and Energy Office provides a 10-day intensive training course for potential users. The training covers the programme description (expectation from users and contribution from the programme), basics of the bio-digester and its management, bio-slurry handling and utilisation.

In these sessions, trainees are energised to learn more about bio-digester technology and ways to maximise the benefits from bio-slurry.

Seed dressing

Raising awareness of the multiple benefits of bio-slurry has popularised seed dressing. Farmers share information about the benefits of seed dressing with bio-slurry to prevent root rot, wilt and other diseases, while improving tillering capacity of the crops, which results in increased productivity. Typically, users dress seeds with 100% bio-slurry, keep them in the shade, and sow them the following day.

Through the effort to disseminate this learning to all bio-digester users, most users in Were Ilu *Woreda* applied seed dressing to major crops such as wheat, faba bean, fenugreek, garlic, lentil and barley in the 2018–2019 cropping season. The results they got from the seed dressing were very encouraging and better than their practices and using of chemical fertilisers. The effectiveness of bio-slurry for seed dressing opens an important market for bio-slurry and eases the promotion of bio-digesters.

They also get additional information from farmers who have already benefitted from bio-digester technology and its co-products⁶. Furthermore, potential users individually visit the farms of model farmers; have the opportunity to ask questions and clear up their misconceptions; discuss challenges, potential risks and available opportunities; create links with BCEs and learn about their role; and get organised under the four-to-one scheme to facilitate construction and initial feeding.

This prior awareness of the benefits of bio-digesters has contributed a great deal to increasing the demand for bio-digester technology, and the construction of a number of high-quality compost pits and shades. Bio-slurry management and utilisation have also been very effective.



Practical demonstration of seed dressing by BCE members

⁵ Programme Implementation Document.

⁶ Bio-digester co-products include energy (for lighting and for cooking) and bio-slurry.

Benefits of dressing with bio-slurry: Fenugreek

Arega Tadesse is working to maximise the benefits from bio-slurry and replace chemical fertilisers with compost. One day, he dressed fenugreek seeds with liquid bio-slurry before planting. He said: "The crop germinated uniformly and has vigorous growth, and the field is not infested by any disease. I expect a promising grain yield from my fenugreek field."



Comparison of fenugreek 'abesh' dressed with bio-slurry (left) and not dressed with bio-slurry (right)



Benefits of dressing with bio-slurry: Garlic

"Bio-slurry can be used as fertiliser and pesticide. I will encourage farmers to construct bio-digesters and use the slurry for agriculture." Woizero Serkie Ali

Woizero Serkie Ali dressed garlic cloves (planting material) with liquid bio-slurry one day before planting. Garlic was out of production due to a soil-borne wilting disease (commonly called 'enjibo'), which reduces yield significantly. In this production year, Serkie dressed the seed of garlic cloves with the liquid bio-slurry before planting.

In many parts of Ethiopia, including Were Ilu, wilt disease has become a major challenge that hinders the production of garlic. The success in fighting wilt disease in these crops may be

attributed to the fact that bio-slurry contains plant growth-promoting bacteria (PGPB), and other beneficial microorganisms. These accelerate plant growth through their capacity to produce plant growth-promoting hormones, increase the availability of mineral nutrients and water for plants, and protect the plants from diseases.



Woizero Serkie Ali in her garlic field



Two fields sown on the same day with faba bean seeds produced remarkably different yields – faba bean seeds dressed with bio-slurry (left) and faba bean treated with chemical fertiliser (right)



Benefits of dressing with bio-slurry: Faba bean

Hassen Tekilew invested in bio-digester technology and was the first to dress faba bean seed with bio-slurry. Other farmers' became interested in bio-digester technology when they saw the germination, the vigorous growth and the capacity of the crop to withstand moisture stress.

The application of bio-slurry as a seed dressing resulted in uniform germination, vigorous growth, reduced pest infestation, higher tillering and promising productivity. So far, the resistance to wilt disease and improved productivity of garlic and faba bean as a result of seed dressing have been magnificent.

The experience of obtaining higher production by seed dressing faba beans, garlic and fenu-greek was disseminated to a considerable number of other farmers who face similar challenges. The farmers who validated the effectiveness of bio-slurry for its improved productivity and suppression of plant disease were invited to different bio-digester promotion events, where they spoke about the benefits of bio-slurry. Shortly thereafter, the *woreda* energy expert included using bio-slurry for seed dressing in the user trainings, and demonstrations were introduced.

Hassen Tekilew's story

Hassen Tekilew, a farmer in *Kebele* 10, harvested 13 chenet (1 chenet = 50-60kg) of faba bean by dressing the seed with bio-slurry. Before the application, he used to harvest no more than 5 chenet in a similar plot of land. The additional yield increment, about 8 chenet, is equivalent to 4 quintals of faba bean. Its value is more than ETB 10,000 at a price of ETB 55 per tasa (1 tasa is equivalent to 1.5kg), which is more than the cost of a bio-digester. This result is without considering the cost of chemical fertiliser that would have been applied to the faba bean field. Thus, we can say that if farmers use bio-slurry on cash crops such as faba bean, they can repay their investment in the bio-digester from the additional income obtained by using bio-slurry in a year.

Demonstrations

Trainings are usually accompanied by demonstrations on farmers' fields, for example using bio-slurry as an organic fertiliser, applying bio-slurry compost, dressing seeds with bio-slurry, and using chemical fertiliser.

In 2018, a farmer was advised to dress garlic cloves before planting in order to prevent the root rot disease known as 'enjibo'. He followed the recommended procedures and achieved his highest ever yield.

Similarly, spraying liquid bio-slurry on a faba bean field affected by chocolate spot was found to be effective in fighting the disease and increasing the crop yield.

Demonstrations: comparing wheat grown with chemical fertiliser, bio-slurry compost and seed dressing

With the support of the regional biogas coordination unit, 30 users were trained in the use of bio-slurry in different forms. The Office of Agriculture was involved in this training, and knowledge about bio-slurry was shared with

agriculture colleagues. As a result, 30 demonstrations were conducted in farmers' fields to show the benefits of bio-slurry in replacing or reducing the cost of chemical fertiliser.



Wheat demonstration with bio-slurry compost (left), chemical fertiliser (centre) and dressing with bio-slurry only (right). The best yield is obtained by compost followed by seed dressing with bio-slurry



Sharing demonstration results was helpful in convincing potential users of the multiple benefits of bio-digester technology. The number of constructed bio-digesters in *Kebele 07* increased after the potential users visited farmers' crop fields. The farmer who cured his faba bean of chocolate spot received 30 requests to construct a bio-digester. Since users in *Were Ilu Woreda* have learnt of the multiple benefits of the bio-digester and bio-slurry, they manage their digesters effectively by constructing shade, drainage and stores for compost.

Best practice adoption

Users are encouraged to share best practices with one another. To maximise benefit, users are encouraged to construct standard compost pits with shades, and connect their toilet to the digester.

Integrated use of bio-slurry (seed dressing, applying liquid and in composted form as organic fertiliser)

Even though the majority of users use bio-slurry for seed dressing, the remaining bio-slurry will be used at the homestead as liquid, and the composted form will be used for their other farms. At their homesteads, seed dressing and applying liquid bio-slurry mixed with water is practised for different crops. Girma Kebede is a case in point. In the past cropping

year, he dressed the seeds of all his crops, except teff, before sowing. He dressed the seeds for one hectare of wheat, 0.25 hectares of lentils, 0.75 hectares of fenugreek, and one hectare of faba beans. He applied bio-slurry compost one week before planting, then mixed it with the soil and planted the wheat seed dressed with bio-slurry. Then, he top-

dressed the liquid bio-slurry after weeding at knee height about one month after planting. Girma is expecting a promising yield from his wheat field and he has learned that the integrated use of bio-slurry will result in higher grain and biomass yields, which can significantly reduce/eliminate the need to use chemical fertiliser.





Standard compost pits, shades and store: the shades for the slurry pits should cover it properly to prevent the loss of important nutrients

Standard compost pits with shades

Unlike digesters in some *woredas*, bio-digesters in Were Ilu are constructed with two standard compost pits, shades and some with compost stores. This clearly indicates that users have understood the agricultural and financial benefits of bio-slurry. BCEs are also taking care in digging standard compost pits, and supporting shade making.

Improved toilets



Digester connected to toilet, with standard compost pits, shade and store

The improved energy source and the bio-slurry have encouraged households to construct improved toilets. This has reduced open defecation and therefore the number of flies; and reduced the extent of defecation in unimproved toilets. As it is permanent, it saves the additional cost of labour and time to continuously digging of toilets that get full in a period of months.

Way forward

Continuous follow-up: The follow-up and the provision of immediate solutions for the problems that occur should be continued in order to maintain and ensure sustained bio-digester functionality.

Scale-up of results: NBPE has started establishing biogas villages. Based on its experience, Were Ilu *Woreda* should focus on scaling-up to a national model biogas *woreda*.

Integration: The synergy created at *woreda* level among stakeholders is very good. However, the synergy between *kebele*-level implementers (agriculture and health) should be strengthened. At regional level, the Bureau of Agriculture has

taken over the responsibility of promoting bio-slurry as an organic soil fertiliser. Other bureaus, such as bureau of health and women and children's affairs, TVET and higher education and research institutions, should also be initiated to take the lead in coordinating efforts with the Bureau of Water, Irrigation and Energy.

Research: Based on information from the Bureau of Water, Irrigation and Energy, farmers are implementing the integrated bio-slurry approach. If research and higher education centres are invited to conduct research on bio-slurry, it will be added value for the work that has already been achieved.



Formalising bio-digester construction enterprises to reach needy users and to sustain bio-digester business

Introduction

The national Biogas Programme of Ethiopia (NBPE) was designed and implemented as a Public-Private Partnership (PPP)¹. The programme was first implemented in *woredas* of Amhara Region in 2009. On 12 April 2017, NBPE's continuation and expansion of the Biogas Dissemination Scale-Up Programme (NBPE+) was implemented.

Currently, NBPE+ is active in 116 *woredas* in the region. In one of the programme-*woredas*, Were Ilu, NBPE+ started implementing in May 2017².

NBPE adopted a PPP model to develop a commercially viable sector and reach needy users through the bio-digester business. To accelerate the rapid market development and growth of the bio-digester business, the regional government re-organised its energy structure in 2015. Following this, the bureau developed a

regional Bio-digester Construction Work and Bio-digester Construction Enterprise (BCE) Establishment Manual and made it operational. In response, the majority of the *woredas* formalised a minimum of one BCE in collaboration with the TVET and Enterprise Development (TVETED) Office.

Formalising the BCEs increased the sense of ownership and accountability of the owners. These enterprises are engaged in door-to-door promotion, demand collection, construction of digesters, users' orientation and after-sales service³. In Were Ilu *Woreda*, these enterprises, in close collaboration with the *woreda* energy team, were actively engaged in the construction of more than 230 digesters and achieved more than 95% functionality in three years.

“Our next plan is to strengthen our business management practices and engage in supplying bio-digester appliances, accessories and other inputs with a mark-up that contributes to our business profit.”

Kedir Indirs, Chairman -
Kedir, Mohammed and
Friends BCE

¹ It includes the public sector, mainly government ministries and regional agencies, and private sector organisations that work in the development of the bio-digester market.

² Were Ilu *Woreda* became part of the National Biogas Programme of Ethiopia after the launch of the Biogas Dissemination Scale-Up Programme (NBPE+). The project year for NBPE+ begins in April. This means the period covers two consecutive calendar years.

³ After-sales service is the provision of services to ensure functionality of bio-digesters, such as replacing parts and educating users to manage daily feeding and bio-slurry. It covers the two-year post-construction period. It can be extended after the two years with an additional payment.

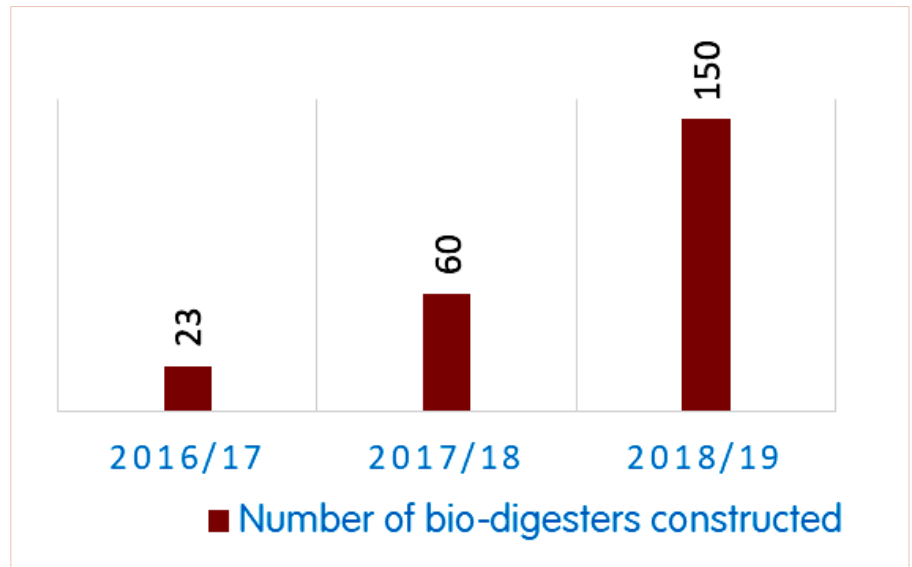
Impact

Poor rural households have increased **access** to bio-digester technology: "I was longing to have a bio-digester. Some of my neighbours were cooking with biogas. Farmers who have applied bio-slurry were also getting better yields. Once the masons started demand collection, I sold two sheep to construct the digester", said a widow, Asegedech Abegaz.

Functionality became much greater than the national average of 78%. The increased functionality has attracted interested users. Despite prospective users' limited financial capacity to buy the technology, they are fascinated by the bio-digesters and their benefits. The masons have played a key role in clarifying the available financial options and opportunities. This has facilitated the creation of a fast-growing and sustainable bio-digester market in rural Ethiopia.

"Members of the BCE have good communication skills. They are also active in providing after-sales service", said Almaz Ayanaw, a bio-

The following graph depicts bio-digester construction progress in Were Ilu *Woreda*.



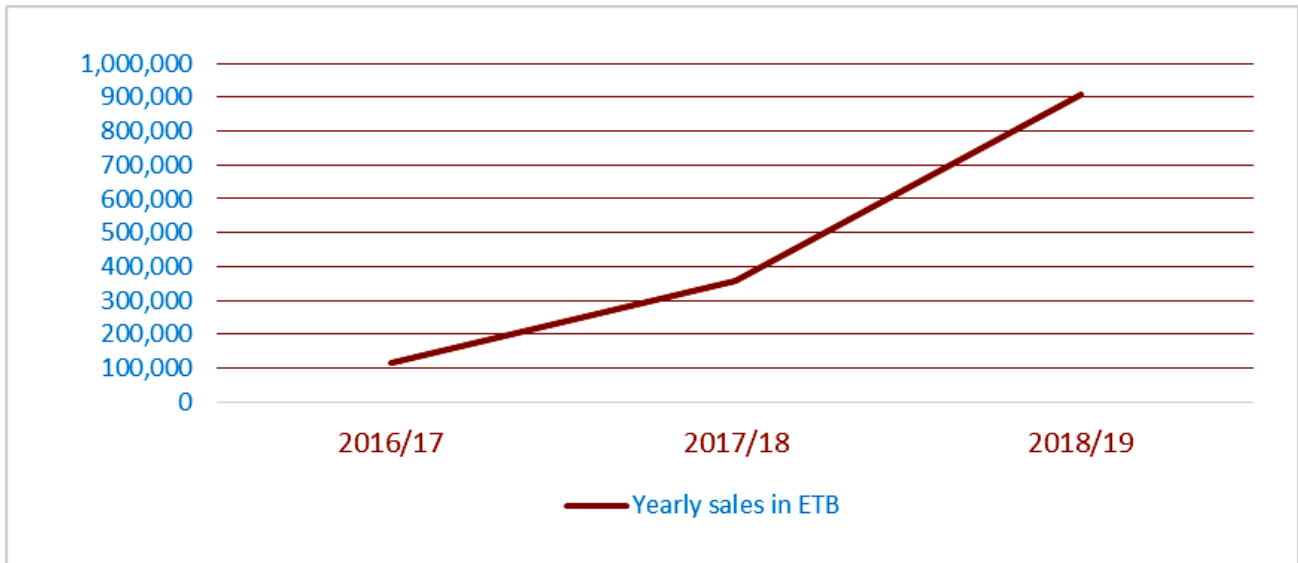
digester user in the *woreda*.

The improved **income** from the promotion and construction of bio-digesters has begun to attract more young people to engage in the business. This will contribute to improving the quality of construction of the digesters, after-sales service and promotion. As the payment mechanism is based on the number of constructed digesters, these BCEs will work hard to promote the technology in adjacent *woredas*.

"Before joining the programme, I worked in water construction. The income from bio-digester construction is much better."

Mohammed Abate, Member -
Kedir, Mohammed and Friends BCE

The chart below shows the yearly sales generated by BCEs.



The sales data shows that the bio-digester construction business is worthwhile business, and that NBPE is creating a fast and sustainable bio-digester market in rural Ethiopia.

Ketema
Legesse

“As bio-digester business is generating a decent income, bio-digester is my life. Using a portion of the income from the business, all of us are building houses.”

“I am contributing to community development while generating sufficient income. Bio-digester construction has become a lucrative business. Looking at our progress, young people are developing an interest to engage in the business.”

Kedir
Indris





Recommendations

Strengthening the capacity of local people can be very effective for sustainability at the grassroots level. This contributes to sustainable social development through increased employment. Formalising enterprises at *woreda* level has helped potential customers to access services easily and efficiently, and also created employment opportunities for unskilled labourers and improved their income.

However, members of BCEs in Were Ilu who received training did not reinvest the revenue they generated from bio-digester activities back into their businesses, and have limited business management skills. Therefore, professional business coaching and mentoring is needed to improve their business and management, as well as to take more responsibility in the bio-digester value chain⁶.

The role of the TVET and Enterprise Development (TVETED) Office in transforming these enterprises to business entities is vital. TVETED should be engaged in



Members of BCEs

(Left to right, back): Ketema Legesse and Takele Wondemagegn

(Left to right, front): Mohammed Abate and Kedir Indirs

ensuring the sustainability of these construction enterprises and to reach more needy people with bio-digester technology.

⁶ According to the NBPE National Framework for PSD, these activities are marketing of biogas; manufacture and supply of accessories and appliances; construction of the digester and piping; user training; after-sales services; complaint handling; quality control; and facilitating linkages with MFIs for credit provision to both end-users and companies.

How do Were Ilu users access credit finance for bio-digesters?

Introduction

Most rural households in Ethiopia earn less than USD 0.50 per day¹. Most rural households' income is for consumption, and very little crop surplus is available to sell and earn cash. Therefore, most households have little or no money to invest in technological innovations to make their lives easier. The dissemination of bio-digester technology needs upfront investment, which is not possible for a large segment of the rural population with low economic status. In most cases, feasible users cannot afford to pay the upfront investment to install the biogas plant, have no knowledge of the multiple benefits of the technology, and cannot share the subsidy given by the National Biogas Programme of Ethiopia (NBPE). To accelerate the dissemination of biogas, unlocking bottlenecks in access to credit was essential.

Implementation approach

The most important approaches the *woreda* used to help potential bio-digester users gain access to finance were implementation process evaluation, biogas technology promotion with availability of credit finance, and solidarity group establishment for the purpose of agricultural input loans.

“It would be discreditable if bio-digesters constructed with the help of credit from ASCI failed to function.”

Semere Eshetie, Biogas Expert

The Biogas Dissemination Scale-Up Programme (NBPE+) – identifying the constraints and opportunities in access to finance flow from microfinance institutions (MFIs) – focused on improving access to credit finance from MFIs and cooperatives for biogas potential users and biogas construction enterprises (BCEs). However, NBPE+ has to rise to the challenge of making these institutions an ally, especially in Amhara Region. Energy experts working under this programme have to take a lengthy and difficult journey linking MFIs to potential bio-digester businesses. Even so, Were Ilu *Woreda* was successful in improving potential bio-digester users' access to finance flow from MFIs.

Evaluating the implementation process

The pace at which bio-digesters were disseminated in Were Ilu *Woreda* was not satisfactory for the *Woreda* Water and Energy Office². The office assessed the potential of the *woreda*, evaluated implementation, and conducted an important consultation meeting with all sector stakeholders. At the end of this meeting, the participants passed a resolution that included doubling-up efforts to promote bio-digesters.

¹ FAO Ethiopia.

² In 2017, Year 1 of NBPE+, the *woreda* facilitated the construction of 23 bio-digesters, while in 2018 the number increased to 60.



The promotion of bio-digester technology was not limited to water and energy experts, but also to experts in all sectors of development. MFIs were also targets for promotion. The *Woreda* energy expert approached the Segno Gebeya sub-branch office manager at Were Ilu *Woreda* Amhara Credit and Saving Institution (ACSI) and took him on an exposure visit. The manager visited biogas beneficiaries' premises and farms, and observed the multiple benefits of biogas technology. The explanation and personal observation of the multiple benefits of bio-slurry helped the ACSI sub-branch office manager realise that bio-slurry can be considered as one of the most effective agricultural productivity inputs. So, he decided to facilitate credit finance for biogas users in the form of agricultural input loans, with a solidarity group-based loan modality.

Establishing solidarity group

To access the credit, groups must consist of not less than three people. This collection of individuals will serve as solidarity group collateral to secure the outstanding loan with both group and individual liability. Following the group establishment, *Woreda* Water and Energy Office experts submitted the list of eligible farmers to ACSI MFI Branch Office with an official letter written by the *Woreda* Water and Energy Office.

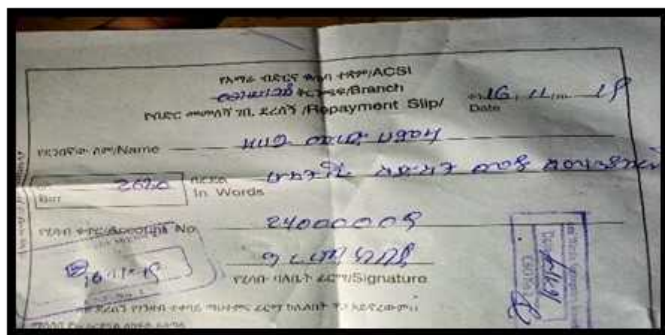


ACSI trained the candidates on the purpose of the credit, the rules and regulations, financial literacy, voluntary and compulsory savings, loan terms and repayment modalities. Accordingly, during Year 2, out of 150 users, 83 (55%) accessed an individual loan of ETB 4,000. Their income improved as their energy costs were reduced and their crop yield increased. All members of the groups continued to deposit savings of ETB 50 per month. They also encourage one another to repay the loan and to keep saving.

Loan recovery status, risks (threats) related and mitigation strategies

Loan recovery status

As the final loan term is 24 months and instalment term is annual, 50% of the matured principal and one year of interest was fully collected. This means that biogas loan recovery rate for Were Ilu *Woreda* reached 100%.



Risks/threats related to biogas loan

- If the annual loan instalment period/month is due, when farmers' income is deficient (between July and November)
- Loose management of bio-digesters may cause non-functionality and risk loan repayment

Mitigation strategies

To mitigate risks and challenges, the *Woreda* Water and Energy Office designed a system to conduct joint monitoring and evaluation regularly, helped credit stakeholders to realise their roles and responsibilities, took immediate action to unlock bottlenecks, convinced borrowers to save some amount of money and, in collaboration with ACSI, arranged appropriate repayment periods/months when borrowers' income is better.

Challenges

Inflexible information: Circular regarding biogas loans, communicated by HO to ACSI branch offices, has some restrictions.

Payment period: Borrowers who have to repay their loans from July to November face some challenges.

High interest rate: on loans for bio-digester technology.

Outcomes

The scarcity of cash in hand for low-income farmers was solved with access to credit facilitated by ACSI MFI, and materials for biogas construction were swiftly supplied. As a result, many farmers instantly decided to own bio-digester technology and start to harvest the multiple benefits.

The ACSI MFI *woreda* branch office confirmed that bio-digester technology benefits the farmers in terms of energy as well as agricultural inputs, and so started to consider productive loans for farmers. Other ACSI branch offices in the *woreda* learned lessons on the feasibility of financing biogas end-users, and promised to provide selected farmers in some *kebeles* with loans to install biogas. Accordingly, fresh applications for biogas credit access have been submitted by these selected farmers to the MFI branch, and are being processed.

Almost all bio-digesters installed in the *woreda* are functioning and producing income, resulting in loan repayments being made and outstanding loans being repaid in full.



“Biogas is life” – Semere Eshetie

Semere Eshetie works in Were Ilu *Woreda* Water and Energy Office as a biogas expert. He studied Applied Physics at Addis Ababa University and graduated in 2008. He taught physics in Addis Ababa for six years at a private high school. He joined the *Woreda* Water and Energy Office in 2016. For the past three years, he has been facilitating the installation of bio-digesters successfully in the *woreda*. In 2019, Amhara regional state awarded him a postgraduate scholarship for his commitment to successfully facilitating the construction of 150 bio-digesters. He has planned to study either sustainable or electrical energy.

Why did you join the Energy sector?

I saw the advertisement and applied. After joining the programme, the launch was delayed in Were Ilu *Woreda*, so I kept reading about the technology. This does not mean that the technology was new to me. But I wanted to understand how it could be implemented in our context. Based on my reading, I had generated biogas using a jerry can as a digester and a tyre airbag for holding the gas. It was successful. I also learnt about the various uses of bio-digesters. The

programme distributed information on bio-slurry management. One of the features that caught my attention was the benefits of bio-slurry for increasing productivity and improving soil fertility. I learnt that Chinese farmers have benefitted from dressing seeds with bio-slurry. I knew that our fellow farmers are challenged with these problems. I realised it would be a game changer technology that I should devote myself to in order to improve the lives of rural farmers.

What did you do to realise this dream?

Together with the *woreda* energy team, I identified key messages that should be delivered in various awareness creation sessions. In meetings, since we have all kinds of participants, we decided to focus on energy (for cooking and lighting), bio-slurry, as well as job creation issues. I tell participants that we can cook all kinds of food, except injera. I also tell them about the different applications of bio-slurry. When people show interest, a 10-day potential

users' training will be organised. In this session, farmers ask whatever comes to their mind and I tell them the truth. The most frequently asked question is 'When will we get a bio-digester-powered mitad to make injera?' I tell them that it is a technology in progress, but when it is ready for commercial dissemination they will be the first to buy it. Expecting to get the mitad, most of the households constructed 6m³ and 8m³ digesters. When they are told about the benefits of bio-slurry, they are reluctant to believe what they hear. Those fast-learner farmers give testimonials about their crops. Artisans also play a key role in disseminating bio-digester technology. These artisans have multiple roles: they have to create demand, construct quality digesters, follow-up functionality and maintenance, and supply appliances and spare parts.

Do you think you have realised your dream?

I have learnt that disseminating bio-digesters needs the commitment of stakeholders. Farmers are reluctant to take up innovations

unless they've been tested and proven. So, I kept learning from them as well as others to convince not only farmers but also stakeholders. For example, we are promoting the connection of toilets with digesters. We have to engage the Office of Health to follow up the quality of the toilet. Similarly, the Office of Agriculture needs to be our ally in order to produce high-quality compost or bio-slurry. The same applies to micro-finance institutions. These institutions are strategic allies in unlocking the financial puzzles. We have increased the number of artisans from seven to 14. We have been successful in constructing 150 digesters in a year in only two *kebeles*. In Were Ilu there are 20 *kebeles*. Biogas is life. It changes the lives of people. Farmers have dressed wheat and faba bean seeds with liquid bio-slurry; some have sprayed liquid bio-slurry or applied bio-slurry compost. The germination, the tillering and the number of seeds from a single seed have encouraged farmers to invest in bio-digesters. The remaining households must also enjoy



the multiple benefits of bio-digesters.

Where do you get the energy for commitment?

From the slurry. I am very happy that it has reduced the burden of our mothers and sisters. To be honest, I am more enthusiastic about the bio-slurry. The farmers are using it as a pesticide as well as insecticide. Due to diseases, farmers in Were Ilu had stopped producing garlic, lentils and fenugreek. Now that they are treating seeds with liquid bio-slurry, they are getting positive results. A farmer told me that weevils have been causing problems in his barn. After he plastered the walls of the barn with bio-slurry, the weevils disappeared. When



I see the fields and hear such stories, I am filled with excitement. This refreshes me to do more. Biogas is changing not only the lives of the farmers but also my own life. It is filling my mind as well as my pocket. When more digesters are constructed, I will get more income from the Expert Incentive¹. Moreover, it makes me active and energetic, and helps me to be open minded. I am always learning new experiences from the farmers, and spend my time thinking about how to improve implementation and technical support. Were Ilu is cold. Towards the beginning of NBPE+, it was very difficult to generate gas from the digester. We started exposing dung to the sun and fed the digester sun-burned liquid dung. This resulted in slurry flow after a week. I am engaged in such life-changing research.

What do you wish to see in the near future?

I wish researchers would engage in studies of bio-slurry. We [the *Woreda* Energy Office experts] are willing to provide information. The office has the raw data. Let them come up with evidence-based research findings to support these hard-working farmers. They will add their own experiments to get more results. I wish all of us were committed to improve the lives of the farmers. I wish all supervisors were motivating employees, like my supervisor. His appreciation and feedback energises me to exert more effort. I wish all the *woreda* officials were committed to provide support for results. The *woreda* has allocated budget for biogas. This budget has helped us to do intensive awareness-creation activities. I wish our experiences were scaled-up in all the sectors.

¹ Expert Incentive is an incentive allocated for *woreda* energy experts to undertake promotion, quality control, user training, reporting and other activities. It has a value of ETB 600 per digester. Since the *woreda* has succeeded in installing 150 digesters, the experts get more money.

Way forward

This objective of documenting the experiences and lessons from the implementation of Biogas Dissemination Scale-Up Programme (NBPE+) is to share the learnings from Were Illu woreda. In NBPE+ project, SNV is responsible for overall programme management, quality assurance, implementation support, and technical assistance, including through design/development/introduction of new products and piloting.

During implementation achieving target became a challenge for woreda energy experts. However, woredas like Were Illu (Amhara region) installed about 150 bio-digesters within a year (2018/2019). How do they achieved this result? What initiated the experts to achieve this? What mechanisms have they introduced/promoted? What mechanisms have the Were Illu woreda energy experts implemented to get the trust of the concerned bodies (microfinance institutions, users etc.)? And other important experiences have to be documented and shared to a wider audience (in and outside of SNV Ethiopia) for sustainability and scale up of results.

To achieve this and facilitate implementation, best practice sharing is considered key. SNV planned to

- ◆ use this document for internal awareness creation (learning workshops, forums) in the form of Presentations, photo stories;
- ◆ share the case for wider audience through web site;
- ◆ distribute the document (in either hard or soft copy) to Ministry of Water Irrigation and Energy, National Biogas Coordination Unit, Regional Water and Energy Bureaus and Regional Biogas Coordination Units to be used as promotion material;
- ◆ encourage RBPCUs to translate the document in local languages;
- ◆ share to Ministry of Agriculture and regional agriculture bureaus to use it as promotional material for bio-slurry extension;
- ◆ share it to other partners for awareness creation and to enhance possible partnerships.