

Biogas is Business – Even at household scale

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Africa Biogas Partnership Programme in Moshi, Tanzania. Photo by Hivos

Few people know what a biodigester is and what it can do. In the western world, it is often seen as a huge device where waste is somehow managed. In developing countries, few people have an image at all. This article describes how HIVOS and SNV (ref.) established a biogas sector in Africa, overcoming constraints to commercial viability, and demonstrating that biogas is not only a solution to harmful and inefficient wood-fuel cooking, but also an alternative to the expensive chemical fertiliser-based farming; in fact it is a perfect fit for mixed farming and in general a life-changer.

Benefits of a biodigester

A six-cubic meter biodigester will work perfectly when fed daily some fifty kilograms of fresh manure mixed with fifty litres of water. It will produce two cubic meters of biogas daily, enough to cater for all the daily cooking needs and provision of light for a household. Women and children never have to go out to look for firewood anymore, and save a lot of time, or money in those areas where there is no free firewood to gather anymore. Cooking is convenient and clean and the kitchen remains free of smoke. Annually two to three tons of firewood are saved

But what's more, the digested manure, bio-slurry (the digestate), is a potent organic fertiliser. Its nutrients are easier

to assimilate by the crops and give better crop results than untreated farmyard manure. When well applied, production increase in most crops is hardly ever below 20% and more often a lot more. It is rich in elements and minerals, can be applied in many ways, restores soil structure and organic matter content and is even a pest repellent. It is applied to kitchen gardens, staple and cash crops, is used for fish rearing and poultry and even as an animal feed supplement. This size of biodigester can produce enough bio-slurry for intensive year-round farming on 1-1.5 hectares of land.

The gas and the bio-slurry are at the root of the business case for the household: time and money savings on the fuel side, money saving on chemical fertilisers, additional production and income from the agricultural activities on the bio-slurry side. It certainly makes sense to invest in a biodigester. Within two years the digester has paid itself back and it will last a lifetime. The benefits are clear.

The 1000 Cookies Lady in Tanzania

Mrs Khadija Maghembe in Western Tanzania complained she frequently did not have enough gas from the digester. Her digester however was a thirteen-cubic meter one, that should produce enough gas for cooking all meals of two big families. When asked, she explained she produced a thousand cookies daily, which she sold in the market, earning something like USD 15 from that every day.

The Biodigester market development programmes

In 2009 HIVOS and SNV started a programme to scale up biodigester dissemination among small scale farmers in six countries in Africa (Burkina Faso, Ethiopia, Kenya, Rwanda, Tanzania and Uganda). This was informed by success stories from China and India, following the pilot national biodigester programme in Nepal SNV started in the eighties. That became a huge success, reaching levels of around 270,000 digesters delivered by the programme with an almost equal amount built independently, up to today. It was soon followed by programmes in Vietnam and Cambodia. The secret of this success is the market-based approach model. If something doesn't work in the market, large scale dissemination will never be reached. The market-based approach involves private and public sector partnerships to enable scale-up and adoption.

The same approach was up-scaled by HIVOS and SNV in Africa (the Africa Biogas Partnership Programme - ABPP) and Indonesia (the Indonesia Domestic Biogas Programme - BIRU): this was called the multiple-actor market and sector development approach. At the core of this approach are the masons and biodigester construction enterprises on the supply side and farm households on the demand side. The ABPP and BIRU programmes train masons and support them to become small contractors, to create the supply. At the same time, intensive promotion campaigns and marketing activities, initially by the programmes and partner organisations, target the high potential farmer sectors.

Slowly the numbers of installed digesters in Africa began to grow. The digesters are however not cheap. The families are

The crispy biogas-chip business in Indonesia

It has been five years since Mugiyati first started her chips business in Getasan, Central Java. She now sells her chips at nearby kiosks. "It's doing pretty good. The money adds to my income," she said. "I used to run this business only during dry seasons. It takes a long time to dry the chips on a rainy day. Besides, I used to buy LPG to cook them. So, I actually suffered financial loss." Using home biogas has helped push down production cost. "I used to spend Rp 60,000 (USD 6) per month on LPG. But now, the fuel cost is close to none because I have been using biogas."

According to Mugiyati, owning a home biogas digester opens up a lot of business opportunities. "If it is possible for you to start one with the help of biogas, do it. You will get double the advantage. Not only can you save fuel, you can also get some extra income," she said firmly.

faced with the choice to buy another heifer, or two, or to buy a biodigester. The first few years this is mitigated by a subsidy, but the cash outlay is still considerable. After the first stream of early adopters starts drying out and subsidies are withdrawn in some countries, the growth starts slowing down.

Affordability and credit

Affordability is an issue, and so is the reputation of the technology. A lot of effort has been put into mobilising credit for biodigester purchase to address the affordability issue, but with mixed results. Initially, credit institutions were



Africa Biogas Partnership Programme in Moshi, Tanzania. Photo by Hivos

reluctant to engage, not well aware of the technology, and there were certainly stories floating around about failing digesters. Functionality of the digesters became top priority and quality control had to be intensified hand-in-hand with creating more awareness about the importance of quality and reputation among the biogas digester construction enterprises. Today the companies are rated according to their performance and the number of issues with their plants and the percentage of non-functioning plants is below 5% in most countries in Africa.

Confidence in the technology is improving, both with farmers and with the credit institutions. But still credit availability is an issue in many areas. If credit were readily available, demand would easily double. The next bottleneck turned out to be limited capital availability. Second-tier capital providers can solve this issue, but their requirements are not easily fulfilled by all local credit institutions. Biogas digester businesses are often considered too small and also they cannot often come up with the required securities. Mitigation of the risk of default on payments becomes important. Here the programme comes in and organises close follow-up of the loans and the construction company, to secure proper delivery of the digester and timely loan repayment. Eventually the financial institutions start seeing there is business in the biogas digester sector.

Reputation and Marketing

The reputation of the technology is improving. The companies are improving, some even growing fast, producing a hundred digesters per quarter or more. We have learned that the best marketing strategy (not the only one) is to tie together a farmers' organisation like a cooperative, the credit organisation (they often have relations to or are even owned by them), one or more biogas digester construction



Photo by HIVOS

enterprises, and a quality control and repair service company. If these four start to know each other well and trust is built, demand can grow fast in that cluster. We call this the biogas digester marketing hub. The cooperative (supported by the programme) starts to promote biogas digesters amongst the members. Those interested can obtain credit and the supplier is there, ready to start building. Independent verification by a call centre confirms if credits are given, if digesters are completed and checks if they are working, if issues are addressed and if after-sales services are provided. It flags when quality inspection is to take place and when issues need to be addressed.

Although the costs of this service are only a very small part of the total cost of the digester, it is however a vital service. To make it work, it is essential to assure compliance by all parties. Not all farmers are organised, so not all potential clients are engaged with a value-chain organisation. For those who are not, the ranking of biogas construction enterprises at least shows which companies work in which area and how their performance is rated. The farmer can then choose. Once construction has started, follow-ups to households are conducted by call centres to see if everything is running smoothly and to answer any questions. The farmers sense a certain protection if they know they can turn to the programme if something fails.

From market creation to market establishment

In Africa, the biogas digester market has not reached the market establishment phase yet. But what is promising is that some new companies have now entered the market with ready-made plastic digesters. Here the digester can be the collateral for a loan, at least partly, because it can be removed.

Uganda - Mugabe's banana farming

Mr. and Mrs. Mugabe are residents of Katinda village in Mbarara District. The couple had lost hope in banana farming due to poor yield. This was attributed to the rocky and unproductive nature of the place. On learning about the biogas digester and the advantages it has on improvement of soil fertility (thanks to bio-slurry generated from it), they went ahead to establish one. When the biogas plant started producing slurry, they applied it on their farm. They first experimented with the growing of vegetables like carrots, spinach and collards. The results were above their expectations! With that amazing experience, they went ahead to establish a banana garden with bio-slurry. The bananas were so healthy that they decided to expand into a larger area of the rocky farm. Today, they use bio-slurry for composting and applying on other crops like pumpkins, ground nuts and beans.

We feel young again - Kenya

Just over a year ago, there was a drastic change in the Githiri household thanks to the installation of their biodigester. "We feel young again," says a beaming Susan when asked how the biodigester has changed her life. "I don't have chest problems anymore and I don't have to wake up early anymore to go and fetch firewood. My health has improved immensely and I feel a lot more relaxed." For cooking she now uses gas generated from her biodigester. Her days of fetching firewood are long behind her. The slurry, a by-product of the biogas plant, is used as organic fertilizer on their farm. It is full of nutrients and guarantees a rich and robust harvest. Furthermore, the slurry provides a source of income for the Githiris as they can sell the leftover slurry to neighbouring farms. "I have forgotten about buying artificial fertilizer. My harvest has improved tremendously. I used to harvest 10 bags of kale per week and now I am harvesting 25 bags a week," Susan says excitedly. With the bigger harvest, there has also been more income for the Githiri household.

Such companies are also bigger than the contractors and can attract investment and create confidence in the market. The presence of these companies shows that companies and private investors are starting to see opportunities in the biodigester market. Still, few financial institutions or investment funds have as yet ventured into this market.

In six countries in Africa together (Burkina Faso, Ethiopia, Kenya, Rwanda, Tanzania and Uganda) to date more than 70,000 digesters have been deployed since start-up in 2009. It is a large number, more than what was built in the whole of Africa together over the last five decades. There has been a similar experience in Indonesia: 20,000 in seven years. But it is still a very small percentage of the total market potential. Even in Kenya, where market development is the fastest, the market penetration rate is less than five per cent so there is still a huge scope. Slowly, market establishment is consolidating and further growth will materialise.

Shifting roles of the programmes

This differentiated development requires a tailored approach of the programmes. Where at the start the programme was the implementer, gradually programme functions were transferred to partner organisations and the construction companies and the role of the programme shifted to a more supporting one, mobilising missing vital components. Today the role of the programme is becoming more and more facilitating and coordinating among the market players and other sector actors. Credit provision, mason training, bio-slurry extension, business development service provision, quality management, subsidies, inclusion of new players in the market, testing new models, standard development, all together the sector starts shaping.

This is the general line of the market and sector development and what we have learnt. At the same time, every country has its own story. Some governments are very supportive, others indifferent. Some countries have very vibrant dairy sectors where large numbers of digesters were sold, other areas are far away, farms are few and far apart and these zones are not very attractive for a company to engage. In some countries firewood is abundantly available; in others women spend up to 2 days a week gathering firewood for cooking and lighting. Sometimes credit is easily accessible, elsewhere it is totally absent. Droughts and poor harvests, even political unrest are other factors that may interfere because they influence the payment capacity. The human factor programme management is much more effective in some countries than in others. So, there are no general recipes and very few shortcuts. Anyway, the biodigester markets are emerging and growing, but would certainly be helped with a lot more support and investment and more engagement of the sector players.

Urgency

A solution to wood-fuel and charcoal cooking is imperative. In all countries deforestation is rampant and population growth is high. Within twenty-five years twice the population will have to cook with only half of the forest resources remaining and in some countries forests will be practically eliminated. Access to energy is a fashionable theme today. However, by far the most attention goes to electrification. The most pressing energy needs of poor people are cooking and lighting and perhaps also communication. The last two can be resolved through electrification, either through connecting them to the grid or by decentralised off-grid generation. Electric cooking is still very expensive and the mini-grids connected to solar farms, waste gasification, micro hydro schemes or solar home systems generally do not have the capacity to generate sufficient power for cooking. Affordable electric cooking, particularly in the country side is still a mirage. Biogas, for those who have livestock, is by far the best solution for cooking. It is totally clean and substantial energy. Besides, instead of emitting greenhouse gases (like LPG does) it reduces greenhouse gas emissions.

It improves production and generates other activities such as producing food for the market, horticulture product sales, fish and poultry production. It clearly improves food security and income. Kitchens are clean. It modernises the farm and even changes gender relations. Women gain time and often independent income, men start preparing coffee, tea and warming up breakfast.... The biodigester is a life changer.

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Notes

1) Biodigester of the fixed dome type. The same would apply for a nine-cubic meter tubular digester, where the double volume of water is applied for feeding the digester.