Best Practices & Innovations (BPI) Initiative  
Building Local Organizational Capacity for Agriculture & Rural Livelihoods  

Uganda Domestic Biogas Program  
Heifer International

Details:

<table>
<thead>
<tr>
<th>Location</th>
<th>Uganda</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start Date</td>
<td>January 1st, 2009</td>
</tr>
<tr>
<td>End Date</td>
<td>December 31st, 2013</td>
</tr>
<tr>
<td>Scale</td>
<td>National</td>
</tr>
<tr>
<td>Target Population</td>
<td>12,000 Households (Approximately: 84,000 Individuals)</td>
</tr>
<tr>
<td>Number of beneficiaries</td>
<td>12,000 (Approximately: 84,000 Individuals)</td>
</tr>
<tr>
<td>Partners</td>
<td>HIVOS, SNV, Local NGOs / CBOs and Government of Uganda</td>
</tr>
<tr>
<td>Funders/Donors</td>
<td>Dutch-Government –DGIS/ ABPP (€4,185,835), SNV (€1,214,615), Households (€5,986,094) and Government of Uganda (€488,842-Technical Support)</td>
</tr>
<tr>
<td>Total Funding</td>
<td>(€11,875,386)</td>
</tr>
<tr>
<td>Website</td>
<td><a href="http://www.heifer.org/">http://www.heifer.org/</a></td>
</tr>
</tbody>
</table>

Overview:

Heifer International’s Uganda Domestic Biogas Program improves farmers’ lives through access to cleaner, cheaper energy. Financial, labor and health costs of charcoal and firewood, combined with availability of livestock manure in project communities makes small-scale biogas units for cooking and lighting attainable and indispensable. Heifer will install 12,000 units over five years and help develop a market-oriented biogas industry. Through Heifer’s Pass on the Gift model, farmers share with their neighbors technical knowledge in building, operating and maintaining biogas units. These skills can also serve as a source of income for participants who choose to build and sell the units.

1. Background/Context

The Uganda Domestic Biogas Programme (UDBP) was designed to improve on the livelihoods of both the peri-urban and rural farmers through improved access to cleaner and cheaper energy (biogas). According to the government statistics, Uganda’s energy consumption is very low. The annual energy consumption was estimated to be 13 million Tons of oil equivalent (TOE) of biomass and 537,000 TOE of oil products (2008).
At the start of the program, literature was reviewed and it was established that the total energy consumption in Uganda in 2005 was estimated at 8,984,508 TOE. The energy consumption per capita was 330 kilogram of Oil Equivalent (kg OE). Electricity consumption per capita was 22 kWh. This level of energy consumption was considered to be low when compared to the average per capita consumption in Sub-Saharan Africa of 522 kWh. Uganda has a population of over 33 million people who mostly depend on biomass energy for cooking.

In terms of cooking fuels, biogas would provide the first priority market segment for private companies selling the biogas plants, provided the users have sufficient biogas feed stock. Firewood is the most commonly used source of energy by households (81.6%), while charcoal is at 15.4%. Collection and transportation of firewood takes enormous labor allocation and consumes a lot of time, especially for women and children. Charcoal is the cooking fuel for more than two thirds of urban Ugandan households. Kerosene (paraffin) is currently the main source of lighting in Uganda. Over 90% of households in rural areas and 58% in urban areas use kerosene for lighting. Uganda’s energy matrix is dominated by biomass-based energy sources contributing about 95%\(^1\) to the total primary energy consumption. Electricity and petroleum products contribute 4% and 1% respectively.

About 91% of the populations did not have access to electricity (as of 2008); in rural areas this increases to 97%. About 72% of the total grid-supplied electricity is consumed by only 10% of the domestic population, concentrated in Kampala and nearby cosmopolitan towns. At national level, electricity consumption can be categorized as follows: residences (55%), industries (20%), commercial end-users (24%) and street lighting (1%). Nationwide, electricity grid access generally follows population density. The majority of the communities, both urban and rural, depend largely on fuel wood and charcoal for their energy needs.

Consumption of biomass was growing by approximately 3.6% annually between 1995-2000\(^2\). It was envisaged that this trend would continue based on the fact that both rural and urban population in Uganda will continue to heavily rely on fuel wood for cooking and water heating. Although electricity from various sources such as hydro, fossil fuel and solar, is key to rural transformation, biomass continued to be used by the majority of rural people for cooking and water heating on account of its relatively low cost, availability and familiarity on its use.

Biomass is predominantly used in form firewood, charcoal, farm residues and wood wastes. Charcoal is mainly used in the urban areas. A considerable biomass amount is used in the services/commercial and industrial sector. Indeed, biomass consumption at the industrial and service sectors in Uganda is so significant that it is said to be comparable to no other country in the region. The high usage of biomass in these sectors has been attributed to the limited availability of electricity and high prices of petroleum products.

In 2004 it was documented that energy consumption estimates per capita biomass demand was 680 Kg (rural) and 240 Kg (urban) for firewood, and 4 Kg (rural) and 120 Kg (urban) of charcoal. Total biomass (firewood and wood for charcoal) demand for households was 22.2 million tons per year. Uganda has a total standing biomass stock of 460 million tons\(^3\). At 95% confidence level, the stock lies in the range of 410 million tons (lower limit) and 521 million tons (upper limit). This biomass included above ground tree parts (stem wood and branches) up to a diameter of 1 cm. The issue of accessibility recognizes the fact that not all biomass is destined for energy. Some of it is not available for energy on

---

\(^1\) UBOS 2006, Statistical abstracts  
\(^2\) AERDP  
\(^3\) Forest Department 2003, National Biomass Study
account of physical inaccessibility, environmental issues or legality; as the case with areas reserved for wildlife. When these two factors are considered, the sustainable accessible supply reduces.

In terms of overall biomass, there existed a national balance with a deficit of 85,000 tons. This is however cleared when crop residues were included. Biomass was however, site specific, due to its bulkiness, which makes it difficult to move from one region to another. For firewood, breakeven distances are less than 80km while charcoal can be transported further distances. At the regional level, there was a deficit of about 3 million tons in both the Central and Eastern Regions, while there is a surplus of about 4 million tons in the northern Region and of about 2 million tons in the Western Region. When the country is divided into surplus or deficit areas, only 26 districts as at that time had surplus biomass, while the remaining districts had a deficit.

When woody biomass demand and supply were projected for the next 10 years (2006-2016), the balance scenario was set to move into one of deficit and later on, acute deficit. The deficit by Year 2011 was set to be around four million tons and 10.7 million tons by year 2016. When agricultural residues were included, the computations showed a small surplus of 250,000 tons for the year 2011. By year 2016 however, the deficit including crop residues was expected be 5.6 million tons as shown in the annex attached.

It was against this contextual background that UDBP was conceived to address the prevailing and future situation from getting out control.

2. Goals & Objectives

The ultimate goal of UDBP is to improve on the livelihoods and quality of life of rural and peri-urban farmers in Uganda through utilizing the market and non-market benefits of domestic biogas. From the existing literature it has been pointed out that biogas has enormous benefits, which can impact on the livelihoods of the households.

Specifically the program aims at achieving the following objectives:

i) To develop a commercially viable market-oriented biogas industry

ii) To further strengthen institutions for sustainable development of the biogas sector

iii) To work towards achieving installation and use of 12,000 quality biogas plants in a period of five years

iv) To ensure sustainability and continued operation of all biogas plants installed under the program.

v) To maximize all benefits of biogas plants, especially related to gender and use of bio-slurry.

vi) To utilize carbon revenue resulting from the GHG emission reduction of biogas plants constructed under the program to establish a financially-sustainable national domestic biogas sector.

The theory of change, causal model or assumptions were:

To improve the livelihoods of farmers, it required creating a conducive environment which enabled them have access to the basic needs. It also includes empowering them to be economically and socially productive. This therefore means improving on the health, financial/economic and social conditions. Through UDBP livelihood can be improved by tackling the agricultural, energy, gender, sanitation and hygiene and employment aspects. All these aspects can be tackled through biogas. However to realize results, certain conditions have to prevail and these include: existence of livestock, especially cows and pigs, acceptance of biogas as a cheaper and friendly source of energy by the different stakeholders and

---

4 Five years include the work done in year one, 2009.
the existence of a strong infrastructure to disseminate the technology. An illustration of the biogas concept conceptual framework is included in the annex.

**Operationalizing the program (implementation strategy)**

The program adopted a multi stakeholders’ approach as a means to achieve its objectives. The results of the stakeholders’ analysis formed a basis for the establishment and composition of the National Biogas Steering Committee which oversees the program implementation. Structurally, the stakeholder group includes: Households with zero-grazed cows, NBSC, UDBP Office, ABPP/HIVOS, SNV, Ministry of Energy and Mineral Development, Biogas Construction Enterprises, Uganda Biogas Association, Renewable Energy NGOs, Vocational Training Institutes and Private Sector Foundation. Each of these stakeholders plays a given role in delivery of the program.

To reach its targeted communities, the program was organized around 10 work packages which include Promotion and marketing, finance, private sector development, quality management, training, extension and gender, research and development, M&E, institutional support and development and human resource. Each of these work packages complements each other and there are specific activities executed. The program also adopted a rigorous networking and partnership strategy aimed at exploring synergies with other organizations.

3. Key Activities

The key activities of the program are organized along the work packages, which complement each other in order to achieve the program objectives.

**Promotion and marketing:** This is one of the key foundations of the biogas program. The program recognized that “A properly functioning plant is the strongest tool for promotion” and “The best promoter of biogas is the satisfied female/male user.” Promotional activities are carried out the different levels i.e. at national, regional, district and at the community/village levels and they target different stakeholders. Promotion and marketing that were carried out included production and distribution of IEC materials related to biogas technology, participation in events and forums that attract potential biogas clients, holding of radio talk-shows in local languages, holding of district stakeholders’ workshops establishment of village networks to promote biogas and introduction of performance based rewards for biogas promoters. The outcome this activity has been increased knowledge about the technology.

**Quality management:** The program realized that to get more clients, performance standards had to be set and monitored throughout the process of construction. Masons have to been trained, certified and supervised by the program during the process of construction. Toolkits and technical drawings are provided to the masons to ensure that they have a point of reference while executing their duties. Periodic checks are made by the engineers to ensure that errors are not made and if they happen, they are identified when it is still early. At the end of the construction a plant completion report is written and endorsed by the client, supervisor and the engineer. After six months the supervisors make visits to the clients to assess the performance of the plants. After sales services are also offered after 12 months.

**Financing:** The program targeted the peri-urban and rural communities whose income levels are low. However the program planned to increase sustainability and ownership. For this matter the program contributed a flat subsidy of 650,000/= Ug shillings towards the total plant construction cost. The program has also networked with micro finance institutions and SACCOs to ensure that interested
potential clients have access to biogas credit. Farmers have also been mobilized and sensitized about the importance of forming savings and credit groups at the community level.

**Private Sector support:** One of the objectives of the program is to make biogas commercially viable. To achieve this, it requires a lot to be done in the area of private sector support and development. The program has supported private sector growth by facilitating the trained masons to form private companies under which they can carry out business. The program has also equipped the masons and the biogas construction companies with business management skills, including diversification, which has improved on their business performance. Some masons have undergone specialized training in appliance fabrication and efforts are now being made to link them to SME credit facilities.

**Training:** The program realized the importance of capacity building in promoting and sustaining the technology. Training activities have been conducted for both consumers and suppliers of biogas technology. Pre-construction, users, bio-slurry management, promoters, supervisors and masons’ training have been conducted to ensure that the parties involved in the technology have the relevant information and knowledge. For all these trainings, the program developed specific training manuals for each category of participants.

**Extension and gender:** Under this work package, the program has implemented a number of activities. Following the model of operating through the existing structures both government and private the program has been able to:

- Establish Bio slurry demonstration plots to illustrate integrated nutrient management practices for slurry utilization in crop production
- Formulate strategies and actions that boost crop, fish and pig production to commercially sustainable levels through utilization of bio slurry in Integrated Nutrients Management and as a food supplement
- Develop and promote appropriate bio slurry disposal systems which prevent pollution and preserve nutrients for agricultural production
- Improvement of sanitation (Encouraging toilet connection and hygienic practices)
- Collaboration with extension agencies and market linkages
- On the side of gender, gender related issues have been integrated into the program. Both women and men have been trained in the technology and what used to be women’s chores, they now being performed by men and vice versa. Currently the program works with two women managed construction enterprises.

**Institution support and development:** The program realized that in order to be sustainable, there was need to establish a strong institutional framework. The program has therefore supported the creation of an institutional framework. There is an umbrella organization for the biogas dealers. Construction companies have been equipped with relevant skills, and implementing partners (NGOs and CBOs) have been supported to strengthen their systems. To create more impact through networks, the program has established working relationships with organizations that work in the area of livestock, energy and sustainable agriculture. The program has also tapped into the platform of sister projects like East Africa Diary Development Project and other cooperative societies.

**4. Effectiveness/Evidence of Success**

The impact of biogas can felt at the individual, household, community, organizational and national level.

- **Individual:** At the individual level, biogas has provided a source of income in form of the employment opportunities that arise out the masonry work. Both men and women have been
employed in the construction works which has boosted their incomes. In some cases biogas has been used as a source of energy for some small businesses like baking. This has also supplemented on the individual’s income. Due to use of biogas there has been a reduction in the risk exposure to diseases that are related to indoor pollution. The program has also improved on the expenditure trends due to reduction in the costs associated to fuel.

- Household: At the household level, biogas has improved on the sanitation and hygienic conditions. This comes as a result of the animals’ wastes not being dumped any longer. Similarly the bio-toilet connection also improves on hygienic conditions in the home. Households that have animals and biogas have stood out to be more hygienic than those without biogas, meaning that even their per-capita expenditure on health is also low. The bio-slurry which is generated has impacted on the households in terms improved agricultural productivity. Bio-slurry has been proved a rich organic fertilizer which lasts longer than the inorganic ones, which are also expensive. Households have been able to increase on their crop yield and feed their animals and fish by use of bio slurry. In some cases households have sold this bio-slurry to their colleagues, which becomes a source of income to family. Because of the gender mainstreaming, there has been improved relationships as a result of sharing roles and responsibilities. With biogas-powered lighting, children now have the opportunity to do reading at night.
Community: At the community level, biogas has enabled the communities to preserve their environment in terms of reduction in deforestation. In situations where communities would have resorted to cutting trees in pursuit of charcoal and firewood, they now use their animal dung as a source of energy for cooking and lighting. In some communities where the unemployed youths would engage themselves in illegal activities, they have been absorbed into the masonry work and some have even started hardware shops as a result of the skills they acquired from the program. Some masons have formed companies which created employment opportunities for their colleagues. To back up how biogas has impacted on the lives of the beneficiaries refer to the photos attached.

5. Equitable Outcomes

The program is gender sensitive. Whatever activities are implemented, gender issues are highly considered. The trainings the program carried out were also gender sensitive. For this matter, among the participants that are selected, the program ensures there are both males and females. Currently there are both male and female masons, supervisors, promoters, beneficiaries/clients, staff, and, above all, two women-led construction companies. Even when it comes to plant construction, weight and height of the plant has to be gender sensitive. The reason for this is that the program discovered that majority the people who operate and maintain these plants are women. The backyard gardens where the bio-slurry is mostly applied are managed by women and children.
By being gender sensitive, it has enabled the program to consider those factors that affect women and children and enabled them to air out their views. The following data backs up the above explanation.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant production</td>
<td>1241</td>
<td>35</td>
</tr>
<tr>
<td>Mason Training</td>
<td>50</td>
<td>4</td>
</tr>
<tr>
<td>User’s training</td>
<td>693</td>
<td>717</td>
</tr>
<tr>
<td>Bio-slurry management training</td>
<td>694</td>
<td>652</td>
</tr>
<tr>
<td>Stakeholders’ workshop</td>
<td>392</td>
<td>162</td>
</tr>
<tr>
<td>Promotion and sensitization</td>
<td>483</td>
<td>364</td>
</tr>
</tbody>
</table>
6. Efficiency/Cost-Effectiveness

A quick assessment of the program’s performance shows that much of the initial investment cost is high in terms of the cost of construction, but in the long run the benefits outweigh the costs. The program is currently undertaking a Biogas user survey that will point out the direct and indirect benefits of biogas.

7. Sustainability

Sustainability is at the core of the program. In order to address this the program already embarked the following:

- Integration into the government’s development programs
- Capacity building in terms of training and system’s strengthening of the key sector players
- Cost sharing with the clients which promotes responsiveness and ownership of the program
- Development of standards that guide the sector players
- Wide stakeholder engagement
- Private sector support and development
- Research and development for better alternative means

8. Challenges & Lessons Learned

**Challenges:**

Biogas being a new technology, it has not yet taken root. For this reason the implementation of the program has faced a number of challenges. These challenges include:

- Limited awareness about the technology. In some communities, members are still hesitant to take it up because they are not sure whether it actually works.
• The volatile macro economic factors (especially inflation and the high interest rates) which have the cost of construction materials to very high, affecting the farmers’ ability to meet their obligations.
• Water shortage. One of the key inputs for biogas is water. However there some communities where members have animals but they have water shortage. This limits the rate at which the technology is being used.
• High investment cost for northern Uganda
  o The program is still pursuing strategic alliance to overcome the challenges
  o Investment in research and development to get cheaper alternatives for plant production.
  o Strategize to tap into carbon credits/ revenue.

Lessons Learned:
• The technology requires continuous sensitization.
• Wider stakeholder involvement can be a good strategy for scaling up.
• Private sector plays a significant role in the commercialization of biogas.
• Quality management is paramount for the success of any program.

9. Enabling Factors & Recommendations

• High costs of charcoal and firewood
• High tariffs for and irregularity of hydro electricity
• Availability of animals
• Technical capacity of staff

Recommendations
• Need to realize commitment beyond technical support
• Offer tax waivers on biogas appliances
• Support the development of a biogas loan product
• Leverage the program investment cost

10. Replicability/Adaptability

The biogas programs have been very successful in Asia in Nepal, India, Bangladesh and China. In Africa they have been successful in Kenya, Tanzania and Ethiopia.