Mzuzu University Biogas Strategic Energy Project
Case Study

MREAP Strand: Community Energy Development Programme (CEDP)
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Abstract: As a partner of the Malawi Renewable Energy Acceleration Programme (MREAP), Mzuzu University led the Biogas Strategic Energy Project located in the Mchinji district in Malawi. Over dependence on local biomass for energy use is costly in terms of time and money and has resulted in added pressure on the nearby forests. This Strategic Energy Project was designed to address the overall need to reduce dependency on wood-fuel and charcoal, while providing a useful product that can be used for cooking. In addition to the installation of 12 biogas digesters, the project trained 9 local bricklayers in the digester construction to support local skills development.
BIOGAS IN MALAWI

As a partner of the Malawi Renewable Energy Acceleration Programme (MREAP), Mzuzu University led the Biogas Strategic Energy Project located in the Mchinji district in Malawi. Over dependence on local biomass for energy use is costly in terms of time and money and has resulted in added pressure on forestry resources. The World Energy Outlook (2014) estimates 97% of Malawi’s 15 million people rely on the traditional use of biomass. Of this, 59% consists of wood-fuel and residues and 41% is converted into charcoal. Utilizing biogas is a relatively new approach in Malawi, though in other countries such as India it is used more widely.

Thus, this Strategic Energy Project was designed to address the overall need to reduce dependency on wood-fuel and charcoal, while providing a useful product that can be used for cooking.

**Strategic Energy Projects (SEPs)**

As part of MREAP, four Malawian SEP partners were involved in order to build up knowledge and learning for the sector on specific projects as well as contribute towards direct benefits for Malawians. Besides the Mzuzu University biogas project, the remaining three are described in brief below.

**WASHTED Solar PV Project**
- **Main Technology:** Solar PV
- **Location:** Chikhwawa District
- **Scope:** 4 health facilities, 4 primary schools with an improved technical design

**Concern Universal Biomass Management & Solar PV Project**
- **Main Technologies:** Solar PV, improved cookstoves
- **Location:** Balaka District
- **Scope**
  - 5 primary schools with community charging stations
  - 8 Village Forest Authorities
  - Regional improved cook stove production, manufacturing, and distribution programme

**Mulanje Renewable Energy Agency (MuREA) Micro-hydro Mini-grid**
- **Main Technology:** Micro-hydro mini grid
- **Location:** Mulanje District
- **Scope:** 88kW scheme

**Approach**

Mzuzu University identified beneficiaries by working with the Agricultural Development Divisions (ADD) who were aware of cattle numbers in the area. A biogas digester requires a significant level of dung for feedstock and production of gas, roughly 10 cattle per digester. The Kasungu ADD identified 19 qualified farmers which had appropriate numbers of cattle in the Mchinji area. These beneficiaries were previously involved with a project with Heifer International that provided the dairy cattle. 10 overall household beneficiaries were selected alongside the Tithandizane orphan care centre to receive biogas digesters in MREAP. An earlier biogas project that was originally installed in 1999 was also chosen to be revamped.

To create a sense of ownership and commitment, beneficiaries that were selected were required to provide labour to dig the trenches as well as some construction materials. Once the trench was ready, all of the materials were brought on site and construction would begin. The majority of the construction activities occurred between Oct 2014 and Jan 2015.

Following construction, the dome of the digester must cure and this can take up to a month before feeding can begin. Initially around 3-4 tons of cattle dung is required before biogas is produced, so this can take some time to gather. Meanwhile, piping works are completed to create a safe and secure tap that leads to the cooking area.

The community is trained on safe use to avoid burns and other dangerous scenarios. Once initial feeding is completed, a regular supply of dung from around 10 cows is required, but is dependent on the breed. Dairy cattle, which tend to produce more dung and stay in one place are preferable to free range local cattle. Once up and running a biogas digester can last for 20+ years with only minor plumbing works.

**Training of Constructors**

Realising that promotion of the technology requires more widespread availability of constructors, Mzuzu University also trained 9 local bricklayers (8 men, 1 woman) in the process of construction. The training process was hands-on and collaborative.

Once they learned part of the process, they would apply it to other sites and this process would repeat until construction was complete. Many of the builders...
had some experience in constructing houses and shops, but this was the first opportunity they had to learn how to build a biogas digester.

Mzuzu University envisages their skills coming to use in future projects and potentially stimulating the local market once people know more about biogas and can see it working.

**Status July 2015**

By July 2015, all the digesters are fed with the initial load of dung and are ready for gas production. Several locations are undergoing final pipe-works, expected to be completed by the end of July.

It is estimated that 430 people will benefit through the use of biogas including 360 orphans.

**Technical Information**

Biogas digester work through the decay of dung in a controlled environment. The digesters at the households were 2 cubic meters in volume while the orphanage digester was 3 cubic meters. If fed properly, it produces methane that can be piped and used for cooking. The dung comes from a minimum of 5 cows. A constant cycle of feeding is required with a 1:1 ratio of dung to water. Once a sufficient initial feed stock (several tons of dung) is built up the system produces gas that gathers at the top of the digester, ready for use. A digester of this size is ideal for about 5 Malawian households, or a small community facility.
Beneficiary: Orphans

With around 360 orphans at the Tithandizane orphan care centre, it provides care and a focus point for caring for orphans from many surrounding villages. There is a high number of orphans in the region due to parents dying from AIDS, young mothers dying during or after childbirth, and from natural causes. Orphan children are left to fend for themselves and can easily be led towards a life of crime and destitution. For many orphans it is unlikely that they will survive long without some kind of intervention.

The centre provides a basic education and the opportunity for play and interaction with other children in the community. This helps the children have fun and remove their minds from what is a very difficult life.
“If this orphanage was not here than you would have expected most of the kids dead by now. We sat down and realized that we need these facilities was because there were high death rates among the children. There was high infant mortality. We thought that if these kids are brought together, the orphans, kids from poor families, they will not see those differences and in so doing their lives would be saved.”

- Orphanage Caretaker
**Beneficiary:**

**Lady Caretakers**

The orphans are looked after by a group of local women who donate their time and other resources to care for the children. Most of the women look after their own children as well. The biogas scheme will mean that the women need only turn up and prepare food instantly using the biogas. Currently, they must either search for firewood, or buy it, both of which take up a lot of time and energy. The children must then wait a considerable time whilst the fire is made hot enough to cook food. This often results in delays in feeding the children. The biogas will mean a more timely delivery of these vital meals to the orphans whilst reducing the burden on the women volunteers.

“The ladies at this orphanage come from different places. It is not necessarily a particular type of grouping, but basically the mother love that is there on the kids so at any point if there is something requiring attention from the ladies, the ladies in the community are just eager to help out of love.”

- Ida Mumba, Orphanage Chairlady
Beneficiary: Farmers

Using manure in a digester is more efficient than letting it decompose in an otherwise uncontrolled environment, in the field for example. The technology is suited for farmers who already have a sufficient number of cattle to provide an ongoing supply of dung for gas production. This can replace other existing sources of fuel (wood-fuel or charcoal) which can benefit the local environment. Furthermore, time and money can be saved from reduced need to gather wood-fuel or buy charcoal, a task which often falls on the women of the household to complete.

The biogas plant also produces a ready supply of organic fertiliser as the process naturally pushes out the digested materials which are lighter than the new dung. With the cost of imported fertiliser relatively high for the average Malawian farmer, this can create savings. This compost can be used as a soil improver and depending on the community, the compost can be sold for a small price to bring in further income or used directly to improve production output.

“We grow maize and soya beans. We have 5 local cattle and 5 straw fed cattle for milk production. The cattle help us raise income from the milk. This will help us since firewood is getting very scarce and it is expensive. It can take up to 6 hours to gather the firewood. 5 families will use the biogas here.”

- Augustine Ditilimoni