

# EQUATOR INITIATIVE

**PROMOTION OF LOW COST  
BIOGAS TECHNOLOGY TO  
RESOURCE POOR FARMERS IN  
TANZANIA**

**BY**

**FOUNDATION FOR SUSTAINABLE RURAL  
DEVELOPMENT (SURUDE)**

1. **Name of the Organization:**

The organization is identified as the Foundation for Sustainable Rural Development. It is based in Morogoro region in Tanzania.

2. **Portrayal of the Nominee**

The Foundation for Sustainable Rural Development (SURUDE) was registered in 1994 as a Non-Governmental Organization (NGO). The main objective of SURUDE is to promote wide use of biogas technology for cooking and heating among rural communities.

Biogas technology is promoted because of its four major attributes:

- (1) It provides alternative source of energy to fuelwood. This retards high rates of deforestation;
- (2) It lessens drudgery on the part of women by reducing their back breaking tasks of fuelwood collection;
- (3) It saves life by reducing deaths caused by indoor pollution;
- (4) It promotes organic farming through the effluent, which is an excellent fertilizer.

SURUDE is composed of 250 members who are mostly farmers. The composition percentage of members is 50% men, 30% women and 20% youths.

**Initiative description and Innovations**

Anaerobic digestion is a biological process through which combustible gas can be produced from biomass. The gas produced by anaerobic digestion is called biogas. Biogas can be used for lighting and cooking. However, biogas that is produced under this initiative is used for cooking. Further research is underway to make this particular gas to be used for lighting as well.

Biogas generally is 60% methane and 40% carbon dioxide. Although any biomass (*except lignin*) can be converted to biogas, high-moisture feedstocks are especially well suited for anaerobic digestion.

In early 1980's, a low cost tubular plastic biodigester was developed in Colombia. The technology was later disseminated to Vietnam. In the middle 90's, a group of Tanzanian scientists from the University of Agriculture in Tanzania travelled to Vietnam to study it. On their return,

they collaborated with farmers to improvise it to fit with Tanzanian conditions.

At first, as few as 20 farmers adopted the technology. As news of its suitability spread, many more farmers joined. Today, over 1,000 farmers throughout the country are using it.

The bio-digester construction starts with a trench of about 8-10 meters long and 60-65 cm deep. The bottom of the trench should be about 50 cm wide while the top is 60-65cm. The tube is placed in the trench and filled with water to expel air before the dung is introduced. The fresh slurry is then introduced. Depending on the temperature, it may take two weeks before the gas tank is filled with biogas. Materials for a biogas plant are locally obtained. The cost of constructing the biogas plant is only US \$ 100. When all materials are delivered to the site, it takes between 3 and 4 hours to set up the plant.

The amount of gas produced depends on the amount of manure put into the digester. The ideal amount is one part fresh manure and 2 parts water. The daily amount of gas will then be about 25% of the liquid volume of the biodigester. Therefore, for a biodigester of 4m<sup>3</sup> liquid volume, the daily gas production will be 1m<sup>3</sup>. In terms of fuel value, it is equivalent to 0,5 litres of kerosene.

In order to operate adequately, the bio-digester requires, on a daily basis, excreta from 1-2 cows, 5-8 pigs or 4 able bodied persons.

### **Poverty Reduction**

Low cost tubular plastic biogas technology was first introduced in Tanzania in 1993. After 10 years of operations, assessment has shown that the initiative has strong poverty reduction potential. The following are some of the examples on how the technology has been able to contribute to poverty reduction:-

- **Income generation through cost savings:** A survey conducted to biogas users showed that a family of six consumed 3 bags of charcoal and 121 litres of kerosene for cooking per month. This costs approximately US \$ 60. When biogas is used, the amount is saved and could be used on other livelihood essentials.
- **Income generation through sale of milk.** Biogas production is associated with dairy farming. In this initiative, poor farmers who cannot afford to own a cow are loaned in-calf heifers under the heifer-in-trust scheme. A farmer who receives an in-calf heifer under this scheme passes on to fellow farmers the first two female calves. (*Note: a calf is*

*passed on when it is one year old.*) A survey conducted on these farmers showed that most of them use income from milk sales to pay school fees for their children, improve their houses, buy adequate clothing for family members and transport equipment such as bicycles ~ transactions that have made a significant difference in the living standards.

- **Income generation through increased crop production:** The waste that comes out of the digestion process, as slurry is rich in organic compounds. Farmers under this initiative have successfully applied it in banana cultivation and vegetable gardening. Studies by Sokoine Agricultural University in Tanzania have shown that slurry from biogas improves productivity of land and maintains soil quality that can support crop production over a long period of time.
- **Poverty reduction through improved health.** Respiratory diseases and sometimes deaths caused by indoor pollution as a result of prolonged exposure to smoke from fuelwood and charcoal is avoided when biogas is used for cooking.
- **Lessening of workload on women.** Cooking by using a biogas cooker is easy and fast. Several households have acknowledged that due to its simple to use mode, some men now help their wives to cook. This has two implications: On one hand it has reduced fuelwood collection and pollution laden cooking tasks on the part of women. On the other hand it has increased gender equity by involving men in domestic chores.
- **Conservation of Biodiversity:** Studies conducted by a Tanzania local energy NGO called TATEDO indicates that every 8 households clear-fell one hectare of forestry each year through charcoal consumption alone. When other causes of forestry destruction are added such as fuelwood, agriculture, construction and mining, deforestation rate in Tanzania is estimated at between 300,000 hectares and 400,000 hectares per year. Studies have further shown that each biogas unit is able to reduce scale of deforestation by 37 hectares per year. This is realized by adopting to biogas in place of fuel wood and charcoal for cooking and heating.
- **Reduction of greenhouse gas emissions:** (*Methane and Carbon dioxide*). Tanzania has a cattle population of 13 million. When cow-dung from all these cattle is left to degrade in the open, Tanzania could produce an estimated 883,3 million m<sup>3</sup> or 375 tons of methane and 588 million m<sup>3</sup> or 1 million tons of carbon dioxide per annum. Greenhouse gases are responsible for increased global warming. Since biogas is 60% methane and 40% carbon dioxide, combustion of biogas reduces emission of the same gases in the atmosphere. By so doing, it contributes to the reduction of global warming.

Trees that are not cut down due to wide adoption of biogas technology also contribute to reduction of greenhouse gases in the atmosphere through the process of carbon sink.

### **Partnerships**

The low cost tubular plastic biodigester project has attracted partners, collaborators and enthusiasts from within and outside Tanzania. In Tanzania, the project has established technology dissemination centres in all major administrative zones. Through these centres, the technology is now replicated throughout the country.

The technology has also been disseminated outside Tanzania. In 1999, facilitators from Tanzania traveled to Cameroon under the auspices of Africa 2000 Network where they trained 60 technicians. In 2000, 50 technicians were trained in Uganda. Last year, SURUDE trained 45 technicians and installed 50 demonstration biogas units in Nigeria at the invitation of UNDP Nigeria.

Apart from UNDP, NGOs and CBOs, SURUDE is also collaborating with the Tanzania government. The government provides extension staff for dairy and crop farming. Other partners in this initiative include: Sokoine University of Agriculture in Tanzania which conduct research on the technology, A Danish company called Superflex and a British Charity called Ashden Trust both of which provide technical and financial support to SURUDE. Furthermore, the Ministry of Energy and Minerals is another partner in Tanzania. It actively promotes renewable energy technologies in Tanzania through government policies and government supported strategies.

### **Sustainability**

- Low cost tubular plastic biodigester systems have been in operations since 1990. They are cheaper and affordable by poor farmers. The material cost including installation is about US \$ 100. There is hardly any cost on operations and maintenance.
- The technology is simple. It uses materials that are obtained locally. Furthermore, two people can fix it in about 4 hours. This means the technology used is easily localised and institutionalized at household level.
- It is demand driven. There is always individual household demand for biogas units after awareness raising on the technology had been effected.
- It is replicable. The technology came from Vietnam. It has since been replicated in Tanzania, Uganda, Cameroon and Nigeria. Projects that are replicable have sustainability potential.

- It lessens the burden of daily labour off women. Projects that provide direct benefits to women are usually sustainable.
- It generates income through milk sales and cost saving. Usually, initiatives that generate income are sustainable.
- It is supported by government policy. Biogas is reflected in Tanzania's energy policy in the section of renewable energy technologies.

### **Other information**

- **Biogas technology, a saviour of lives**

Biogas technology is already saving lives in Tanzania. In Kwimba district, North East of Tanzania elderly women who have red eyes are indicted that red eyes occur due to witchcraft practices. These allegations falsely hold that since witchcraft is practiced at night, the perpetrators do not get enough sleep and hence the eyes becoming red. Witchcraft in these areas is punishable by death through mob justice. As many as 500 cases of this kind have been reported in the Lake Victoria areas.

Scientific studies however object to the myth that red eyes on women occur because of witchcraft. Scientists explain that the red eyes on women occur as a result of prolonged exposure to smoke that comes from fuelwood. Adoption of biogas cookers, which are smoke less, therefore clears the reddish colour on the eyes of women. This is turn help to save their lives.

- **Biogas technology, an instrument for promotion of sustainable agriculture**

Biogas is instrumental in promoting sustainable agriculture. In this initiative, farmers are loaned in calf heifer and biogas unit as a package. The farmers are also provided with seedlings of multipurpose trees for planting to provide supplementary feed to the livestock. Therefore, under the package, farmers get income from sale of milk, reduce fuelwood requirements by using biogas the effluent of which is used to improve land productivity which in turn provides the livestock with forage and crop residues. In other villages, the slurry from the biogas flows into the fishpond to nourish fish. Such low cost recycling of natural resources promote sustainable agricultural production, which is critical in poverty reduction.

### **Contact Person**

Dr. Sebastian V. Sarwatt  
Executive Secretary  
Foundation for Sustainable Rural Development (SURUDE)  
P.O.Box 3087  
MOROGORO  
TANZANIA

Tel: 255 – 744-411 968  
E-mail: [sysarwatt@suanet.ac.tz](mailto:sysarwatt@suanet.ac.tz)  
Website: [www.superflex.dk/surude](http://www.superflex.dk/surude)

### **Contact Persons for Partner groups**

Mr. Thomas Niyegila  
Director  
Igabi Training Institute of Agriculture  
P.O.Box 98  
Bukoba  
TANZANIA  
Tel: (No Telephone)  
E-mail: (1) [niyegila@yahoo.com](mailto:niyegila@yahoo.com)  
(2) [ymuchuruza@church-bookshop.or.tz](mailto:ymuchuruza@church-bookshop.or.tz)

### **Nominator**

Mr. N.C.X. Mwiwaha  
Assistant Commissioner  
Ministry of Energy and Minerals  
P.O.Box 2000  
Dar es Salaam

Tel: 255 22 2119158

E-Mail: (1) [mwiwaha-mem@raha.com](mailto:mwiwaha-mem@raha.com)  
(2) [nmwiwaha@hotmail.com](mailto:nmwiwaha@hotmail.com)

## **Two references**

- (1) Ms. G. Kamuzora  
Assistant Director  
Planning and Privatization  
P. O. Box 9242  
Dar es Salaam

Tel: 255 741 417491  
Fax: 255 22 2115519  
E-Mail : gbamanyisa@yahoo.co.uk

- (2) Dr. G. C. Kifaru  
Head, Department of Animal Science and Production  
Sokoine University of Agriculture  
P.O.Box 3004  
Morogoro  
TANZANIA

Tel: 255 23 4617  
Fax: 255 23 4562  
E-mail: dasp@suanet.ac.tz