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Proposals

Pilot Project for the Installation of Domestic Biogas in Peri-Urban Zones of the city of Bamako

Oumar Salim Mohamed Kaba

Climate Change Project Summary Global Environment Facility Small Grants Programme United Nations Development Programme. Email: oumar.kaba@ikatelnet.net.

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In Mali, approximately 92% of household and small industry energy needs are met with wood and charcoal. In peri-urban regions, where small farmers supply cities with food products, wood resources are especially over-exploited. Bamako, Mali's capital, has doubled in size in the past 20 years, and has placed a huge strain on the wood resources of this area. Loss of vegetation cover, leading to desertification in a country that is already one-third desert, is a major problem in this area. Biogas offers one possible solution to this energy problem in farming regions, since it converts livestock waste into a combustible gas, and also produces high-quality fertilizer. However, prior to this project most efforts to promote biogas systems have failed. This was primarily because these biodigestor models were made of metal, which requires skilled metalworkers and access to electricity to operate the tools, needed to produce them. In addition, the metal would rust in due to the wet weather. The government has made numerous efforts to address the situation since 1970, but these projects were not well coordinated. In 1990, the government formulated a new, National Domestic Energy Strategy, and gained international financial backing. It is in this context that the Mali Folkecenter, an offshoot of the Danish renewable energy organization called the Folkecenter, began its biogas project.

PROJECT DESCRIPTION

Overview

This project sought to initiate the spread of biogas units in peri-urban areas around the city of Bamako through the development of a locally-adapted prototype, the establishment of demonstration sites, trainings for local people to construct these biodigestors, and the public dissemination of the benefits of the model. The wider use of biogas units would help reduce the use of firewood in peri-urban areas and would supply high-quality fertilizer for local farming efforts.

Implementation

The project was supported by a local expert in biogas technology, who worked with selected demonstration sites to develop a locally-adapted model of a biodigestor, using local materials. The project began by conducting a feasibility study to better understand current local conditions as related to project implementation. Using this information, the project then selected five demonstration sites. Demonstration sites were individually-owned agriculturalists, who were selected according to the following criteria: 1) own sufficient agricultural area, 2) raise livestock in a permanent way, 3) own at least 20 cows in order to produce sufficient manure, 4) willingness to provide labor, local materials, and a financial contribution to the project, 5) have a large household which consumes significant amounts of wood or charcoal. The project then trained these individuals to construct and maintain biogas units, using their own labor and local materials, with the advice and participation of the local expert and other project team members. In September 2001, the project organized a national seminar to inform communities, local authorities, and development partners in the region about the new biogas systems, and produced information materials to spread the word. A final evaluation, including the environmental and social impact of the project, was also planned. The project is now looking for funding to

scale up to 100 more sites, thereby reducing the per unit cost of the technology.

Technology

This biodigestor is of the floating metal drum type. It is built underground and lined with cement and brick. It has fibro-cement feeding and outlet tubes, a floating metal drum to collect the gas, and plastic and metal tubes to transport the gas to the burners for cooking. Using 100 kg of cow manure per day over a period of 23 months, these biogas systems produced an average of 2.5 m^3 of biogas per day, and an average of 900 m^3 per year. Significant amounts of fertilizer are also produced by these sites. At the Technical Institute for Research and Applied Training, the Animal Production department is testing the use of chicken waste as a substrate, thereby producing methane gas. This gas could be used to warm the chicks in the wintertime.

While the digestors at the five sites cost around $750 each, the project aims to refine its local model such that it could be produced on a large scale at a cost of approximately $200 per unit.

Environmental Benefits

- **Global:** the reduced use of firewood for cooking and other activities as a result of the biogas installations reduces greenhouse gas emissions.
- **Local:** local forests and vegetation will be under less pressure as a result of the decreased use of firewood.

Livelihood Benefits

- **Health:** the reduced use of firewood for cooking improves health conditions for women and children.
- **Income:** less firewood and/or charcoal will need to be obtained, since the farms are producing their own energy.
- **Food production:** the use of the high-quality fertilizer produced as a byproduct of the biodigestor may lead to increased agricultural productivity.
- **Reduced drudgery:** women and children spend less time collecting wood for cooking.

Beneficiaries

Direct beneficiaries so far are the five families, each with an average of 30 members, which are serving as demonstration sites for the technology. Other beneficiaries are the 200 students at the Polytechnique Institute for Research and Applied Training, which houses a demonstration site for teaching purposes.

Capacity Building

This project has conducted intensive training to develop the capacity of at least one local person at each site to build and operate the biogas unit. These individuals will later be responsible for spreading the technology around their area.

In addition, the project itself employs two technicians, who through the process of working with this project have learned more about biogas units and are intimately familiar with this particular model. These individuals are also now more capable of facilitating the spread of biogas technology. Finally, the project's national expert is a professor at a local university, and as a result students at that university will have an opportunity to intern with the project as a part of their studies. At the Polytechnique Institute for Research and Applied Training, 200 students are learning about biogas using the school's demonstration model developed by the Mali-Folkecenter.

Partners

- **Local universities:** this project has involved a professor from the Rural Polytechnique Institute as a local expert. This has helped the project spread understanding of biogas technology to students at the university. In addition, at the Polytechnique Institute for Research and Applied Training, a demonstration biogas system has been constructed, helping this institute's 200 students learn about the technology. Already, at the Technical Instititute other applications of biogas are being uncovered. For example, the Animal Production department hopes to use digestors to make methane from chicken waste, which could then be used to keep baby chicks warm during the winter months. This is an example of how partnerships can yield unexpected benefits.
- **Local farmers:** the farmers at the five demonstration sites are the most critical partners, since they are contributing local materials and labor, and serve as the future promoters of the technology.
- **Local government officials:** according to SGP Mali, government officials at the municipal level are interested in promoting this project. Many of them were invited to the national seminar to disseminate information about the project and the biogas technology. They have also visited some of the biogas demonstration sites.

LESSONS LEARNED

1. Environmental Management

The project illustrates the importance of adapting technology to local conditions to ensure that it works in the local setting, and that its use can be sustained. Prior to this project, biogas could not be sustained because models required materials that were not locally availab-

le and that were not adapted to local weather conditions. This project made a specific effort to address both of these problems, and as a result has met with much greater success.

The project also illustrates the incorporation of a baseline feasibility study and an ex-post study of the project's impacts.

2. Barrier Removal

Technical: this project has helped remove technical barriers by developing, with the involvement of community members, a new version of a biogas unit that is adapted to local conditions. The project is also helping to train a new generation of students at local tehnical schools who will be aware of the biogas technology and its benefits.

Financial: The current models used in the project are far too costly for the market in Mali at $750 each, but if the organization is successful at scaling this up to more sites and therefore reducing construction costs, then the project will have helped reduce financial barriers. The development and testing done at these five sites was the first step toward addressing this barrier.

Information/awareness: the project incorporated several aspects to help improve access to information about biogas technology:

- A national seminar, held in September 2001, to which public officials, development agencies, and many others were invited
- Development of written materials, such as brochures, radio and television clips, and so forth to educate the public.
- The integration of capacity development for local farmers. The involvement of these individuals from the beginning in construction and design, with the goal of preparing them to promote the technology in their area, helps greatly in raising awareness about biogas and its benefits.
- The presence of the model digest or at the Technical Institute for Research and Applied Training has resulted in improved understanding of the biogas technology on the part of 200 students, and this knowledge is being transferred to other departments who are developing other applications of biogas technology.

Policy: municipal government officials have become aware of the project and support it. Thus, when policy measures become necessary in order to enable the spread of the technology, these individuals may be more Ministry of Mines, Energy and Water, who appeared supportive. For example, the seminar held in September 2001 was attended by the general secretary of the supportive of the project. However, there is no evidence yet of specific commitments on the part of the government.

3. Scaling Up

The project shows good prospects for scaling up its results. Certainly, the use of local demonstration sites to develop and refine the technology helps ensure the biogas units are effective in this environment and are reproducible with local materials. However, further support is needed in order to test these biogas systems on a larger scale before they can be commercialized. Recently, the Mali-Folkecenter was about to receive support from DANIDA, a Danish government source, to conduct a socio-economic feasibility study for an additional 100 biogas sites, but due to political changes in Denmark that source of funding was suspended. That project would have brought an Indian biogas specialist, Raymond Myles, to Mali to study implementation there in conjunction with the Rural Polytechnique Institute. However, instead the Folkecenter is consulting with private companies and other NGOs who are working on commercializing improved stoves that can be used with biogas systems. Government officials have visited the current biogas sites, and are very enthusiastic but no specific support has yet been made available.

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