BIOGAS TECHNOLOGY AND INTEGRATED DEVELOPMENT [EXPERIENCES FROM SRI LANKA]

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INTRODUCTION

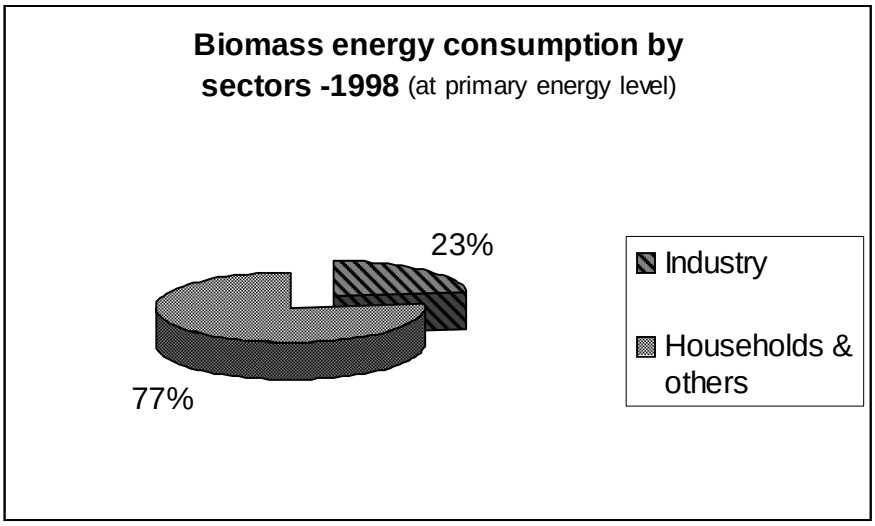
Work on biogas in Sri Lanka dates back nearly two decades. Many governmental and non-governmental organisations have been active in this area at various periods of time. Many of these initiatives lacked sustainability as they were implemented in isolation. ITDG South Asia started its project on developing and popularising biogas technology in 1996 by carrying out a sample survey to find out the status of biogas technology in Sri Lanka and to learn lessons from the past experiences. This phase was followed by a series of new activities aimed at widespread popularisation of the technology.

Traditionally the biogas technology was looked at as a source of energy for the rural population mainly for lighting, though it possessed several other benefits. The ITSL project recognised the need to look at the biogas technology in an integrated manner to reap the multiple benefits, which this technology offers. This paper summarises the experiences of the ITSL project particularly in relation to the integrated approach.

BACKGROUND

Various sources of energy are being utilised by the Sri Lankan population to satisfy their energy needs. The three main sources of energy used in Sri Lanka are Biomass, hydro and petroleum oil. It is estimated that the share of biomass in satisfying country's energy needs accounts for 45%, with petroleum and hydro accounting for 41% and 14% respectively. As shown in Figure 1, household cooking account for the major use of biomass. With fuel wood becoming increasingly expensive and also scarce in some parts of the country, there is a need to look for alternative cooking fuel.

Sri Lanka's economy is still largely based on agriculture. In effect, nearly 75% of the rural peasantry is engaged in this activity as their major occupation. One of the major constraints for agricultural activities of farmers is the increasing cost of fertiliser. In the recent past, the fertiliser factor has had both adverse economic and political implications on the country as a whole as well as on individual farmer families.



Today, solid waste is collected and disposed at a large number of unprotected sites. The problem is most acute in the Colombo Metropolitan Area (CMA) and in other major cities such as Dehiwala-Mt. Lavinia, Moratuwa, Kandy, Galle, etc. Even in remote areas, solid waste dumps have become a common sight. Colombo municipal area produces about 750 metric tones daily and the figure for the whole metropolitan area is about 1,000 – 1,100 MT/day. The composition indicates that about 85% of the waste is organic and has moisture content of about 60-75%. These data have been largely determined for the waste arising in the Colombo area.

Solid waste dump sites are generally located in areas inhabited by the poorer segment of the society who lacks access to proper infrastructure to maintain even the minimum level of hygiene. This adverse situation is further aggravated by the presence of garbage dumps.

Main emphasis of the ITSL biogas project was to develop and promote appropriate designs of biogas units that could address the three areas discussed above in an integrated fashion.

Experience from Sri Lanka

Experience has shown that for the success of any rural oriented technology, it is essential that it is appropriate to the social and economic conditions of the country. As Sri Lanka is an agricultural country, biogas technology perfectly blends with our culture and society. However, the success of promoting any technology depends on careful planning, management, implementation, training and monitoring.

The ITSL study "Integrating Energy and Environmental Mamanagement through Biogas – A Country Review" revealed many factors, which have directly or indirectly resulted in the failure of biogas technology. Although unconfirmed data suggests that there are nearly 5000 biogas units constructed through out the country the above sample survey results indicate that the ***functioning rate*** is as low as 28.5%. The ***success rate***, i.e. including plants which have been given up due to arrival of grid supply, remains at 33%.

ITSL's biogas project was formulated in the light of the findings and recommendations of this survey. The project also considered the issues explained in the previous section and follows an integrated/multiple-use approach.

Main features of this project are:

- networking and institutional development / strengthening.
- promotion and extension.
- construction of demonstration projects.
- research & development.
- training.
- monitoring.

Although several institutions have been active in the field of biogas development in Sri Lanka, they were working largely in isolation, at times with overlapping activities. ITSL recognised the need to bring about inter-institutional collaboration so as to benefit from the strengths of each institution in promoting the technology. Over the last three years, the project collaborated with the following institutions:

NERD Centre[1]

This is a pioneer research organisation in Sri Lanka that is responsible the development of the Sri Lankan Dry Batch Biogas unit. This innovation received a silver medal in an international exhibition for environmentally friendly innovative processes *(24E Salon International des inventiona, Geneva 1996).* The dry-batch system is designed to handle straw arising out of paddy cultivation. The digestion period identified is six months which is also the paddy cropping cycle. The concept is to obtain straw from one crop, digest it for six months and take out the digested material for use as fertiliser for the next crop. The project helped NERD Centre to commercialise the dry batch technology.

Department of Animal Production and Health (Dept. AP&H)

The department identified the biogas technology as a means of providing additional economic benefit to their clientele. Both the Sri Lankan dry batch type and the continuous (Chinese) type are being used by these farmers. The project strengthened the technical capacity of this department to undertake the extension work on biogas technology within their existing service network. Training imparted to the staff includes project identification, implementation and trouble shooting.

[1] National Engineering Research and Development Centre

Universities

The project collaborated with Universities in conducting biogas research and development, particularly focusing on the performance optimisation, cost reduction and assessing multiple end-uses. In addition, special training courses on renewable energy, including biogas, were conducted for the benefit of undergraduate students.

NGOs

Most of the information disseminatioin activities and pilot projects were implemented in collaboration with grass-root level NGOs. Memebers of local NGOs were also given training on identifying opportunities for application of the biogas technology oin their respective regions.

Users and Builders

A major activity of the project was to provide training on the construction of biogas plants to village level masons and end-use equipment manufacturers. Biogas plant owners were given training on operation and maintenance of biogas units.

SOME IMPACTS OF THE PROJECT

In Sri Lanka, women in rural villages are usually expected to provide hard labour for domestic activities with little time for leisure. Involvement in the collection of firewood for cooking, cleaning of animal sheds, fetching water for drinking and washing take up all their time. While the introduction of biogas does not solve all these issues, it has reduced the time women spend in the collection of firewood and in the kitchen cooking and cleaning utensils. A recent study done by ITSL shows that 75% of the energy requirement for cooking in these households are supplied by their household biogas units. The women and girl children in average save 2 - 2 1/2 hours per day when cooking with gas. Most of these females (79%) use this time for some income earning activities in which they earn the equivalent of 24% of their monthly income.

Women in beneficiary households who raise animals have expressed their satisfaction with biogas units because it reduces their time in disposal of animal waste. Previously, they collected animal waste and disposed of it far away from the sheds, which was a time consuming and tiresome activity. Now the animal waste is being diverted to the nearby biogas units with minimum effort. In addition to the time saving, households using biogas have gained fairly high social status in the villages.

A study has also shown that 30% of the households who own a biogas unit had earlier used kerosene lamps. 82% of them were using bottle lamps which poses severe health hazards.

As highlighted earlier, the fertiliser value of the slurry is an important determinant in adopting the biogas technology. Therefore, the project initiated a study with the Department of Agriculture Engineering, University of Ruhuna, to evaluate the bio fertilizer aspects of the technology.

As revealed by this preliminary experiment conducted on fertilizer values of the by-products of straw digesters, it has been documented that digested material is enhanced with NPK after going through the digester due to the

activities of the microbial population. Therefore, the by-products have a very high bio fertilizer value, which help to reduce the fertilizer budget of the farmer significantly. As revealed by the experiments, 10 tons of digested straw can replace the entire fertilizer demand of one hectare of paddy field. As such, if the average landholding of a farmer is 0.25 ha, his entire fertilizer demand could be met with two digesters of 1 ton capacity. Moreover, with current trends, rice grown with bio (organic) fertiliser can fetch a high price in the market.

Another positive observation noted by some users were that when the slurry is diluted with water and sprayed on green chilies, the plant is protected from leaf disease. Leaves of plants grown on soil applied with slurry have shown greater resilience.

While energy and fertiliser remain the main uses of biogas at household level, it is being increasingly recognised as a waste disposal technology by the local government authorities for whom garbage is a severe environmental problem. Three garbage based biogas plants have already been contructed and are serving as demonstration units.

CONCLUSIONS

At the national level in Sri Lanka, biogas technology has a number of benefits such as:

- waste getting cleared (the environmental management tool)
- a useful fuel gas being generated (the energy generation tool)
- the production of the digestate as a by-product, which is considered to be an excellent soil conditioner (the fertiliser option)

Biogas technology can play a vital role in solving some of the major problems faced by the Sri Lankan societies of the present and future. Biogas utilisation should happen in a more systematic way, as it is fast becoming one of multiple end-uses in Sri Lanka. The planners should not buy into prevalent images such as biogas being not a desirable source of energy as it is from waste, or that it is an energy source only for the rural poor etc.

To emphasis on the acceptability of biogas - on which the whole success of its potential contribution lies- one cannot do better than quote from Sasse1988-

" A technology is appropriate if it gains acceptance… Biogas technology is extremely appropriate to the ecological and economic demands of the future. Biogas technology is progressive. …. The biogas plant must be a symbol of social advancement. " This excerpt is to emphasise the importance of the technology.

References:

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