Evaluation Study of
The National Project on Biogas Development *

Executive Summary

The Programme

The National Project on Biogas Development (NPBD) of the Ministry of Non-Conventional Energy Sources (MNES) was started in 1981-82 for promotion of family type biogas plants, the current potential of which is estimated at 12 million, to provide clean alternate fuel to the rural masses and enriched organic manure for agriculture. The implicit objective of the programme is to reduce the use of non-renewable fuels and fuel wood. It is a central sector scheme covered under 20-point programme. In order to help the poor and the disadvantaged who can not own and operate family type biogas plants, the programme for promoting large biogas plants at the community level was taken up in 1982-83. The NPBD carries a package of incentives for the adopters, implementing agencies and the turnkey workers.

The Evaluation Study

The NPBD has been receiving public attention and scrutiny because of its potential as an alternate source of cheap and renewable source of energy, and also because of its poor performance, high mortality rate of plants (see chapter 6) and high central subsidy. Based on the lessons learnt through feedback from findings of research studies and from their own monitoring system, the MNES has been modifying the implementation strategy for NPDB from time to time. However, there is no evidence to suggest whether the performance of NPBD has actually improved.

At the instance of MNES, the Programme Evaluation Organization (PEO) took up the evaluation of NPBD primarily to examine if the implementation methods being currently followed are contributing to increased adoption of family type biogas plants and to reduced mortality and non-functionality rates. Through diagnostic analysis, the study aims at identifying the factors contributing to the success and failure of the programme. In addition, the study is designed to reflect on the viability of alternate strategies to realize the biogas potential in the country.

Methodology

To test the hypotheses implicit in the study objectives, information/ data was collected from both secondary and primary sources. The secondary data was collected through structured questionnaires for state, district, block, village, implementing agencies and regional biogas training centre level functionaries. The primary information was collected through a sample survey of 615 biogas users and 740 non-users of biogas from 133 villages in 62 districts representing 19 major states.

* The Study conducted by Programme Evaluation Organization, Planning Commission, Government of India (May, 2002).

Planning and Implementation

During the Eighth Plan, the achievement with regard to installation of FTBPs was reported to be 128% of its target of 7.5 lakh plants. Encouraged by this, the Ninth Plan target was enhanced to 12.6 lakh plants. In the first three years of the Ninth Plan, however, only 39% of this target was sought to be achieved, using 64% of Plan allocation. This discrepancy demonstrates the deficiencies in the planning mechanism of NPBD. In fact, the reporting system and data base of MNES leave much to be desired, and any planning based on this data-base can not be regarded as scientific.

To achieve its stiff targets, the MNES adopted a target oriented and top-down approach for implementing the programme through a large number of agencies, each competing with the other because of the incentives involved. The unhealthy competition among the implementing agencies has led to (a) substandard quality of construction and materials, (b) overlooking of the eligibility and sustainability criteria, (c) possibility of double counting and over reporting of achievements and (d) problem in fixing accountability for failure /non-functionality. This could be avoided by earmarking specific area to specific agency by MNES.

Physical Performance

The MNES has achieved 97% to 108% of annual targets during the five years, 1995-2000. Large variation in performance is also seen across the states. In 1995-96, West Bengal achieved 200% of its target, while Gujarat only 54%. Though, at the state level, the achievement as worked out from secondary data seems impressive, one would take the reported achievement with a pinch of salt because of the inadequacies in implementation and reporting system.

Achievement of Target and Functionality rate of biogas plants at different levels*

(In percent)

Functional Level	% Achievement of target in 1998-99	Functionality rate during 1995-96 to 1999-2000
State (19)	108.4	86.0
District (41)	96.2	84.4
Block (38)	78.4	77.4
Village (133)	-	72.7
Sample HHS	**-**	**55.3**

The information presented above shows declining achievement levels as one moves down from the state to the grassroots level. The table also presents data on functionality of plants installed during the reference period. Here too, one observes the same inconsistencies in secondary data. The PEO survey data show that functionality of plants is much lower than that being reported by the implementing agencies at different levels. Though these estimates can not be taken as representative for the entire programme, this piece of information certainly raises a question about the credibility of the reporting system of the scheme.

* Source: PEO Survey.

All this tends to suggest that the actual achievement is much lower than what is being reported by MNES and that the entire reporting system of NPBD scheme warrants a thorough review, both for accuracy and internal consistency.

Financial Performance

The NPBD is a central sector scheme with additional subsidy being provided by some of the states to promote the programme. A major part of the allocation (around 75% in 1993-94) normally goes for subsidy. About 60% of the sample households have, however, indicated that subsidy is not important to them as family type biogas plants are being adopted generally by the well-to-do farmers. It has also been observed that reduction in the level of subsidy during 1998-99 did not have much adverse impact on the performance of NPBD.

There are reports from Andhra Pradesh, Madhya Pradesh and Gujarat that a few plants have been subsidized fully for economically/socially weaker sections through additional subsidy provided by the state government without looking into the sustainability of these plants. Most of these plants are lying non-functional.

Mismatch between release of resources and receipt by states on the one hand, and between aggregate receipt and expenditure at the state level on the other, has been observed. However, adequate explanation for these discrepancies could not be provided in the report for lack of information.

Monitoring and Supervision

As stipulated by MNES in its guidelines for implementation of NPBD, all plants during their construction need to be supervised to check for quality of materials as also to ensure that the specifications for construction are adhered to. It is also mandatory that 1-5% of the plants constructed at a given point of time be inspected by state level officials, followed by 5-10% verification at the district level and 100% at the block/village level before release of the subsidy. But, there are quite a few instances of subsidy being paid without actual inspection of the plants, and / or while the plants await commissioning. In the absence of physical verification, the dissemination of information from village to block, block to district and district to state, is supplemented through monthly/quarterly progress reports prepared by turnkey workers, mostly without field visits. In order to have better monitoring and supervision, MNES may involve Panchayat level officials for verification of subsidy claims of the plant owners

Repair and Maintenance

The main reasons for plants becoming non-functional are structural and operational problems, non-availability of cattle/dung, easy availability of other convenient fuels, chocking of inlet/outlet, corrosion/leakage in pipeline, scum formation in digester slurry and water accumulation in gas pipe. Some of the problems could have been rectified by the beneficiaries themselves, had they been trained properly about preventive maintenance.

Only 11% of the sample households having defective plants, got their plants repaired during the reference period. The government scheme of repair introduced in

1993-94 also did not evoke much response. The scheme is re-introduced recently, during 2000-2001, to set right all those plants, older over five years, not in use primarily due to structural defects. However, the success of this scheme is also doubtful. This is because the services for repair and maintenance provided by implementing agencies are so unsatisfactory and inadequate that FTBP is not considered a dependable source of energy. Many users have already switched over to alternate fuels and many others are using it as a supplementary source.

MNES spends over Rs.3,000 for installation of every new plant, while with this amount, as many as three plants can be repaired easily. The trade off between installation of new plants and making unused plants functional need to be evaluated to improve the quality of spending and better impact. Perhaps, it may be appropriate to have **target holidays** of 2 years, during which resources can be redirected to make all installed plants functional.

Training, Research and Development

For training, research and development, MNES spends an amount of Rs. 50 lakh every year. But a major chunk of the amount, over two third, goes towards salary and contingency of staff engaged in biogas activities. There are nine biogas training centres across the country. These centres conduct four types of training programmes for masons, turnkey workers, staff engaged in biogas development and the users, against the target assigned by MNES annually. With a little amount left for training and R&D, the training centres find it difficult to make both ends meet. The worst hit area is the training of users. Out of 1620 training programmes targeted during 1997-98 to 1999-2000, 773 programmes have actually been conducted. The quality of training also varies widely. In five states, although, a majority of beneficiaries are trained, there is no tangible impact on the level of performance.

Major Findings

Family type Biogas Plant

- A majority of biogas user households are well-to-do farmers holding a sizeable amount of agricultural land exceeding 2.5 acres while about 5 percent of them do not own any agricultural land (Chapter 7).
- About 75% of the owners of functional FTBPs have reported substantial saving in the cost of cooking fuel. 90% of them have reported that use of enriched slurry has reduced the cost of chemical fertilizers. (Chapter 7).
- Sanitary linked biogas plants have a lower acceptability rate due to socio-psychological inhibitions in respect of routine operation of these plants (Chapter 7).
- Only 45 percent of the plants are working fully, while plants working partially are 10%, incomplete 3.6%, uncommissioned 5.9%, non-operational 26.2% and dismantled 9% (Chapter 7).
- Over 60 percent of plants turned non-functional due to various structural problems. Most of these are from Orissa (43%) and Maharashtra (46%) (Chapter 7).
- A small proportion of households (3.4%), mostly among SC/ST category, do not have any dung to operate their plants (Chapter 7).

- Most state level biogas cells are overstaffed, while in districts staff deficiency was felt in all the states leading to inadequate supervision during construction as also physical verification of plants at different levels (Chapter 3).
- Many households, nearly 90%, are not aware about government scheme of repair of defective plants (Chapter 6).
- Financing of biogas construction through institutional sources is not considered a viable proposition. Only 11% of the sample households availed this facility (Chapter 5).
- The average size of cattle holding of the owners of functional biogas plants is found to be 5.23, while that for the owners of non-functional plants works out to 3.19.
- The household demand for family type biogas plants is influenced by factors like availability of alternate convenient fuels (LPG), distance of a village from the nearest town and inconvenience in handling and maintaining biogas plants (Chapter 7).

Community Biogas Plant

- The MNES has almost discontinued the promotion of community biogas plants in the past five years. During this period, only 9 such plants have been installed of which 8 are in Madhya Pradesh.
- Only 7% of the CBPs surveyed, are functional. A similar study on CBPs conducted in the past by Agricultural Finance Corporation, Mumbai has indicated a functionality rate of 12%.
- The main factors contributing to the success of CBPs are the smaller number of participating members (around 15), more members from occupational category of agriculture and animal husbandry (77%) and higher monthly family income of the members.
- The main reasons for failure are: larger number of members, non-contribution of monthly maintenance charges as well as dung, non-availability of labour to operate the plant and complaints about non availability of gas, unsuitable timing of operation, non-cooperation of members for repair/ maintenance, etc.

Impact of the Programme

The NPBD has the potential for generating socio-economic benefits in the form of reduction in the use of non-renewable energy for cooking/lighting supply of enriched biomass for agriculture increased employment opportunities (about 30 mandays in construction of a 2 m^3 plants and also in repair and maintenance) and improved quality of life for the rural households. The overall socio-economic impact can indeed be substantial if the proportion of users and intensity of use of biogas in rural areas goes up several times their present levels.

In the sample villages (PEO survey) only 7% of the households were found to be using bio-gas, often as a supplementary source of fuel. Obviously, the impact is not significant even though the programme has remained operational for about two decades. The findings of the PEO study tend to suggest that realization of the potential will remain a distant dream without fundamental changes in the existing design and implementation of NPBD. Though this study was not designed to suggest such major modifications in strategies, some possible directions have been indicated in the relevant section.

Potential for Family Type Biogas Plants

Alternate estimates of family-type biogas potential are available from both the official and non-official sources, which vary from 12 million to 22 million family type plants in the country. Such estimates are derived purely on technical parameters, such as bovine population, dung availability and cattle ownership across households. PEO also made an attempt to arrive at one such assessment on the basis of 1991-92 cattle census and using the MNES's criteria of cattle ownership, which worked out to 24 million biogas plants (Annexure 4.2).

The extent of realization of potential thus derived depends on the factors that impinge on household fuel consumption behaviour. These factors relate to the socio-economic characteristics of households and certain community level indicators of wellbeing (see findings above). Though no attempt was made to derive the effective demand for family type biogas plants, the following example gives an idea of the differences that can exit between **technically derived potential** and **realizable potential.** In the PEO survey, the average size of cattle ownership of households having functional biogas plants works out to more than 5 cattle heads. If this information is used, the potential for family type biogas plants comes down from **24 million to less than 11.7 million** (Annexure 4.3). If other factors such as household income, education level and availability/cost of alternate fuels are used alongside this, the realizable potential of FTBP **will be much less than 11.7 million.** This example tends to suggest that any strategy to realize the potential for family-type plants must give due weightage to the socio-economic behaviour of households/ communities.

Strategy to Realize Biogas Potential

The biogas potential in the country is certainly much more than what is often referred in the context of Family Type Biogas Plants. Through technological improvement and considering the availability of other biomasses and waste material, it would be possible to raise the potential of biogas. A multi-pronged strategy need to be devised to realize the biogas potential. No doubt, the acceptability to use family-type biogas plants can be raised from its current level of 30 lakh plants substantially if certain corrective measures, such as ensuring strict adherence to the norms of construction, repair and maintenance, rationalization of implementation methods to avoid unhealthy competition among the agencies, strengthening monitoring and supervision, etc. are taken. Though all these necessary steps should be taken to realize the potential of family type biogas plants, the experience during the last two decades has shown that even with best efforts, the proportion of the total biogas potential that can be realized through this strategy alone, will still be very small. Success of NPBD will depend largely on the ability to raise the use of biogas several times its current level by bringing a larger proportion of households within its ambit, by expanding non-domestic use of biogas in areas where commercial fuels are being used, by raising the potential of biogas through technology development and by making biogas sustainable without unjustified level of budgetary support.

However, large scale use of biogas and realization of its potential may not be possible in a distorted policy environment where alternative fuels, such as electricity, kerosene, diesel and LPG are subsidized and where fuel wood can be collected without much cost to the household. If such policy distortions can not be corrected

because of socio-political compulsions, the development of biogas will be possible only through extension of similar fiscal incentives to it. It is, however, expected that the new development paradigm characterized by globalization and liberalization will gradually remove the constraints arising out of policy distortions and a congenial environment for development of biogas would eventually ensue.

In the meanwhile, efforts must be directed to expand the programme in the areas which have shown signs of success and which hold the promise. One way would be to encourage the use of medium size plants being currently used by several welfare institutions and NGOs. PEO field teams observed that 90% of the institutional biogas plants were functional. However, the greater part of the potential has to be realized through Community Biogas Plants (CBPs) of large capacities. Lessons need to be learnt from past experience and new ways of making such plants functional must be found.

Perhaps, it would be appropriate to assess the viability of CBPs in a different context. Some aspects that merit attention in the new scenario are:

- Whether the day-to-day operation of CBPs can be contracted out.
- Whether it is possible to develop a market for dung, enriched slurry and biogas in rural areas so that the day-do-day operation can be commercialized and made self-sustainable.
- Whether CBPs can be made commercially viable by linking them to related programmes, such as rural water and sanitation, underground irrigation, rural street lighting, etc.
- Whether subsidies currently being given to kerosene, diesel and electricity in rural areas can be reduced through promotion of CBPs.
- Whether technological improvement is possible for using bio-wastes (other than dung and night-soil) as input for biogas.
- Whether CBPs are viable in the framework of social benefit-cost analysis as its social and environmental benefits are likely to far out-weigh the direct benefit to individuals.

Other factors may also be important to work out the viability of CBPs. It would be appropriate to engage the best technical and socio-economic research institutions to work on the new concept, design, implementation and viability of CBPs.
