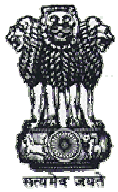
Evaluation Study

On

National Project
on
Biogas Development



Programme Evaluation Organisation
Planning Commission
Government of India
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Content

Preface

The origin of the National Project on Biogas Development, launched in 1981-82 by the Ministry of Non-Conventional Energy Sources, can be traced back to 1970s when successive oil crises and their fallout effect on economic growth necessitated development of alternative sources of energy. Though the socio-economic and environmental impact of biogas is well recognized, NPBD has been receiving public attention and scrutiny in India because of its vast potential on the one hand and its poor performance, high mortality and non-functionality rates on the other. At the instance of MNES, the Programme Evaluation Organization (PEO) undertook evaluation of NPBD primarily to examine if the implementation methods being currently followed are contributing to increased adoption of family type plants and to reduced mortality and non-functionality rates. The study is also designed to identify the factors contributing to success and failure, to examine the efficacy of family type biogas plants as an instrument to realize the biogas potential and to reflect on alternate strategies for biogas development.

The major findings of the study are:

- A majority of biogas user households are well-to-do farmers.
- Only 45 percent of the plants are working fully and another 10 percent are being used partially.
- The average size of cattle holding of owners of functional biogas plants is found to be 5.23 as against the criteria of 3 used for estimating potential.
- While the secondary data available with MNES/State Governments indicate impressive achievement and functionality rates, the primary data do not support such figures, thus raising a question about the credibility of the reporting system of the project.
- The project does not seem to have significant impact as only 7% households in the sample villages were found to be using biogas, often as a supplementary source of fuel.
- In order to harness the potential of biogas, there is a need to bring a much larger proportion of rural households in the ambit of NPBD. This is possible only through creation of large biogas plants at community level. The report has suggested a new strategy for realizing the biogas potential, as it is not possible for the majority of rural households to own and operate FTBPs.

PEO encourages the participation of planners, implementing agencies and other stakeholders in the preparation of the design and implementation of its evaluation studies. The summary of findings and draft reports are also circulated among the concerned officials to seek their views and suggestions before finalizing the report. The summary of findings of this study was also circulated among the concerned officials of Planning Commission and MNES, some of whom offered valuable suggestions. We express our gratitude to all those who responded to our request.

The study received continuous support and encouragement from Deputy Chairman, Minister of State for Planning, Chairman (EAC) and Secretary, Planning Commission. The study was designed and directed by Shri V.K. Bhatia, Joint

Adviser who was ably assisted by Shri Balwinder Pal, Senior Economic Investigator at the headquarters of PEO. The efforts put in by Shri D. Routray, Consultant, PEO in the preparation of tabulation plan, data management and drafting of the report deserve a special mention. The analysis of data and report writing was carried out under my overall guidance and supervision. The Regional /Project Evaluation Offices of PEO under the guidance and supervision of the headquarters, conducted the sample survey and prepared qualitative notes on the basis of their own observations. This data base and the notes form the core input to the analysis and findings of the study.

The contribution of the officers of NIC (YBU) in computerized analysis of survey data and the help and cooperation extended by the officials of MNES at various levels is acknowledged with thanks.

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New Delhi
Dated: May, 2002

Evaluation Study of
The National Project on Biogas Development [*]

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

* Source: PEO Survey.

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.

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.

Chapter 1

Introduction

The Scheme

The National Project on Biogas Development (NPBD) was launched during 1981-82 for the promotion of family type biogas plants to provide clean and convenient fuel for cooking and lighting in rural areas and enriched organic manure for use in conjunction with chemical fertilizers in agricultural fields, improve sanitation and hygiene by linking toilets with biogas plants, and reduce the drudgery of women. The programme for promoting community and institutional biogas plants (CBP/IBP) was started in 1982-83 with the objective of setting up large-sized biogas plants in villages and at institutions having assured and regular availability of large quantities of cattle waste and thereby benefit the weaker sections of society. It was supplemented by the scheme for setting up large-sized plants linked with community toilet complexes in 1993-94 in order to recycle human waste for improving sanitation.

Implementation

1.2 The project is implemented through State Nodal Departments and Agencies, Khadi and Village Industries Commission (KVIC), national level Non-Governmental Organisations (NGOs) and National Dairy Development Board (NDDB). In turn, State Governments and KVIC are involving a large number of grass roots level NGOs and trained village technicians in the construction and maintenance of biogas plants. Nine Biogas Training Centres, located in the various states are providing the training, technical back up and publicity support in a decentralized manner.

Potential and Achievement

1.3 About 9.6 lakh biogas plants were installed during the Eighth Five Year Plan period, against the plan target of 7.5 lakh biogas plants. During 1997-98 and 1998-99 respectively about 1.75 lakh and 1.50 lakh plants have been set up. A cumulative total of over 28.63 lakh family type and 2674 community type biogas plants have been installed in the country up to 1998-99, thereby covering about 24% of the estimated potential.

1.4 On the basis of availability of cattle wastes and ownership pattern of livestock, the Advisory Board on Energy in its report published in May, 1985 indicated a potential for setting up 16 to 22 million small biogas units in the country. However, MNES and Ninth Five Year Plan Document have indicated a potential of 12 million plants based on 1981-82 livestock census and availability of cattle dung. During the Ninth Plan, a target of installing 12.6 lakh plants has been fixed, while the proposed Tenth Plan target is 15 lakh plants.

Estimated Cost of Family Type Biogas Plant

1.5 The estimated cost of a common 2 cubic metre capacity family type fixed dome Deenbandhu Model Plant is about Rs. 12,000/- in North Eastern States, Rs. 10,500/- in other hilly areas and Rs. 8500/- in plain areas.

Financial Assistance

1.6 The NPBD has been receiving financial support from both budgetary and non-budgetary sources. The non-budgetary support comes from the Reserve Bank of India (RBI) and National Bank for Agriculture and Rural Development (NABARD). During the Ninth Plan, an outlay of Rs. 294 crore has been earmarked for the programme.

1.7 A fixed amount of central subsidy is given to the beneficiaries irrespective of model and size of plants which varies from Rs. 1800/- for normal areas to Rs. 6500/- for north eastern region states and Sikkim. An additional central subsidy of Rs. 500/- per plant is given for linking the plant with sanitary toilets.

1.8 A sum of Rs. 500/- per plant is also given as turnkey job fee to the approved entrepreneurs, trained masons and technicians, State Corporate bodies and NGOs for installation of plants on a turnkey basis. This fee is higher i.e. Rs. 700/- per plant in North Eastern States (excluding plain areas of Assam). In addition, financial assistance is provided to the households at the rate of Rs. 2500/- per plant for a kit to modify the diesel engine besides service charges being provided to the implementing agencies linked with a given target range.

1.9 Financial assistance is also given to the Regional Biogas Development and Training Centres (RBDTCs) for organizing various types of training courses.

1.10 A non-recurring grant of Rs. 10,000/- and a recurring grant of Rs. 20,000/- per year are given to a Biogas Extension Centre for organizing users courses in the villages.

1.11 During 1999-2000, a total of Rs. 59.51 crore has been released to state governments and implementing agencies against the budgeted outlay of Rs. 59.50 crore. A budget estimate of Rs. 61.70 crore has been made for the year 2000-2001.

Publicity

1.12 At the central level, advertisements are issued in the print media highlighting the benefits of biogas technology and details of the financial assistance given. The state nodal departments and nodal agencies are using different media for awareness generation and publicity. Implementing agencies like SDA, KVIC, NDDB etc. are also taking up intensive campaign on biogas in selected villages.

Monitoring

1.13 The state nodal departments and agencies conduct 100% physical verification at the block level before forwarding the subsidy claim to MNES. Sample verification of about 5-10% of the plants is done by the staff of the state headquarters. The services rendered by turn key workers and NGOs are monitored periodically by State Governments and implementing agencies. The RBDTCs and Regional offices of MNES carry out field inspections on a random basis.

Need for Taking up Evaluation Study.

1.14 The NPBD has been receiving public attention 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 and high central subsidy. The MNES has been getting the scheme evaluated periodically for identifying the constraints to progress and for introducing mid-course corrective measures. The scheme was evaluated in 1986-87 to examine the changes taken place from time to time. The NCAER has completed three rounds of evaluation studies and also was involved in Socio-Economic Cost-Benefit analysis of the project. The NPBD has also been evaluated by CAG during 1985-93. However, most of the studies conducted so far laid emphasis on only one or a few aspects of the scheme. No diagnostic and comprehensive evaluation of the scheme has been undertaken so far. Hence, the MNES has requested PEO to take up the study to examine all the relevant aspects relating to the design, implementation and impact of the scheme.

Chapter 2

The Evaluation Study – Objectives and Methodology

At the instance of the Ministry of Non-Conventional Energy Sources (MNES), the Programme Evaluation Organisation has taken up the evaluation study on National Project on Biogas Development Programme to examine the performance, implementation mechanism and impact of the scheme. In consultation with the MNES, it was decided to confine the evaluation study to the following objectives:

Objectives of the Evaluation Study

2.2 The main objectives of the evaluation study are :

1. To assess the physical & financial performance of the NPBD.

2. To evaluate the adequacy of implementation mechanism including monitoring mechanism and the methods of financing.

3. To assess the factors contributing to the success of working biogas plants and also those contributing to mortality and sub-optimal performance.

4. To reassess the potential for setting up of family type biogas plants.

5. To study the socio-economic profile of the beneficiaries and suggest methods of identifying the potential users.

6. To examine the viability of community based biogas plants and of extending their coverage to families, who cannot afford family type biogas plants.

7. To study the impact of NPBD in terms of socio-economic and environmental benefits to the users as well as to the nation.

8. To evaluate the impact of the awareness and publicity programme conducted under the project.

9. To identify the factors that can promote community involvement in the process of installation, maintenance and servicing.

10. To evaluate the effectiveness of the State Level Training Centres on improving functionality and availability of decentralized installation, repair and maintenance services.

11. To suggest measures for improving the performance of the scheme including identification of areas for research and developments.

2.3 On the basis of the findings, the evaluation study may suggest modifications in design and implementation of the scheme that could contribute to the improvement in performance and hence effective utilization of resources allocated to MNES and State Nodal Departments. The findings of the study may also help in identifying the areas of strength/weakness and in making diagnostic analysis of successes and failures.

Methodology

2.4 Keeping in view the objectives of the study and for testing the hypothesis, both primary as well as secondary data were collected through instruments structured at various levels. While the secondary data was collected through State, District, Block, Village, Implementing Agency and Regional Biogas Training Centre schedules, the primary information was collected through beneficiary and non-beneficiary schedules. Besides, formal and informal discussions were also held by the field teams with the nodal departments to ensure accuracy of the data.

Instruments

2.5 The following instruments were structured for collection of qualitative and quantitative data.

State, District and Block Level Schedules

2.6 These schedules were designed to collect secondary information on administrative structure, livestock population, physical and financial performance, training of users/staff, awareness/publicity, etc.

Village Level Schedule

2.7 This schedule was designed to generate data on aspects like population, literacy, availability of livestock and its distribution, availability of infrastructure, number of plants installed, role played by PRIs in installation/ maintenance/ servicing and impact of the programme.

Beneficiary Level Schedule

2.8 The beneficiary level schedule was prepared to collect primary information on profile of beneficiary households, type of fuel used, details of biogas plants installed, training, repair/ maintenance, awareness/publicity and impact of the scheme.

Non-user Schedule

2.9 This schedule was prepared exclusively to know the reasons for not installing the biogas plants and fuel use pattern of the non-user.

Household Schedule for CBP

2.10 This schedule was developed for collection of primary data from users regarding benefits from CBP and their impact.

Schedule for In-charge / Supervisor of CBP

2.11 This schedule was designed to understand the problems faced during installation and operation of such plants with special emphasis on the reasons for success as well as failure of these plants.

Schedule for Implementing Agency

2.12 This schedule was used to collect secondary information regarding implementation mechanism, staffing pattern, physical and financial progress, repair/maintenance, training, awareness/publicity, etc.

Schedule for Regional Biogas Development and Training Centre

2.13 This schedule was designed to collect secondary information on training components, monitoring/inspections, research and development in area of NPBD, etc.

Guide Points

2.14 The guide points were provided to the field teams for preparing qualitative notes on aspects like administration, implementation, physical and financial performance, maintenance, impact/benefits, overall assessment, etc. for selected states and districts.

Selection of Sample

2.15 A multi-stage sampling design was adopted in the study, which is as follows:

States covered

2.16 A total of 19 states viz. Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Orissa, Punjab, Rajasthan, Sikkim, Tamil Nadu, Uttar Pradesh and West Bengal were selected in consultation with MNES as well as on the basis of number of biogas plants installed during 1995-96 to 1998-99.

Districts

2.17 After working out average number of biogas plants per 1000 rural population for each district in the selected states and categorizing them into two categories i.e. above average and below average, a minimum of two districts and a maximum of six districts were selected by circular systematic sampling.

Blocks

2.18 One Block from each selected district was selected randomly after categorizing them in the similar way as followed for districts.

Villages

2.19 All the villages in the selected Block were categorized under two categories i.e. villages with number of biogas plants above average and villages with number of biogas plants below average. From each category, one village was selected randomly.

Households

2.20 From each selected village, five users of Biogas plant and six non-users of biogas plant from different categories as given below were selected by Circular Systematic Sampling method.

Table 2.1

Distribution of Selected Households

(No. of households)

Household Group					
General			**SC/ST**		
User of Biogas plant	**Non-User of Biogas Plant**		**User of Biogas plant**	**Non-User of Biogas Plant**	
	6 or more cattle	Less than 6 Cattle		6 or more cattle	Less than 6 Cattle
4	2	2	1	1	1

Community Biogas Plant

2.21 It was decided that from each selected state, one functional and one non-functional CBP would be selected purposively and subject to their availability

Households and In-charge for C.B.P.

2.22 Five users and six non-users of functional as well as non-functional CBP were selected randomly. It was decided to canvass Incharge/Supervisor of all the selected CBPs (both functional as well as non-functional).

Biogas Development and Training Centres

2.23 All the nine Regional Biogas Development and Training Centres providing training, publicity and technical back up support to state Nodal Departments and agencies were selected.

Coverage

2.24 The study constituted the following sample size :

1.	States	…	19
2.	Districts	…	62
3.	Blocks	…	62 (61)*
4.	Villages	…	124 (133)
5.	Users	…	620 (615)
6.	Non-users	…	744 (740)
7.	CBP	…	38 (13)
8.	Users – CBP (Functional & Non-functional)..		190 (74)
9.	Non-users – CBP (Functional & Non-functional)		228 (85)
10.	In-charge – CBP (Functional & Non-functional)		38 (13)
11	Implementing agencies		62 (69)
12.	Biogas Development and Training Centres		9 (10)

Note : 1*. Dang district in Gujarat constituted one block only.
2. Figures in parentheses represent the actual sample size against the envisaged.

Reference Period

2.25 The reference period for the study was 4 years i.e. 1995-96 to 1998-99. But later on, this was extended up to 1999-2000 on the request of MNES.

Orientation of the Field Teams

2.27 The study design and the instruments of observation were finalized in the meeting of REOs and PEOs held on 26-28th July, 2000 at Headquarters. The REOs, in turn, held orientation programmes for their respective field staff in the first half of August, 2000. The study was launched in the field in the second half of August, 2000.

Chapter 3

Planning and Implementation Mechanism

The Ministry of Non-Conventional Energy Sources (MNES) earlier known as the Department of Non-Conventional Energy Sources (DNES) has been entrusted with the planning, promotion, organization and implementation pertaining to the National Project on Biogas Development (NPBD) in the country since 1981-82. Its function consists of providing financial assistance to a network of agencies involved in the programme for promotion of the activity apart from support for training and publicity. It also provides staff support in a few selected hilly/difficult terrain states such as Jammu & Kashmir, Mizoram, Sikkim and other North-Eastern States at the state as well as the district level for carrying out implementation work under NPBD.

Allocation of Targets by MNES

3.2 MNES sets the target for five years and annual plans after taking into account the capacity of the implementing agencies and resources available for the plan after consultation with Planning Commission. After the approval of annual plan outlay, the MNES fixes the targets for various states/implementing agencies keeping in view their past performance, untapped potential in their respective states and other related factors. The progress is reviewed during the year and mid-course corrections, if necessary, in regard to their targets are carried out. As against the potential of 12 million biogas plants in the country, 12.72 lakh biogas plants had been installed country by the end of the Seventh Plan. The Eighth Plan target for NPBD was 7.5 lakh biogas plants, against which the achievement was reported as 9.6 lakh biogas plants. Encouraged by this achievement, the Ninth Plan target was fixed at 12.6 lakh biogas plants. The outlay for Ninth Plan was fixed at Rs. 264 crore. During the first three years of the Ninth Plan, while the physical achievement has been 4.93 lakh biogas plants (39% of the target), the expenditure has been to the extent of 64% of the outlay. It is observed that the targets fixed for annual plans have no relevance to the target for the five-year plans.

Network of Agencies

Nodal Agencies

3.3 The NPBD is implemented by a wide network of agencies, most of which are State Government Departments like the Department of Rural Development, Agriculture, Science & Technology etc. In some states, the programme is run by the Rural Energy Development Agencies/Corporations. Out of 19 states, where the field survey was conducted, the Rural Development Department is implementing the programme in 7, followed by the Department of Agriculture 4 and the Agro-Industries Development Corporation 2. In the remaining States, all the promotional aspects of NPBD are looked after by the Rural Energy Development Agencies except Andhra Pradesh, where it is looked after by Energy Development Corporation. In case of Andhra Pradesh, Arunachal Pradesh, Bihar, Gujarat and Meghalaya, the funds are directly released to the implementing agencies following the advice of the respective

state governments. The state-wise break up of agencies involved in the implementation under NPBD is given in the following table and Chart 3.1.

Table 3.1

List of agencies associated with the State Govts. for implementation of NPBD

Name of the State	Nodal Department.	Implementing Agency		
		State Government Department	Energy Dev. Agency	Other Agency
Andhra Pradesh	-		Non-Conventional Energy Dev. Corpn. (NEDCAP)	KVIC
Arunachal Pradesh	-		Arunachal Pradesh Energy Dev. Agency (APEDA)	KVIC
Assam	Rural Dev. Deptt.	Rural Dev. Deptt.	-	KVIC
Bihar	-		Bihar Energy Dev. Agency	KVIC
Gujarat	-		Gujarat Agro-Industries Corpn. (GAIC)	KVIC NDDB
Haryana	Deptt. of Agriculture	Deptt. of Agriculture	-	KVIC
Himachal Pradesh	Deptt. of Agriculture	Deptt. of Agriculture	-	KVIC
Karnataka	Deptt. of Rural Dev. & Panchayati Raj	Deptt. of Rural Dev. & Panchayati Raj	-	KVIC
Kerala	Deptt.of Agriculture	Deptt. of Agriculture	-	KVIC/ SDA
Maharashtra	Deptt.of Rural Dev.	Deptt.of Rural Dev.	-	KVIC
Madhya Pradesh	*Deptt. of Agriculture		(i) .Madhya Pradesh State Agro Industries Dev. Corp. (MPSAIDC) (ii) Madhya Pradesh Urja Vikas Nigam (MPUVN)	KVIC
Meghalaya	-		Meghalaya Non-Conventional & Rural Energy Dev. Agency (MNREDA)	KVIC
Orissa	*Deptt. of Science & Technology		Orissa Renewable Energy Dev. Agency (OREDA)	KVIC
Punjab	Deptt. of Agriculture	Deptt. of Agriculture	Punjab Energy Dev. Agency (PEDA)	KVIC
Rajasthan	Special Scheme & Integrated Rural Dev. Deptt.	Special Scheme & Integrated Rural Dev. Deptt.		KVIC
Sikkim	Deptt. of Rural Dev.	Deptt. of Rural Dev.		KVIC
Tamil Nadu	Deptt. of Rural Dev.	Deptt. of Rural Dev.		KVIC
Uttar Pradesh	Deptt. of Rural Dev.	Deptt. of Rural Dev.		KVIC
West Bengal	* Deptt. of Science & Technology	Deptt. of Cottage & Small Scale Industries.		KVIC

* Not involved in actual implementation but receives funds from MNES and transfers it to the implementing agency.

Involvement of Other Agencies

3.4 In order to make the scope of the programme wider for a greater acceptability and also to bring about a healthy competition among agencies for a speedy growth of NPBD, the agencies like Khadi & Village Industries Commission/Khadi & Village Industries Board (KVIC/KVIB) were included under the purview of the programme during its initial years of inception. Subsequently, area specific agencies such as the National Dairy Development Board (NDDB), Anand, Sustainable Development Agency (SDA) Kanjirapally, All India Women's Conference (AIWC) and South Asia partnership India (SAP) New Delhi, were inducted in the programme and given independent targets by the MNES. SAP was associated with this programme, till the year 1997-98 only. The KVIC is implementing the programme in all the sample states, as may be seen from the table above. However, in a few larger states, it has regional offices to oversee implementation of NPBD at the district level with the help of Asstt. Development Officer/Supervisors. The agencies such as NDDB, AIWC, SDA, etc. which are area based, are operating on a low scale. The installation work handled by these agencies (AIWC, NDDB, SDA, SAP) at the aggregate level accounts for about 2-7 percent of the plants set up in the country.

Organisational Set up Under NPBD

3.5 Generally, a two tier set up, one at the state and the other at the district level, has been found in all the major states, except Meghalaya and Sikkim, where the volume of work is considerably low. In the first stage, a set of officers are associated at the state headquarter level for overall monitoring of the programme including that of drawing, disbursement, allocation of targets and providing regular feedback, while in the second and the last stage at the district, there happens to be an in-charge in the rank of an officer assisted by a few supervisors/technicians, who regulate the implementation activities at the field level. None of the agencies have staff posted at the block or down below at the panchayat/village level.

3.6 The KVIC has a few supervisors/technicians at the state level earmarked for all Non-conventional Energy Programmes other than in the states of Andhra Pradesh, Bihar, Uttar Pradesh, etc. where the activities are managed by a few regional offices. Similarly, in the states like Meghalaya, Sikkim and Arunachal Pradesh, where the work load is not much, the installation activity is taken up with the help of the staff posted at the headquarter only. The implementing agencies such as NDDB, AIWC, SDA etc., have a centralized staffing pattern, staff being posted only at the headquarter of the concerned implementing agencies.

Set up and Functions of the State/District Level Officials In-charge of Biogas.

3.7 As revealed from the field enquiry, two sets of officers either administrative or technical are made responsible for biogas development in each state at the state or at the district level. These officers, in addition to attending biogas work, perform several other duties in connection with other rural energy programmes apart from attending to agricultural/ rural development programmes. The biogas work mainly include acting as overall in-charge, maintenance of accounts/ releasing of subsidy,

monitoring and evaluation, inspection of plants, preparation and submission of progress reports and distribution of targets, etc.

3.8 At the state level, in all, there are 68 administrative and 55 technical officers accountable for NPBD in the 19 states covered in the sample. In a majority of states (16), the administrative officer is acting as the overall in-charge of biogas while this responsibility is vested with the technical officers in the remaining three states.

3.9 The technical officers, apart from attending biogas activities as overall in-charge in some states, tend to look after other Non-Conventional Rural Energy Schemes (NRES) such as wood based gasifier, wind monitoring/mapping, installation and supervision of solar devices, bio-mass survey, etc. These officers in some states also monitor the activities pertaining to the 20-point and other rural development programmes being implemented in their states.

Adequacy of Staff

3.10 The administrative as well as technical staff taken together is considered more than adequate at the state level. On an average, there are more than 6 persons involved in NPBD in a state level biogas cell varying from 2 in Bihar to as large as 18 in Gujarat. However, the biogas cell at the headquarter level of Meghalaya is understaffed with one Project Director looking after all rural energy programmes in the state apart from a field assistant.

3.11 However, at the district level, staff paucity in respect of technical staff is reported in almost all the states except Bihar (BREDA), Madhya Pradesh (MPUVN) and Assam. The district offices are invariably overstaffed in these three states. The implementing agency in Orissa (OREDA) has reported the acute shortage of technical staff at the district level. Due to scarcity of funds with the agency, some 13 Junior Engineers who were on duputation from other departments and posted at the district level to oversee the process of implementation have been sent back to their parent departments. Similarly, in Tamil Nadu, there is no staff at Nilgiris district and out of 28 districts in the state, there are 5 technicians posted in 5 districts besides the district level in-charge, who is looking after administration, in addition to his other usual work. In a number of districts in Uttar Pradesh, there is no technical staff available for inspection of the plants before release of the subsidy. The Punjab Energy Development Agency (PEDA) also reports shortage of administrative as well as technical manpower in most of its districts. In Andhra Pradesh (NEDCAP), due to shortage of technical staff at the district offices, the subsidy is released in a number of cases even without physical verification of the plants.

3.12 At the block level or down below, no staff is earmarked exclusively for biogas by any of the implementing agencies. However, the implementing agencies such as Rural Development Department and the Department of Agriculture, takes the help of their extension officers posted at the block level and also village level functionaries (VLW) for publicity and motivation, whenever necessary.

3.13 As evidenced, in the states where the government departments themselves are implementing the NPBD, there is no staff exclusively assigned for biogas

promotion either at the state or district level. This holds good for other states too where energy development agencies are involved in the programme. The implementing agencies in general, takes the help of the existing staff busy in other activities. The work pertaining to the biogas development is the additional responsibility assigned to them. As such, the NPBD work is not being attended to by them on priority. In some cases, these agencies avail the services of the hired staff on deputation from other departments for a fixed period of time. In addition, the positions are subject to frequent transfers. Hence the attachment of the staff towards the programme is rarely felt.

Role of NGOs

3.14 Beside the State Nodal Departments/Implementing Agencies, the KVIC is a major stake holder in the NPBD, claiming a lion's share of 20 to nearly 30% per year. However, the role of other agencies such as NDDB, AIWC etc. at the aggregate level, is found to be limited as may be seen from the table below and Chart 3.2.

Table 3.2

Share in the Achievement of Targets by various Agencies

Year	State Nodal		KVIC/KVIB		Others*		Total	
	Achieve-ment	% of Total	Achieve-ment	% of Total	Achieve-ment	% of Total	Achieve-ment	% of Total
1995-96	125608	75.6	37666	22.7	2746	1.7	166020	100.0
1996-97	125128	75.7	36421	22.0	3882	2.3	165731	100.0
1997-98	116352	69.3	47900	28.5	3594	2.2	167842	100.0
1998-99	108181	75.1	32868	22.8	2983	2.1	144032	100.0
1999-2000	115565	72.3	33346	20.9	10887	6.8	159798	100.0

* Others include NDDB, AIWC and SDA

Functional Linkage Between Agencies

3.15 The Rural Development Department as also the Department of Agriculture have the advantage of utilizing the services of the Panchayat/agriculture extension officers and village level workers for promotion of biogas through their functional linkages at district, block, panchayat and village level. But this facility is not available to the other implementing agencies having set up only upto the district level. In West Bengal and Orissa where Nodal Department is not involved in the programme implementation, the functional linkages between the Nodal Departments and the implementing agencies are reported only at the headquarters level. But inter-agency functional relation between different agencies involved in NPBD is not a regular practice in most of the states covered in the sample. Also, there is wide variation in the performance of various agencies against the target assigned by the MNES. This variation is across the agencies as also in different years. The agency wise achievement as per cent of the target is given in the following table and Chart 3.3.

Table 3.3

Performance of various agencies against targets allocated by MNES

(In percent)

Year	Agency of Installation			
	State Nodal	KVIC/KVIB	Others	Total
1995-96	85	140	100	106
1996-97	100	81	108	94
1997-98	89	120	100	98
1998-99	116	110	107	110
1999-2000	116	95	120	100
Total	**96.2**	**105.0**	**110.5**	**97.8**

3.16 For the country as a whole, during the reference period, i.e. 1995-96 to 1999-2000, the MNES had dispensed with a target of 7,98,013 family type biogas plants irrespective of agencies. As against this, the achievement during the period was reported to be 8,03,127 i.e. 0.6% higher compared to the All-India target.

Monitoring of NGO Activities

3.17 There is no set mechanism to monitor the activities of the NGOs. It is obligatory on the part of the KVIC and other agencies such as NDDB, AIWC etc. to keep the state nodal department/agencies posted with the relevant information about the biogas plants set up by them from time to time to avoid any duplication. But the survey team has not come across any such stipulation being followed in many states such as Andhra Pradesh, Haryana, etc. But as far as the local NGOs engaged by the district level implementing agencies are concerned, the progress made by them is monitored by the concerned agencies, either by a visit at the plant site or through monthly/quarterly reports.

Role/Duty Defined

3.18 It is only in the context of adequacy of manpower that the role and duties of each functionary is defined. Otherwise, the same person is found to perform several duties at a time, in most of the districts. As reported by the survey team, the role of each functionary is defined and delineated in the states of Andhra Pradesh, Haryana and Madhya Pradesh, while in the remaining states, the role of functionaries engaged in biogas programme at the various levels is not well defined.

Availability of Trained Manpower

3.19 The training programme targeted for the user, staff, mason and the turnkey workers assumes a great relevance in the context of the success of NPBD. The MNES is spending quite a good amount every year for orientation of those involved in the programme implementation. Till the year 1996-97, there were 18 Regional Biogas Development and Training Centres (RBDTC), sponsored by the MNES

located mostly in Agricultural Universities in different states. The number has been reduced to 9 due to under-rating of their performance over the years resulting in non-availability of the facilities in many states. The states which are not covered under the existing RBDTC are Bihar, Uttar Pradesh, Maharashtra and Kerala. However, the States like Arunachal Pradesh, Gujarat, Madhya Pradesh, Meghalaya, Orissa and Sikkim being attached to some centres or the other, are not in a position to depute manpower regularly for training at the location of the centre due to financial constraint of the implementing agencies. Some states in isolation or in addition to RBDTC, run their own training programmes either through allocation under State Plan Sector or funded by the MNES. These programmes are implemented with the help of biogas extension centers. In some states, such as Tamil Nadu, Uttar Pradesh, Punjab and Kerala, these centres apart from conducting training programme for users, have undertaken few training courses for staff, mason and turnkey workers, which is also felt inadequate. The orientation programme arranged by Regional Biogas Development and Training Centres is also awfully inadequate, details being discussed in Chapter 6. There was a general feeling that the trained manpower is too meagre to handle a massive programme like biogas, when the installation activities are taken up simultaneously in each and every district that too in a number of block/villages within a district at a time. Hence, the training base may suitably be strengthened to accommodate more courses specially for mason, staff and turnkey worker.

State Level Coordination Committee

3.20 In a majority of states, a state level coordination committee although exists, it rarely meets. But in the states like Bihar, Meghalaya, Madhya Pradesh, Arunchal Pradesh, Assam and Sikkim, this Committee does not exist. There are reports of this committee meeting once in 3-4 years, again not regularly in the states like Andhra Pradesh, Orissa, Rajasthan, Punjab. The committee is expected to look into the aspects relating to coordination among agencies involved in biogas as also the convergence of programme (NPBD) with other rural development programmes of the government taken up in the area for minimizing cost of operation and efforts. Other issues relating to the exchange of information by the implementing agencies to eliminate bogus subsidy claims and revision of unit cost etc. are normally discussed in this meeting.

Following is the composition of the Committee :

1. State Level in-charge of the Nodal Implementing Agency.

2. Director/representative of KVIC.

3. Representative of MNES as the case may be.

4. Representative of RBDTC

5. Representative of other implementing agencies as the case may be.

6. Representative of NABARD/other financial institutions.

Publicity and Awareness

3.21 Although publicity measures adopted by the centre and the state have resulted in installation of a large number of biogas plants across the country by now, on several occasions, these materials rarely reach at the village level, where actual installation takes place. Again the targeted population staying in remote areas have little access to the electronic media. Hence, it is felt that the machinery for undertaking publicity and awareness programme should be well equipped and made more effective. The evaluation team did not come across any publicity material claimed to have been published in the states like Madhya Pradesh (MPSAIDC), Bihar, Meghalaya and Assam. This may be the case in a few more. In fact, at the block/village level, the user training was the only source of motivation for installation of biogas plants, as reported by a large proportion of beneficiaries in the sample villages.

Financing of Biogas Plants

3.22 The Central subsidy is an important motivating factor for adoption of biogas plants. This covers about 25% of the cost of a plant under general category households. In North Eastern states, where the unit cost of a plant is relatively higher than that of other areas, the subsidy component alone accounts for over 60% of the cost of a plant. It is only in the context that a household, who is not in a position to afford for the difference in the cost (gap between subsidy and cost), is forced to go for financing the plant through his personal sources. The commercial as well as cooperative banks have long been associated with the programme. These banks provide loan for construction of biogas plants under NABARD re-finance scheme following the guidelines of RBI. But the response is not quite good in view of the fact that it is not a viable proposition. Also because of little access to a number of stipulations laid down by the financial institutions such as guarantee, default payment etc. many households have not come forward even to apply for loan as may be seen below.

Table 3.4

Beneficiaries classified by availability of bank loan

No. of beneficiaries surveyed	615	
No. of beneficiaries applied for loan	63	(10.2%)
No. of beneficiaries sanctioned loan	62	(10.1%)
No. of beneficiaries denied loan	1	(0.2%)

3.23 Availing bank loan for construction of biogas plant appeared no longer a problem for a majority of households, who availed loan for this purpose. It is observed that 82% of them got the amount sanctioned within a month of their application, while for nearly 13%, the waiting time was between 2-3 months. About 5% households had to wait for more than 4 months to get the loan amount released from the bank. The only household in Punjab who applied for bank loan failed to get the amount due to cumbersome procedure and non-cooperative attitude of the bank

officials. There were 11 households who reportedly borrowed the amount for construction of biogas plants through private sources such as friends/relatives (7), employer and other sources (4). It is also quite surprising to note that no one among sample households has ever borrowed the amount from more than one sources. It has also been observed that over 60% of the beneficiaries, who availed loan from banks got the help of implementing agencies officials for filling up loan application as also getting the payment, while 31% beneficiaries managed through the village/panchayat level workers.

Monitoring Mechanism

3.24 The monitoring and supervision is an important aspect of NPBD. As stipulated in the guidelines for implementation of NPBD, all the plants during their construction need to be supervised 2-3 times to check if any substandard material has been used. Similarly, the subsidy claims as laid down by MNES, need to be settled only after all the plants are physically inspected by the district level officials and a certificate of commissioning is obtained duly countersigned by the beneficiaries. It is also mandatory that 1-5% of the plants constructed at a given point of time are inspected by the state level officials at random followed by 5-10% verification at the district level and 100% at the block/village level, before release of the subsidy and other claims. But none of these obligations are met fully in any state. If at all a few plants have actually been inspected at the state/district level or down below, there is no evidence of a report to this regard being compiled in any state at the aggregate level. In the absence of adequate staff at the district with none of the implementing agencies for physical verification of the plants installed, the dissemination of information from village to block, block to district and so on is supplemented through the monthly/quarterly progress reports prepared by the turnkey workers, mostly without any field visit. This holds good even for KVIC, where the Rural Energy Technician (RET) holds the charge of this activity. The trend is similar in all the sample states. Although it is binding on the part of each RBDTC to do sample verification of 500 plants installed at a particular period of time, except Jorhat where the number is fixed to 100, this target is rarely met owing to inadequate supervisory staff with the centres as may be seen below :

Table 3.5

Inspection of plants by RBDTC

(No. of plants)

Name of the Centre	Year		
	1997-98	1998-99	1999-2000
APAU,Hyderabad	20	100	51
AAU, Jorhat	3	6	18
TNAU, Coimbatore	548	507	611
IIT, Kharagpur	600	260	380
HPAU, Palampur	392	511	507
HAU,Hissar	51	87	46
PAU, Ludhiana	240	240	240
CATE, Udaipur	207	187	128
VAS, Bangalore	538	507	510
Total	**2599**	**2405**	**2491**

Indicators Monitored

3.25 The main indicators being monitored at the state as well as the district level are the realization of targets on a monthly and quarterly basis, followed by disbursal of subsidy and other financial commitments under NPBD. The other aspect monitored at the district level, is the compilation and submission of periodical progress report every month/quarter to the state level implementing agencies. The state level implementing agencies, with whom the accountability rests, in turn, keep the relevant information posted to the MNES. The Monthly Progress report required to be sent to MNES by 8th of every month contains information on –

- Annual target
- Number completed up to previous month
- Addition during the month
- Cumulative (up to the end of the month)

3.26 Similar information is also sought for the training courses. However, the quarterly progress report sent by 15th of the month following each quarter, contains additional information on :

- number of plants inspected
- number found non-functional
- number revived
- utilization of bank loan
- publicity campaign undertaken

Role of Turnkey Worker

3.27 The turnkey worker, otherwise known as Rural Energy Technician (RET) under the threshold of KVIC, is a key person under NPBD, particularly when the district level biogas staff is not adequate to undertake motivation, publicity, identification of beneficiaries, arrangement of construction material, trained masons, selection of plant size, supervision of construction, release of subsidy, etc. A turnkey worker, in addition to providing repair services on payment for defective plants beyond warranty, also undertakes free maintenance of the plants during their warranty period constructed under his supervision. He, despite playing a significant role in the promotion of NPBD, is found to confront with a number of problems in respect of arranging token money for initial registration in the district and releasing of job fees after the plant is commissioned. He feels that the amount of Rs. 500 paid to him, in lieu of his services in plain areas and Rs. 700 in hilly/difficult terrain which restricts his movement considerably, is much less and not tuned to his responsibility of maintaining the plants for a period of 3 years. At the Annual Renewable Energy Conference on “Policy Perspective 2000-2012” held on 23-24th May, 2000 at Vigyan Bhawan, New Delhi, almost all states and agencies emphasized the need to increase the rate of turnkey job fee under NPBD, as the present rates were fixed about a decade ago. Again the KVIC and a few more implementing agencies are following the pattern of retaining 25% of the turnkey fees for three years to ensure that the post installation repairs are attended to by the concerned turnkey worker without fail. The turnkey workers in general do not appreciate such a stipulation. In

Andhra Pradesh, the implementing agency (NEDCAP) deducts Rs. 200 per plant towards the service charges provided to the turnkey worker in respect of arranging materials at the plant site, transportation and other related expenses incurred during installation. In view of this, a number of turnkey workers are leaving NEDCAP to join the Sustainable Development Agency (SDA).

3.28 On an average, nearly 500 turnkey workers are trained every year (Chapter–6) in the country, of which hardly 50% are available for involvement in the programme due to problems as indicated above. Again, many of those trained, do not find a place in the system owning to stipulations laid down by the implementing agencies. Since the TKWs are contractually engaged for a year, subject to renewal every year, which is not certain, it is but natural to feel insecure. Hence, a sense of dedication towards the programme is rarely being noticed in a number of instances.

Follow up Action in Case of Shortfall in Target

3.29 At the district level, only physical targets are monitored. Except putting pressure on the TKW/RET, there is no other effective mechanism to ensure the realization of targets. At the same time, it is also not possible to depute additional manpower (turnkey worker) from one district to the other, because of accountability of the TKW to a particular district. However, within a district, it is quite possible for a TKW to undertake the additional responsibility in case of shortfall in the target of his counterpart working in the nearby areas. But this too is not done in any state.

Summary

3.30 The NPBD is one of the largest ambitious programmes of the Ministry of Non-Conventional Energy Sources incepted way back in 1980s. The operation involves an annual outlay of nearly Rs. 70 crores against a targeted coverage of over 1.5 lakh family type biogas plants in the country. Of this amount, the MNES spends over Rs. 50 crore, while the remaining portion is shared between the states. In the first three years of the Ninth Plan, 39% of the Ninth Plan target of installation of biogas plants have been achieved with 65% of the outlay.

3.31 The major stake holders under the programme are various state government departments such as Agriculture, Rural Development, Science & Technology, Small Scale and Cottage Industries besides a few Energy Development Agencies/ Corporations sponsored by the state governments. The involvement of these departments and agencies/corporations in the programme is to the tune of nearly three fourth of the total assignment. Apart from these, the KVIC also handles over a fourth of the activities. There are a few area based agencies like NDDB, AIWC, SDA, etc. which claim a share of about 2 per cent in the programme

3.32 The funds released by MNES under CFA basically aims at providing subsidy to the adopter of biogas, service charges/staff support to the implementing agencies, turnkey fees, training, publicity and awareness.

3.33 The monitoring of the programme is generally done at two levels, i.e. through staff assigned the responsibility at the state and district. Down below the district where actual implementation takes place, no one is made accountable, except the turnkey worker who has no stake in the programme.

Problem Areas

3.34 While state level staff accountable for biogas promotion is reported adequate in a majority of states, the district level set up is understaffed in almost all the districts surveyed. The monitoring machinery is also ill-equipped at every stage for want of supervisory staff at the district level. For want of a set mechanism, the repair and maintenance service of older plants also has taken a back seat. The publicity and awareness is an important but neglected area under NPBD. Although, MNES spends a lot of amount every year to increase awareness, no perceptible dent has been observed in the level of acceptability of the programme for want of effective machinery to take up the issue. The importance of training under NPBD is also overlooked due to inadequate funding pattern by the MNES. As reported by quite a few biogas training centres, due to fund crunch, they have not been able to organize required number of training programmes because of shortage of trainers. Most trainees also found to lack seriousness and quit in between the programme owing to a low stipendiary provision. In the absence of any cadre staff for biogas, a sense of dedication and seriousness towards the programme is not felt at any stage. Those involved in the programme, are found to be busy in several other activities at a time that too without any priority for biogas. Institutional financing for biogas is infrequent inspite of RBI's guidelines to the commercial as well as cooperative banks for easy flow of funds for biogas under NABARD's refinance scheme. This is because the beneficiaries in general fail to show interest because of lengthy and cumbersome procedure in the sanction of such loans.

Chapter 4

Physical Performance

All investment projects of social values in general and individual interest in particular require periodic appraisal in terms of physical performance against a given target over years to marginalize the short comings in the process of implementation, if any. It is in this context that the present study on evaluation of National Project on Biogas Development (NPBD) has been taken up by the Programme Evaluation Organization (PEO) of the Planning Commission. In this chapter, an attempt is made to analyse the data collected from the selected states, districts, blocks and villages for the period 1995-96 to 1999-2000 to assess the physical performance under NPBD. The indicators monitored for reviewing physical performance under NPBD are achievement of targets, both physical and financial, potential for biogas, Monitoring and supervision, publicity and awareness, availability of trained manpower and convergence of the facility with other programmes of the government.

Fixation of Targets

4.2 During the field visit, the study team interacted with the State Nodal Departments/Agencies to find out the criteria adopted for fixing the targets. It was understood that, at the state level, the targets are fixed by the Ministry of Non-Conventional Energy Sources (MNES) and communicated to Nodal Departments/ Agencies in the beginning of financial year. In most of the states, the targets are fixed on the basis of past performance in relation to allotted targets as well as biogas potential in the area. The methodology adopted for distribution of targets in the selected states is given in the following Table and Chart 4.1.

Table 4.1

Criteria used for fixing the targets for installation of Biogas Plants

(N=19)

Criteria adopted	No. of States adopting
Past performance	11 (58%)
Potentiality in the area	6 (32%)
As per demand of RETs/NGOs	6 (32%)
Cattle population/availability of dung	5 (26 %)
Availability of funds	4 (21%)
Geographical conditions/area of the districts	3 (16%)
Staff position in the nodal department	3 (16%)

Source : State Level Schedule (NPBD – 1)

Note : Because of more than one criteria adopted, total may not add up.

4.3 For the selected districts and other agencies, the same criteria that is, past performance, potential of the area, number of applications received, cattle population, etc. are used for fixation of targets. The various criteria adopted for fixation of targets for the selected districts are given in the Table 4.2 and Chart 4.1.

Table 4.2

Criteria used for distribution of targets in the selected districts.

(N=62)

Criteria adopted	No. of districts adopting
Past Performance*	50 (81%)
Potential of the area	23 (37%)
No. of applications received/public demand	13 (21%)
Cattle population	11 (18%)
Availability of funds	6 (10%)

Source : State Level Schedule (NPBD – 1)

Note : Because of more than one criteria adopted, total may not add up.

Criteria Used for Distribution of Targets at Other Levels

4.4 At the block level, criteria such as potential, local demand by NGOs/RETs etc. were found to be the basis for distribution of targets. Likewise, at the village level, capacity of self employed workers (SEWs), availability of manpower, awareness of people, etc. were taken into consideration, while fixing the targets.

Physical Performance at National Level

4.5 An overview of performance scenario during Eighth Five Year Plan period indicates that about 9.6 lakh family type biogas plants were installed against a target of 7.5 lakh biogas plants. During 1998-99 and 1999-2000 about 1.50 lakh and 1.68 lakh plants respectively were installed. A cumulative total of over 30.30 lakh family type and 3075 community type biogas plants have been set up in the country up to 31.3.2000.

4.6 The information in respect of performance of family type biogas plants installed in the selected states, districts, blocks and villages was collected for the reference period of the study. The information thus collected has been analysed in the following paragraphs.

Performance Across the States

4.7 The physical performance of any programme, to a large extent depends upon available potential, availability of resources, manpower, linkages with other programmes etc. While analyzing the performance/achievements these issues have been given due consideration.

4.8 The physical performance (number of plants installed) in all the sample states during reference period of the study is given in Annexure 4.1. It appears from the Annexure (col.14) that a total of 29,53,765 plants have been installed as on 31.3. 2000. Among states, Maharashtra topped the list with 6,68,375 (22.63%) plants being installed in the state so far. This was followed by Uttar Pradesh having installed 10.91% and Gujarat 10.27% of the total plants. It has also been observed that about 53% of the plants were installed in 4 of the 19 sample states. With regard

to year-wise installation, the maximum number i.e. 1,67,846 plants were set up in the year 1997-98 and the minimum i.e. 1,44,032 plants during 1998-99.

4.9 The information in respect of plants installed in relation to targets allotted was also collected and analysed for all the selected states. The achievement under NPBD in different states when analysed revealed that in the states like West Bengal and Tamil Nadu, except the year 1996-97 and Madhya Pradesh, except for the period 1997-98, the level of performance is quite high. Even the achievement level in West Bengal during the year 1995-96 is over two hundred percent, while in Gujarat, it is over 53 percent during the corresponding period. Across the years, the level of achievement also varies. In the year 1997-98, it is as good as 108% compared to nearly 97% in 1995-96 at the aggregate level. The percentage achievement of targets for the selected states is given in the following table and states classified by achievement of targets during 1995-2000 is depicted in Chart 4.2.

Table 4.3

Percentage Achievements in selected States

State	Plants Commiss-ioned as on 31.3.1995	Percentage Achievement during					Plants Commiss-ioned as on 31.3.2000
		1995-96	1996-97	1997-98	1998-99	1999-2000	
Andhra Pradesh	167497	96.5	104.1	99.8	99.7	87.6	265011
Arunachal Pradesh	74	100	100	104	97.8	114.7	827
Assam	* 14856	133	97.4	96.1	103.4	94.2	41724
Bihar	* 84564	82.8	80.5	90.6	105.6	94.9	112340
Gujarat	239021	53.7	93.1	80.6	90.4	98.3	303314
Haryana	28162	115.3	103.9	93.6	148.9	70.1	38474
Him. Pradesh	36292	79.4	103.9	111.1	103.3	102.5	41754
Karnataka	162230	83.5	101.5	73.1	108.4	76.2	270959
Kerala	44562	80.2	80.2	86.8	99.8	74.6	61001
Madhya Pradesh	* 92133	125.2	115.3	80.2	108.7	187.0	191147
Maharashtra	583041	98.8	99.8	109.2	115.2	108.1	668375
Meghalaya	345	100	100	100	100	100	1245
Orissa	93516	103.1	110.9	104.5	100.8	84.2	146072
Punjab	34589	85.3	93.4	95.1	88.5	106	62393
Rajasthan	54229	101.2	114.2	101.7	131.9	101.2	63846
Sikkim	1373	114.9	100.5	74.8	85.9	107.2	2485
Tamil Nadu	* 177619	112.3	65.6	135.0	155.3	129.4	196391
Uttar Pradesh	250458	101	95.5	99.7	95.4	78.3	322245
West Bengal	* 86077	201.5	162.5	**198.19**	177.07	106.8	164162
ALL STATES	**2150638**	**96.75**	**102.05**	**98.19**	**108.41**	**99.55**	**2953765**

- Information furnished by MNES

Table 4.4

Achievement of Targets in Selected States

Year	States with achievement		
	More than 100%	**More than 80%**	**Below 80%**
1995-96	1. Arunachal Pradesh	1. Andhra Pradesh	1. Gujarat
	2. Assam	2. Bihar	2. Himachal Pradesh
	3. Haryana	3. Karnataka	
	4. Meghalaya	4. Kerala	
	5.Orissa	5. Maharashtra	
	6. Rajasthan	6. Punjab	
	7. Sikim		
	8. Uttar Pradesh		
	9. Madhya Pradesh		
	10. Tamil Nadu		
	11. West Bengal		
1996-97	1. Andhra Pradesh	1. Assam	1. Tamil Nadu
	2. Arunahal Pradesh	2. Bihar	
	3. Haryana	3. Gujarat	
	4. Himachal Pradesh	4. Kerala	
	5. Karnataka	5. Maharashtra	
	6. Meghalaya	6. Punjab	
	7. Orissa	7. Uttar Pradesh	
	8. Rajasthan		
	9. Sikkim		
	10. Madhya Pradesh		
	11. West Bengal		
1997-98	1. Arunachal Pradesh	1. Andhra Pradesh	1. Karnataka
	2. Himachal Pradesh	2. Assam	2. Sikkim
	3. Maharashtra	3. Bihar	
	4. Meghalaya	4. Gujarat	
	5. Orissa	5. Haryana	
	6. Rajasthan	6. Kerala	
	7. Tamil Nadu	7. Punjab	
	8. West Bengal	8. Uttar Pradesh	
		9. Madhya Pradesh	
1998-99	1. Assam	1. Andhra Pradesh	NIL
	2. Bihar	2. Arunachal Pradesh	
	3. Haryana	3.Gujarat	
	4. Himachal Pradesh	4. Kerala	
	5. Karnataka	5. Punjab	
	6. Maharashtra	6. Sikkim	
	7. Meghalaya	7. Uttar Pradesh	
	8. Orissa		
	9.Rajasthan		
	10. Madhya Pradesh		
	11. Tamil Nadu		
	12. West Bengal		
1999-2000	1. Arunachal Pradesh	1. Andhra Pradesh	1. Haryana
	2. Himachal Pradesh	2. Assam	2. Karnataka
	3. Maharashtra	3. Bihar	3. Kerala
	4. Meghalaya	4. Gujarat	4. Uttar Pradesh
	5. Punjab	5. Orissa	
	6. Rajasthan		
	7. Sikkim		
	8. Madhya Pradesh		
	9. Tamil Nadu		
	10. West Bengal		

District Level

4.10 In the year 1999-2000, achievement of targets in the sample districts was quite impressive compared to other years. But for a majority of years, it was below the expected level. In the first and last year of the survey, the physical achievement figures exceeded the target by over 5 per cent in 1995-96 to nearly 33 per cent in 1999-2000, while for other years, it was below 100 percent ranging from 93 and 99 percent in 1997-98 and 1996-97 respectively. This may be seen below :

Table 4.5

Targets and Achievements in selected districts

Year	Number of plants		
	Target	Achievement	% Achievement
As on 31.3.95	-	349760	-
1995-96	29885	31488	105.4
1996-97	29990	29673	98.9
1997-98	34719	32486	93.6
1998-99	27032	25996	96.2
1999-2000	17862	23699	132.7

Block Level

4.11 Since inception of the programme in 1981-82, a total of 44,456 biogas plants have been installed up to 31.3..2000 in all the 61 selected blocks. Out of these, 16,724 plants were installed during reference period of the study i.e. 1995-96 to 1999-2000. Year-wise achievement in relation to targets in 38 out of 61 blocks for which the data was available during reference period is given below:

Table 4.6

Targets and achievements in selected blocks

Year	Number of plants		
	Target	Achievement	% achievement
As on 31.3.95	-	27737	-
1995-96	2149	2007	93.4
1996-97	2552	2398	94.0
1997-98	2753	2403	87.3
1998-99	2221	1742	78.4
1999-2000	NA	2778	-

4.12 The performance in relation to the achievement of targets in 38 blocks for which information was available, is not quite impressive for any of the years under study. The reason for shortfall in the achievement at this level was due to inadequate staff to motivate the villagers to adopt biogas.

4.13 It has been observed that there is a wide variation in the level of achievement indicated at the various levels e.g. during 1998-99, while the states reported achievement of 108.4% of the target, at the district and block levels it was reported as 96.2% and 78.4% respectively (Chart 4.3)

Village Level

4.14 In the selected villages (133), the survey team came across 2502 plants being installed and commissioned at different time intervals. All these commissioned plants when categorized by their current status at the village level revealed that a majority of them, nearly 73%, are in use after being commissioned against over 55% functioning in the country at the household level. The distribution of plants by their status of use at the village level is given below :

Table 4.7

Biogas plants classified by status at village level

Name of the State	No. of Villages	No. of Family Type Biogas Plants (Cumulative)		
		Number Installed	Commissioned and in use	Commissioned but not in use
Andhra Pradesh	12	268	176 (65.7)	92 (34.3)
Arunachal Pradesh	4	19	13 (68.4)	6 (31.6)
Assam	4	17	14 (82.4)	3 (17.6)
Bihar	4	27	15 (55.6	12 (44.4)
Gujarat	10	167	125 (74,9)	42 (25.1)
Haryana	5	34	22 (64.7)	12 (35.3)
Himachal Pradesh	4	23	0 (0.0)	23 (100.0)
Karnataka	12	121	93 (76.9)	28 (23.1)
Kerala	5	125	114 (91.2)	11 (8.8)
Madhya Pradesh	10	80	62 (77.5)	18 (22.5)
Maharashtra	12	919	660 (71.8)	259 (28.2)
Meghalaya	4	50	48 (96.0)	2 (4.0)
Orissa	6	56	39 (69.6)	17 (30.4)
Punjab	4	126	114 (90.5)	12 (9.5)
Rajasthan	4	37	15 (40.5)	22 (59.5)
Sikkim	4	32	28 (87.5)	4 (12.5)
Tamil Nadu	5	109	35 (32.1)	74 (67.9)
Uttar Pradesh	10	62	27 (43.5)	35 (56.5)
West Bengal	14	230	219 (95.2)	11 (4.8)
Total	**133**	**2502**	**1819(72.7)**	**683 (27.3)**

4.15 A total of 2502 FTBPs have been installed in all the selected villages as on 31.3.2000. On the basis of information available, as many as 1819 (72.7) plants were reported to be commissioned and in use. Among selected villages in the sample states, the highest number of plants i.e.919 were reported to be installed in the state of Maharashtra. This was preceded by Andhra Pradesh (268) and West Bengal (230) plants. On the contrary, a minimum number i.e. 17 was reported in the selected villages of Assam. This was followed by 19 in Arunachal Pradesh and 23 in Himachal Pradesh. **It was also observed that, in Himachal Pradesh, all the plants were reported to be non-functional whereas in the sample villages of Meghalaya, 96% of the total plants were reported to be in use.**

Physical Performance Vis-à-Vis Availability of Technical Staff

4.16 The study team did not find any correlation between the level of achievement of physical targets and number of technical persons available in different districts to oversee implementation. Even in the states like Assam and Rajasthan, where technical staff for biogas is limited to one in each district, the achievement of targets

in these states is over 100 percent compared to between 90-97% in the states such as Andhra Pradesh, Bihar and Punjab with an average of more than 3 technical persons per district. The situation is not much different in the remaining states. In the absence of any technical as also administrative staff at the selected districts in Meghalaya, the achievement is 100% in all the years under study as shown below :

Table 4.8

Availability of technical staff vis-à-vis physical performance

State	No. of districts selected	No. of tech. persons	Average achievement in (%)
Andhra Pradesh	6	23	97.3
Bihar	2	6	90.9
Punjab	2	7	93.7
Assam	2	3	100.2
Rajasthan	2	3	110.0
Meghalaya	2	-	100.0

4.17 Instead, administrative staff is far excess in 6 selected districts of Karnataka, i.e. 18 against 5 technical followed by 13 against 7 in Madhya Pradesh and 14 against 9 in West Bengal. Interestingly, all the 10 persons in the selected districts of Uttar Pradesh and 4 in Kerala are from administrative discipline.

Status of Biogas Plants

4.18 The survey team, during the course of field operation, contacted the state level nodal/implementing agencies in various states to find out the current status of plants from the record they maintain. **A majority of states failed to provide this information as because the records are not maintained properly while only 6 were able to provide the details.**

State Level

4.19 The information pertaining to the present status of family type biogas plants at the state level was available in respect of 6 out of 19 selected states as indicated below :

Table 4.9

Status of FTBPs in selected states as on 31.3.2000

State	Status of Plants				
	Commissioned and in use	Commissioned but not in use	Incomplete	Dismantled	Total
Gujarat	299117	3920	-	-	303037
Haryana	32777	5697	-	-	38474
Meghalaya	603	7	-	5	615
Orissa	83637	5344	-	57091	146072
Punjab	58102	4000	191	100	62393
Sikkim	1569	498	310	108	2485
Total	**475805 (86.0)**	**19466 (3.5)**	**501 (0.1)**	**57304 (10.4)**	**553076 (100.0)**

Note : Figures in parenthesis are percentage to total.

4.20 It has been observed from the table that 86% of the plants were reported to be in use in the six states for which the break-up was available. On the contrary, a small percentage (3.5) of plants was reported not in use. Moreover, a little over 10% plants were still lying incomplete.

District Level

4.21 At the district level, the information regarding status of FTB plants was available for 41 districts out of 62 selected for the study. The information thus received and presented in table 4.10 reveals that a little over 84% plants were reported to be in use and about 11 per cent were not in-use. The percentage of in use plants was even less than that of reported at state level.

Table 4.10

Status of FTBPs in selected districts

State	No. of Districts selected for the study	No. of Districts for which break-up available	Status of plants					
			Commissioned and in use	Commissioned but not in-use	In-Complete	Dismantled	Sanctioned but not installed	Total
1.Andhra Pradesh.	6	4	34929	2853	-	4305	-	42087
2.Arunachal Pradesh	2	1	24	3	1	-	-	28
3 Assam	2	1	357	4	-	-	-	361
4. Bihar	2	2	1816	390	-	-	-	2206
5. Gujarat	5	3	32373	831	-	-	-	33204
6. Haryana	2	1	555	253	-	50	-	858
7. H.P.	2	0	-	-	-	-	-	-
8. Karnataka	6	1	11789	762	-	220	-	12771
9. Kerala	2	1	3352	28	-	-	-	3380
10. M. Pradesh	5	3	7659	614	-	-	-	8273
11.Maharashtra	5	4	145109	15470	-	5660	-	166239
12.Meghalaya	2	2	240	16	-	-	6	262
13 Orissa	3	3	13730	2885	-	1239	-	17854
14. Punjab	2	1	3161	10	76	1908	-	5155
15. Rajasthan	2	1	147	584	-	69	-	800
16. Sikkim	2	2	1140	445	260	21	-	1866
17.Tamil Nadu	2	2	5114	2120	-	92	-	7326
18.Uttar Pradesh	5	5	5965	6364	3	3566	6	15904
19.West Bengal	5	4	34792	4717	112	59	-	39680
All States	**62**	**41**	**302252 (84.4)**	**38349 (10.7)**	**452 (0.1)**	**17189 (4.8)**	**12 (Neg)**	**358254 (100.0)**

Source : District Level Schedule (NPBD-2)

Block Level

4.22 Also a similar attempt was made at block level to know the status of FTBPs. Table 4.11 shows that taking 38 blocks together for which the information was made available, a little over 77 per cent were reported to be in use and about 13 per cent were not in use. It has been observed that there was a further decrease in percentage of plants in use when compared with state and district.

Table 4.11

Status of FTBPs in selected blocks

State	No. of Blocks selected for the study	No. of blocks for which break-up available	Status of plants				
			Commissioned and in use	Comssioned but not in use	In-complete	Dis-mantled	Total
1.Andhra Pradesh	6	3	579	140	-	183	902
2.Arunachal Pradesh	2	2	25	4	10	-	39
3. Assam	2	2	67	2	-	-	69
4. Bihar	2	0	-	-	-	-	-
5. Gujarat	4	0	-	-	-	-	-
6. Haryana	2	1	52	20	-	7	79
7. H.P.	2	0	-	-	-	-	-
8.Karnataka	6	1	282	31	-	-	313
9. Kerala	2	0	-	-	-	-	-
10. M. Pradesh	5	5	1477	230	4	153	1864
11. Maharashtra	5	5	14911	1913	-	1664	18488
12. Meghalaya	2	0	-	-	-	-	-
13. Orissa	3	3	1696	516	-	146	2358
14. Punjab	2	1	585	-	-	43	628
15. Rajasthan	2	2	34	51	13	261	359
16. Sikkim	2	2	1020	437	235	21	1713
17. Tamil Nadu	2	2	266	216	2	47	531
18.Uttar Pradesh	5	5	426	331	-	247	1004
19. West Bengal	5	4	2826	122	-	17	2965
All States	61	38	24246 (77.4)	4013 (12.8)	264 (0.9)	2789 (8.9)	31312 (100.0)

Source : Block Level Schedule (NPBD –3)

Observation

4.23 A downward trend has been noted with regard to in-use plants i.e. 86% at state level, 84% at district level, 77% at block level, 73% at village level and only 55% at household level (Chart 4.4). This is so because the maintenance of records at higher level does not seem to be authentic. Moreover, progress reports for submission to higher authorities are prepared arbitrarily and without physical verification of plants.

Constraints in Achieving the Targets

4.24 It has been noted that in many states the realization of targets was not up to the mark during the reference period of the study. In this connection officers of state as well as district nodal departments were interviewed. During the course of discussion various reasons were advanced by them. Following constraints were reported at state level :

Table 4.12

Major constraints in achieving targets at state level

(N=19)

Constraints	No. of States
Non-availability of technical manpower	11 (58%)
Inadequacy of funds	10 (53%)
Subsidy received at the end of the year	9 (47%)
Targets were very high	5 (26%
Delay on the part of implementing agencies	3 (16%)

Note : Because of more than one constraint, total may not add up to 100.

4.25 It was further observed that in some states viz. Gujarat, Haryana, H.P., Karnataka, Kerala, Sikkim and Uttar Pradesh, the target realization was even below 80 per cent. All these states had reported more than one reason for that.

4.26 At the district level, the officials of the implementing agencies were interviewed to ascertain their views on the constraints faced in achieving the targets. Some of the reasons put forward by them were entirely different than those advanced by state level officers. These are listed as under :

Table 4.13

Major constraints in achieving targets at the district

(N=62)

Constraints	No. of districts
Inadequate livestock	45 (73%)
High cost of plants	42 (68%)
Lack of awareness	42 (68%)
Non-availability of technical manpower	35 (56%)
Other sources of energy are inexpensive	34 (55%)
Inadequate manpower with nodal department	32 (52%)
Inadequacy of funds	20 (32%)

Note : Since more than one constraint is reported by the households, the total may not add up to 100.

Identification of Size of Plants More Popular

4.27 An attempt was made to know the size of plants most popular in different states. For this, VLWs at village level and beneficiary households were interviewed. It was gathered that in 90 (68%) sample villages, 2 cum plants were reported to be more successful/popular. This was followed by 1 cum. size in 21 (16%) and 3 cum size in 15 (11%) sample villages. It was also noted that in the state of Andhra Pradesh, in as many as 11 villages out of 12 selected, 1 cum size was reported to be more popular . In almost all the sample states 2 cum. size was considered more useful. The following reasons were reported for its usefulness:

Table 4.14

Reasons for popularity of size

(N=133)

Reasons	No. of villages
Less dung/less number of cattle required	95 (71 %)
Suitable for small family	78 (59%)
Better gas formation/functioning satisfactory	28 (21%)
Cost is not more	22 (17%)
Easy to operate	18 (14%)
Less maintenance is required	15 (11%)

Note : Because of more than one reason given by the household, the total may not add up to 100.

4.28 With regard to sample beneficiaries, as many as 252 (41%) were found to have installed plants of 2 cum. This was followed by 202 (33%) beneficiaries having installed 3 cum. plants.

Identification of Type of Plants More Successful

4.29 Among sample villages, as many as 107 (80%) reported Deen Bandhu model biogas plant most popular at the field level. Only 6 villages in three states viz. Bihar, Andhra Pradesh and Tamil Nadu, KVIC type of biogas plants were most popular and successful. Besides, in 6 sample villages of Himachal Pradesh., Maharashtra and Uttar Pradesh, Janta type biogas plants were more successful. The following reasons were attributed for the popularity of Deen Bandhu Model Biogas Plant:

Table 4.15

Reasons for popularity of Deen Bandhu Model Biogas Plant

Reasons	No. of villages
Low cost of the plant	85 (64%)
Maintenance is easy	50 (38%)
Better performance/adequate gas is available	35 (26%)
Long life	32 (24%)
Requires less dung	18 (14%)

Note : Because the households have given more than one reason, the total may not add up to 100.

4.30 Again, at household level it was found that as many as 476 (77%) beneficiaries had adopted Deen Bandhu Model. This was followed by 74 (12%) beneficiaries adopting KVIC model and 47 (8%) Janta type biogas plants.

Community Biogas Plants

4.31 With regard to CBPs, the position is far from satisfactory as only 9 CBPs were installed during reference period of the study. As per available information, eight were installed in the state of Madhya Pradesh and one in Tamil Nadu. However, most of these plants i.e. 98% are from 9 states such as Andhra pradesh, Madhya

Pradesh, Maharashtra, Orissa, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal and belong to pre-reference period. In the case of the remaining states, not even a single community biogas plants has been set up. The reasons for such plants not being encouraged in different states have been highlighted in Chapter 8. In respect of working of CBPs, it has been noted that only 24 plants constituting 7.4% were in use.

Institutional Biogas Plants

4.32 The similar information on achievement of target was also collected in respect of IBPs and NPBs during field survey. On the basis of available information, a total of 1565 institutional biogas plants have been installed till 31.3.2002. Out of these, 1413 (90.3%) plants were reported to be in use. It has been further observed that, Uttar Pradesh occupied the first position in the list with 443 plants being installed there, followed by Punjab 400 and Tamil Nadu 176. In 3 states viz. Arunachal Pradesh, Assam and Sikkim, not even a single plant was reported to be commissioned under this category till date.

Night Soil Biogas Plants

4.33 Till the year 1999-2000. a total of 1240 NBPs have been installed in 14 states of which 289 (23.3%) were set up prior to reference period. However, there are no Night soil biogas plants in the states like Assam, Haryana, Meghalaya, Sikkim and Tamil Nadu. The West Bengal alone has a total of 978 i.e. nearly 80% of such plants. The available information regarding status of such plants reveals that 92.6% of the plants were reported to be in use. Only a small number of plants, that is 57 and 34, were reported to be not in use and dismantled respectively. Further, Uttar Pradesh was the only state, which reported installation of 72 plants during reference period. All the 72 plants were installed by KVIC and were reported to be in use.

Reassessment of Biogas Potential

4.34 The reassessment of the potential for setting up Family Type Biogas Plants was the other major objective of the evaluation study. Earlier, the estimated potential for setting up 16 to 22 million biogas units in the country had been worked out by the Advisory Board on Energy in its report entitled 'Towards a perspective on Energy Demand and Supply in India in 2004/05' published in May 1985. However, the MNES and Ninth Five Year Plan Document had indicated a potential of 12 million plants based on 1981-82 cattle census and availability of cattle dung.

4.35 The PEO has also made an attempt to reassess the potential on the basis of data collected during field survey. Keeping in view, the criteria laid down by MNES i.e. households should have 3 and more bovine and also the availability of water in the sample villages, a broad potential was estimated. This was further corrected by taking into consideration the FTBPs already installed and the perception factor of the non-users (who have the required quantity of dung). The estimate was projected on the basis of bovine population (Indian Livestock Census 1992) for the selected States. The estimated potential in the selected states is given in Annexure 4.2.

4.36 As per Col. K of the Annexure 4.2, the estimated biogas potential in the 18 selected states comes to around 24 million as against about 12 million estimated by MNES. It has been further noted that except Andhra Pradesh in all the 17 states, the reassessed potential is much more than the potential indicated by MNES and Ninth Five Year Plan Document. In as many as 11 States these estimates are 1 to 2 times higher . In 3 states, these are 2 to 3 times more. In the State of Sikkim it was substantially higher i.e. about 9 times of the potential estimated by MNES.

4.37 The estimated potential of around 24 million biogas plants calculated above is based on ownership criteria of 3 or more cattle heads for each household. The survey data, however, reveals that more than 5 cattle heads are required for functional biogas plants. Using this as a denominator, the biogas potential works out to 11.7 million (details at Annexure 4.3).

Coverage of Potential

4.38 With regard to coverage of estimated potential, Maharashtra topped the list with 70% of the biogas potential being exploited in the state so far. This was followed by Gujarat (59%), Karnataka and Kerala, 37% each. On the other hand, Rajasthan lagged behind with coverage of only 7% of the potential estimated for the state.

Constraints in Achieving Potential

4.39 However, the realization of potential may not be studied in isolation. There are other factors too. It is the level of investment that matters to a number of potential users. If supply of alternate convenient fuel is not a major constraint which is generally not when the villages are closer to motorable roads, the housewives prefer LPG to biogas because of low initial investment apart from avoiding daily operation of the plant which is a tedious job. In all these cases, although the families have enough potential in terms of cattle ownership and affordability, they may still not prefer biogas due to operational problems. As of initial investment, while an ideal size of 2 cum. biogas plant, enough for a family of 6-7 persons, costs Rs. 8000-10,000, the investment in LPG is much less, about Rs. 1,500 – 2,000. The analysis of data on the functional aspects of family type biogas plants installed at the village level indicates that plants closer to the approach road have a high mortality rate compared to those installed at a far off distance. As has been observed, failure rate of plants falls faster with increase in the distance of the village from the approachable roads as shown below :

Table 4.16

Working status of plants classified by distance from Block Headquarter

(in percent)

Distance (Km.)	Rep. Village	Plants working and in use	Plants not working
Upto 5	23	46.2	53.8
6-10	30	69.6	30.4
11-20	43	80.0	20.0
21-50	35	76.0	24.0
Above 50	2	14.3	85.7
Total	**133**	**72.7 (1819)**	**27.3 (683)**

Monitoring and Supervision

4.40 The machinery for undertaking monitoring and supervision is not effective under NPBD in any state. The basic reason behind this is the inadequacy of technical staff at the level of the districts and down below. And even if staff is adequate in a few districts, their movement is restricted because of fixed TA/DA ranging between Rs. 400-450 per month. As a result, supervision of plants during the construction is not done in many cases. So also is the position with regard to the inspection of plants before release of subsidy. Inspection as laid down by MNES at the district and state level is rarely done. Also there is no account of it in any state. The sample verification of plants on random basis by the Regional Biogas Centres is not done as per the desired norm except the centre at Coimbatore and Bangalore. In table 3.6 of Chapter 3, agency wise number of plants inspected in the last three years of the reference period is given.

Publicity and Awareness

4.41 Publicity and awareness is an important, but overlooked aspect under NPBD. Generally, at two levels, i.e. National and State, publicity campaigns are taken up with the help of electronic/print media. Several instruments used for generation of publicity and awareness among the households regarding the benefits of biogas, very often do not reach the targeted group staying in the countryside. Among various methods adopted for propagation about the usefulness of biogas, fair exhibition is most popular reported by 16 states out of 19 states covered in the sample followed by leaflets in 15 and booklets in 13. The use of other media for highlighting the use of biogas among the households is not popular in most of the states. In table 3.4 of chapter 3, instrument-wise publicity for biogas programme is given. As utilization pattern is not tuned to the requirement at the ground level, there is a need to take the help of other modes such as display panel at the place of public gathering like bus/railway station, places of pilgrimage/tourist interests, television slides or even may be introduced in the school syllabus for better use of the facility.

Availability of Trained Manpower

4.42 The training has a great relevance in the context of implementation of the programme particularly for construction, repair/maintenance, providing feedback etc. Normally, four types of training is imparted under NPBD, i.e. for user, staff, mason and turnkey worker. Generally, the training aspect under NPBD is looked after by the Regional Biogas Development and Training Centre (RBDTC) sponsored by MNES and also Biogas Extension Centre (BEC) created by the state government. As reported, most of the centres are handicapped due to shortage of trainers. In Table 6.4 of Chapter 6, the training at the aggregate level by the Biogas Extension Centre as also by Regional Biogas Development and Training Centre is given. Of the training given at the aggregate level, the share of RBDTC is separately presented in Table 6.6 of the same chapter. The orientation offered by either BEC or RBDTC is reported inadequate in terms of quantitative and qualitative assessment. Hence, MNES may examine whether necessary measures can be taken to augment the number of trainers as well as the number of courses

Convergence of the Facility with Other Programmes of the Government

4.43 There is no complementarity between schemes operated by other agencies. If the schemes undertaken by MNES were complementary to other schemes such as Jawahar Rojgar Yojana (JRY), Indira Awas Yojana (IAY), etc., implemented in rural areas for upliftment of economically and socially weaker sections of the society, the performance could have been better without the requirement of additional manpower and efforts for motivation, monitoring and supervision etc.

Summary

4.44 Physical performance is a function of investment and delivery system. It refers to the creation of assets against a given target, while delivery mechanism depends upon a variety of factors such as availability of fund and the extent of its utilization, manpower support to carry out the activity, publicity and awareness, potential available and exploited and complementarity of the programme with other schemes of the government/agency in operation in the area. This chapter discusses different aspects of physical performance in relation to available delivery mechanism, most of which are not well-equipped to sustain the activity at a desired level under NPBD. The programme gets budgetary support from centre as also from state in addition to non-budgetary support from RBI, NABARD etc. Because of delay in receipt of central allocation, under utilization of fund is reported in most of the years under study.

Chapter 5

Financial Performance

The implementation of National Project on Biogas Development across the country entails a lot of financial outlay particularly for the Government of India. In masterminding such a huge operation, the MNES, which is the nodal Ministry for the implementation of the project, spends over Rs. 50 crores every year against a tentative target for installation of over 1.50 lakh family type biogas plants throughout the country. Besides, most of the states are also funding the scheme under State Plan Sector. In some states, the funds are also raised through internal/external grants, public borrowing etc. for Additional Resource Mobilization (ARM) under NPBD. Other issues relating to payment of subsidy, its adequacy and timeliness, bank loan for construction of biogas plants, funding to regional biogas training centres, research and development in the field of biogas etc. are also being discussed in this chapter.

Sources of Fund

5.2 National Project on Biogas Development is a hundred percent Centrally Sponsored Scheme. The Central Financial Assistance (CFA) is a major component of NPBD accounting for nearly three fourth of the total financial outlay. The project costs the ex-chequer i.e. centre and the state together, a total of more than Rs. 69 crore a year, of which the state share is around 27%. The amount raised through ARM constitute hardly 0.4% of the total amount spent under NPBD in a year. The break up of receipt of funds according to source during 1995-96 to 1999-2000 by sample states is given in Annexure 5.1 and a summary at all state level is given below :

Table 5.1

Year-wise receipt of funds under NPBD

(Rs. lakhs)

Year	Receipt of funds			
	SF	CFA	ARM	Total
1995-96	1576.12	5132.41	6.92	6715.45
1996-97	2480.79	4544.65	3.02	7028.46
1997-98	2006.71	5345.00	5.12	7356.83
1998-99	1879.27	5382.46	101.95	7363.68
1999-2000	1645.03	4415.24	20.80	6081.07
Total	9587.92	24819.76	137.81	34545.49

5.3 The funds under CFA for implementation of NPBD in different states are released by MNES in two equal instalments during May-June and October every year. The release of funds by MNES as per its record during the reference period of five years under study was to the tune of Rs. 263.15 crores against Rs. 248.19 crores being shown as receipt in the records maintained by different states for the

corresponding years. The variation in the amount released by MNES and the corresponding amount received in different states in the last five years is shown below :

Table 5.2

Amount released by MNES vis-à-vis amount received in sample states

Year	Amount released by MNES	Amount received by states
1995-96	4737.74	5132.41
1996-97	4886.92	4544.65
1997-98	5440.22	5345.00
1998-99	5376.52	5382.46
1999-2000	5873.67	4415.24
All	**26315.07**	**24819.76**

Flow of Fund

5.4 Soon after the issue of Administrative Approval of the Government of India for implementation of NPBD during a year, the MNES intimates the physical as well as financial targets to each state/agency separately. Thereafter, the release of fund towards first instalment is made based on the receipt of utilization certificate in the case of State Government Departments and audited statement of expenditure in case of Nodal Agencies, KVIC, NDDB and other participating NGO's for the second preceding year. The Central Financial Assistance for each state, based on a fixed target range, is calculated at the prevailing rate, generally on per plant basis, applicable for different category of areas. An advance equivalent to 50% of CFA towards first instalment is released to State Government/U.T. Administration, KVIC and other implementing agencies for implementation of NPBD after adjustment of the unspent balance for the previous year, if any. Subsequent CFA to the Government Department/KVIC, etc. is released during third quarter only after 40% of the physical target and financial progress is achieved.

5.5 After receipt of the first instalment, the State Government/Implementing Agencies place the necessary funds at the disposal of the district authorities along with physical targets worked out for each district separately. In respect of target allocation, a top down procedure is adopted i.e. the target flowing from the district to block, block to panchayat and panchayat to village. But fund allocation is restricted only up to the district level. However, the district authorities are empowered to release the subsidy, turnkey fee etc. in respect of plants constructed at the Panchayat/village level only through reimbursement of claims on case to case basis after the commissioning of the plant and after obtaining a certificate to that effect duly countersigned by the beneficiary.

Components of CFA

5.6 Various components of Central Financial Assistance provided by MNES under NPBD consist of:

(a) Central subsidy for the adoption of Biogas
(b) Turnkey job fee
(c) Sanitary linkage of toilets
(d) Incentive for saving diesel by biogas.
(e) Service charges/staff support.
(f) Other support activities (training etc.)
(g) Communication/publicity.

5.7 However, there is no separate budgetary allocation for any of the components under CFA except for item (d), which categorises a subsidy of Rs. 2500 to each of the 500 families for purchase of a kit and other accessories to modify diesel engine into dual fuel engine. In respect of the remaining components, there seems ample flexibility in approach with regard to the expenditure incurred.

Funding by States

5.8 Apart from funds being provided by MNES under central financial assistance towards NPBD, most of the states also provide fund for the programme. The funding by state is basically aimed at providing additional subsidy to the adopters. The funding pattern under State Plan Sector is regular in states like Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Meghalaya, Punjab, Rajasthan, Tamil Nadu and Uttar Pradesh. In the states such as Arunachal Pradesh, Bihar, Haryana, Kerala, Orissa and West Bengal, the flow of state funds for NPBD is not that regular. But in the remaining states viz. Andhra Pradesh, Assam and Himachal Pradesh, there seems no budgetary provision under State Plan Sector (Annexure 5.1).

Use of Fund

5.9 While source wise receipt of amount separately under State Plan Sector, Central Financial Assistance, as also Additional Resources Mobilization etc. has been found to be compiled and made available to the study team in the sample states, the bifurcation of expenditure under corresponding sources has not been attempted at any point of time in any state. As a result, the comparison between the receipt of fund and utilization of the amount by source in different states was not possible. Hence, the receipt of fund from all sources and the expenditure incurred at the aggregate level is used for analysis purpose. The year wise break up of expenditure in respect of different states in relation to the amount received during the corresponding period is given in Annexure 5.2 and a summary at all-state level given below and also in Chart 5.1.

Table 5.3

Receipt and expenditure under NPBD during 1995-96 – 1999-2000

(Rs. in lakh)

Year	Receipt from all sources	Expenditure at Aggregate level	Expenditure as % of receipt
1995-96	6715.45	6069.00	90.4
1996-97	7028.46	6601.20	93.9
1997-98	7356.83	6688.21	90.9
1998-99	7363.68	6100.50	82.8
1999-2000	6081.07	5979.73	98.3
Total	**34545.49**	**31438.64**	**91.0**

5.10 As has been observed, the receipt of fund has been in excess of the expenditure by about 9 per cent. This may be due to the fact that the fund allocation for the last quarter of the year for a matching target of 50% biogas plants has not been utilized fully. Under utilization of fund may also be due to late receipt of funds from MNES particularly, the first instalment in the beginning of the year. In some states, the study team encountered certain problems relating to expenditure data for different years. The states of Assam and Gujarat could not furnish any information to the evaluation study team in respect of the expenditure incurred under NPBD in any of the years under study. Of course, Gujarat situation may be attributed to the recent earthquake havoc in the state during field operation but this should not be the case in other areas.

5.11 Again, the expenditure data quoted by MNES in respect of 10 states picked up at random out of 19 selected pertains to the amount only under CFA. Hence, no way comparable with the statement of expenditure made available to the REO/PEO study team against those corresponding states at the aggregate level, i.e. state fund and central assistance taken together. The expenditure data supplied by MNES under CFA for 10 states such as Andhra Pradesh, Gujarat, Himachal Pradesh, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Sikkim and West Bengal vis-à-vis those supplied by the state nodal departments/implementing agencies at the aggregate level for different years is given below :

Table 5.4

Statement of expenditure in selected states from 1995-96 to 1999-2000

Year	Expenditure at aggregate level reported by PEO	Expenditure admitted by MNES Under CFA (State share excluded)
1995-96	3297.12	2684.10
1996-97	3208.72	2416.70
1997-98	3511.87	2584.10
1998-99	2797.08	2285.00
1999-2000	2980.89	2586.70
Total	**15795.68**	**12556.70**

5.12 As brought out earlier, over a fourth of the cost of NPBD is met by the contribution from different states. Since the expenditure data admitted by MNES does not take care of the state funding to the programme, the difference between the above parameters of expenditure should be closer to the state share which is not. While the state share of NPBD is over a quarter in respect of receipt of fund under state plan sector (Annexure 5.1), the state share in the expenditure at the aggregate level works out to slightly over 20% which seems unrealistic. This is because of unsystematic method adopted in maintaining the receipt/expenditure accounts at the state/implementing agency level. Hence, the present system may suitably be modified keeping in view the uniformity and practicability to the extent possible.

Adequacy and Timeliness of Release of Funds

5.13 The fund earmarked for different components under CFA is adequate considering the present volume of operation except for the fees for turnkey worker,

training, R&D and publicity. A fee of Rs. 500/- paid to a turnkey worker is not consistent to his responsibility of maintaining the plant for 3 years and also not revised since a decade, while most other components got revised during this period. The evaluation study teams which interacted with the nodal/implementing agency officials in different states during the field operation, also felt the need of an upward revision in the turnkey fees to enable him to perform his duty with honesty and sincerity. So also is the funds earmarked for training, which need to be revised upward as a major portion of this amount is spent for salary and contingencies, leaving little for training, R&D activities. The fund requirement for publicity and awareness under NPBD is inadequately met owing to a small budget accounting for about 0.3 percent of the total expenditure on the project.

5.14 Usually, the MNES funds under CFA are released to the state nodal departments/implementing agencies by May-July every year. The release of funds to the districts takes some more time. So is the case with the availability of state fund. This is simply a delay of over 3 months. As pointed out by most of the district level implementing agencies, if the fund would have been placed at their disposal at the beginning of the year, they could have achieved a higher target.

Role of Subsidy

5.15 The importance of central subsidy needs no mention. It plays a vital role in motivating the households to adopt biogas. As expressed by nearly 40% households, had subsidy not been there, they would not have gone for installation of gas plant. But still, there are over 60% households to whom subsidy is not so much important in respect of adoption of biogas. **Since to a significant proportion of households, the importance of subsidy is not so much, further reduction in the rate may not affect the overall performance of the programme as experienced during 1998-99 in the wake of a reduction in the amount for certain categories of beneficiaries.** But this reduction should be in respect of categories, where it forms a substantial proportion of the cost. This may be done keeping in view a high mortality rate of plants among a certain category of beneficiaries, particularly in Andhra Pradesh and Madhya Pradesh. The views of the sample households classified by their perception on the importance of subsidy is given below :

Table 5.5

Perception of household on importance of subsidy

Importance of subsidy	% of households
Very important	37
Not so much	63
Total	**100**

Timeliness in the Payment

5.16 The payment of the subsidy amount after commissioning of the plant was not a matter of concern for a majority of households, over 56%, who got their dues within a month of the claims made while 35% of the beneficiaries had to wait a period between 1-3 months. The remaining households who waited in excess of 3 months

constitute nearly 10% in the sample. The distribution of households by time waited to get subsidy released is given below:

Table 5.6

Time waited to get subsidy

Months waited	% of rep. Households
Less than one month	56
Between 1-3 months	35
Between 3-6 months	5
Over 6 months	4
Total	**100**

5.17 The beneficiaries in general, have used the influences of the implementing agency officials, including the turnkey workers, to get their subsidy released after commissioning of the plants, followed by panchayat/village level officials as seen below :

Table 5.7

Role of PRI in getting subsidy released

Officials helped to get Subsidy	% of rep. Households
PRIs/VLW	23
NGO	4
Imp.Agency official/Turnkey worker	56
Others	17
Total	**100**

Problem Faced in Getting Subsidy

5.18 The receipt of the amount on account of subsidy was not reported to be a constraint for a thick majority of households, except 6%, to whom the process appeared to be cumbersome. Among these households, to a few, the problem was due to the location of the installing agency at a far-off place. Some households also experienced the non-cooperative attitude of the implementing agency officials for getting their amount released as may be seen below:

Table 5.8

The distribution of households by problem faced in getting subsidy released

Problems faced	% of rep. Households
Cumbersome procedure	80
Non-cooperative attitude of officials	20
Agency far away	17

Note : The percentage is not additive because 6 households reported more than one problems.

Mode of Payment of Subsidy

5.19 By and large, the subsidy is paid to the adopter through A/C Payee bank cheque drawn in favour of the beneficiary, if he is loanee. When the entire cost of construction of the gas plant is borne by him out of his own resources, private borrowing or both as the case may be, it is paid in cash. However, in some states such as Gujarat and Andhra Pradesh etc., the amount payable towards subsidy is being adjusted against the construction materials, such as, gas stove, burner, gate valve, pipe, nipple and the like centrally procured and supplied by the installing agency aiming at maintaining the quality and durability. But the payment is invariably linked to the commissioning of the plant that too only after issuance of a completion certificate countersigned by the beneficiary.

5.20 As per the usual practice, the state nodal departments/implementing agencies, soon after getting the release of fund from MNES along with physical targets, re-allocate the fund to each district in instalments keeping in view the tentative target of plants to be set up at a given point of time. But there is no provision for financial allocation beyond district. Since the subsidy and other claims are settled only at the district, the concerned turnkey worker is asked to furnish the completion certificate along with the subsidy claim for the reimbursement against the plants constructed under his supervision.

Rationalisation of Subsidy

5.21 With the passage of time, the entitlement for subsidy has witnessed a series of changes with regard to the category of beneficiary, type of area etc. Earlier, the payment of subsidy was linked to the size of the plant. Bigger the size of plant, higher was the amount of subsidy payable to the beneficiary. As a result, a number of large sized plants, i.e. 6 m^3 and above came up without any reference to the availability of dung and family size of the household. Subsequently, the subsidy entitlement was de-linked to the size after getting the reports of a high failure rate of these over sized plants installed because of a higher subsidy. The changes that have been brought in the subsidy pattern over the years generally relate to the increase/reduction and even some times creation of new category (1997-98), when felt necessary. While the present practice of payment of central subsidy based on a certain rationality tends to protect the interest of the socially and economically weaker section households, the state subsidy, wherever paid, does not take into account the counter effect on the sustainability of the programme in the long run. Many a time, the subsidy from both the sources taken together is found to meet almost the full cost of plant in respect of a certain category of beneficiaries. **There are reports of 8 plants being constructed by the scheduled caste households in Lopudu village during March 2000, under Visakhapatnam district in Andhra Pradesh with the additional subsidy provided by Andhra Pradesh Scheduled Caste Financial Corporation, practically with no contribution by the beneficiaries, most of whom even do not possess enough cattle heads to operate the plant and some of them keep on moving to different villages during busy agricultural season.** On the day of the field visit, none of the plants was found working. Similar reports are there from Madhya Pradesh, Gujarat, etc. where the payment of additional subsidy amounted to overlook the sustainability of the programme. The financial help to the economically and socially weaker households

is no doubt a welcome as long as it maintains the sustainability through a reasonable contribution by the household to keep his interest alive in the product. In view of the fact that a household does not contribute a significant proportion of the cost of a plant to claim a stake in the programme, the additional amount of subsidy, where ever applicable under State Plan Sector, instead of being paid to the beneficiary may be utilized for more productive uses, i.e., towards strengthening of the training base, publicity and post warranty repair service etc. hither to not attended with that seriousness.

Effect on Reduction of Subsidy

5.22 Till the year 1996-97, the entitlement of subsidy was linked to the size of the plant. But, the rate was higher for a 3 cum. Plant compared to 2 m^3 and 1 m^3 under each category of beneficiary. During the year 1997-98, a separate category for hilly areas of Jammu & Kashmir and Himachal Pradesh was created with the provision of a higher element of subsidy to supplement the increase in the cost of construction materials, labour and transportation. While the beneficiaries in all the North-Eastern States enjoy the benefit of drawing an enhanced subsidy at every stage, their counter parts in other areas had to face a downward revision from 1998-99, which in fact was thought to down size the programme. Hence, the MNES allotted a lower target of 1,33,500 biogas plants for the country as a whole following the reduction against 1,80,000 in the previous year. In spite of the reduction in the level of subsidy for a number of categories during this period, the achievement was 8 per cent higher than the target assigned at All-India level compared to 97 and 98 per cent in 1995-96 and 1997-98 respectively. **Thus the reduction in subsidy has been found to have no effect on the physical performance in different states.**

Funding to Regional Biogas Training Centres

5.23 This is an important but overlooked area under NPBD being managed by 9 Regional Biogas Development and Training Centres sponsored by MNES in various parts of the country. An annual budget of around Rs. 50 lakh is kept for all these centres. Normally, two third of this amount is spent for staff salary and contingency, while the remaining amount is earmarked to meet the expenses in connection with the training needs, research and development activities. Each centre is assigned a tentative target of training courses to be conducted during a year based on which fund allocations are made and 50% of the amount allocated is released to the centre in advance for undertaking various training programmes at its end. By and large, the target of various programmes is met except for users on the face of a small budget. The achievement of target against each programme during 1997-98 to 1999-2000 at aggregate level is given below:

Table 5.9

Training programme conducted by RBDTC by type

(No. of programmes)

Type of Training	1997-98		1998-99		1999-2000	
	Target	Ach.	Target	Ach.	Target	Ach.
Construction-cum-Maintenance	45	42	45	51	57	53
Turnkey Worker	11	10	11	9	11	9
Staff Training	36	42	36	50	36	31
User/women education programme	510	207	510	238	600	328

5.24 It is not alone the number of courses which matters, but the attendance in each course except for users is quite thin i.e. 5-8 instead of 10 between courses, due to a low stipend provided during the training period. Again, many among those take part in the programme, tend to disappear after a couple of days and very few attend the course till end. Ideally speaking, for a programme of this magnitude with an annual outlay of Rs. 50 crores, cost on staff, training, .R&D component should be between 2-3%. But, it is hardly 1 per cent of the total amount spent on NPBD. **Hence, the financial support to the RBDTCs may suitably be enhanced to provide a scope for increase in the manpower to accommodate more courses in a year as also increase in the amount of stipend payable to the trainees commensurating with their cost of living to avoid their plight during the programme.** The allocation of funds to the RBDTCs during the last 3 years and expenditure incurred in the corresponding period is given below:

Table 5.10

Receipt and expenditure incurred by RBDTCs

(Figures in rupees)

Year	Receipt	Expenditure
1997-98	44,01,710	44,44,921
1998-99	54,50,608	50,02,664
1999-2000	58,16,910	52,45,571
Total	**1,47,59,228**	**1,46,93,156**

Role of Financial Institutions

5.25 Since the central subsidy forms a small proportion of the total cost of a biogas plant, many a time, the middle and particularly the lower economic segment households look for easy, cheap and convenient sources for financing the biogas plant. The Reserve Bank of India (RBI) and the National Bank for Agriculture and Rural Development (NABARD) have long been associated with the programme. As a matter of fact, the loans raised for erection of biogas plants through commercial and cooperative banks are refinanced by NABARD on a liberal terms and conditions. But, the involvement of these financial institutions in the financing of biogas plants has decreased over the years which is a situation uncalled for. As has been observed from the beneficiary schedules, out of 615 sample biogas owners, bank loan

applications were 63 of whom 62 got the loan while 1 could not get the amount due to cumbersome process and non-cooperative attitude of the bank officials, Among 62 user households i.e. 10% of the sample who availed bank loan, a majority, over three fourth (80%) got the amount within a month of their application. It is also quite unlikely that no one from 20 selected households each in Arunachal Pradesh, Assam, Bihar, Himachal Pradesh, Meghalaya, Punjab, Rajasthan and Sikkim has ever availed bank loan for biogas construction during the reference period. Alike, not a single household out of 50 selected in Gujarat, 30 in Orissa and 45 in West Bengal has availed bank loan at any point of time during 1995-96 to 1999-2000 for erection of the gas plant. The state-wise break-up of households who availed bank loan is given as under :

Table 5.11

Beneficiary households classified by availing of bank loan

State	No.of Households selected	No. of house-holds availed bank loans	Loanee households as % to total	No. of households Self funding
Andhra Pradesh	60	10	17	47
Harayana	20	6	30	14
Karnataka	60	11	18	47
Kerala	20	6	30	14
Madhya Pradesh	50	1	2	48
Maharashtra	50	17	34	27
Tamil Nadu	20	7	35	13
Uttar Pradesh	50	4	8	41
All rep. states	**330**	**62**	**19**	**251**

5.26 However, the use of loan from other sources such as friends/relatives and money lender etc. is quite negligible, i.e. 11 households out of 61 excluding 6 non-reporting cases.

Research & Development

5.27 In view of the limited resources, there was no major break through in the area of research and development in any centre during the last 3 years. But the centre at Coimbatore in Tamil Nadu claims to have developed a new model of biogas plant under the brand name of Sakthi, while the IIT Kharagpur is currently looking for the possibility of reduction in the size of biogas plant through 'Two Stage Solid State Fermentation Technique'. Similarly, the centre at Udaipur is working on 'Dry Fermentation Technology' as also trying for the possibility of 'Horizontal Biogas Plant'. At the same time, this centre is pre-occupied with a study on 'Dehydration Technique of Spent Slurry'. The development and design of 'Chetak Biogas Plant' is one more activity undertaken by this centre. The Jorhat centre is currently associated with the evaluation of SPRERI (Sardar Patel Renewable Energy Research Institute) biogas plant for producing gas by using banana stem along with dung. However, most of these centres look for separate fund allocation to undertake further work on research and development.

5.16 Problems and Suggestions

5.28 The present form of maintaining the account under NPBD is found to be ambiguous. Although it shows how much amount is received from the state as well as central sector at a given point of time, but details in respect of expenditure by sector have not been attempted in any state. Further, the frequent adjustment of unspent balance as also over spending by a few states make the procedure more complicated. The variation is also seen between the amount released by MNES and the amount received in different states. Hence, an alternative in terms of providing uniformity and transparency may be developed and tried under different conditions and based on the feed back further improvement in the procedure may be brought.

5.29 The additional amount of subsidy from the state governments applicable to a particular category of beneficiary in a number of cases has been found to be counter productive and is at the expense of the sustainability of the programme because the beneficiary does not contribute significantly. This may be discouraged. Otherwise the beneficiary will lose stake in the plant. As a result, he will not take interest in operating it. Instead, the state subsidy where ever provided, may be utilized for promotional activities such as training, publicity, repair and maintenance, etc. This will enlarge the scope of the programme for a wider impact and acceptability.

5.30 At present, the payment of the turnkey job fees is not at a desired level. Looking at the activity a Turnkey Worker shares for maintaining the plants for 3 years free of cost apart from arranging construction materials and labour, the amount of Rs. 500 payable to him in lieu of services rendered, is in no way consistent to his responsibility. Also the amount has not been revised since a decade while other components of CFA have undergone changes. In view of the increase in the cost of living, as also the responsibility he shares, there should be an increase of 2 times in the amount payable to him at present.

5.31 Since the head wise expenditure is not maintained in any state, it is difficult to ascertain how much amount is being spent on publicity/awareness at the aggregate level. If a rough estimate is made on the basis of Rs. 2.5 lakh for every 10,000 plants, the total expenditure under this head may come closure to about Rs. 40 lakh which is less than even 1 per cent of the project cost. The amount earmarked on the basis of target range is much less and in any case should not be less than 2 per cent.

5.32 A majority of the states had reservation with regard to the release of fund particularly from central sector, which is always delayed beyond 3 months pending further delay in releasing the amount to the district. As a result, the implementing agencies hardly get 9 months and in the process, target of the 1st quarter, i.e. 15% of allotment, is left unattended. This is sometimes made good in the subsequent quarters. The MNES may look into this aspect and do the needful to release the funds in time to the nodal departments/implementing agencies.

5.33 The research and development is another area where practically no amount is spent by the RBDTCs as because there is no separate provision in the budget under this account. Again, the fund being a major constraint with a number of RBDTCs, training programme targeted in the past 3 years was not taken up. However, a major

portion of the funds, over two third, received by RBDTC is used for salary and recurring contingency of the staff designated under NPBD. The MNES's budgetary allocation of about Rs. 50 lakh a year to RBDTCs for staff support, training and inspection etc. is not at a desired level particularly when the component of DA/TA of the trainers and supervisors are included in the package. This works out to nearly 1 per cent of the total outlay under NPBD which seems quite inadequate.

Chapter 6

Repair & Maintenance, Training and Publicity

This is an important area under NPBD, but neither the MNES nor the state nodal departments/implementing agencies have taken any effective steps to ensure repair facility for servicing of older plants, turned non-functional due to several problems. Although the MNES's scheme of one time repair of older plants over five years, suffering due to structural problems, was in operation for a year during 1993-94, it could not be made effective for want of specific proposals from states as also due to financial constraint. The scheme is now re-introduced with a view to revive all these plants which became non-operational due to structural problems through partial assistance from the government. Under the scheme, a beneficiary can get the plant repaired subject to a limit of 50% of the present level of subsidy, the household is entitled.

Need for Repair

6.2 The field teams have come across over 25% of the sample plants lying defunct, at various parts of the country during the study. Numerically, it is still large when the plant population is around 30 lakh. In terms of investment, both by the government as well as beneficiary, it runs to crores of rupees if average investment per plant is estimated at Rs. 10,000. When the very purpose of the programme has been defeated owing to a high mortality rate, the entire amount spent for installation of these plants have gone waste. It is rather late to realize its adverse effect in other areas. Although it is delayed, nevertheless, an attempt to revive these plants may result in substantial improvement in the environment, particularly conservation of forest to maintain ecological balance apart from providing fuel for cooking and enriched manure for crop production to the households. Keeping in view the above factors, the MNES once again has come forward with the scheme of repair of non-functional plants suffering from structural problems. The scheme needs motivation and proper publicity to become more effective.

Reference to Plants Lying Defunct

6.3 Out of 615 plants inspected, as many as 161 were found lying defunct in different states. These plants were commissioned in different time intervals. For want of preventive maintenance, as also due to structural and social problems, these are rendered non-functional. The distribution of plants by their present status is given below:

Table 6.1

Biogas plants classified by present status

Status of Plants	Number of Plants
Incomplete	22
Uncommissioned	36
Commissioned but not in use	161
Commissioned and in use	340
Dismantled	56
Total	**615**

Non-functional Plants

6.4 Out of 161 non-functional plants in the sample, most of the plants (over 60 percent), failed due to problems in the structure. The Maharashtra has largest number of non-working plants, i.e. 27, followed by 16 in Uttar Pradesh, 14 in Karnataka, 13 each in Andhra Pradesh and Orissa, 12 each in Himachal Pradesh and Gujarat and 10 in West Bengal. Surprisingly, all the non-functional plants in Bihar, Assam, Haryana, Orissa, Rajasthan, Sikkim and Tamil Nadu are made non-operational due to structural problems only. In two states viz. Meghalaya and Punjab no plant was found to be non-functional. The distribution of non-functional plants by structural problems in different states is given below :

Table 6.2

Non-functional plants classified by state

State	No. selected	No. of non-functional Plants	No.having structural Problems
Andhra Pradesh	60	13	6
Arunachal Pradesh	20	3	-
Assam	20	2	2
Bihar	20	8	8
Gujarat	50	12	6
Haryana	20	5	5
Himachal Pradesh	20	12	5
Karnataka	60	14	5
Kerala	20	4	1
Madhya Pradesh	50	7	5
Maharashtra	50	27	18
Orissa	30	13	13
Meghalaya	20	-	-
Punjab	20	-	-
Rajasthan	20	7	7
Sikkim	20	5	5
Tamil Nadu	20	3	3
Uttar Pradesh	50	16	4
West Bengal	45	10	6
All States	**615**	**161**	**99**

6.5 Janata plants are not user-friendly because of a high non-functional rate. Out of 47 plants covered in the survey belonging to this model, 20 have become non-operational. This is about 43% followed by KVIC, 31%. The most effective model under field conditions is the Deenbandhu biogas plants which has a success rate over 75% as shown in the table below and also in Chart 6.1.

Table 6.3

Non-functional plants classified by type

Model	No. selected	No. Non-Functional	Non-functional plant as % to total
KVIC	74	23	31.08
Janata	47	20	42.55
Deenbandhu	476	118	24.79
Rubberised digester	14	-	-
Other	4	-	-
Total	**615**	**161**	**26.18**

Structural Problems

6.6 Out of 161 non-functional plants, 99 rendered non-operational due to various structural problems primarily because of faulty construction, emphasizing the need for improvement in the quality of training to the mason. The details of plants suffering from various structural problems are given below:

Table 6.4

Distribution of Plants by type of structural problem

Structural Problems	No. of Plants
Broken/defective foundation	11
Broken (cracked digester wall)	14
Crack in dome (Janata type)	10
Corroded gas holder (KVIC type)	7
Broken/defective central guide frame	10
Broken Central Wall	9
Other problems (not specified)	38
Total	**99**

Operational Problems

6.7 Another 34 plants are not found to be in use due to a number of operational problems such as chocking of inlet/outlet, shortage of dung/water/manpower, water accumulation in gas pipe, etc. However, these are minor problems and could have been attended to by the beneficiaries themselves had they been trained properly about preventive maintenance. The distribution of plants made non-functional for want of preventive maintenance (operational problem) is given below :

Table 6.5

Distribution of plants by operational problem

Operational Problem	No. of plants
Chocking of inlet/outlet	6
Shortage of dung/water/manpower	14
Water accumulation in gas pipe	3
Corrosion/leakage in pipe line	6
Defective burner	2
Scum formation in digester slurry	4
Dung used for other purpose	3
Other problems	7

Note : The total is not additive because the households have given more than one reasons for non-working of their plants.

Social/Economic Problems

6.8 28 plants are suffering from social problems due to which these are made non-operational. Of these, over a third of the owners have abandoned the use of their plants because of switching over to other cooking devices, such as LPG etc. The distribution of plants by reason of non-use of plants due to social problems is given below.

Table 6.6

Distribution of plants by social/economic problem

Social Problem	No. of plants
Litigation of property	3
Division/selling of property	3
Shifting of residence	5
Shifting of cattle shed	6
Other cooking device installed	10
Other problems	8

Note : Since the respondents have specified more than one reasons for non-working of their plants due to social/economic problems, the total may not add up to the number of observation.

Repair of Non-functional Plants

6.9 The repair of the non-functional plants beyond warranty, as found in the survey, has not been accorded any priority by a majority of beneficiaries. About a third of them i.e. 52 households who were interested in repair, consulted the officials of the implementing agencies, technicians and the block officials etc. while the remaining households did not show any interest in the matter. Again all those wished to get their plants repaired, a majority, over two third, did not come forward owing to high cost and non-availability of the technicians followed by a few due to indifferent attitude of the agency officials. However, the actual repair was effected only in case of 18 plants against 52 opted for it. In seven cases out of eighteen, the repair work

was done by the technician available in the village itself, while for eight plants, the owners had to travel a distance of more than 1 km to avail this facility.

Number of Times the Repair Done

6.10 In a majority of cases, i.e. 14 out of 18, the repair was carried out only once, while in 2 cases, it was effected 2 times. In Orissa, a plant was found repaired as many as 4 times.

Amount Spent for Repair

6.11 Since most of the defects were of miner nature, their repair was not very expensive. The total expenditure incurred by 9 beneficiaries was less than Rs. 100 each for carrying out necessary repairs in their plants. The amount spent for repair was higher between Rs. 101-200 each for 3 plants, followed by another 3, the repair of which cost the beneficiaries between Rs. 201-500 each. Still, there were 3 households in the sample, one each from Maharashtra, Meghalaya and Orissa, who effected repair in their plants paying a sum exceeding Rs. 500 per plant.

Awareness about Government Scheme of Repair

6.12 As revealed from survey, the MNES's scheme of repair is not known to an overwhelming majority (nearly 90%), even when the scheme was in operation for some time. For want of specific proposals from states as also due to budgetary constraints, the scheme could not make substantial progress.

Post Installation Repair Service

6.13 For plants in warranty period, the services are provided by the concerned turnkey workers free of cost, but after the warranty is over, the households are expected to carry out repair at their own expense following a fault in the plant. It is very often found that the beneficiary avoids going for it due to non-availability of the facility in the vicinity. With a view to provide an assured repair service against payment of a certain amount annually, the willingness of the households was sought. The analysis of their views when segregated revealed the willingness of about 40% households who would like to avail the facility, if made available. However, a majority of about 70% who supported the move, offered to pay Rs. 100 annually against 22% willing to pay between Rs. 201-500.

Involvement of Panchayat Raj Institutions

6.14 The Panchayat Raj institutions (PRI) have been found to play a major role in respect of motivation/installation, maintenance and repair of plants in a majority of villages, even when they are not directly involved in the programme. There are extension officers in every block, who monitor all the developmental activities of the government such as agriculture, industry, education, health and sanitation, etc. at the village level through the village level workers posted in most of the villages. These officials, apart from attending to their routine duties have been found to be very useful for biogas promotion, particularly when plants in the villages need servicing and repair. They help the beneficiary in identifying the mechanic/technician

or the turnkey worker available in the vicinity to attend the repair work. The availability of the representatives of the PRI in the sample villages for coordinating installation, repair and maintenance work is given below:

Table 6.7

Availability of PRI in sample villages for support activities

Support activities	Sample village (No)	No. of rep. villages
Installation	133	131
Maintenance	133	77
Repair/Servicing	133	94

6.15 Since not much attention has been given towards maintenance and repair service at any stage by none of the nodal/implementing agencies, the RBDTC was requested to develop and organize training courses on repair and maintenance of biogas plants in selected ITI's, polytechnics, etc. so that the services of those trained may be utilized for maintenance and repair servicing of non-functional plants, case to case on a self sustainable basis. This was brought out at the Annual Renewable Energy Conference on "Policy Perspectives 2000-2012" held on 23-24th May, 2000 at Vigyan Bhavan, New Delhi. The RBDTC were requested to prepare a detailed plan on the subject and forward it to MNES for action. Since Panchayat Raj Institutions are largely being involved in NPBD by virtue of their availability in the villages, MNES may also consider to utilize their services by way of providing some incentives.

6.16 In view of a large scale mortality rate of plants beyond warranty period, when the beneficiary is not interested to carry out repair at his end, the re-introduction of the scheme of repair of family type biogas plants was a welcome during the meeting held on 23-24th May, 2000, wherein the states agreed to send a specific proposal district-wise based on field assessment by 30th of September. The states were requested to ensure that after receipt of funds, repair work should be completed in a period of less than six months.

Training Component under NPBD and Role of RBDTCs

6.17 There are 9 Regional Biogas Development and Training Centres (RBDTC) sponsored by MNES to impart training to the masons, turnkey workers, staff engaged in biogas operation and the users, preferably ladies. Each centre caters to the training needs of a particular state or more depending upon the infrastructure available with it. It was, however, observed that the states like Maharashtra, Uttar Pradesh, Kerala and Bihar were not covered under any centre. This apart, there are Biogas Extension Centres (BEC) in some states, namely, Kerala, Maharashtra etc. to look after the training aspect under NPBD. These centres are operated by the state governments. The MNES also provides a fixed non-recurring grant of Rs. 10,000 and a recurring grant of Rs. 20,000 per year to each centre. But the study team could get information pertaining to the number of persons trained by these training units under various disciplines separately only during 1998-99. However, RBDTC was able to provide break up of training imparted under different categories in respect of last three years under study. The training programme documented in

the state at the aggregate level, i.e. the programme conducted by Biogas Extension Centre as also Regional Biogas Development and Training Centre for the year 1998-99 is given below:

Table 6.8

Number of persons trained during 1998-99

State	Type of Training			
	User	Staff	Mason	Turnkey worker
Andhra Pradesh	3560	-	-	-
Assam	147	8	-	-
Himachal Pradesh	671	18	49	-
Karnataka	2000	45	50	15
Kerala	1700	50	40	10
Maharashtra	6500	-	-	-
Meghalaya	300	-	12	-
Orissa	6500	-	50	-
Punjab	400	-	10	410
Rajasthan	1720	-	57	17
Tamil Nadu	4561	140	37	18
Uttar Pradesh	10000	-	68	-
West Bengal	3100	40	100	26
All States	**41159**	**301**	**473**	**496**

6.18 Although users trainings are expected to have positive bearing on the level of functionality of plants, it has not been found so in a number of states. For example, in Uttar Pradesh, about 77% of the beneficiaries are trained, but functionality level is hardly 34%. So is the case in Maharashtra where 40% of the beneficiaries are given training on routine operation and maintenance. As against this, only 22% plants have been found functioning.

Coverage of States by RBDTCs

6.19 Each RBDTC is given some area of operation in terms of meeting the training requirements under NPBD for that particular state where it is located apart from coverage of some more states. The centre-wise coverage of states is given below :

Table 6.9

Coverage of states by RBDTCs

Name & Location of the RBDTC	States covered
1. APAU, Hyderabad	Andhra Pradesh
2. AAU, Jorhat	Assam & North Eastern States
3.H.P.K.V.V., Palampur	Himachal Pradesh and Jammu & Kashmir
4. VAS, Bangalore	Karnataka
5. CAT, Udaipur	Rajasthan, Delhi, Madhya Pradesh & Gujarat
6. TNAU, Coimbatore	Tamil Nadu, Pondicherry & Lakshadweep
7. IIT, Kharagpur	West Bengal, Sikkim & Orissa
8. HAU, Hissar	Haryana
9. PAU, Ludhiana	Punjab, Chandigarh.

6.20 These centres usually undertake four types of training programmes for staff involved in the NPBD, turnkey workers, mason and the user against a fixed target allocated by MNES every year. The centre wise distribution of physical achievement in respect of different training courses against the targets assigned by MNES is as indicated in the table below and also Chart 6.2.

Table 6.10

Type of Training conducted by RBDTC during 1997-98 – 1999-2000

Location of the Centre	Type of Training							
	Staff		TKW		Mason		User	Women Training
	T	A	T	A	T	A	T	A
Hyderabad	9	8	3	3	15	14	200	**25**
Udaipur	21	39	6	1	18	15	120	90
Coimbatore	15	14	6	6	18	18	180	185
Kharagpur	21	15	3	6	18	26	120	109
Kanjipally (BEC)	-	9	-	4	-	14	-	3
Ludhiana	6	20	3	5	15	16	240	240
Palampur	6	4	3	2	15	16	160	26
Bangalore	9	5	3	1	15	11	200	55
Jorhat	15	1	3	-	18	7	160	28
Hissar	6	8	3	-	15	9	249	61
TOTAL	**108**	**123**	**33**	**28**	**147**	**146**	**1629**	**822**

T – Target A - Achievement

6.21 Besides, the Centre at Udaipur conducted one international workshop on biogas during the year 1997-98 while the centre in Kerala had 2 training programmes for panchayat officials, one each during 1997-98 and 1998-99.

6.22 The achievement figures, by and large, at the aggregate level was close to the targets assigned by MNES for different programmes except those for users which was short of the targets by 50 percent. Across the centres, the variation in the achievement under users programme is wide. It is as good as 100 percent in Ludhiana and Coimbatore, compared to a mere 12 percent in Hyderabad and 16 percent in Palampur. As of individual centre, it was Jorhat which was not able to organize any programme for turnkey workers in none of the years under study and as of staff training, the centre has completed only one course against 15 assigned to it between 1997-98 to 1999-2000. It has also not achieved much success in educating the users. As against a target of 160 courses in the last 3 years, it has conducted only 28. The number of programmes conducted for masons and is also below a desired level compared to the targets. However, the performance of TNAU, Coimbatore, with regard to the achievement of targets under various programmes in the last 3 years, is quite good.

6.23 The PEO teams have also not found either KVIC or any NGO imparting training to their staff, turnkey worker and masons separately in any state. But these agencies keep track of the programmes being arranged by RBDTC and depute their functionaries for training, whenever such an opportunity comes.

6.15 Nature and Duration of Training

6.24 Generally, four types of training courses are arranged for user, staff, mason and the turnkey worker under NPBD. The details of these courses are as under :

User Course

6.25 By and large, the user courses are arranged at the plant site for a day. A plant commissioned in the village is used for demonstration purposes. The beneficiaries are given practical training on regular operation and maintenance of the plant such as quantity and frequency of feeding, dung and water proportion, attending scum formation, low pressure in winter, periodical painting, water accumulation in gas pipe, checking of gas leakage in pipe line, cleaning of burner etc. In 12 out of 62 districts surveyed, 36 programmes for users were conducted during the year 1998-99 and the number of persons trained during this period was 2028 working out to an average attendance of 56 trainees per course.

Staff Training

6.26 The staff training is intended to make the officials of the implementing agencies, KVIC etc. familiar with various procedures for maintaining account on receipt of fund and disbursement of subsidy, turnkey fees, etc. under NPBD, apart from preparation and submission of progress report to MNES and the state level nodal departments/implementing agencies on monthly/quarterly basis. The course duration is 2-3 days and the number of participants per course is around 10. Out of 62 districts surveyed, this training was organized in 5 and the staff trained during 1998-99 was 29 spread in 6 batches.

Construction-cum-Maintenance Training

6.27 This is popularly known as mason training programme wherein fresh masons as well as masons already trained are given re-orientation on construction/repair of the biogas plants for 16 consecutive days by a master mason under the RBDTC. The programme carries stipend for the trainees. The necessity for refresher courses for those masons already trained is felt in the event of frequent changes being brought in the design and structure of the biogas plants. The training programme for masons was undertaken in 8 out of 62 districts selected for the survey. The number of programmes conducted in 1998-99 was 15 and the persons trained in 15 courses was 89 with an average of nearly 6 per course.

Training of Turnkey Workers

6.28 The turnkey workers are selected from among unemployed rural youth. They are trained for 25 days on various aspects of NPBD such as identification of beneficiary, preparation of list and forwarding the same for approval of the district authority, arrangement of construction material and trained mason, supervision of construction, processing of completion certificate and subsidy claims etc. Apart from these, a turnkey worker has to provide a trouble free service for three years to all the plants promoted by him. The training of turnkey workers was taken up in 7 districts during 1998-99 out of 62 sample districts. **The average number of days a**

programme continued was found reduced to 14-15 days against 25 days envisaged under NPBD with an average attendance of 3-4 turnkey workers per course, because of low stipend during training. It is generally being felt that a duration of 25 days is too long a period and in any case should not exceed 15 days.

Publicity and Awareness

6.29 This is an important area but MNES is spending a very small amount (Rs. 5 lakh during 1993-94) every year to generate awareness about the benefits of biogas. Generally, the publicity campaign is taken up at two levels, i.e. at the central as well as state. At the central level, the awareness about biogas is generated through print/electronic media, i.e. the use of slides, short films, slogans, etc. at National Channel of Doordarshan and All-India Radio. Most states take the help of printed literature in local languages such as hand bills, manuals, local newspaper, etc. Among methods adopted to give publicity to the biogas programme in the sample states, mela/exhibition is reported to be the most commonly used and popular instrument reported by 16 states followed by leaflets in 15 and booklets in 13 states. The instruments such as local idioms, folk art form, wall painting etc. is not found to gain popularity for spreading of knowledge among the households in many states. The distribution of states by devices used for generating awareness/publicity is given below:

Table 6.11

Instruments used for publicity and awareness

Instruments	No. of Rep. States
1. Doordarshan	5
2. All- India Radio	8
3. Wall painting	6
4. Folk Art Form	3
5. Local Idiom	2
6. Fair/exhibition	16
7. Video –on- Wheel	6
8. Leaflets	15
9. Booklets	13
10. Manuals	6
11. Newspaper etc.	9

Awareness at the Village/Household Level

6.30 At the village level and down below, the information regarding the benefit of biogas was given through leaflet/manual, fair/exhibition and mostly by the representatives of the implementing agency/departments. Looking at the greater role played by the VLW as also the officials of the implementing agency, namely, agriculture extension officers, further utilization of the services of these may be looked forward. The distribution of households by source of information about biogas at village level is given below :

Table 6.12

Source of information about biogas at the household level

Source	Rep. Households (No.)
Friends/relatives	209
Other plant owners	127
Village level worker	206
Agricultural officer	302
Publicity media	30
Fair/exhibition	13
Leaflet/Manual	49
Other sources	116

Note : As because the beneficiaries have given more than one sources, the total is not additive.

Summary

6.31 The chapter deals exclusively with the available facility for repair, maintenance, training and publicity under NPBD, which is very weak across the country. The survey result highlights that every fourth plant is a non-functional plant, a majority of which, over 60% are non-operational due to various problems connected to basic structure of the plant. Because sufficient care was not taken at the time of construction to ensure the use of quality materials as per specifications, these plants turned non-functional after their commissioning. Plant owners in general are not interested in repair of such plants as because the technicians are not available easily and if available in the vicinity, they are not well-equipped with the hardware materials as also with proper knowledge. Again, there is no guarantee of working of plant even after repair. It is because of this reason that repair was effected only in case of 18 plants out of 52 households i.e. nearly one third, who wished for it. Four out of eighteen plants were repaired more than 2 times including one in Orissa repaired as many as four times. MNES scheme of one-time repair of defective plants older over 5 years suffering from structural problems could not make any headway for want of budgetary support and proper publicity. The training needs of the users as also the functionaries, involved in the programme implementation is inadequately met owing to budgetary constraints. Publicity and awareness is an over looked area under NPBD being handled at the national and state level, not targeted towards those for whom it is intended. The limited impact of the programme is felt by the households in the countryside due to poor accessibility of the facility. Commonly used methods for generation of awareness and publicity to the biogas programme as revealed from the survey at the state level are fair/exhibition, leaflets and booklets. However, the use of electronic media such as telecast through Doordarshan, advertisement in All-India Radio, video-on-wheel etc. is not effective due to inadequate coverage in many states.

Chapter 7

Socio-Economic Impact of Biogas

The socio-economic background of the households among other things is considered as an important factor to influence decisions making for adoption of biogas. While the financial support extended by the government to the beneficiaries in the form of subsidy is restricted to hardly 25-40 percent of the cost of a plant for different categories of beneficiaries, a major share of the cost is raised through own resources or private/institutional borrowing, the economic background of the beneficiaries is invariably referred before making a final choice. A higher subsidy rate approved by MNES to reduce the financial burden of the poor and vulnerable sections of the society and to promote the use of biogas among them is undoubtedly a good step in this direction.

Distribution of Sample Beneficiaries

Distribution by Caste

7.2 When ownership of plants among social categories is considered, other caste households were found to claim a major share of around 52 percent as against 14 and 10 percent by the Scheduled Caste and Scheduled Tribe households respectively. However, a majority of the plants, about 55 per cent, installed by the Scheduled Caste beneficiaries are found non-working at the time of field visit and about 16% of these plants have been dismantled because of non-availability of required quantity of dung to operate these plants . Most of these plants were reported to have been built due to the attraction of a higher subsidy from central as well as state pool. The distribution of households by social category in relation to the working of their plant is given below :

Table 7.1

Working of Plants classified by social category

Social Category	Rep.HHS (Nos.)	% of working Plants
Scheduled Castes	88	45.5
Scheduled Tribes	59	54.2
Backward Castes	149	54.4
Others	319	58.6
All	**615**	**55.3**

Distribution by Income

7.3 Almost all biogas plant owners are well-to-do households, basically farmers with an average annual income of Rs. 49,640 barring 21 families in the lowest income bracket of less than Rs. 12,000 per annum. The survey result highlights an inverse relation between the level of income and adoption of biogas. The increase in the number of biogas plants as a result of increase in the level of annual income over

Rs. 24,000 is reported in as many as 80% cases. It is not alone adoption of biogas but a similar trend in respect of functioning of the plants owned by these households has also been observed as given below:

Table 7.2

Working of Plants classified by annual income

Annual Income (Rs.)	Rep. HHS (Nos)	% of working plants
Upto Rs. 6,000	2	50.0
6,000 – 12,000	19	31.6
12,001 – 24,000	107	49.5
24,001 – 48,000	170	53.5
48,001 – 60,000	70	58.6
Above 60,000	247	59.9
All	**615**	**55.3**

Distribution by Size of Holding

7.4 The survey team has also come across an inverse relation between the acquisition of biogas plants and holding of farm land by the households. While it is not necessary to possess agricultural land to be eligible for a plant, the households possessing required number of milch animals without any cultivable land can as well opt for biogas plants as long as supply of dung is assured. There are 28 such households who do not hold any agricultural land but have acquired biogas plants, a majority of which (57%) is found non-working at the time of survey. The land holding seems to have a positive bearing on the adoption of nearly 70% of biogas plants particularly among small and medium farmers holding up to 3 hectares of cultivable land as may be seen below :

Table 7.3

Working status of plants classified by land holding

Landholding (Hectare)	Rep. HHS (Nos)	% of working plants
No land	28	42.9
Upto 1.0	172	54.1
1.1 – 3.0	253	55.3
3.1 - 5.0	81	54.3
5.1 – 10.0	63	58.7
Above 10.0	18	77.8
All	**615**	**55.3**

Distribution by Level of Education of Head

7.5 The education of the head of the biogas families has found to play no role in respect of installation of biogas plants. There are 76 such households whose heads are not literate but because of attraction of subsidy and other benefits under the programme, they have adopted biogas. However, a large number of plants held by this category is found non-working at the time of survey. Similarly, a majority (over 50%) of plants with those where the head is literate and also educated up to primary level is non-functioning. The improvement in the level of functionality is reported only in the case where head of the household is studied up to middle class as shown below :

Table 7.4

Distribution of plants by level of education of head

Level of Education	Rep. HHS (Nos.)	% of working plants
Illiterate	76	52.6
Literate	57	49.1
Primary	102	46.1
Middle	138	66.7
Matric	120	51.7
Above	122	58.2
All	**615**	**55.3**

Distribution by Occupation of Head (Primary)

7.6 The cultivation is a major occupation among 65% of the biogas families followed by 12% in service and 10% in trade/business. Over 73% of the plants headed by 19 households whose occupation is animal husbandry is reported working and in use against nearly 49% in respect of the heads of the biogas families in service. The distribution of plants by occupational classification and working status is given below :

Table 7.5

Working of plants classified by occupation of head

Occupation of Head	Rep. HHS (Nos.)	% of working plants
Animal husbandry	19	73.3
Cultivation	399	55.1
Wage earner	28	50.0
Trade/Business	61	59.0
Service	76	48.7
Others	32	61.3
All	**615**	**55.3**

Distribution by Year of Installation

7.7 Out of a cumulative of 615 plants covered in the sample, over a third, i.e. 37%, pertains to pre 1995-96 period ranging from 1981-82. Since most of these plants are older by over 10 years, the functional rate of these plants as reported in the survey is lower, about 45%, compared to over 60% in the case of post 1995-96 plants with an average working of 55.3% at all plant level. The survey team has also come across a number of dismantled plants under older segment for want of dependability. Out of 56 plants dismantled so far, as many as 42 are from this category. The working status of plants by year of installation is given in the table below and also shown in Chart 7.1.

Table 7.6

Working plants classified by year of installation

Year of Installation	Rep. HHS (Nos.)	% of functional plants
Pre 1995-96	228	45.2
1995-96	91	50.5
1996-97	85	70.6
1997-98	108	54.6
1998-99	80	77.5
1999-2000	23	43.5
Post 1995-96	387	61.2
All	**615**	**55.3**

Distribution by Type of Plant

7.8 The Deenabandhu biogas plant is a very popular model adopted by over 75% of the households followed by KVIC (12%) and Janata (8%). However, in Meghalaya, there are 14 rubberised nylon fabric digester biogas plants of which a majority (85.7%) are found working currently. Among different models, the performance of Deenabandhu biogas plants is better. It is nearly 59% compared to 44.6% in the case of KVIC and 25.5% under Janata categories. The working status of plants by type is given below as well as in Chart 7.2.

Table 7.7

Working Plants classified by type

Type of Plant	Rep. HHS Nos.)	% of working plants
KVIC	74	44.6
Janata	47	25.5
Deenabandhu	476	58.8
Rubberised digester Plant	14	85.7
Others	4	75.0
All	**615**	**55.3**

Distribution by Size of Plant

7.9 The preferred size of biogas plant as understood from the household survey is 2 cum. followed by 3 cum. although the information collected at the village level indicates that 3 cum. is more popular. These two categories together claim a share of about three fourth under NPBD. However, the percentage share of plants less than 2 cum. size and above 3 cum. is as small as between 6-8. The performance of the larger sized plants between 3 cum and 4 cum. is rated higher than the size below 2 cum. These plants report a functionality rate of over 60% compared to 30% in the category of 1 cum. and 54% in 2 cum. The functionality rate is found to fall for plants above 4 cum. capacity. These larger sized plants require a considerable quantity of dung for daily feeding which the households find difficult to arrange. The working of plants by size is given below:

Table 7.8

Working plants classified by size

Size of Plant (cum)	Rep. HHS (Nos.)	% of working plants
1	56	30.3
2	252	54.4
3	204	60.8
4	47	63.8
6	40	60.0
Above 6	16	50.0
All	**615**	**55.3**

Distribution by Agency of Installation

7.10 The major installing agencies for family type biogas plants under NPBD as found from the survey are state government departments followed by energy development corporation and agencies promoted by various state governments to look into the promotional aspects of all the rural energy programmes in the states. The survey covers a sample of 89% plants constructed through these two agencies barring nearly 7% by KVIC. The installation of biogas plants done by other agencies is hardly 3 percent. The performance of the plants installed by government departments is rated poor, i.e. 45.9% working against over 62% by the government sponsored energy development corporations/agencies. The KVIC's performance in respect of functionality is still higher, over 64%. The distribution of plants by agency of installation vis-à-vis their functional status is given below :

Table 7.9

Working of plants classified by agency

Agency of Installation	Rep. HHS (Nos.)	% of working plants
State Govt. Departments	283	45.9
Energy Dev. Corporations/Agencies	270	62.2
KVIC	42	64.3
NGOs	5	80.0
Others (NDDB, SDA)	15	73.3
All	**615**	**55.3**

Availability of Dung

7.11 Cattle dung is a basic input to operate a biogas plant. Apart from cattle dung, a few households also use sheep/goat dung, bird droppings and human excreta in their plants to generate gas. While theoretically all types of biomass can be used to produce methane gas, the plants installed in India are generally not designed to use materials other than animal and human waste.

7.12 It is, therefore, necessary that the plant owners should have enough cattle heads if the plants are to be operated successfully. One of the pre-requisite for getting a biogas plant sanctioned is the availability of cattle dung compatible to the size of plant one is looking for based on family size. But this requirement is not met in many cases. The survey team has come across 21 such households who did not have any access to dung at the time of installation of the plant and even at the time of visits of the plant. In the rest of the categories, dung availability was not a

problem. Over 40% households in the sample reported daily dung availability of more than 50 kgs. followed by 38% between 26-50 kgs. per day. The distribution of households by availability of dung to operate their plants may be seen below :

Table 7.10

Size of plant and availability of dung

Size of plant (cum)	Rep. HHS (Nos)	No.of HHS with daily availability of dung					
		0 kg	Upto 25 kg	26-50 kg	51-75 kg	Above 75 kg	Average Dung per cum. (kg)
1	56	3	14	28	3	8	41
2	252	6	41	108	56	41	26
3	202	10	26	67	44	55	22
4	47	2	7	17	5	16	28
6	40	-	3	8	9	20	15
Above 6	18	-	3	5	2	8	11
All	**615**	**21**	**94**	**233**	**119**	**148**	**19**

Average Availability of Dung

7.13 Availability of dung for bigger sized plants above 6 cum. was a major constraint. Also there is a wide variation in the availability of dung between sizes. The average quantity of dung available for feeding each cum. is much lower i.e. between 11-15 kgs. when the plant size exceed 6 cum. compared to 41 kgs in the case of 1 cum. and 22-28 kgs. for plants between 2-4 cum. capacity against a requirement of 25 kg. per cubic meter per day.

Sanitary Linked Biogas Plants

7.14 The sanitary linked biogas plants are some what popular in the states of Bihar and Maharashtra. Both these states account for 44 such plants against 67 covered in the sample. These plants have been installed with the attraction of an additional subsidy with the view to improve the sanitary conditions in and around the plant site. This impact is felt by 58 plant owners with whom the survey team interacted during the field visit. In a majority of these plants (62), there happens to be no hesitation by the family members to use the gas as also for daily feeding. Many of these plants are not functioning well and their functionality rate is under 50% at the aggregate level. The distribution of sanitary plants by state is given below :

Table 7.11

Distribution of sanitary plants by state.

State	Size of sample	Rep. HHS	% working
Bihar	20	15	40
Maharashtra	50	29	34
West Bengal	45	9	67
Remaining States	500	14	50
All States	**615**	**67**	**49**

Status of Plants

Incomplete Plants

7.15 The survey team has come across 22 incomplete plants in various stages of completion because of non-installation of gas holder, pipe line, burner, etc. The delay in completion as reported by the households is basically due to non-supply of construction material, gas holder, labour and mason as shown below :

Table 7.12

Incomplete plants classified by reason of delay

Reason for delay	Rep. HHS (Nos.)
Construction material not supplied	1
Delay in getting gas holder	2
Labour/Mason not available	2
Delay by agency of construction	1
Shortage of fund	3
Other reasons	14

Note : Because of more than one reasons given by the households, the total may not add to the size of sample.

Un-commissioned Plants

7.16 Out of 615 plants surveyed, 36 were found un-commissioned because of a number of reasons such as non-availability of dung for initial feeding, want of guidance, as also money for purchase of dung for commissioning, etc. It is quite surprising to note that immediately after completion of the construction, 15 plant owners did not show any interest in respect of commissioning of their plants meaning thereby that the plants were thrust upon them. The distribution of plants by reason of delay in commissioning is given below :

Table 7.13

Un-commissioned plants classified by reason of delay

Reason for delay	Rep. HHS (Nos.)
Non-availability of dung for initial feeding	14
No money for purchase of dung	5
No gas formation after initial feeding	5
No interest in plant	15
Other reasons	15

Note : Because of more than one reasons given by the households, the total may not add to the size of sample.

Dismantled Plants

7.17 Out of 56 dismantled plants found during the survey, 38 were dismantled, because these had become non-functional due to structural and other problems with a little hope of revival even after repair. However, 18 plants were working at the time of dismantling. These plants were dismantled owing to more than one reason. The

prominent reasons for dismantling these plants were selling of cattle by 5 households followed by 6 who felt inconvenience in maintaining these plants. Most of these plants, 4 in either case, are from Andhra Pradesh. The distribution of plants being dismantled (18) while functioning by reason of dismantling is given below :

Table 7.14

Working plants classified by reason of dismantling.

Reason of dismantling	Rep. HHS (Nos.)
Cattle sold out	5
Inconvenient to maintain	6
Gas not available in adequate quantities	3
Availability of alternate fuel	2
Other reasons	11

Note : Because of more than one reasons given by the households, the total may not add to the size of sample.

Partially Used Plants

7.18 Out of a total of 340 working plants in the sample, 64 i.e. 18.8% reported being used partially due to several reasons. A majority of these plants, over 50% are from the state of Karnataka. Madhya Pradesh and Maharashtra also reported 10 percent each under this category. Of the reasons reported to the survey team, operational problem was very important reason for partial use of their plants followed by availability of alternate fuels and over capacity of the plants held. This may be seen below :

Table 7.15

Partially used plants classified by reasons.

Reason for partial use	Rep. HHS (Nos.)
Structural defects	4
Operational problem	36
Reduction in family size	2
Availability of alternate fuel	31
Over capacity plant	23
Other reasons	17

Note : Since the households have specified more than one reason, the total may not add up to the size of observation.

7.5 Steps Taken to Improve Working of Plant

7.19 It seems that most households are not sufficiently fed about preventive measures to be taken to keep their plants in good working condition, during their training. As revealed, periodical painting of gasholder is not very common among the households holding KVIC type biogas plants. Out of 74 KVIC model biogas plants covered in the sample, the painting of gas holder is done only in case of 9 households. Preventive measures such as stirring of digester slurry, checking of gas leakage, etc. are found to be performed in a very casual manner as shown below :

Table 7.16

Preventive measures taken to keep plant in good working

Preventive measures	Rep. HHS (Nos.)
Painting of gas holder	9
Stirring of digester slurry	15
Checking of gas leakage	32
Timely repair of defects	5
Cleaning of burners	37
Other measures	5

Note : As the households have given more than one measure, the total may not add up to the number of observation.

Steps Taken to Get Full Supply of Gas in Winter

7.20 In winter season, gas supply tends to fall due to low pressure particularly in the plants set up in colder climatic zones. To overcome the problem of low gas formation, several measures have been suggested to be adopted by the households. The remedial measures to ensure full supply of gas includes adding of oil cakes/molasses, cattle urine, use of warm water etc. in the digester slurry. The distribution of households experienced a fall in gas formation in winter by steps taken to overcome the situation is given below :

Table 7.17

Steps taken to ensure full supply of gas in winter

Steps taken	Rep. HHS (Nos.)
Add oil cake/molasses	16
Add cattle urine	48
Use warm water in feed slurry	56
Insulate digester externally	27
Other steps (lime water, human urine, Chemical fertilizer like urea)	83

Note : Since households have taken more than one steps, the total may not tally.

Fully Working Plants

7.21 The sample study has covered 276 plants commissioned during different time intervals, currently working to the full satisfaction of the users. The perception of these households was sought to know their views as to why they feel about it. Their views when segregated revealed that the plants with 124 households i.e. 45%, are working with minimum complaint followed by 122 households for whom the gas produced from their plants is sufficient for cooking needs of the family. Still, there are 68 households who feel that the time taken for cooking different dishes from biogas, is reasonable. Reasons like un-interrupted supply of gas and use of two burners makes cooking process easy, was reported by 61 and 43 households respectively. The break up of reasons for ensuring full satisfaction on the working of plants is given below :

Table 7.18

Fully working plants classified by reason.

Reason for satisfaction	Rep. HHS (Nos.)
Working with minimum complaint	124
Sufficient for cooking need of family	122
Reasonable time taken for cooking	68
Un-interrupted supply of gas	61
Two burners working full to the capacity	43
Other reasons.	8

Note : Because of more than one reasons given by the households, the total may not tally.

Benefit from Plants Working Fully

7.22 Biogas plants provide several benefits to the society in general and users in particular. Among different benefits accrued to the beneficiary households, cooking is most important. The availability of slurry manure is an added advantage. This manure is considered far more superior to farm yard manure in respect of NPK contents. If applied in the field, it reduced the use of chemical fertilizers to a great extent. It increases crop production because of higher nutritional value compared to traditional manure and wet dung prone to frequent plant diseases.

Use of Biogas for Cooking

7.23 Over three fourth i.e. 257 out of 340 biogas users are using biogas purely for cooking while the remaining households use biogas for other purposes such as water heating for bathing and washing, preparation of tea/coffee, boiling of milk etc. Most of these biogas stoves are having two burners. On an average, the use of biogas for cooking purpose is nearly for 4 hours a day, which varies from 2-5 hours between one household and the other.

Use of Biogas for Lighting

7.24 Although lighting through biogas is not common, still, there are 21 households in the sample who use biogas for lighting ranging from 1 hour per day in Kerala and Maharashtra to over 4 hours a day in West Bengal, Uttar Pradesh, Bihar and Meghalaya.

Other Uses of Biogas (Motive power)

7.25 The use of biogas for motive power is not that popular among households in our country. However, two households, one each from Andhra Pradesh and Meghalaya, are using biogas for this purpose. These two households in question, have been using biogas daily for one hour through conversion of diesel engine into dual fuel engine. Although the scheme is highly subsidized, the households are not coming forward to use the facility due to the problem of transportation of gas from plant site to the site of engine.

Use of Slurry Manure

7.26 The slurry manure is considered far more superior to farm yard manure in respect of NPK contents. If applied in the field, it reduces the use of chemical fertilizers to a great extent. It increases crop production because of higher nutritional value compared to traditional manure and wet dung prone to frequent plant diseases.

7.27 In the sample, 90% households are using slurry manure in the field in the place of chemical fertilizers to increase crop production while nearly 2% households are selling the entire quantity of manure they produce from their plants. In all 18,739 quintals of manure is being produced from these plants in a year. This works out to an average of 74 quintals per plant per year. Selling of slurry manure is not common among biogas households. As most of them are agriculturalists, they prefer to use the slurry manure produced from their plants in the field and avoid using chemical fertilisers for which they have to make down payment forthwith. The value of this manure as reported by those households who are selling outside is roughly Rs. 30 per quintal.

Its Utility

7.28 The utility of slurry manure is best known for its application to improve crop productivity. This has been realized by over 70% households who feel that the improvement in the crop production is certainly the result of application of slurry manure in the field. Nearly 30% households give somewhat different opinion about the impact of slurry manure on crop production. They feel that the application of slurry manure in the field influences the crop productivity to some extent only. There are other factors too. The distribution of households by their experience of improvement in crop production due to utilization of slurry manure in the field is given below :

Table 7.19

Distribution of households by perception on improvement in crop Production due to use of slurry manure

Extent of improvement	Rep. HHS (%)
Great extent	71
Some extent	29
No improvement	-
Neg. impact	-

Benefit of Biogas

7.29 Biogas plant provides a series of benefits. This has been realized by 83.4% among the current users while to the remaining 16.6%, the benefits are not perceivable. The realization of benefits of biogas is basically on account of cleanliness in the kitchen and environment, saving on the use of traditional fuels, saving in cooking time and saving in the cost of fertilizers. The distribution of households by the perception on the benefit of biogas is given below:

Table 7.20

Benefit of biogas classified by views of households

Benefit of biogas	Rep. HHS (%)
Provides clean fuel for cooking	96
Provides gas for lighting	11
Cleanliness of environment	73
Improvement in the health of ladies	50
Saving in manure cost	74
Employment generation	8
Saving in cooking time	79
Saving in traditional fuel	60
Other benefits	3

Benefit not Perceived

7.30 Yet, to a little over 16 percent households (98), the dis-incentive has offseted the benefits perceivable from biogas plants. Most of these households showed their reservations with regard to the availability of technician for repair of plant, technical help and guidance from the implementing agency, etc. The distribution of households by their perception on the non-benefit of biogas is given below :

Table 7.21

Households classified by perception on non-benefit of biogas

(N=98)

Benefit not perceived	Rep. HHS (%)
Not giving adequate gas	35
Lot of manual labour involved	21
No technical help from implementing agency	39
Technician not available for repair	37
Plant remains defective most of the time	27
Other reasons	19

Note : Since more than one reason is considered, total may not add up to the size of observations.

Use of other fuels

7.31 As found in the survey, the use of biogas has not done away with the use of other fuels completely. Most households still use same fuels but in reduced quantity after the use of biogas. These fuels are mostly used for purposes other than cooking. Although, biogas is preferred for cooking, for other uses where a bulk quantity of subsistence is to be prepared, biogas is not found to be equally efficient. Hence, the households prefer to switch over to other fuels than depending upon biogas. The boiling of water for washing clothes and also taking bath in winter are few of the activities undertaken by the households through the use of other fuels. Similarly, certain dishes like chapatti and roasting of brinjal/potato etc. if prepared from biogas, tend to lose taste. Hence, the housewives avoid using biogas for this purpose. It is also not convenient to boil large quantity of water using biogas for preparation of cattle feed or par-boiling of paddy.

Fuel use pattern

7.32 The biogas household uses a variety of fuels such as firewood, dung cake, coal/soft coke, LPG, kerosene, electricity, etc. for different end uses. Most of the fuels such as firewood, dung cake etc. are collected in the country side free of costs, hence the households use to burn these fuels extensively without any feeling for its evil effects on the environment.

Firewood

7.33 285 sample biogas user households are using firewood of whom 47 are purchasing the quantity they need every month. On an average, a biogas household among those collecting uses 134 kg. of fuel wood against 170 kg. being used by a non-user of biogas per month. The average quantity of fuel wood purchased and consumed per month is also lower in the case of a biogas user (101 kg) compared to his counterpart i.e. a non-user (112 kg). No one among user and non-user of biogas in Himachal Pradesh is using fuel wood for cooking or other purposes.

Coal/soft coke

7.34 The use of coal/soft coke is not common among biogas user as well as non-user households in many states. In the sample, among current user of biogas, only 5 households, one each from Karnataka, Meghalaya and West Bengal and 2 from Bihar, are using soft coke/coal for cooking against 14 from those who are not using biogas at present. Among these non-user households, 11 are from West Bengal and 3 from Andhra Pradesh. The average quantity of coal/soft coke used per month among biogas households is 51 kg. against 58 kg. in the case of non-user households.

Dung cake

7.35 99 among 340 user households use dung cake entirely collected, nearly 90 kg. a month, against 82 kg. being used by a non-user household. In seven states, namely, Arunachal Pradesh, Assam, Himachal Pradesh, Karnataka, Kerala, Meghalaya and Tamil Nadu, dung cake is not used for any of the end-uses either by the user or non-user households.

LPG

7.36 The use of liquefied petroleum gas (LPG) for cooking among biogas users as also those not using biogas, has increased over the years. A biogas household is found to use one cylinder of 14.2 kg. per month against 1.6 by the non-user of biogas. Among the user segment, 66 households are using LPG compared to 99 from the category under non-user. In Himachal Pradesh, no one among user as well as non-user households is using LPG while in Arunachal Pradesh, no household among 20 selected under user category is using LPG.

Kerosene

7.37 This is a fuel basically used for lighting in rural areas in the absence of electricity and also used as stand-by when there is irregular power supply. In the sample of user households, 190 are using kerosene at the rate of 6.3 litres per household per month compared to an average of 5.9 litres by 478 households not using biogas at present. In Hiamchal Pradesh, no one among 20 user households selected, is using kerosene for lighting.

Electricity

7.38 Electricity users are 135 in the sample of 340 user households while among non-users, the size is 244. On an average, a user household consumes 58 kwh. of electricity per month. The quantity is reduced to 46 if it is a non-user household. In three states, namely, Himachal Pradesh, Karnataka, Orissa, electricity is not in use for lighting among user as well as non-user households. The average monthly consumption of fuels by user as well as non-user of biogas is given below :

Table 7.22

Average monthly consumption of different fuels by biogas user and non-user households

Type of fuel	Average Quantity per month				
	User HHS (340)	Non-user HHS (740)	Saving in Quantity	Rate (Rs.)	Value of saving (Rs.)
Cooking/heating					
Fuel wood (kg)					
Collected	134 (70)	170 (657)	36	1.00	36
Purchased	101 (47)	112 (125)	11	1.00	11
Coal/soft coke (kg)	51 (5)	58 (14)	7	2.00	14
Dung cake (kg)	89 (99)	82 (309)	(-) 7	0.25	(-)2
LPG (No. of cylinder)	1.05 (66)	1.6 (99)	0.55	235.00	129
Total cooking/heating	**xxx**	**xxx**	**xxx**	**xxx**	**188**
Lighting					
Kerosene (Litre)	6.3 (190)	5.9 (478)	(-) 0.4	8.10	(-)3
Electricity (units)	58 (135)	46 (244)	(-) 12	2.50	(-)30
Total Lighting	**xxx**	**xxx**	**xxx**	**xxx**	**(-)33**
ALL FUELS	**xxx**	**xxx**	**xxx**	**xxx**	**155**

Note : Figures in the bracket are reporting households.

Savings Due to Use of Biogas

Saving in Cost of Cooking Fuels

7.39 Saving in cost of cooking fuels by the user households when calculated, it comes to Rs. 188 per month. This is reduced to Rs. 155 when negative cost under lighting fuels is adjusted.

Saving in Cost of Chemical Fertilizers

7.40 Saving in the cost of chemical fertilizers when replaced by use of slurry manure in the field, comes to Rs. 185 per month calculated on the basis of Rs. 30 per quintal for 74 quintals of manure produced in a plant per year.

Environmental Upgradation

7.41 Cleanliness in the kitchen and environmental upgradation is another important benefit of biogas. While quantitative measurement in respect of these aspects is not possible, the user households have a positive feeling of realization of these benefits.

Saving in the Cooking Time

7.42 The response is quite positive. The housewives who used to work in smoke filled kitchen before switching over to biogas, find themselves quite comfortable while cooking through biogas, using 2 burners at a time, thereby saving half the time they used to spend in kitchen earlier, when biogas was not there.

Saving in Time to Clean Kitchen/Utensils/Cooking Vessel

7.43 The cleaning of cooking vessels, which was a tedious job earlier and was taking more time because of accumulation of black soot on the bottom of the vessel, is considered as a great relief for the ladies in terms of saving time while cleaning.

Saving in Time on Collection/Processing of Fuel

7.44 The time spent on collection and processing of fuels stand saved due to use of biogas. The fuels collected from nearby forest, roadside bushes and farm land was taking a lot of time. Now that biogas is available, the time saved can be utilized for productive purposes.

Reduction in the Drudgery of Women/Children

7.45 Since biogas is a clean and smokeless fuel, its use is likely to reduce the health hazards of women and children prone to frequent eye/lung ailments as a result of working in the smoke filled kitchen during most part of the day. To the extent this objective is met, it is difficult to assess quantitatively due to small number of observations.

Summary

7.46 This chapter deals with socio-economic background of the plant owners in general and the impact of the programme on society as also individual user in particular. The survey finds an inverse relation between the level of income of the household and adoption of biogas. Most of the plant owners are well-to-do farmers with an average annual earning of Rs. 50,000. The working proportion of plants held by higher income bracket households is also higher compared to their counter parts. The Scheduled Caste and Scheduled Tribe households are fairly represented in the sample. It is nearly a quarter against twice the size among other caste households.

But in respect of performance, the plants held by these households (SC/ST) is rated lower than those in other social segments. Other than 28 households, all plant owners operate farm land. Functional rate of plants is higher among households operating farm land exceeding 5 hectares. Although, cattle ownership for assured supply of dung is a prerequisite for sanction of a biogas plant, still 21 households in the sample do not have cattle. The level of education of the head is found to play no positive role in respect of adoption of biogas plant as also their functionality. Nearly 65% plant owners are cultivators by occupation followed by 12% in service and 10% in trade/business. 19 plant owners in the sample are engaged in animal husbandry. Of the plants surveyed, over a third belongs to pre-1995-96 period. Deenbandhu is the cost effective and popular model of biogas plants and has been adopted by over three fourth of the beneficiaries in the country. The ideal size of biogas plant is 2 cum. followed by 3 cum. Eleven percent plants are sanitary linked, a majority of which are reported from Maharashtra, Bihar and West Bengal.

7.47 Biogas plants provide several benefits, some of which can be quantified while quantification in respect of the remaining benefits is not possible. Quantifiable benefits are saving in the cost of cooking fuels reported by over 75% users and chemical fertilizers by 90% households using slurry manure. On an average, a user household saves Rs. 340 per month towards both the end uses including Rs. 185 against the imputed value of slurry manure produced in a plant. Twenty-one households use biogas for lighting ranging from 1 hour to 4 hours a day. The sample has 55.3% working plants of which 18.8% are working partially. For computation of benefits, the plants working partially as also working full to the satisfaction of the users is considered. The user also gets the benefit of saving in cooking time and time for collection/processing of fuels. It provides a great relief to housewives who used to work in smoke filled kitchen earlier being subject to frequent eye/lung ailments. However, all these benefits are not quantifiable. This apart, society also enjoys certain benefits under the programme in terms of environmental upgradation, i.e. cleanliness in the absence of littered dung here and there, conservation of forests to maintain ecological balance etc.

Chapter 8

Community Biogas Plant

The biogas programme, particularly family type, has been mostly adopted by large and medium farmers. This is true because these households usually possess sufficient cattle heads to operate their biogas plants. This also is substantiated by survey data, which works out an average of 5-6 cattle holding among households having functional biogas plants. Apart from holding of land/cattle, affordability also matters. Small and marginal farmers, most of whom are hand to mouth and have little access to institutional financing may find it difficult to arrange funds for the construction of biogas plants out of their limited resources. In order to extend the coverage of biogas plants to families who cannot afford small family type biogas plants, the programme for installation of large sized biogas plants at the community/ village level was taken up after a couple of years of the introduction of family type biogas plants.

Past Performance

8.2 The move for Community Biogas Plants, in the initial years of implementation, picked up fast. Many small and medium farmers came forward being influenced by the benefit of regular supply of gas without any botheration for maintenance of the plant. In the villages where such plants were installed, managing committees were formed to look after the operation and maintenance of plants. However, this arrangement did not work for long and had a pre-mature death due to frequent non-supply of dung as also monthly contribution towards maintenance by members. Also there are reports of in-fighting among members in respect of supply of gas in good quantities to influential families compared to insufficient supply in tail areas. All these problems posed a serious challenge to the very existence of the programme. As learnt, MNES has decided to transfer the programme to the state governments from Tenth Five Year Plan onwards.

8.3 During the period between 1982-83 and 1999-2000, a total of 331 CBPs have been built in 11 out of 19 selected states. A majority of these plants are among plants installed prior to 1995-96 and only 9 CBPs have been set up during the 5 years of reference period, i.e. 1995-96 to 1999-2000. Of 9 plants installed, 8 are in Madhya Pradesh and 1 in Tamil Nadu. Out of 331 CBPs installed so far, only 24, i.e. 7.3% are working. These functional plants are located in the states of Madhya Pradesh (21), Gujarat (1), Haryana (1) and Punjab (1). In respect of remaining states, these plants are lying non-functional or are being dismantled. Punjab alone accounts for more than 42%, followed by Madhya Pradesh (24%) and Uttar Pradesh (13%). The distribution of CBP by working status in selected states is given below:

Table 8.1

Installed CBP classified by state

State	Number of Plants					
	Upto March 1995	Net addition 95-96 to 99-00)	Total	Plant in use	Plant not in use	Dis-mantled
Andhra Pradesh	25	-	25	-	25	-
Gujarat	2	-	2	1	1	-
Haryana	2	-	2	1	1	-
Madhya Pradesh	93	8	101	21	80	-
Maharashtra	2	-	2	-	2	-
Orissa	11	-	11	-	11	-
Punjab	132	-	132	1	131	-
Rajasthan	3	-	3	-	2	1
Tamil Nadu	8	1	9	-	9	-
Uttar Pradesh	43	-	43	-	43	-
West Bengal	1	-	1	-	1	-
Total	**322**	**9**	**331**	**24**	**306**	**1**

8.4 With a view to study the reasons of success and failure of CBPs, it was decided to select one functional and one non-functional plant from each of the sample state. But during the course of field survey, only 4 functional and 10 non-functional plants were found in the sample states. The functional plants were located in Gujarat, Haryana, Madhya Pradesh and Punjab. The survey team came across one more operational CBP in the state of Kerala, but this was installed beyond the reference period, i.e. August, 2000. This too was included in the survey to get the desired sample size. Ten non-functional plants surveyed are from Andhra Pradesh, Gujarat, Haryana, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu and Uttar Pradesh. However, due to earthquake problem in Gujarat, the plants in either category, i.e. functional and non-functional were not covered.

Particulars of CBP

8.5 All the 13 plants surveyed, 4 among functional and 9 under non-functional category, are of floating dome KVIC model with their sizes varying between 15 and 85 cum. Except 2 plants, one each from Kerala and Madhya Pradesh, majority are of 85 cum. capacity. As per age of these plants, five are older over 10 years, installed way back before 1987-88, while the one in Kerala has been installed in 2000.

Pattern of Cost Sharing Under CBP

8.6 Most of the plants were constructed through combined contribution by the beneficiaries and implementing agencies apart from the contribution through government subsidy. In states like Orissa, Punjab and Uttar Pradesh, the details regarding the contribution made by the members as also the implementing agency were not available at the time of field visit. Similarly, total cost of construction of the gas plant in Maharashtra which is of 60 cum. capacity, was not reported by the

concerned agency. The distribution of CBP by sharing of costs in the selected states is given below:

Table 8.2

Cost sharing under CBP

(in Rs.)

Functional CBP	Total cost	Contribution by Member	Contribution by Imp. Agency	Subsidy	Size (cum.)
Haryana	9,54,423	-	4,54,423	5,00,000	85x3
Kerala	94,000	8,000	42,000	44,000	15
Madhya Pradesh	70,000	30,400	-	39,600	15
Punjab	3,22,541	-	1,60,000	1,62,541	85
Non-Functional CBP					
Andhra Pradesh	2,21,719	-	2,21,719	-	85
Haryana	5,97,000	20,381	-	5,76,619	85x2
Madhya Pradesh	2,83,125	8,250	-	2,74,875	85
Maharashtra	NA	NA	-	NA	60
Orissa	1,31,760	NA	NA	NA	30
Punjab	5,49,811	NA	-	5,49,811	85x2
Rajasthan	4,58,000	4,000	-	4,54,000	40
Tamil Nadu	2,02,454	-	1,32,454	70,000	25
Uttar Pradesh	2,71,806	NA	NA	NA	85

Construction of CBP

8.7 The initiative for installation of biogas plants at the community level was taken by the villagers themselves in Kerala and Punjab, while in respect of Haryana and Madhya Pradesh, the implementing agencies took the lead. In respect of 3 non-functional plants, the move for construction was made by the villagers and for 4, the implementing agencies motivated the villagers. Three non-functional Plants were set up with the help of other local bodies.

8.8 It was as also reported that in Haryana, the land was provided by the Central Institute for Research on Buffaloes (CIRB). In case of plant in Punjab, the land was provided by village panchayat while for plants in Kerala and Madhya Pradesh, the land was donated by some individual doners keeping interest in the environmental upgradation.

Involvement of Agencies

8.9 A number of agencies were found to be involved in sanction, construction as also supervision of CBP at the time of construction. In Haryana, apart from District Rural Development Agency (DRDA) being involved in sanction, construction and supervision of CBP, KVIC was also involved under the programme. State government agencies played a vital role in respect of sanction, construction and supervision of these plants in the states of Punjab, Andhra Pradesh, Orissa, Tamil Nadu and Maharashtra. In one case, the villagers in Maharashtra also took necessary steps to promote the sanction and construction, while supervision of this plant was carried out by the in-charge of the plant himself. However, in Kerala, installation and supervision activities were co-ordinated by a local NGO, who was also responsible for getting the CBP sanctioned on behalf of the villagers. There

were other organizations such as Urja Vikas Nigam (M.P.), Rajasthan Cooperative Dairy Federation (RCDF) and approved contractors in Uttar Pradesh and Tamil Nadu which took up sanction, construction and supervision of CBPs in these states.

Period of Construction

8.10 The duration of construction of CBP was also different in different states. As per available information, the construction period of the gas plants varied between 30 days in Kerala to 285 days in Haryana, with exception of Rajasthan, where the construction took as many as 880 days. The unusual delay in construction was reported due to seepage in the foundation wall in the plants in Maharashtra and Tamil Nadu while in Rajasthan, delay on the part of the implementing agency was attributed for this.

Sanitary Linkage of CBP

8.11 None of the 13 plants surveyed among functional and non-functional category except one reported non-functional in Haryana, was linked to sanitary toilets. The use of night soil in the plant was not acceptable to the manual labour working on the plant and also some households in the village. As reported, this plant did not lead to any environmental problem.

Socio-Economic Profile of CBP Members

Caste Structure

8.12 The membership under CBP has not been found restricted to a particular caste or two. It is open to the villagers but among like-minded persons. In all the 13 CBPs (both functional and non-functional) surveyed, there were 295 members. Average membership per plant under functional category was about 15 against 26 in each non-functional unit. The percentage of members from other castes was 73.8% in the case of functional plants, while it was 42.7% in non-functional plants, as may be seen in Table 8.3 below. It has been observed that plants with manageable number of participants, having capacity to bear the maintenance charges are more successful.

Table 8.3

CBP Members classified by social class

(No. of Members)

Social status	**Functional Plant**	**Non-functional Plant**	**Total**
SC	2 (3.3)	26 (11.1)	28 (9.5)
ST	3 (4.9)	39 (16.7)	42 (14.2)
OBC	11 (18.0)	69 (29.5)	80 (27.1)
Other castes	45 (73.8)	100 (42.7)	145 (49.2)
Total	**61**	**234**	**295**

Figures in brackets indicate percentages.

Occupational Classification

8.13 Cultivation is the main occupation of a majority (57.3%) of members under CBPs. This is followed by wage earners who constitute about 21 per cent. If occupation like animal husbandry and agriculture is combined together, it is about 65%. The occupation of most of the members under functional plants have been reported as animal husbandry and agriculture. It is nearly 77% in the case of former against 62% in the later category. This may be one of the reasons for success of these plants as because dung supply is assured in majority of cases. The details of membership by occupational classification under functional as well as non-functional CBP is given below:

Table 8.4

CBP Members classified by occupation

(No. of Members)

Occupation	Functional Plant	Non-functional Plant	Total
Animal Husbandry	8 (13.6)	15 (6.4)	23 (7.8)
Cultivation	37 (62.7)	131 (56.0)	168 (57.3)
Wage earners	10 (16.9)	53 (22.6)	63 (21.5)
Trade/Business	3 (5.1)	6 (2.6)	9 (3.1)
Service	1 (1.7)	27 (11.5)	28 (9.6)
Others	-	2 (0.9)	2 (0.7)
Total	59*	234	293

*For two members, occupation was not available.
Figures in brackets indicate percentages.

Income Distribution

8.14 Income distribution is un-equal among members under functional and non-functional category. The average monthly income seems to be higher among members of functional CBPs compared to those under non-functional units. Nearly 80% members of functional CBPs are used to earn more than Rs.5000 a month against 44% earning a sum less than Rs.2000 under non-functional category. The distribution of members by size of income earned per month by both types of beneficiaries is given below:

Table 8.5

CBP members classified by monthly income

(No. of members)

Monthly income (Rs.)	Functional Plant	Non-functional Plant	Total
Upto 2000	-	103 (44.0)	103 (35.9)
2001-5000	5 (8.2)	94 (40.2)	99 (34.5)
Above 5000	48 (78.7)	37 (15.8)	85 (29.6)
Total	**53***	**234**	**287**

*Income was not reported in case of 8 members.
Figures in brackets indicate percentages

Operational Arrangement

8.15 For operation and maintenance of these plants, committees are formed in each and every village. The committees in turn, have appointed an in-charge to look after day-to-day working of the plants such as daily dung collection/feeding and supply of gas etc. As reported, the committees are empowered to take action against any member not contributing his share of dung. Only two committees, one each in Haryana and Orissa out of 13 cases examined, have taken action against those members who did not contribute their share of dung. The action taken was in the form of lodging FIR, conducting an enquiry etc.

Availability of Water for CBP

8.16 Water is an essential input, next in importance to dung, for working of a biogas plant. In view of its importance, information about its requirements and availability at the village level was collected. As understood through this exercise, tubewells and hand pumps are the main sources of supply of water to feed the CBPs followed by dug well. However, the use of piped water and water from nearby spring for making slurry, is reported in one case each in Tamil Nadu and Kerala respectively. As reported by the in charges of CBPs, availability of water was not a constraint at all but in villages of Haryana, Madhya Pradesh, Punjab and Rajasthan, payment for water ranging from Rs. 3 to Rs.20 per day was made.

Availability of Cattle

8.17 Cattle holding is another important factor for smooth running of a CBP. With a view to examine the extent of fulfilment of this aspect, all CBP members were asked to specify the number of animals being held by them at the time of visit of the survey team. As revealed, among functional CBP members, nearly two third own cattle while the remaining members have no access either to cattle or dung. As of cattle holding by members under non-functional CBPs, a similar trend was observed. As felt, cattle/dung ownership is not the only reason for CBPs becoming non-functional. There are other factors such as cooperation among members, easy availability of other fuels, payment of monthly charges, un-equal use of gas etc. too. The distribution of members by availability of cattle for both categories of plants is given below:

Table 8.6

CBP Members classified by cattle holding

(No. of members)

Ownership of cattle	Functional plant	Non-functional plant	Total
Cattle owner	40 (65.6)	149 (63.7)	189 (64.1)
No cattle	21 (34.4)	85 (36.3)	106 (35.9)
Total	61	234	295

Figures in brackets indicate percentages.

Cost of Operation

8.18 The cost of operation includes the cost involved for commissioning of the plant and also for regular maintenance and operation. To start with, a biogas plant requires a large quantity of dung, which is about 20-30 times more than the quantity required for daily feeding in a plant. It has been found that the requirement of dung for initial feeding was partly met through collection from members while a major portion of the requirement was purchased from outside. However, this was one time collection in either case. The contribution by members towards initial cost for commissioning the plant is not found to follow any criteria. In states like Haryana, Andhra Pradesh, Maharashtra, Orissa and Uttar Pradesh, the members of CBPs have not made any contribution towards initial cost for commissioning the plants whereas the members of CBP in Kerala, Madhya Pradesh and Rajasthan have made full contribution towards initial cost for commissioning the plants. Cost incurred for daily operation except Tamil Nadu was as high as over Rs. 500 in Rajasthan and Haryana against a low of Rs.3 in Madhya Pradesh and Rs. 35 in Uttar Pradesh. Distribution of plants by cost of operation is given below:

Table 8.7

Classification of CBP by initial cost and cost of operation

Functional Plant	Initial cost (Rs.)		Contribution by members towards daily operation (Rs.)*
	Total	Contribution by members	
Haryana	18,000	-	377
Kerala	1,500	1,500	425
Madhya Pradesh	5,000	5,000	3
Punjab	7,200	200	86
Non-Functional Plant			
Andhra Pradesh	5,738	-	230
Haryana	40,503	210	544
Madhya Pradesh	17,000	17,000	22
Maharashtra	3,000	-	210
Orissa	3,000	-	145
Punjab	2,060	60	175
Rajasthan	20,000	20,000	513
Tamil Nadu	1,100	300	NA
Uttar Pradesh	3,200	-	35

* Includes imputed value of dung.

Duration of Working (Non-Functional CBP)

8.19 Two, out of 9 non-functional plants surveyed, worked for a duration of over 5 years while one non-functional plant in Haryana which was commissioned spending over Rs.40,000 and daily operation cost of Rs.544, highest among the CBPs surveyed, was in operation only for 8 months. Another 4 plants turned, non-operational within a year of their installation. These plants are reported from Andhra Pradesh, Punjab, Rajasthan and Tamil Nadu. However, the remaining plants worked for a period ranging between 12 months in Madhya Pradesh to 86 months in Orissa and 75 months in Uttar Pradesh. The distribution of non-functional plants by period of working is given below:

Table 8.8

Non-working plants classified by period of working

State	Month of installation	No. of months worked
Andhra Pradesh	7/85	7
Haryana	6/86	8
Madhya Pradesh	8/88	12
Maharashtra	9/89	27
Orissa	7/92	86
Punjab	9/87	6
Rajasthan	7/85	3
Tamil Nadu	9/95	1
Uttar Pradesh	3/87	75

Reasons for CBPs Becoming Non-Functional

8.20 The main reason for **CBPs** becoming non-functional is due to shortage of dung owing to non-contribution by members. Among other reasons, lack of coordination and community approach among members, non-availability of operator due to low payment, non-payment of monthly maintenance charges by members, etc. are important. The details are given below :

Table 8.9

Reasons for plant becoming non-functional

Reasons	No. Reporting	% to Total
Shortage of dung due to non-contribution by members	25	51
Lack of coordination among members	17	35
Non-availability of operator	13	27
Non-contribution of monthly charges	12	24

Note : Because of more than one reason, total may not add up.

Benefit from CBP

8.21 A community biogas plant provides a series of benefits to the society in general and the members in particular. This is true to the plants which worked for a considerable period of time as a result of which the expected return from these plants has positively felt. As of individual benefit, use of gas for cooking was the main objective because of which several households were attracted towards the programme. In order to ascertain the extent of usefulness of this objective, the members irrespective of their affiliation to functional and non-functional category of plants, were asked about the requirements and availability of gas in terms of hours of cooking. The information thus compiled, revealed that in 4 cases, i.e. Kerala, Andhra Pradesh, Madhya Pradesh and Orissa, the requirement of biogas for cooking was fully met while another plant in Madhya Pradesh currently working generated more gas than required by its members. Otherwise, shortfall in the production of gas was reported in all other cases due to partially working of these plants (3) and less availability of dung (4) and more number of connections released in case of a plant in Haryana. Two states, namely, Tamil Nadu and Rajasthan, are not covered in the

analysis for want of information on availability and requirement of gas daily. The distribution of plants by requirement and availability of gas is given below:

Table 8.10

CBP classified by requirement and availability of gas for cooking

State	Availability of gas for Domestic use (Hrs./Day)	
	Requirement	Availability
Functional Plants		
Haryana	6	5
Kerala	4	4
Madhya Pradesh	4	6
Punjab	6	5
Non-Functional Plants		
Andhra Pradesh	3	3
Haryana	6	3.5
Madhya Pradesh	4	4
Maharashtra	3	2
Orissa	4	4
Punjab	2	0.2
Uttar Pradesh	4	2.5

8.22 The benefits perceived by members of 4 working CBPs are highlighted in terms of supply of gas as per the requirement of the members, cheap and convenient source of energy, organic manure etc. Similarly, the reason for non-functioning of the plants at the community level as reported by the in-charges is basically due to lack of cooperation among users/members, insufficient or practically non-contribution of dung, ineffective committee for maintenance, inadequate gas formation and lack of interest by the implementing agencies. Their views in respect of revival of these plants pertains to the introduction of a system of compulsory contribution of dung, activisation of the committee for maintenance, technical and financial assistance by the implementing agency etc.

Realisation/Perception of Impact Under CBP

8.23 Use of CBPs have rendered multiple benefits to the users. Of these, important is cooking followed by lighting through biogas. In one case, biogas is used for other purpose such as viewing of Television. The use of slurry manure for crop production is a further advantage to the CBP users. With a view to examine the extent of utilization/realization of these benefits, 25 households among those using biogas at present from functional CBPs were interviewed through a separate set of questionnaires. Their views on different aspects of benefits from CBP are segregated and given below:

Table 8.11

Current CBP users classified by perception of benefits

(N=25)

Benefits Perceived	Rep. HHs (No.)
Cooking	20
Lighting	5
Other use	1
Benefit of manure	6
Saving of time by ladies	23
Cheap fuel	21
Clean fuel	18
Cleanliness in kitchen	19
Improvement in health	17
Saving in traditional fuel	17

Note : Since more than one benefit is perceived by the beneficiaries, the total may not add up.

Monthly Income and Expenditure

8.24 Most of the CBPs are found loss making units both under functional and non-functional categories except one in Rajasthan which was commissioned way back during July 1985 and worked only for 3 months. In 5 CBPs where expenditure on operation and maintenance was mounting over years, there was no income either through sale of slurry manure or contribution from members. The situation was not very different among the remaining lot (5 cases) where the plants have generated some income for sustenance. In these plants, the expenditure incurred on operation and maintenance per month was between 2-5 folds compared to the income. The distribution of plants by monthly income and expenditure is given below :

Table 8.12

Classification of CBP by monthly income and expenditure

(in Rs.)

State	Income	Expenditure
Functional		
Haryana	6,200	11,850
Madhya Pradesh	NIL	90
Punjab	1,780	2,110
Non-functional		
Andhra Pradesh	NIL	6,900
Haryana	700	3,184
Madhya Pradesh	NIL	650
Maharashtra	NIL	3,500
Orissa	NIL	145
Punjab	700	3,500
Rajasthan	700	440
Uttar Pradesh	802	1,183

Note : Income and expenditure data was not available for Kerala and Tamil Nadu.

Non-User of CBP

8.25 Apart from users of CBP, a cross-section of non-users in the selected villages were also interviewed. The survey team in a bid to find out various reasons behind not becoming a member, contacted 85 households to elicit information about the awareness and impact of the programme at the household as well as community level. While 10% among those interviewed were found lacking any knowledge about CBP, their counterparts (90%) seemed quite aware about various benefits under the programme. But inspite of sufficiently being fed about the benefits of CBP, most of them have not taken any initiative to join the programme due to the following reasons.

Table 8.13

Reason for not becoming member of CBP

(N=83)

Reason	Rep. HHs (No.)
Availability of other cooking device/cheaper fuel	23
Insufficient cattle	22
Membership not available	21
Residence far off	11
Other CBP not functioning satisfactorily	12
Gas not supplied timely	6

Note : Since more than one reason is spelt out by the respondents, total may not tally.

Willingness to Become Member

8.26 A total of 39 (46%) households out of 85 non-users interviewed, are willing to joint CBP subject to the fulfillment of the conditions such as regular supply of gas, monthly charges are not more than Rs.100, CBP is near to their houses etc. Some households are interested in government constructing and running the plants which they feel would ensure regular supply of gas at a minimum operational cost. A few cattle less households are also interested in joining the CBP with the reservation that bank loan should be provided to purchase cattle so that they would be in a position to contribute dung for running the plant. The distribution of households by willingness to join CBP by conditions is given below:

Table 8.14

Non-users classified by conditions to become Member of CBP

(N=39)

Condition of Membership	Rep. HHs (No.)
If supply is made available regularly	18
If monthly charges are not more than Rs.100	15
If CBP is installed near to their house	9
If a new plant is constructed/Govt. runs the plant	7
If bank loan is approved to purchase cattle	6
Other conditions (subsidized rate etc.)	3

Note : Because of more than one reason, total may not add up.

Views of Biogas Users from Family Segment

8.27 All 615 users of family type biogas plants were also asked whether they are willing to join CBP if such a facility is made available, against payment of certain amount per month. This amounts to commercialization of biogas and setting up large sized plants at the community level in which case, the households need not attend routine operation and maintenance pending it to be done by some other agency or individual entrepreneur who would charge a certain amount every month from the households for use of the facility (Biogas). The households were asked to react on the proposal by way of amount they are willing to pay in case such a facility is made operational in their areas. The opinion thus collected revealed that over 50%, i.e. 310 out of 615 households who supported the idea, offered to pay a sum, up to Rs.500 per month. The distribution of households by their willingness to pay for biogas per month is given below:

Table 8.15

Distribution of family segment users by willingness to pay towards gas from CBP

Amount willing to pay per month (Rs.)	Rep. HHs (%)
1-50	16.5
51-100	23.2
101-200	31.6
201-500	28.7
Above 500	-

Views of Non-User of Biogas from Family Segment

8.28 The survey team contacted 740 households among non-users from family segment to know their reaction to join a CBP if the facility is made available in their villages. Out of 740 households interviewed, only 154 households, i.e. 21% replied in positive. A majority of those households who did not want to join a CBP in the near future advanced several reasons for their reservations. These include family/economic problems, social taboo, etc. The distribution of households by their reservations for non-joining CBP is given below :

Table 8.16

Family segment non-users classified by reasons for not joining CBP

Reasons for not becoming member of CBP	Rep. HHS (%)
Economic problems	37
Family problems	26
Social taboo	19
Lack of cooperation among villagers	11
Unequal supply of gas among members	3
Scattered houses/population	2
Shortage of dung/water	7
Lack of proper management	5
Availability of other fuels	18

Note : Because of more than one reason given by the respondents, total may not add up.

Summary

8.29 Although over 90% CBPs installed till March 2000, are lying defunct in the length and breadth of the country, the programme is considered neither a social nor an individual evil. Those who are currently using the facility as also used the product in the past, have not experienced any major problems with regard to availability of gas except a few households in the tail areas to whom supply of gas was not that uniform. This was due to inadequate supply of dung by some households against whom no action was taken by then committee. As has been found, in a majority of cases, cooperation among the villagers are missing, because of which monthly contribution towards maintenance as also daily feeding for running of plants, have not been effected. The MNES may think in terms of revival of these plants by way of spending appropriate amount, a portion of which may be collected from the members. After repair, these plants may be handed over to the village committees or interested entrepreneurs or local bodies to run these plants viably. A considerable section, over 50% family segment plant owners have opted to participate in CBP if the facility is made available. Taking into account their willingness and ability, implementing agencies at the state level may be requested to identify volunteers/local entrepreneurs/NGOs at the grass root level, who are interested to run these plants on commercial basis. 39 out of 85 non-user households of CBP interviewed, have also expressed their willingness to join the stream under certain conditions.

8.30 Though the experience of operating CBPs has not been encouraging so far, but in order to harness the full biogas potential, the policy makers would need to reconsider the implementation strategies after taking into account the lessons learnt from past experience. It would need to be mentioned here that 90% of the institutional biogas plants of the same capacity range have been found to be very successful. Keeping this in view, it would be appropriate to examine with the help of leading technical and socio-economic research institutions the following aspects relating to CBPs :

- 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.

Chapter 9

Research and Development

In India, the work on biogas technology started as early as 1950s and its development on experimental basis was taken up only during 1960s. The actual construction of plants began during this period with the Directorate of Agriculture Extension under the Ministry of Agriculture, sponsoring a few plants. The initial model of biogas plant was Gramlaxmi, a floating dome KVIC Model. Further improvement in the model was brought through research and development undertaken by Government Organisations such as IARI and Khadi Gram-udyog etc with the objective of a regular supply of gas to the owners with a minimum cost of construction and maintenance. But this was found to be a cost ineffective model as the cost of steel drum used in the plant was over 40% of the cost of plant, which needs replacement every 5 years if painted periodically. Otherwise, the drum life may get reduced. The response towards these plants was not quite good in view of a high cost involved in the construction and their maintenance. An alternative in terms of reduction in the cost under a fixed dome Janata category was developed and propagated. Cost-wise this was a preferred Model. But in all these plants, the gas pressure in winter was found low owing to flat surface of the dome. Problem was more in winter and in colder region where gas formation tends to fall because of low atmospheric pressure. Keeping this factor in view, a modified version of Janata under the brand name of Deenbandhu, a cost effective model, was developed by a New Delhi based NGO, Action for Food Production (AFPRO) during late 1970s. The traditional KVIC Model was also improved through use of pre-fabricated ferro-cement segments in the digester and gasholder by way of using fibre glass reinforced plastic (FRP) with a view to make the plant affordable. All these models are approved and now under active propagation.

Need for Research & Development (R&D)

9.2 Research and Development is an important component of biogas programme for improvement in the present structure and design of the plants. It is a process of evaluation of shortcomings experienced during the use of the facility and making modifications keeping in view the essential requirements of the system. In most of the investment projects associated with individual interests and social values, R&D is given due priority. The need for R&D arises with the advent of new technology as also to remove shortcomings in the present practice through evaluation of performance.

Organisations Conducting R&D

9.3 For research and development under NPBD, the MNES is funding 9 existing technical institutes (RBDTC) located in various agricultural universities across the country. Although, no separate fund is allocated for this purpose, the Regional Biogas Centres in Himahcal Pradesh, Punjab, Rajasthan and Tamil Nadu, have managed to fund this activity out of annual grants given by MNES towards salary and contingency for staff and training etc. Besides, the programme implementing

agency of Orissa, i.e. Orissa Renewable Energy Development Agency (OREDA), is also working on some developmental activities.

Areas under R&D

9.4 The active area of research and development under NPBD is evolution of low cost technology based biogas plants and their propagation apart from use of bio-mass, kitchen/cattle wastes in the feed slurry, use of bamboo sticks in place of chicken mesh, improvement in the stirring mechanism in Deenbandhu model, use of micro organism to increase gas output in all the seasons as also to reduce the dependability on cattle dung having many fold uses. Other area under R&D includes utilization of ferro-cement technology, casting of design without shuttering in the Janta Models, design and development of suitable biogas burners and biogas holders, testing of biogas burners and biogas holders developed by various organizations for their efficiency, analysis of fertilizer value of bio-digested slurry to find out ways and means to increase its fertilizer value by supplementing with various additions etc.

Results of R&D and their Acceptance Level

Development of New Model

9.5 The Department of Bio Energy, College of Agricultural Engineering, Coimbatore, has brought out a new animal dung based spherical biogas plant under the brand name 'Sakthi' which is 20% cheaper than Deenbandhu Model, 30% cheaper than Janata and 40-50% cheaper than KVIC under 2 cum.capacity. It occupies less space because of spherical shape of the digester. The pressure of gas is also more.

9.6 The technical back up support unit at Palampur, Himachal Pradesh, has developed a new biogas plant "Himshakti Model" which is reported to be cost effective and is designed to suit the local conditions of the area. The model is under field trial. The success of the model will depend upon its level of acceptance under field conditions.

9.7 The Regional Biogas Development and Training Centre, Vellayani, Thiruvananthapuram, is currently engaged in conducting field trial on "Vaincap model' biogas plant in cooperation with the Vivekanand Kendra, Kanya Kumari. The rate of success of this model is still to be assessed. As revealed, the centre is not activated through release of funds by MNES now.

9.8 The Punjab Agriculture University, Ludhiana, has developed "PAU Kacha Pucca Model" biogas plant in the recent years. Cost wise, this is cheaper than all other models being propagated in family segment under NPBD. The propagation of these plants are done through demonstration in about 30 villages under 10 districts of state. But the level of acceptance for these plants was not quite good. The households were not in favour of accepting changes in structure due to use of low cost materials challenging a threat to the durability.

9.9 The Department of Renewable Energy Sources, College of Technology and Agricultural Engineering, Udaipur, has designed and developed a new generation "Chetak Biogas Plant", also a cost effective model suitable for agro-climatic conditions of the state. The level of acceptance of this product will be known once tried under field conditions.

9.10 Orissa Renewable Energy Development Agency (OREDA) is working on development of a spherical model biogas plant, which is reported to be more cost effective and efficient. The OREDA is also looking into possibility of construction of biogas plants through HDPE sheets.

9.11 Sustainable Development Agency in Kerala has developed technology for the use of ferro-cement in place of bricks. Though this technology is cost effective, its acceptance has been found to be very poor among the beneficiaries.

Improvement in Other Aspects

9.12 Apart from the developments/improvements in the existing models, research and development in other aspects of biogas are being attended to by RBDTCs. Some of these are as under :

(i) The development of biogas cum solar powered light trap as a substitute to conventional electric powered light trap which is difficult to install and operate, is another break through in the technology developed by Department of Bio Energy, College of Agriculture Engineering, Coimbatore. The trap consists of an insect trap frame assembly and two lighting units, one solar powered electric fluorescent lamp or a biogas (mantle) interchangeable. The field-test in cotton crop showed that almost all the phototropic pests of cotton could be monitored with the trap. The department also developed biogas balloon for transportation of biogas from one destination to the other. The use of laterite brick in the digester of KVIC Model was also suggested by this department.

(ii) The training centre at Jorhat, Assam, has suggested improvement in the stirring mechanism specific to Deenbandhu plant which has been implemented at the field level. This centre is being associated with the evaluation of the SPREAI biogas plant by way of using banana stem as input for generation of gas. It is also conducting operational research programmes on use of biogas slurry for crop production on a continuous basis to create awareness among farmers on the manurial value of biogas slurry.

(iii) The Palampur Centre in Himachal Pradesh developed a low cost technology for reducing the percolation of biogas from the dome of the plant apart from suggesting the use of micro-organism for enhancing the biogas production in winter.

(iv) In Kerala, the use of bamboo stick in place of chicken mesh in ferro-cement model biogas plant was suggested by the biogas training centre located at Vellayani.

(v) The casting of dome without shuttering in Janata design as also introduction of alternate feed materials for biogas generation was suggested by CTAE, Udaipur.

(vi) IIT, Kharagpur, is currently working on the reduction in the size of biogas plant through two-stage solid state fermentation technique as also on the use of low cost alternate building materials for reduction in the construction cost of biogas plants.

(vii) The VAS Bangalore is engaged in the performance evaluation of dual fuel diesel engine at different induction rates of biogas to utilize the energy for post harvest operations.

(viii) RBDTCs are also engaged in preparation of leaflets and course materials for training.

Role of RBDTCs in R&D

9.13 For research and development, there are no separate guidelines issued by MNES to the RBDTCs as because there is no separate fund allocation for this purpose. Hence RBDTCs take the liberty of utilizing the funds on priority for staff salary, allowances, etc. leaving little margin for training, extension and R&D activities. However, component-wise amount received and spent was not available in many centres. This was available at the aggregate level for the latest 3 years of the study (1997-98 – 1999-2000), as shown below:

Table 9.1

Amount received and utilized by RBDTC

(in Rs.)

Location of Centre	1997-98		1998-99		1999-2000	
	Received	Utilized	Received	Utilized	Received	Utilized
Hyderabad	568500	423312	518500	328013	650000	310480
Jorhat	52500	117505	260000	445150	325000	316174
Palampur	602000	403981	462000	501171	650000	505074
Bangalore	549000	428789	475512	450000	642430	347127
Udaipur	600000	687286	620000	848377	1000000	946605
Coimbatore	706250	821812	827618	850983	1115562	1151231
Kharagpur	406100	365277	374272	332472	800000	573592
Hissar	242860	268599	232506	232506	300918	300918
Ludhiana	416000	497551	325000	550110	325000	638397
Vellayani	258500	430809	445200	463882	8000	155973
Total	**4401710**	**4444921**	**4540608**	**5002664**	**5816910**	**5245571**

Pattern of Expenditure

9.14 The amount released by MNES is normally spent on three major components such as salary and allowances for staff engaged in biogas, recurring contingency and training. In order to ascertain the direction where a bulk of the amount is spent, the biogas training centres were requested to furnish information on receipt and expenditure by sources to the study team from their records which most centres were not able to furnish, except APAU, Hyderabad, HPKVV, Palampur, PAU, Ludhiana and IIT, Kharagpur. As of annual report of the centre, no one except TNAU, Coimbatore, was able to provide a copy to the study team. Even centres like PAU, Ludhiana and IIT, Kharagpaur were not in a position to provide a copy of their annual report for any of the years under study. Hence, analysis at the aggregate level was not possible and was confined to the four centres as under :

Table 9.2

Pattern of expenditure in selected biogas training centres during 1997-98 to 1999-2000

Location of Centre	Receipt (Rs.)				Expenditure (Rs.)			
	Salary	Contingency	Training	Total	Salary	Contingency	Training	Total
Hyderabad	1015000	180000	542000	1737000	578575	343334	139896	1061805
Palampur	1150000	60000	504000	1714000	1125161	225065	60000	1410226
Ludhiana	816005	-	250000	1066005	1436274	196874	52910	1686058
Kharagpur	879000	313831	586350	1779181	560534	471323	239484	1271341
Total	3860005	553831	1882350 (29.9%)	6296186	3700544	492290	1236596 (22.8%)	5429430

9.15 As may be observed from above, the funding pattern as also the expenditure at the aggregate level or at the level of individual centre is tilted towards payment of salary and recurring contingency for the staff. When receipt of fund during the last three years is considered, the portion earmarked for training component under the programme is nearly 30% at the aggregate level. It comes down further to about 23% when actual expenditure on training is incurred by these centres. When training specifications are not met to the fullest extent due to a low provision in the budget for training, the scope for research and development in the field of biogas is far from reach. The MNES guidelines are also silent on this aspect.

Summary

9.16 It is said that R&D make sense if done properly. For a programme like NPBD, only R&D can increase the efficiency of the plants. It has been observed that MNES has not kept any separate allocation for R&D. The guidelines issued by the Ministry are also silent on this aspect. The funds released by MNES to RBDTCs are intended to be spent only on staff salary, recurring contingency and training. Inspte of this lacuna, a few Biogas Training Centres located at Udaipur, Coimbatore, Palampur and Ludhiana are still pursuing various research activities including development of cost effective models. A few RBDTCs are also working on the utilization of alternate feeding materials apart from cow dung especially kitchen/agricultural wastes, coconut/banana stem etc. for biogas production. The Jorhat centre is conducting operational research programme on use of biogas slurry for crop production on a continuous basis to create awareness among farmers on

the manurial value of biogas slurry. The VAS, Bangalore is also engaged in the performance evaluation of dual fuel diesel engine at different induction rates of biogas to utilize the energy for post harvest operations. Unusual delay coupled with inadequacy in receipt of funds as also staff deficiency due to vacant posts at different levels are cited as the major constraints for achievement of the targets of various training courses under NPBD. Practically, all the training centres are looking for a separate fund allocation for research and development activities in the field of biogas.
