Gram Vikas

Rural Enterprise in Renewable Energy Development: A case study of biogas programme of Gram Vikas in Orissa

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Gram Vikas is a rural development organisation working with the poor and marginalised communities of Orissa since 1979, towards making sustainable improvements in the quality of life of the rural poor.

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RURAL ENTERPRISE IN RENEWABLE ENERGY DEVELOPMENT

A CASE STUDY OF BIOGAS PROGRAM OF GRAM VIKAS IN ORISSA

Winrock International India
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List of Abbreviations

AE	Assistant Engineer
AED	Agricultural Engineering Department
AFPRO	Action for Food Production
BDO	Block Development Officer
CHF	Canadian Hunger Foundation
DC	District Coordinator
DNES	Department of Non-conventional Energy Sources
DPAP	Drought Prone Area Program
DRDA	District Rural Development Agency
GV	Gram Vikas
IIM	Indian Institute of Management
IRDP	Integrated Rural Development Program
IREDA	Indian Renewable Energy Development Agency
IREP	Integrate Rural Energy Planning Program
IRMA	Institute of Rural Management Anand
ITDP	Integrated Tribal Development Program
JE	Junior Engineer
KVIC	Khadi and Village Industries Commission
LPG	Liquid Petroleum Gas
MNES	Ministry of Non-conventional Energy Sources
MNP	Minimum Needs Program
MWT	Mobile Women's Team
NGO	Non-governmental Organization
NPBD	National Program on Biogas Development
NPIC	National Program on Improved Chulhas
NREP	National Rural Employment Program
OREDA	Orissa Renewable Energy Development Agency
RESCO	Rural Energy Service Company
RHEP	Rural Health and Environment Program
RLEGP	Rural Labor Employment Guarantee Program
SC	Scheduled Caste
SDC	Sub-divisional Coordinator
SEE	Self-employed Entrepreneur
SELCO	Solar Electric Light Company
ST	Scheduled Tribe
TERI	Tata Energy Research Institute
TKW	Turnkey Worker
YSMD	Young Students Movement for Development

I.Rural Economy, Energy and Enterprise

sector. Commercial fuels such as LPG, kerosene and diesel have not penetrated the rural areas much despite heavy government subsidies, due to absence of efficient energy markets, a consequence of low purchasing power and poor infrastructure development.

Biomass fuels are largely collected free of cost, and are not traded in the markets, except in semi-urban, peri-urban areas where there is high opportunity cost for human labor spent in fuel collection. Women and children walk long distances and spend considerable amount of time in fuelwood collection resulting in family drudgery. Growing demand for biomass fuels, especially fuelwood, is exerting pressure on land sources affecting their long time sustainability.

Over two-thirds of the Indian population –close to 700 million -- still live in rural areas despite half-a-century's rapid urbanization . Agriculture remains the principal occupation of these people. In general, rural areas are characterized by low per capita incomes, inadequate infrastructure, low access to markets, weak technological base and poor availability of basic amenities (education, health facilities, etc.). Electricity supply remains poor with less than one-third of the rural households having connections. Due to these reasons, there is little development of industry and enterprise in the rural areas. Where the agricultural situation is precarious, being largely dependent on monsoons with little access to irrigation facilities, high level unemployment and consequent migration to urban areas are also prominent features.

While rural lifestyles are largely woven around exploitation and use of biomass resources, the level of biomass dependence varies across the country due to diversity in socio-cultural conditions and resource endowments, and the consequent levels of economic development. This dependence is well reflected in the energy sector, where biomass fuels – wood, animal waste and crop residue -- contribute over 75 percent of the total energy. Further, nearly 90 percent of biomass fuels are consumed in the household sector, mainly for cooking and heating. It is estimated that over 200 million tons of fuelwood, 100 mt of dung and another 100 mt of crop residues are consumed annually in the rural energy

Since Independence, most of the energy and non-energy interventions to achieve 'rural development' have been in the form of welfare programs implemented by the government with huge subsidies provided from the public exchequer. Several programs such as Integrated Rural Development Program (IRDP), National Rural Employment Program (NREP), Integrated Tribal Development Program (ITDP), Rural Labor Employment Guarantee Program (RLEGP), Minimum Needs Program, Drought Prone Area Program (DPAP), etc. were aimed at various welfare measures in rural areas. In the energy sector, Integrated Rural Energy Planning Program (IREP), National Program on Improved Chulhas (NPIC) and National Project on Biogas Development (NPBD) are prominent. Electricity and diesel are supplied at extremely low prices in the agricultural sector. Annually, 50-60 percent of the government budget is allocated for various rural development programs, and billions of rupees go into subsidizing various programs. However, according to government estimates, 40-50 percent of the rural population still remains below the poverty line.

[1] *The facts and figures in this section are taken from Putti V R (1998). As If Institutions Matter: An Assessment of Rural Energy Technologies in Rural India. Dissertation. University of Twente, Enschede, The Netherlands.*

Huge governmental infrastructure in the form of District Rural Development Agencies (DRDA), block development offices, agricultural extension agencies, etc. was created for implementing various development programs. Following the 73rd Amendment to the Indian Constitution, village Panchayats were also given direct financial powers to undertake developmental programs at the grassroots level. Apart from the government machinery, non-governmental (voluntary) organizations (NGOs) are also involved in program implementation at various levels. However, NGOs usually operate under the governmental framework of subsidy-driven, target-oriented program implementation.

It is in this overall context that rural enterprise needs to be seen. Enterprise development is expected to lead to higher efficiency (and competitive pricing) in providing services while contributing to income generation and local employment. However, given the heavy state control and the prevailing subsidy culture coupled with traditional and informal economic practices, there has been little scope till now for development of enterprise in rural development activities, including energy services. Nonetheless, with the advent of economic reforms since early 1990s, some effort has been made to reduce state involvement and encourage private entrepreneurship and commercialization in several development activities. Power sector restructuring and regulation is a major illustration of this process. However, these reforms are still young and their efficacy in leading to better economic efficiency and service is yet to be demonstrated. Poor institutional and human capacities remain the biggest barriers for the success of such a reform process.

II. Case Study in Enterprise Development

The present case study documents and analyzes the experience of entrepreneurial development in the biogas program of Gram Vikas (GV), a non-governmental organization in Orissa. For, this experience is significant in the context of the overall paradigm shift that appears to be occurring in rural development. As would be seen in this document, the enterprise model that has been the outcome of this initiative could be a pointer to the institutional approaches required for sustainable rural energy development. Further, such a model can also show how energy could be the nucleus around which an integrated approach can be followed for sustainable rural development. Thus, the case study has the following objectives:

i) To identify factors that have led to the success of the biogas intervention of Gram Vikas and contributed to the development of a large group of entrepreneurs;

ii) To examine the role and motives of Gram Vikas that have led to the institutional transformation in biogas program; and

iii) To examine the sustainability of the entrepreneurial activity in the context of the overall rural development.

The approach and methodology adopted for conducting this case study are discussed in Appendix I.

III. Orissa – A Socio-Economic Profile

Orissa is a predominantly rural state on the eastern coast of India, with fertile green coastal plains rising to the hills of the Eastern Ghats . Only 13.4 percent of the state's population live in urban areas and one out of every four individuals belongs to one of the several tribal communities. The state is abundant in natural resources like forests and minerals (bauxite, iron, manganese, etc.).

Despite these rich resources, Orissa counts amongst the most backward states in the country with a literacy rate of 48.6 percent and a per capita annual income of Rs. 3,963 (at 1992-93 prices) . Orissa's economy is largely based on agriculture, which provides 80 percent of the rural employment. Most parts of the state lack basic infrastructure; less than 70 percent of villages and less than 10 percent of rural households have electricity connections. Electricity requirement for irrigation forms just 5 percent of the total demand in the state. Economy in tribal villages is largely controlled by moneylenders, who virtually enslave the tribals through usury.

Migration from rural areas is very common in several parts of Orissa, due to drought conditions and insufficient employment. Poor employment opportunities in and around their villages often drive the men-folk to look for work in larger cities, within and outside the state, such as Bhubaneswar, Surat, Hyderabad and Mumbai. People who own some land migrate seasonally; at the onset of the monsoons they participate in the tilling and sowing and then go off to towns and cities and work in factories, coal mines, etc . They return when it is time for the harvest, after which they go back to these industrial towns. This form of seasonal migration is widely practiced and supplements the income of rural families.

More than 77 percent of Orissa's rural households are dependent on wood as a cooking-fuel and 15 percent utilize cow dung cakes. The rest use fuels such as kerosene, electricity and coal. Biogas caters to just 0.23 percent. The biomass fuels are collected and used in a completely non-monetary way in the rural areas. However, big towns in Orissa have fuelwood markets, catered to by the surrounding villages, which generate incomes through headloading trade.

Considering this backward scenario in the state, there has been little entrepreneurship by way of small industries or developmental activities in the rural areas. However, Orissa had been the

[2] *Facts and figures in this section are taken from TEDDY (2000). TERI Energy Data Directory and Yearbook 1999-2000, Tata Energy Research Institute, New Delhi; and TERI (1998). Green India 2047. Tata Energy Research Institute, New Delhi.*

[3] *1 US$ is Rs 45 (August 2000)*

[4] *Many people migrate to Surat to work in textile mills. As laborers in Orissa they earn only Rs. 30 a day whereas by working in cities like Surat they can earn anything between Rs. 70-100 a day.*

first state to go in for power sector reform by restructuring the state electricity board in 1995 into two separate companies for generation, and transmission and distribution. The latter company was privatized in 1999. While these reforms are too recent to feel their impact, it appears that rural energy services, which are not likely to generate major profits for private companies on account of low and intermittent loads, would not be a high priority.

Orissa has the distinction of having the highest number of voluntary agencies in the country, over 7000, covering virtually every village. Most of these NGOs implement government-funded welfare and development programs, based on grants and charities, which are used to subsidize various programs.

It is in this overall environment that Gram Vikas's biogas program has spawned the entrepreneurial model

IV. Biogas Technology Dissemination Program

In response to the rural energy crisis perceived in the late 1970s, the government of India launched two major interventions in the form of biogas plants and improved cookstoves. These have been implemented as national programs with a subsidy-driven, target-oriented approach, usual for most rural development programs. By March 2000, close to 3 million biogas plants and 30 million improved stoves were installed in the country . In the state of Orissa, nearly 150,000 biogas plants were disseminated. The overall potential for biogas technology in India, based on cattle-owning pattern, has been estimated at 12 million plants with a corresponding figure of 605,000 for Orissa.

One of the key institutional mechanisms adopted by the government of India to implement the National Project on Biogas Development (NPBD) is the involvement of NGOs. Scores of NGOs across the country have participated in biogas implementation at various levels including planning, implementation, monitoring, training and information dissemination. In fact, several evaluation studies of the biogas program indicate that NGO involvement has been one of the main contributing factors wherever the program has been successful . Gram Vikas in Orissa has been one such non-governmental organization, which made a significant impact on the biogas program and rural energy scenario

[5]Biogas is a combination of methane and carbon dioxide with traces of sulphur and moisture, generated by fermentation process of organic material under oxygen-free conditions. Biogas is a clean, environmentally-benign fuel and can be used for cooking, lighting and motive power applications. Two basic designs of digesters – fixed masonry dome and floating metal drum – exist in India for biogas production.

[6]Annual Report 1999-2000. Ministry of Non-conventional Energy Sources, New Delhi.

V. Biogas Program of Gram Vikas

The beginnings

Gram Vikas (GV) has a mandate to work in partnership with marginalized people to empower them to organize themselves for a sustainable future with an improved quality of life. GV has its origins in the Young Students Movement for Development (YSMD), a Chennai-based student organization. In 1971, a number of YSMD volunteers came to Orissa to undertake relief and rehabilitation work following a devastating cyclone and tidal wave. After the relief work, a group of the YSMD volunteers decided to stay back and initiate development projects in the area. In 1977, this group moved to Ganjam district and set up a base at Mohuda village from where they began implementing the Integrated Tribal Development Program (ITDP) among the tribal population of the Kerandimal hills.

In 1979, GV became a registered society and expanded its work to many tribal villages, covering several issues like health, education, gender, improved agriculture, and tribal exploitation and marginalization in the form of indebtedness, bondage, and land alienation. The overall objective was to empower the tribal communities. Providing the villagers with better varieties of cattle was an important component of ITDP, so GV used to run a dairy. Looking for an effective use for the dung, they hit upon the option of biogas technology and decided to use it to meet their cooking and lighting needs.

Initially, GV had not envisaged setting up a largenumber of plants nor were they inclined to get into the program in a big way. Nevertheless, Gram Vikas was the only organization in Orissa (even though it was working only in the Ganjam district) which was considering biogas plants in a serious way. At that time Gram Vikas was also actively lobbying with the Secretary of the Agriculture Department and with the state government to promote biogas technology in Orissa. When NPBD was launched in late 1981, Gram Vikas was the only NGO in Orissa that was in a position to take part. Two factors primarily drove GV's decision to participate in NPBD.

The first one was GV's desire to demonstrate that NGOs could take up large, technology oriented programs. This was to disprove the government's perception of NGOs being capable of implementing only small programs in a limited geographical location. Gram Vikas therefore took on the biogas program as a challenge to demonstrate that an NGO, with all its limitations and some funds from the government, could implement a large-scale technical program more successfully than the government.

The second factor was the need for GV to establish a wider credibility than it had enjoyed till then. At that point, GV had worked only with the tribals, and the general public and government officials knew practically nothing about them. During the early 1980s the organization was going through a difficult period as certain people were propounding rumors about it being a Christian missionary organization. Some of these were moneylenders -- from whose fatal grip GV was trying to release the tribal populations -- who, in an effort to safeguard their vested interests began spreading these

[7]*See Dutta S, et al. (1997). Biogas – The Indian NGO Experience. Tata Energy Research Institute, New Delhi]; TERI (1997). Enhancement of capacity for sustainable rural energy services for rural developmemt: country study – India. Report submitted to the UN Department for Development Support and Management Support, New York. Tata Energy Research Institute, New Delhi; Ravindranath N H and D O Hall (1995). Biomass, Energy and Environment – A developing country perspective from India. Oxford University Press, Oxford UK.*

rumors. Therefore in an effort to improve the public's as well as the government's opinion and goodwill, and to convey that they were a non-profit organization willing to work for the public good in general, Gram Vikas took up the biogas program as a strategic option. Through the biogas program they wanted to show tangible and very apparent results of their intentions and capabilities.

After this initial resolve, however, differences within the organization during 1985-86 led to an impasse as to the desirability of working on a 'non-developmental' technology like biogas, and the same management team implementing both biogas and tribal welfare programs. There was speculation of GV being divided into two organizations: one implementing the ITD program and the other the biogas program. The conflict was resolved by reworking GV's constitution, under which a new team dedicated solely to the biogas program was created. This provided Gram Vikas with a dual focus and two teams, working independently of each other, and each concentrating on its program area. After this, GV was fully committed to the biogas program.[8]

Program Initiation

In 1978, Gram Vikas set up its first biogas plant on its campus in Mohuda with assistance from the Khadi and Village Industries Commission (KVIC)[9] . The plant was a floating dome, KVIC model of 8 m3 capacity and the gas was used for lighting. However, the same year the plant stopped producing gas and was shut down[10] . In 1979, another attempt was made and a cheaper, fixed dome, Janata model, 15 m3 biogas plant was constructed on the campus[11] . This plant was successful and the excess gas was used to run a generator that provided electricity to the office building during power failures. Realizing that biogas was a viable rural energy option, especially at the family-level, GV was keen on extending this initial experience to its work area across south Orissa.

They soon got such an opportunity when the people of Toda, an operational village under their ITDP, approached them to construct a biogas plant in their village to meet their lighting needs. Toda being in a remote hilly village in the forest, its inhabitants had access to plenty of firewood for cooking but no electric connections for their lighting needs. Seeing the biogas plant and biogas lights at the GV campus they were motivated to try the same in their village. So GV provided all the technical and material support, while villagers contributed their labor by transporting 6000 bricks, 400 cubic feet of sand, 200 cubic feet of chips, 50 bags of cement, pipes, etc. from the nearest road-head to their village. It was a 6 m3 community plant that provided one light in each of the 28 households and one community hall, where the GV animator held adult education and non-formal education classes. A system for collection of dung from households was devised and a user training program was conducted to teach the beneficiaries how to use and maintain a biogas plant. In addition, a couple of young men were also trained to carry out minor repair works.

By this time, it came to the knowledge of the state government [Agricultural Engineering Department (AED), which was then the nodal agency] that Gram Vikas had the technical know-how of both KVIC and Janata model biogas plants and the capacity to construct them. Two government Junior Engineers were sent from Bhubhaneswar oa was divided into four zones: Southern, Northern, Western and Central zone. Each zone had an Executive Engineer, appointed by the Agriculture Department, who had the responsibility of constructing a certain number of biogas plants per year in his zone. Since GV had by now established themselves as one of the pioneering agencies in biogas technology in Orissa, they were invited by all the Executive Engineers to work in their area and help them meet the allotted targets. Gram Vikas thus expanded its biogas program to the entire state of Orissa, and every year, was meeting a bulk of the state target.

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[8]Apart from the 'institutional' imperatives that encouraged taking up the biogas program, GV also had a genuine desire to achieve 'demystification' of 'modern technology' by disseminating it with the involvement of local people. However, this organizational mandate of demystification of science got articulated not in the beginning, but as the organization grew over a period of time.

[9]KVIC had pioneered the propagation of biogas technology in India in the early 1960s.

[10]The same plant was later rebuilt by GV personnel and is still functional without any problems.

[11]Janata model was based on Chinese fixed dome design and was introduced in India in 1977 by PRAD (Planning, Research and Action Division) of the government of Uttar Pradesh. See Putti V R (1998). Op. Cit. Footnote 1.

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By this time, it came to the knowledge of the state government [Agricultural Engineering Department (AED), which was then the nodal agency] that Gram Vikas had the technical know-how of both KVIC and Janata model biogas plants and the capacity to construct them. Two government Junior Engineers were sent from Bhubhaneswar to Thoda to observe the construction of the biogas plant. They also invited GV to conduct training programs in construction of biogas plants for their personnel as well as for other masons. In early 1982, the first Mason Training program, with the help of supervisors and masons from AFPRO[12] was held on the Gram Vikas campus. Practical demonstrations were made by constructing four biogas plants of varying capacities. One was constructed on the GV campus while the other three were in the adjoining villages of Narasimhapur and Gopalpur. Gram Vikas thus developed an initial team of masons and technicians who had the skill and some experience in the construction of biogas plants.

However, the conditions were not entirely conducive for promoting the biogas program in the state. In 1982, cement was an expensive and scarce commodity and was not easily available in the open market. It had to be imported from South Korea and though the Agriculture Department had some stock of cement, authorizing its release involved lengthy procedures. Due to high cost of cement, motivating people to construct biogas plants was not an easy task. Moreover, biogas being a relatively new technology in rural areas people did not know much about it and found it hard to believe that by just mixing dung and water in a cement and brick tank, a gas that could be used for cooking and lighting would be produced. They had misconceptions that biogas was a very sophisticated technology which involved a lot of gadgetry and therefore would be an expensive option. There were only a handful of biogas plants in the state at that time and people had not seen a functional one and were not aware of the benefits that could be derived from it. It was in these difficult conditions that Gram Vikas was trying to promote and extend the biogas program.

In an effort to make the initial breakthrough, GV decided to target a rich, educated and influential family of three brothers in Agastinuagaon, a village in Chatrapur Block close to Mohuda. They hoped to motivate the family into constructing biogas plants and then using the demonstration as a motivating factor for other inhabitants in and around the village. The family agreed and in 1982 three Janata model biogas plants (two 4 m3 and one 6 m3 plant), one for each were constructed. Great care was taken to adhere to the technical specifications[13] . The construction of these three plants was a vital step for Gram Vikas as their success boosted their self-confidence. However, it did not have as great a demonstration effect as they had hoped for in that particular Block since GV were not allotted that area by the government for the next year, and so could not follow through with the movement that they had initiated.

In October 1982, Gram Vikas was again invited by AED to conduct two Mason Training programs at Agarpada in Balasore district. AED wanted to train their technicians, Junior Engineers (JE), Assistant Engineers (AE), and Executive Engineers in biogas technology so that they might successfully meet the target allotted to the state. GV agreed to undertake the assignment as it was an opportunity to extend their influence beyond Ganjam district. In the course of these training programs, each of a 20-day duration, about 100 masons, 12 work sarkars and 6 supervisors were trained in the construction of biogas plants and a total of 16 plants were constructed.

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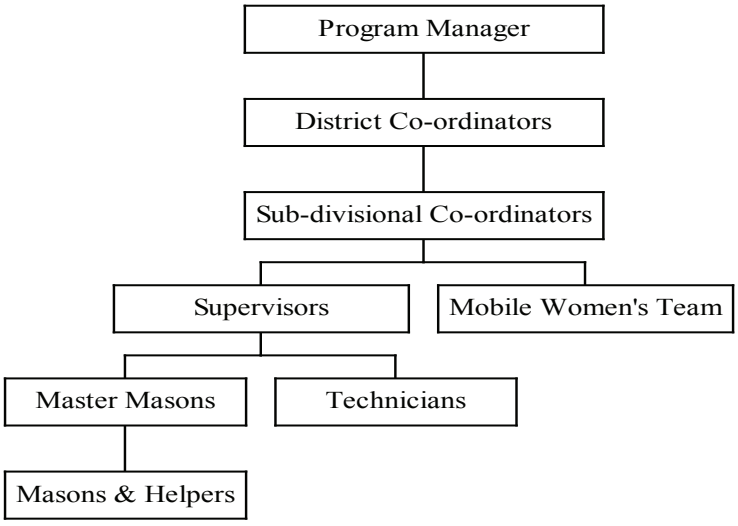
[12]AFPRO (Action for Food Production) is an NGO based in New Delhi, which has long technical and operational experience in the biogas sector. GV had a collaboration with AFPRO for nearly a decade during its involvement with biogas technology dissemination.

[13]During the field trip in late 1999, these three plants were found to be fully functional even after 17 years of continuous operation. The gas produced is used up on a daily basis for cooking. The plants never suffered any problem.

Following the programs at Agarpada, GV conducted two more at Raj Kanika in Cuttack district, one in Mayurbhanj and another in Sambalpur. By the end of these six programs, GV had extended its work area to the northern, central and western parts of the state and had trained approximately 500 masons, 50 work sarkars and 12 supervisors while increasing their own work force substantially.

The state of Orissa was divided into four zones: Southern, Northern, Western and Central zone. Each zone had an Executive Engineer, appointed by the Agriculture Department, who had the responsibility of constructing a certain number of biogas plants per year in his zone. Since GV had by now established themselves as one of the pioneering agencies in biogas technology in Orissa, they were invited by all the Executive Engineers to work in their area and help them meet the allotted targets. Gram Vikas thus expanded its biogas program to the entire state of Orissa, and every year, was meeting a bulk of the state target.

Figure 1.GV's Organsational Structure for the Biogas Programme



Institutional arrangements

The Executive Director of Gram Vikas also acted as the program manager of the biogas program throughout its duration. Approximately 80 percent of his time was spent on the biogas program and the rest in supervising other activities including fund raising. Under the program manager were District Coordinators (DC) who were responsible for the overall biogas activities within a district or a cluster of districts. DCs had Sub-Divisional Coordinators (SDCs) working under them. The number of SDCs allotted to one DC depended on the total area to be covered and the potential for biogas plants. The SDC was responsible for the Supervisors , who oversaw the work of Master Masons, who in turn had a number of masons and helpers working under them. Supervisors also directed the work of Technicians (Figure 1).

During 1987, a professional program manager was brought in to relieve the Executive Director from leading the biogas program. However, this arrangement could not last for more than a year due to interpersonal problems, and GV had to fall back on the earlier arrangement.

Important issues were discussed and approved at the monthly meetings held at the headquarters in Mohuda, while area-specific issues were discussed at the regional level meetings. Only the DCs attended the monthly meetings at the headquarters . The DC, SDC, supervisors, and technicians attended the monthly meetings held at the regional level. Every three months the Executive Director also attended the regional meetings. All major decisions had to be finally approved by Gram Vikas's Board of Governors.

Women in program implementation

Though GV as an organizational policy encouraged women to take up lead roles in their activities, women's participation in the biogas program was not extensive. This was mainly due to the nature of specific job requirements and also the prevailing social conditions and practices. Some of the problems in women having a role in the program were:

- Program staff would have to travel extensively on bicycles across villages in a block.

- They would have to make night-halts in unfamiliar villages, which may be unsafe and socially unacceptable.
- A lot of resources and time are spent on training the staff, but once the women get married they leave the job or are forced to leave, rendering the investment to be lost.

Nevertheless, Gram Vikas did have 8 Mobile Women's Teams (MWT), consisting of 6 women each, which conducted users' training programs for the 'actual users' (women). Each team was provided with a vehicle to travel around, and careful arrangements were made in advance if they had to stay a night (e.g. a house in the village would be taken on rent or an Inspection Bungalow would be hired for the night).

The MWT educated women-users on various aspects of maintenance of their biogas plants such as ratio of cow dung and water mix to be fed into the digester, regular maintenance, cleaning the biogas stove, removing water from the gas pipeline and minor plumbing works.

After Gram Vikas pulled out of the biogas program, members of the MWT assisted in carrying out the survey and rectification of biogas plants. Gram Vikas absorbed a few of this workforce into their other programs like ITDP and RHEP. However, most of these women quit after facing severe hardships in the field such as high incidence of malaria; several did so after getting married. Only three of the MWT still remain with Gram Vikas.

Major problems and barriers faced during program implementation

Interactions with state nodal agency

Till 1983-84, the Agriculture Engineering Department implemented the biogas program in Orissa. The program got transferred to the Orissa Renewable Energy Development Agency (OREDA), formed in 1984 to act as the state level nodal agency for coordinating all renewable energy programs of DNES. The first Chief Executive of OREDA had a keen interest in the biogas program, and appreciated the role being played by GV in its development. During his tenure, GV enjoyed a strong relationship with OREDA, and it being a new organization, a bureaucratic atmosphere was largely absent and things could be discussed and decided informally. Moreover, most of the personnel at OREDA were people on deputation from the Agriculture Department with whom Gram Vikas already had an established rapport. Over the years, however, GV's relationship with OREDA underwent periodic changes, being largely dependent on the officer in charge of the nodal agency. In fact, as the program grew in size and GV in stature, the relations seemed to gradually deteriorate.

The issue of the release of subsidy by OREDA was a good illustration of this rocky relationship. Under NPBD, procedure for release of subsidy and turnkey fees to the implementing agencies was an elaborate one. Once a biogas plant was constructed and commissioned, the turnkey agency (GV in this case) had to prepare and submit a Completion Certificate. A Gram Sevak on behalf of the Block would then come and inspect the plant. The certificate would then be forwarded to the Block Development Officer (who had the job of conducting random checks), who in turn would forward it to the District Rural Development Agency (DRDA). A Junior or Assistant Engineer of OREDA, who was placed at the DRDA, (and supposed to physically verify at least 10 percent of the total plants in the district) would then pass the requisition on to the Project Director, DRDA and he then forwarded it to OREDA at Bhubaneswar. OREDA would then authorize DRDA to release the subsidy to the BDO who in turn would disburse it to the beneficiary. In this long-winding chain of monitoring officials, any one could hold up the release of subsidy by not visiting the plant or not forwarding the Completion Certificate. A negative report submitted by any one of them could also delay the process interminably.

1984-85 onwards, Gram Vikas accelerated their biogas program and was installing more and more plants every year and began fulfilling 60-80 percent of the state's target on their own. But this could not be done if GV waited for the funds to be released from OREDA and then begin installation. On the other hand, the beneficiaries were mostly not in a position to contribute funds for cement and other materials necessary for the plant construction. Obtaining a bank loan for this purpose was also found to be too lengthy a procedure. Therefore, GV took it upon themselves to provide the materials upfront with the understanding that the beneficiary would repay Gram Vikas after receiving the subsidy. The undertaking from beneficiary that the subsidy could be released directly to GV in lieu of the materials supplied, would be submitted to the BDO. Gram Vikas financed the initial costs through some international funding they tapped from the Canadian Hunger Foundation (CHF) and later from EZE, Germany and ICCO, The Netherlands. In several instances, funds from their other programs were diverted to the biogas program.

In this manner, Gram Vikas pumped in a large portion of its organizational funds into the biogas program with the expectation that they would be reimbursed when the subsidies were released. This strategy helped them construct thousands of biogas plants across Orissa in a timely manner. However, payments of subsidies and turnkey fees got delayed due to non-clearance by OREDA. The outstanding amount reached a staggering Rs 20 million when Gram Vikas was forced to take it up with the Department of Non-conventional Energy Sources (DNES) to have the funds released. The

problem of unreleased funds kept recurring throughout their involvement with the program. Even today GV are owed nearly Rs 4 million in uncleared dues. It is GV's perception that though they were contributing heavily towards the achievement of the state's target, OREDA seemed to view Gram Vikas as a competitor rather than a collaborator[17] . In 1988, in an attempt to overcome this problem, Gram Vikas initiated an alternative institutional arrangement by helping create a national network of NGOs that managed biogas program implementation independent of state nodal agencies.

AFPRO NGO Network

After numerous dialogues with the Secretary of DNES, Gram Vikas and other like-minded NGOs were successful in convincing the government to nominate Action for Food Production (AFPRO) as the coordinating agency for the NGOs that were part of the network for program implementation under NPBD. Being based in New Delhi and having considerable experience in biogas dissemination, AFPRO were thought to be suitable as they could liaison easily with DNES. According to this arrangement DNES supplied funds to AFPRO who then disbursed the subsidies and turnkey fees directly to the NGOs that were implementing the biogas program. This process was established to reduce the lengthy procedure of verification and certification prior to disbursement by government nodal agencies. However, nodal agencies still had a role in verification as they were expected to check approximately 30-40 percent of the plants constructed (as against 100 percent previously).

Initially this system seemed to work for GV because in 1989-90, they constructed a record number of 11,767 biogas plants. However, within a year, Gram Vikas pulled out of this network because it felt that AFPRO was not providing the expected support and cooperation. AFPRO also insisted on inspecting the plants, checking the audit reports just like it was with OREDA. The first ten million rupees due to Gram Vikas were released relatively easily but thereafter their funds got blocked again. Using their substantial contribution to the biogas program in Orissa, Gram Vikas tried to convince the Secretary of DNES to sanction funds directly to them but its request was turned down.

From AFPRO's point of view, as articulated by the then coordinator of the network, there was an enormous imbalance within the network as Gram Vikas was implementing bulk of the network's target, with other NGOs operating at a very small scale. Therefore, the operational style of AFPRO did not prove to be useful for Gram Vikas. When GV's efforts to bypass AFPRO and get funds directly did not succeed, they came out of the network. Gram Vikas argued that since they were installing a huge number of plants by investing their own money upfront, they had the biggest stake in the program and therefore deserved a differential treatment in release of funds. For GV, the primary objective of promoting the network was to facilitate the process of disbursement of funds, but as they felt that this objective was not being accomplished, they discontinued their association with the network they were so instrumental in creating[18] .

After withdrawing from the AFPRO network, GV returned to working with OREDA, on some improved terms and conditions, such as, OREDA would provide the subsidy for 25 percent of GV's targeted number of plants in advance, and that the subsidy would be released prior to the verification of the plants by OREDA's JEs and AEs. These new favorable conditions were made possible due to the reinstatement of OREDA's first Chief Executive, who had a keen interest in rural energy and who was supportive of GV, as the Chief Executive cum Chairman of OREDA. However, once this officer was replaced these 'special' arrangements were nullified and matte=rs were back to where they were earlier; GV's problems resurfaced.

Involvement of masons and technicians

In the beginning, GV motivated masons and technicians who were involved in other construction activities in villages, to receive training in biogas construction, and then used them on a contractual basis in program implementation. However, in spite of having trained hundreds of masons and technicians, Gram Vikas found it difficult to mobilize them to be involved in construction of the thousands of biogas plants they were undertaking each year. Some of the reasons for this situation were:

- Construction work in biogas program was carried out only 6 to 8 months in a year and for the remainder

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[17]OREDA officials, however, strongly refute this notion, and attribute the delay in funds release to Gram Vikas's failure to provide correct records. However, the evaluation studies conducted on GV's biogas program did not indicate incorrect reports as a major issue. GV agrees that there could be a few such incidents given the large size of the program, but they rectified the problems whenever they were reported. Though it is difficult to verify, GV also claims never to have paid bribes to hasten the process despite pressure on them, which could be a reason for deliberate delays. It seems reasonable, however, to assume that bureaucratic red tape coupled with behavioral problems of individuals on either side could have contributed to this situation.

[18]It is interesting to note that just after two years, DNES de-recognized AFPRO's status as an implementing agency and stopped channeling funds through it. Thereafter, AFPRO's role in NPBD was limited to training and information dissemination among network partners, which was accomplished with funding from CHF. AFPRO's involvement with the network and NPBD came to a formal end in 1997.

(during monsoon), there was no work. As the masons were hired only on a contractual basis, they had to look for other work during off-season. This intermittent nature did not appeal to many workers.

- They did not like being away from their families and preferred getting back to their homes in the evenings. However, as most of the construction work was done in spread out villages this was not always possible and masons had to stay at the construction site until the plant was built.
- In many remote areas there were few avenues for entertainment (e.g. cinemas, restaurants, etc.).
- During the construction work they were dependent on beneficiaries for their meals and therefore had to be content with whatever the beneficiary had to offer, which they did not always find palatable.

Many of the masons worked with petty contractors during the off-season and the good ones were generally encouraged to stay on. Others became small contractors themselves. To overcome this problem, Gram Vikas decided to take the masons and supervisors on its payroll (this was in 1987-88). Though this move created its own set of administrative problems, Gram Vikas managed to establish a team of good masons whose skills were upgraded from time to time (for instance, they were trained to construct water tanks which are technically more complex than biogas plants). Moreover, the security of regular employment provided them better motivation. The number of masons and supervisors employed in GV's biogas program kept increasing with dissemination, and reached a high 780 during 1989-90 (Table 1).

Table 1. Employment under GV's Biogas Program

Year	Supervisors	Masons	Total
1980-81	0	1	1
1981-82	1	2	3
1982-83	6	10	16
1983-84	17	24	41
1984-85	76	145	221
1985-86	134	332	466
1986-87	129	307	436
1987-88	172	379	551
1988-89	234	402	636
1989-90	276	504	780
1990-91	256	448	704
1991-92	259	412	671
1992-93	270	432	702
1993-94	145	246	391
1994-95	3	7	10
1995-96	3	5	8

Critique of GV's biogas program

Overall achievements

By the time of its final withdrawal in 1995-96, GV installed over 54,000 biogas plants in nearly 6000 villages covering 13 districts[19] (Figure 2). Over 80 percent of these plants were constructed during 1986-92, the most active period of GV's involvement with the peak of 11,767 plants being achieved in 1989-90 (Figure 3).[20] As can be seen, the predominantly tribal districts of Ganjam, Mayurbhanj, Kalahandi and Sambalpur witnessed the highest installation of GV's biogas plants. As has been the norm with NPBD, over 90 percent of the plants were of 2 and 3 cubic meter capacity (Table 2). In terms of overall achievement, the numbers make GV the single largest organization under the National Project on Biogas Development (NPBD). This distinction was made possible due to the creation of a workforce of nearly 2000 masons and technicians and their development through conducting of over 700 training programs (Table 3)

Table 2. Size-wise Distribution of Biogas Plants

District	1 cum	2 cum	3 cum	4 cum	6 cum	8 cum	Total
Balasore	51	1232	251	72	40	0	1646
Bolangir	52	4024	738	347	46	0	5207
Cuttack	1	3760	978	255	87	1	5082
Dhenkanal	0	28	26	12	1	0	67
Ganjam	100	9188	2534	427	57	1	12307
Kalhandi	1	5502	1810	560	45	1	7919
Keonjhar	0	453	65	42	9	0	569
Koraput	35	2903	802	75	11	2	3828
Mayurbhanj	31	4461	2223	287	52	0	7054
Phulbani	0	225	123	21	5	0	374
Puri	0	4	41	11	1	0	57
Sambalpur	3	3106	2765	838	354	7	7073
Sundargarh	9	1535	982	258	78	2	2864
Total	**283**	**36421**	**13338**	**3205**	**786**	**14**	**54047**

[19]The project was withdrawn in 1993-94, and less than 150 plants were constructed in the next two years before a complete stop.

[20]As shown in Figure 3, GV always exceeded the targets given by OREDA.

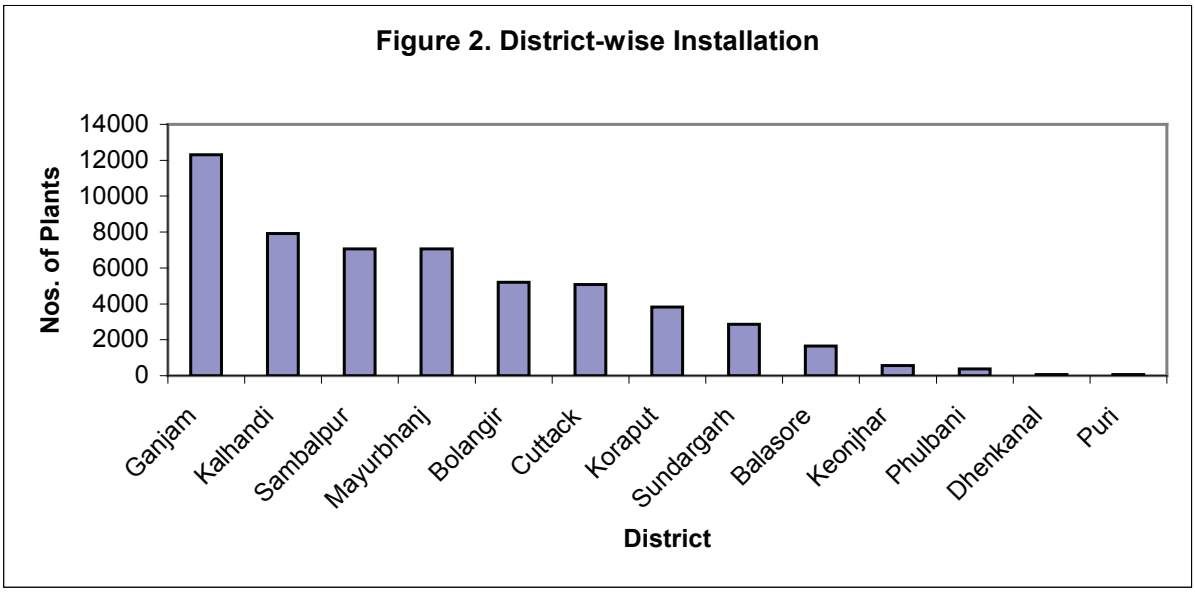
Figure 2. District-wise Installation
Nos. of Plants
14000
12000
10000
8000
6000
4000
2000
0
Ganjam
Kalhandi
Sambalpur
Mayurbhanj
Bolangir
Cuttack
Koraput
Sundargarh
Balasore
Keonjhar
Phulbani
Dhenkanal
Puri
District

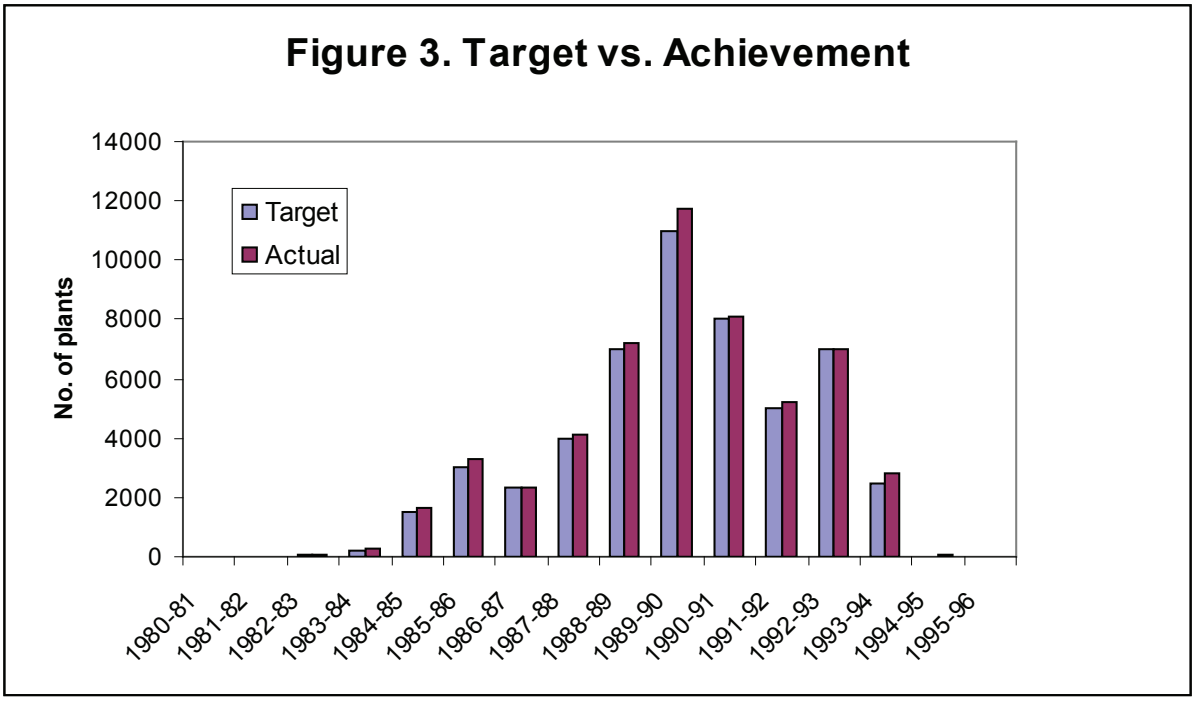
Figure 3. Target vs. Achievement
No. of plants
14000
12000
10000
8000
6000
4000
2000
0
Target
Actual
1980-81
1981-82
1982-83
1983-84
1984-85
1985-86
1986-87
1987-88
1988-89
1989-90
1990-91
1991-92
1992-93
1993-94
1994-95
1995-96

Table 3. Biogas Training Programs by Gram Vikas

Year	Number of programs		
	Users	Masons	Refresher
1980-81	0	1	0
1981-82	0	1	0
1982-83	0	1	0
1983-84	0	3	0
1984-85	0	2	0
1985-86	54	32	0
1986-87	69	56	24
1987-88	112	58	12
1988-89	130	112	64
1989-90	434	178	45
1990-91	79	6	0
1991-92	0	0	0
1992-93	0	0	0
1993-94	0	0	0
1994-95	0	0	0
1995-96	0	0	0
Total	**878**	**450**	**145**

Functionality of GV's biogas plants

Due to the emphasis placed on training and quality construction, the functionality of biogas plants has always been high in GV's program. This has been corroborated by several evaluation studies conducted by different sources at different points of time[21] . At the time of withdrawal, Gram Vikas took it upon themselves to determine the functionality of the plants by conducting a 100 percent plant verification survey during 1993-95. This survey found that 60 percent of the total 54,000 plants were functional (Figure 4a). The survey also

[21] *See the following references:*

i) *Moulik T K and P R Shukla (1986). Comparative evaluation of operating performance of KVIC and Janata models of biogas plants in India. Indian Institute of Management, Ahmedabad.*

ii) *Jha M (1986). Gram Vikas, Orissa – Case study. [In] Proceedings of IRMA-AFPRO-CHF National Workshop on Implementation of Janata Biogas Program through Voluntary Organizations. Action for Food Production, New Delhi.*

iii) *Ramana P V, S Dutta and N Hazarika (1994). Biogas – a source of rural employment. Tata Energy Research Institute, New Delhi.*

iv) *Putti V R (1998). Op. cit. Footnote 1.*

concluded that about 8,700 among the dysfunctional plants could be restored, and accordingly, GV undertook rectification of these plants with funding from NORAD. The beneficiaries contributed their unskilled labor and the required cowdung . Thus, the plant functionality at the time of complete withdrawal improved to over 76 percent (Figure 4b). The continuing non-functionality of the remaining 24 percent of the plants was mostly due to one of the following reasons:

- Death of cattle due to drought
- Migration (often families migrated to Surat in Gujarat to work in the textile factories there; others left home to work in coal mines)
- Sale of cattle to alleviate financial stress.
- Structural defects and minor breakage thatthe beneficiaries did not bother to rectify.
- Selling off of equipment (stove, pipes, etc.)
- Poor or no maintenance in running the plant.

Nevertheless, the GV program's functionality rate of 76 percent over a period of more than a decade represents one of the most successful dissemination programs in the country under NPBD

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[22] There were a few exceptional cases (10-20) in which the beneficiaries were adamant that their plant was not functioning due to bad construction and repair by Gram Vikas. Therefore to prove them wrong Gram Vikas bore the cost of the unskilled labor as well as the cowdung for the plant and got the plants started for the beneficiaries.

[23] In contrast, the overall success rate of AFPRO-CHF Network biogas program was slightly less than 60 percent [Dutta S et al. (1997). Biogas – The Indian NGO Experience. Tata Energy Research Institute, New Delhi].

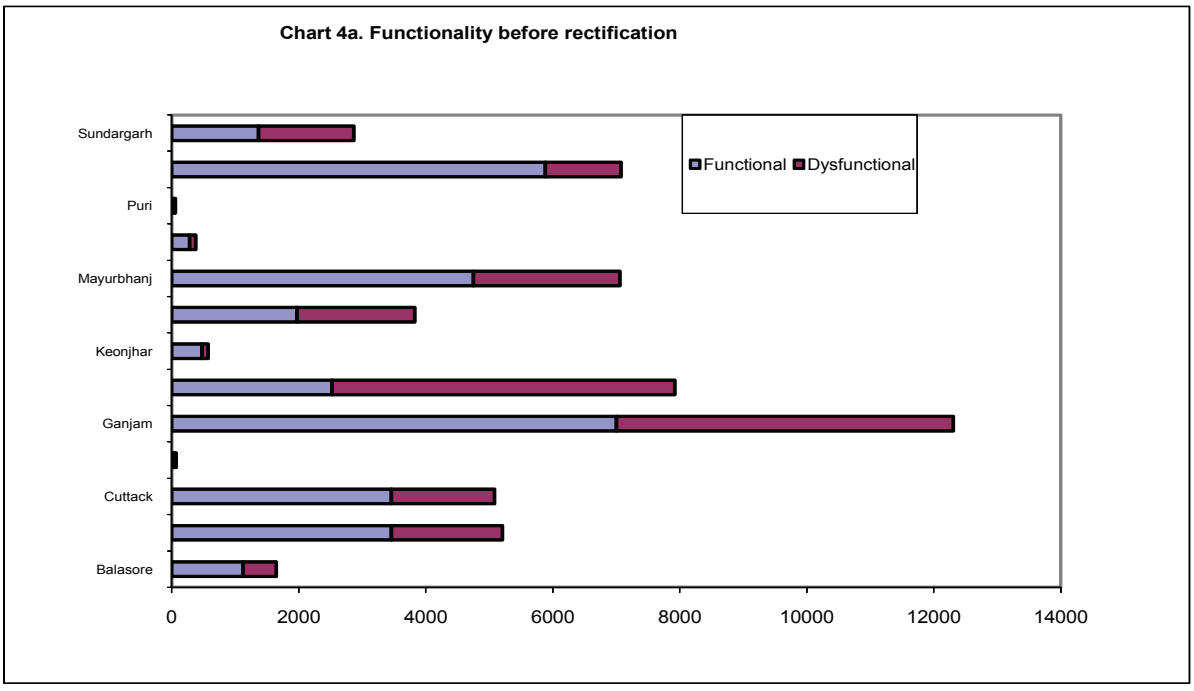


Chart 4a. Functionality before rectification
Sundargarh
Puri
Mayurbhanj
Keonjhar
Ganjam
Cuttack
Balasore
Functional
Dysfunctional
0
2000
4000
6000
8000
10000
12000
14000

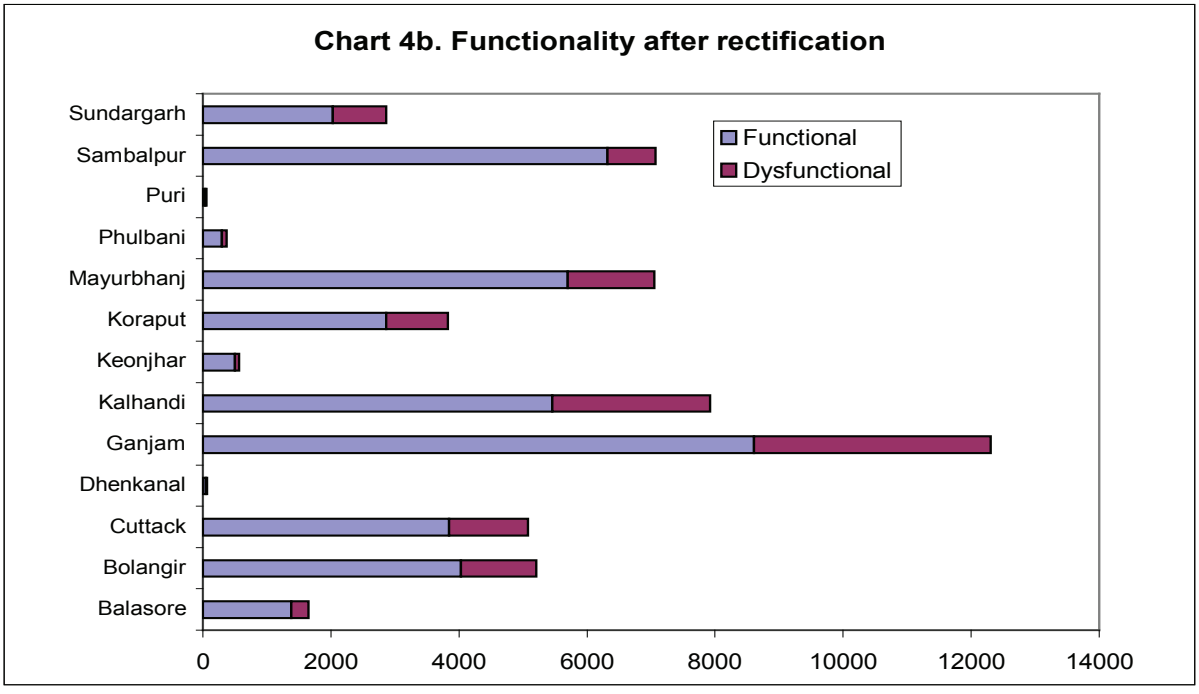
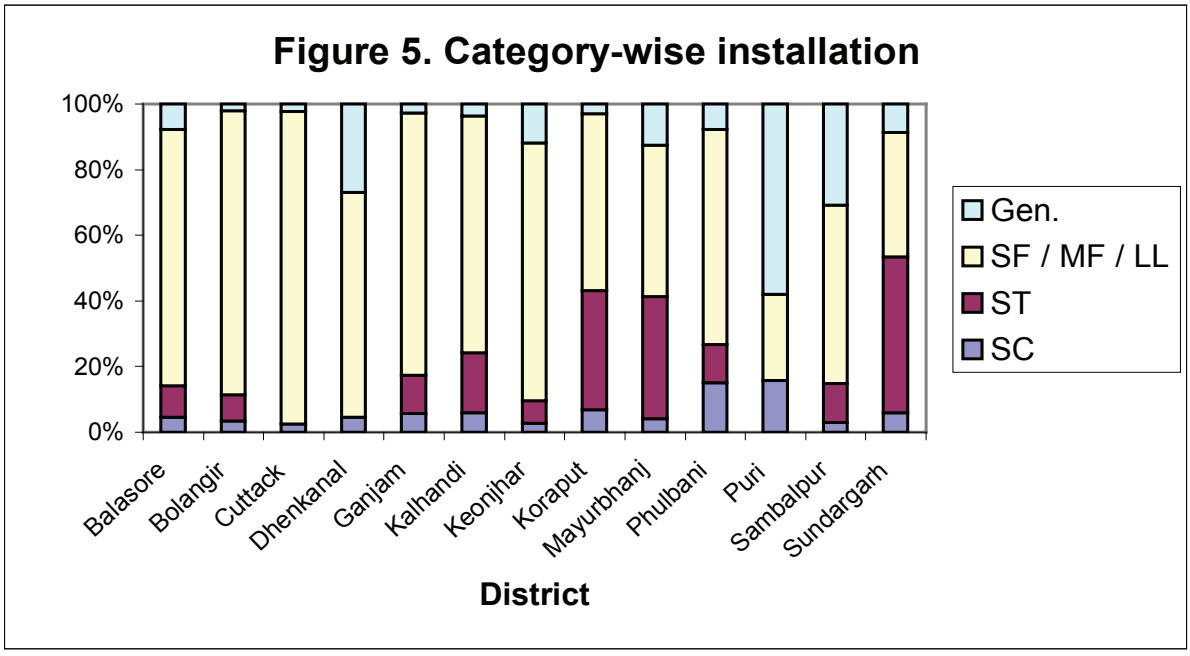


Chart 4b. Functionality after rectification
Sundargarh
Sambalpur
Puri
Phulbani
Mayurbhanj
Koraput
Keonjhar
Kalhandi
Ganjam
Dhenkanal
Cuttack
Bolangir
Balasore
Functional
Dysfunctional
0
2000
4000
6000
8000
10000
12000
14000

Socio-economic profile of GV's biogas program

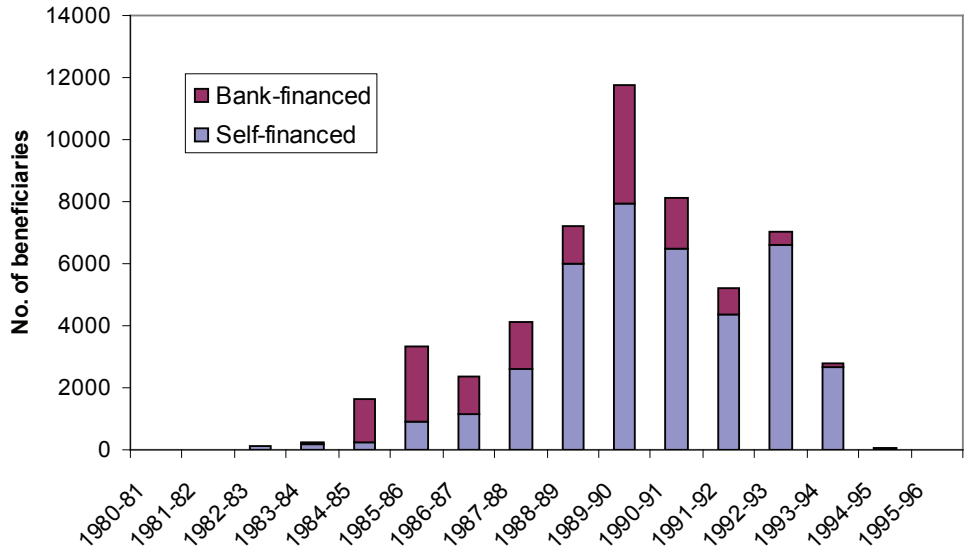
Biogas technology is often described as a program that is individual-oriented and which does not benefit the poorest. However, the geographical region in and socio-economic categories with which GV worked suggest that this axiom was not true in their program. In fact, more than 90 percent of Gram Vikas's biogas plants were constructed for small farmers/marginal farmers/ landless and scheduled tribes and castes (Figure 5). The number of really affluent households benefiting from this program has been low. Although during the initial stages of the biogas program rich beneficiaries were sought (like the brothers of Agastinuagaon), that was mainly to educate the people about the technology and demonstrate its benefits. During the year 1984-85 this profile was changed and less of the rich and more of the small/marginal farmers, landless, SC/ST were targeted. Nevertheless, over 72 percent of the total biogas plants were set up with beneficiaries self-financing the (non-subsidy portion of the) cost, which indicates the level of confidence and goodwill GV enjoyed among the people (Figure 6).



There is also another, indirect way the biogas program benefited the poorest of the poor. Use of biogas resulted in considerably reduced fuelwood demand in the village and the landless poor had gained more access to the resource. Therefore Gram Vikas has been able to alleviate the plight of the poorest to some extent through its biogas program.

Apart from the energy and environment related benefits, GV's biogas program also provided sustained direct employment to 2000 masons and 700 supervisors, who were mostly from poor, lower middle class background.

Figure 6. Finance Pattern of Beneficiaries



Contribution to R&D: Development of Deenbandhu

Apart from its achievements in the dissemination of biogas plants, Gram Vikas also made a contribution to the development of the Deenbandhu biogas model, which simplified the technology and reduced the plant cost. Deenbandhu is currently the most widely used model under NPBD.

Based on their experience, Gram Vikas personnel had observed that the fixed dome Janata biogas plants generally developed leaks over a period of time, due to variable gas pressure. Often there were microscopic leaks that were not detectable initially but some of which developed into larger cracks later resulting in plant breakdowns. To prevent this problem GV carried out experiments to try and 'leak-proof' these plants. Various methods such as using a filler and then applying a coat of epoxy paint, chiseling out the earlier plastering and re-plastering the inside of the plant, having a layer of chicken-mesh and stone chips which was then re-plastered were tried, but without much success. Gram Vikas finally tried providing a lining of polythene on the interior of the dome of the plants and found that this method of leak proofing worked only for plants of 2-3 m3 capacities[24].

In this background, Gram Vikas was interested in developing a biogas model that would be cheaper and technically less complex than Janata. They invited Ludwig Sasse, a Contribution to R&D: Development of Deenbandhu Apart from its achievements in the dissemination of biogas plants, Gram Vikas also made a contribution to the development of the Deenbandhu biogas model, which simplified the technology and reduced the plant cost. Deenbandhu is currently the most widely used model under NPBD.

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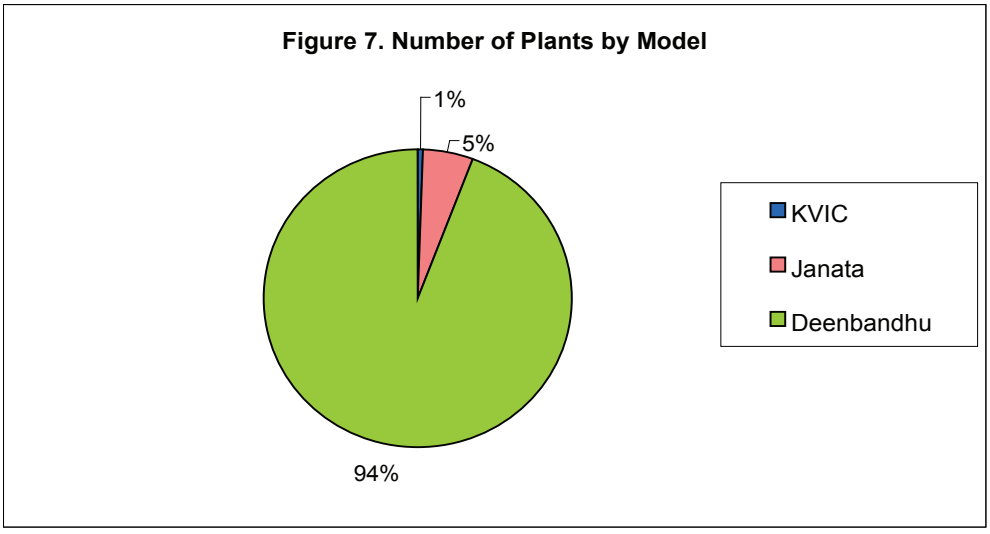
In this background, Gram Vikas was interested in developing a biogas model that would be cheaper and technically less complex than Janata. They invited Ludwig Sasse, a scientist working with the German organization, Bremen Overseas Rural Development Agency (BORDA) to come and experiment with different models of biogas plants on their campus. Approximately 20-30 models were tested using clay, different ratios of cement and mortar, etc. but only two of the developed models survived the pressure exerted by the gas (even 5-inch bricks were broken under pressure). Anil Dhussa, who had received training in biogas technology in China and was just moving from Bharatiya Agro Industries Foundation at Urlikanchan to AFPRO at that time, was also invited to come and participate in the ongoing experimentation[25]. Dhussa made some modifications to the models experimented on by Sasse. One of these models tested at the GV campus was Deenbandhu, developed in 1984. Deenbandhu was found to be considerably cheaper and technically less complicated than Janata.

Initially OREDA did not authorize large-scale implementation of this new model. Therefore Gram Vikas, with the support of AFPRO, approached DNES and sought their permission to disseminate Deenbandhu. DNES directed OREDA to let Gram Vikas construct a certain number of Deenbandhu plants (300-400) under OREDA's supervision, and if these plants worked successfully for 6-8 months the model could be considered for future extension. OREDA personnel were skeptical about the Deenbandhu plant because it required only about 10 bags of cement while Janata required 25. They found it hard to believe that the Deenbandhu plant could withstand the gas pressure. The Deenbandhu plants worked successfully and Gram Vikas were allowed to construct a limited number of these plants in the following year as well. From 1986-87 onwards Gram Vikas installed only Deenbandhu. The masons, technicians and supervisors working on Gram Vikas' biogas program and OREDA personnel were then trained in the construction of the Deenbandhu model. Ultimately, Deenbandhu accounted for 94 percent of the 54,000 plants installed by GV (Figure 7).

Figure 7. Number of Plants by Model



[25] *Personal communication with Anil Dhussa. August 2000.*

Concluding observations on GV's biogas program

i) By taking up the biogas program and implementing it successfully for over a decade, Gram Vikas has considerably achieved its twin objectives of gaining credibility among rural people, and demonstrating to the government that grassroots NGOs are capable of undertaking large dissemination programs.
ii) GV's role in implementing the program under NPBD gave a major boost to biogas technology in the state of Orissa, which otherwise suffered from weak infrastructure.
iii) GV's success in program implementation contributed to enhanced credibility for biogas technology. Functional plants had a positive demonstration effect among the users.
iv) Emphasis on quality control, personnel training and regular monitoring has strongly contributed to high technological performance.
v) Biogas program and the other developmental programs of GV have helped to some extent in awakening the social consciousness among the marginalized sections of the population in one of the most backward regions of the country.
vi) GV's program expansion has been despite the institutional complications faced with OREDA, AFPRO, etc. However, GV had to suffer severe financial crunch on account of its commitment to technology dissemination. This has been one of the chief reasons for its ultimate withdrawal.

VI. Beyond the Biogas Program

Withdrawal from NPBD

After nearly a decade of biogas program, it was during 1989-90 that Gram Vikas had begun to contemplate moving on to a more comprehensive program. One reasoning behind this was that they had sufficiently promoted biogas in Orissa and it was now time for the program to have a 'life of its own'. The major consideration in this regard was the large work force in the program; finding alternative options for the masons was the first step towards withdrawal from the biogas program.

However, this idea of withdrawal, which was germinated by the Executive Director, faced severe opposition in the organization. Biogas dissemination reached a peak in the year 1989-90 with nearly 12,000 biogas plants being constructed, and the program staff felt it was not the time to discontinue their most visible initiative. Moreover, there was no other new program in the offing as yet, which could replace the biogas program, and the proposal of withdrawal engendered a feeling of insecurity among the employees. Consequently, biogas program continued till the concept of the Rural Health and Environment Program (RHEP) was fully developed as an alternative program.

However, biogas masons and supervisors were encouraged to strike out on their own as turnkey workers and deal directly with the government nodal agency. They were assured that in case they did not find sufficient work they could come back to the rolls of Gram Vikas. A number of masons and technicians did become turnkey workers and started constructing plants on their own. Based on the success of these 'pioneers' many more ventured out. Thus from 1989-90 onwards, the number of masons in GV's employment began to recede, and by 1995-96 only 3 supervisors and 5 masons were left with GV from a high 276 and 504, respectively in 1989-90 (Table 1).

Making the decisive step of withdrawal was not an easy one. Though the idea was mooted in 1989, it took over four years to execute it, mainly due to the misgivings among the staff, who apart from being insecure were also skeptical about the success and viability of RHEP. However, in 1993, the government made a drastic reduction in the subsidy provided per plant, and considering the slash in subsidy and the number of plants that GV was constructing each year, continued involvement with NPBD was thought to be unviable. Also, RHEP was ready to be launched. It was a combination of these factors that precipitated Gram Vikas's withdrawal from the biogas program in late 1993. The problems GV was increasingly facing with OREDA in release of payments, etc. also contributed to this measure in a substantial way.

Launching the Rural Health and Environment Program

As mentioned earlier, there had always been a difference in opinion within the organization as to whether Gram Vikas should be involved in biogas dissemination which was essentially an individual-oriented program and which the poorest of the poor could not benefit from. Some of the staff felt that, though Gram Vikas had benefited greatly from its biogas experience, it was now time for them to move ahead and shift focus from a household-oriented program to a community-based one. Thus originated the concept of the Rural Health and Environment Program (RHEP).

The original idea for RHEP came from a realization that villages in non-tribal areas also suffer from many of the problems faced by tribal people, such as poor health, low educational standards, high levels of unemployment, poor or no access to safe drinking water and severe

insanitary conditions. The biogas program was instrumental in bringing about this understanding as it offered Gram Vikas an insight into the lives of villagers living in over 6000 villages throughout the state.

RHEP's objective was to tackle rural development in a holistic and integrated manner and address a wide spectrum of issues. The aim of the program was to meet the health and environmental needs of the rural communities through the provision of basic infrastructure in conjunction with people's mobilization and empowerment. RHEP can be seen as a logical extension of the biogas program, which aimed essentially at clean energy supply. One of the basic conditions to start an RHEP in a village is that the people should collectively contribute to a corpus fund, which would act as the foundation for various development activities to be implemented by village level committees. The critical differences between the biogas program and RHEP are:

- Biogas program was an individual-oriented program while RHEP takes a community-based approach.
- RHEP did not require the beneficiary to have any assets such as cattle or a capacity to generate relatively large amounts of funds.
- RHEP provides equal facilities to all classes of people (rich, poor, SC, ST).
- Monetary contributions towards the village corpus fund in RHEP depends on the financial status of the individual. (The rich contribute a lot more than the poor)[26] .
- RHEP is not a target-oriented program and has a much slower process; therefore its results are not as tangible as those of the biogas program.

RHEP was launched formally in 1992 and the biogas plant installation, verification and rectification program enabled Gram Vikas to identify villages for initiating RHEP. The rectification program also helped some of the employees to find geographical niches where they could start implementing biogas and other programs as self-employed workers.

By 1999, RHEP covered about 40 villages in its first phase and the second phase is in progress currently. GV aims to cover several hundred villages under this scheme in the coming years.

The spin-off of biogas staff

While RHEP was being developed, GV's biogas staff was being continuously encouraged to take up independent activities. However, most members of the staff were reluctant to move from a 'safe job' at Gram Vikas. They had joined the organization not because they believed in renewable energy or the need for rural development, but wanted to have a sustained employment. To motivate the employees to embark on the independent route, Gram Vikas had taken a number of steps:

- Certificates were provided to masons and technicians stating that the bearer had constructed at least 100 biogas plants, which functioned without any technical defects for a minimum of two years. The Executive Director of Gram Vikas attested the certificate. (only those meeting the criteria were given this certificate)
- They were given the option to return to Gram Vikas.
- The regional coordinators of Gram Vikas would help them liaison with the DRDAs.
- Gram Vikas stood as a guarantor for turnkey entrepreneurs with Banks, cement dealers, etc., to enhance their creditworthiness.
- Some of the ex-employees who set up their own NGOs received a stipend from Gram Vikas, for a period of six months to one year, to see them through until funds from OREDA were received.

These incentives did encourage several employees to venture out, however, most of those who went on to become TKWs in the biogas program did so only after Gram Vikas formally withdrew in 1993-94. None of the biogas staff were retrenched after the withdrawal; some of them left in pursuit of other jobs, some became turnkey workers in NPBD and the rest were absorbed into RHEP and ITDP.

Biogas after Gram Vikas

Being the largest contributor to Orissa's biogas program, Gram Vikas' withdrawal threw the entire program in the state off balance for three to four months. A number of government officials, from Collectors to DRDA Directors, tried to pressurize Gram Vikas into reconsidering their decision but GV stood firm. As a result of GV's withdrawal, OREDA had to look for other TKWs to fill the enormous gap that was created. Until this time OREDA was not promoting TKWs in a big way with hardly any resources being spent on advertisements and promotion campaigns. Following GV's withdrawal, advertisements were printed in local papers, were aired on the All India Radio and the issue was promoted in rural forums.

Also, hundreds of masons and technicians trained by Gram Vikas were readily available to implement the target. OREDA, to its credit, took this opportunity

[26] In some villages there is a system by which for every 100 kg of paddy that a farmer grows he has to contribute 1.5 kg towards the RHEP maintenance fund. This system ensures that the rich contribute more than the poor.

and encouraged them to participate in NPBD. Thus, GV's withdrawal had a positive effect on the growth and promotion of rural entrepreneurship in the biogas program in Orissa in at least two ways:

i) It forced OREDA into promoting a greater number of TKWs, and

ii) Considering the magnitude and coverage of Gram Vikas' biogas program, OREDA did not have to look beyond GV to meet its yearly targets, and as such, other smaller NGOs and individuals did not have much scope to work as TKWs. But after GV's withdrawal, OREDA actively encouraged other organizations to take on the program.

VII. Rural Entrepreneurship

From District Coordinators and Sub-Divisional Coordinators to those who had been Biogas Supervisors and Masons with Gram Vikas have taken up entrepreneurial activity in NPBD. Many started out on their own once Gram Vikas discontinued its biogas program while some did so even before that. However, after 6 years, it is difficult today to estimate how many of the masons and supervisors are actually continuing in the field as turnkey entrepreneurs, as many of them might have moved on to other areas and professions. It is also difficult to determine how many of the entrepreneurs continuing in this field are successful in having a sustainable livelihood. Gram Vikas, after the assistance provided in the initial stages, did not keep track of their progress and had provided in the initial stages, did not keep track of their progress and had information only on those who kept in touch with the organization on their own. Nevertheless, GV's estimation is that a large number of their ex-employees continue as entrepreneurs in the larger sphere of rural development.

The key factor that appears to have motivated these entrepreneurs is the self-confidence and skill that they had developed, and the exposure, recognition and encouragement from Gram Vikas and OREDA that they had received. The most common reason for taking up the entrepreneurial activity was the possibility of enhancing income (in the form of turnkey fee of Rs 500 per plant, disbursed over a 3-year warranty period) and an improved quality of life.

Institutionalization

Until 1993, MNES had a policy that permitted only organizations (and not individuals) to implement the biogas program. Therefore all GV's masons and supervisors, who started work as TKWs before then had to register themselves as societies. After the amendment allowing individuals to construct biogas plants under the NPBD, several individuals became TKWs with OREDA and currently their numbers nearly equal those working through Non-Governmental Organizations (NGOs).

Since working on a small annual biogas target alone is not likely to generate enough income to sustain themselves, the general trend for organizations working as TKWs has been to expand their scope of work to include activities such as construction of smokeless chulhas, latrines, and low-cost houses . For this purpose, manyof these organizations had their staff trained in various construction activities. Many are already implementing three to four different programs simultaneously.

Individual TKWs (independent masons) also undertake other programs such as the construction of smokeless chulhas and sanitary latrines, but biogas program remains their primary activity. Having worked with the biogas program for quite a while they have settled into a work-area whereas in the case of other programs they are yet to establish themselves. However, some of the more enterprising ones are working on other programs too and are even planning to set up their own NGOs.

Dependent masons work for NGOs or independent masons, generally on a contractual basis. Being mostly illiterate or school dropouts, their primary reason for continuing to work with the biogas program is that they earn more through this activity as compared to their usual masonry work on construction sites. However, there are also cases where a dependent mason, given

[27]For instance, if a TKW typically has a target of 100 plants per year, the income through turnkey fees would be about Rs 16,000-18,000 (one-third of the total Rs 50,000) in the first year, Rs 33,000 in the second and Rs 50,000 from the third year, provided the target of 100 plants remains the same every year. An organization with 4-5 employees will not be able to sustain on this income.

the opportunity and resources, has branched off to become an independent turnkey worker.

TKWs are also regularly invited by OREDA to participate in biogas training programs as resource persons. Here they pass on their knowledge and skills to other masons. This transfer of technology helps build a human resource base that has the potential to ensure the continuity of rural entrepreneurship in the biogas program. This entrepreneurial system has a dynamic flow of human resources that sustains the program and provides TKWs with an opportunity to expand the scope of work.

Gaining social credibility

Acceptance and trust of the community is a critical factor for the success of a TKW. The beneficiaries seem to identify better with a person directly involved with the construction work, that is, the biogas supervisor or the master mason, than the agency responsible for the construction of their plant. Therefore when such a person becomes a turnkey worker (supposing that the plants he had constructed/supervised had been successful) he is accepted and trusted much more easily by the community. Our study found that most of the TKWs were working in the district where they had been last posted with Gram Vikas, which was generally not their native place. TKWs have adapted themselves to their work-area for the only reason that having worked here for several years they are accepted by the local communities, which greatly facilitates their work. As employees of Gram Vikas, most of these TKWs have had a chance to create a personal rapport with District Rural Development Agency (DRDA) personnel responsible for the implementation of the biogas program in their area. As TKWs, having good relations with these officials smoothens the process of receipt of the subsidy and, more importantly, the turnkey fee. This relationship also betters their chances of being allotted another program.

Most TKWs maintain not only their plants but also plants that have been constructed by other agencies (e.g. OREDA, Gram Vikas). They do this to keep up their credibility and the goodwill of the people. For the repair and maintenance of plants that have either not been constructed by them or whose warranty periods have expired, they charge a fee[28] . Therefore, in an effort to 'sell their product' TKWs keep older plants in their work-area from going defunct. This enhances the sustainability of the biogas program and the income of the TKW.

Sustainability of entrepreneurship

While biogas program has enhanced the quality of life and income of most of the TKWs, certain policy changes by NPBD are leading to a growing sense of insecurity among them. In the past few years the government has reduced the subsidy for biogas plants (Rs 1800 for those above the poverty line and Rs 2300 for those below) and the target allotted to TKWs. While the subsidy has been reduced on one hand, the prices of construction material have risen on the other. This automatically increases the cash contribution the beneficiary has to make towards the construction of the plant. This is a major disincentive for most potential beneficiaries. Therefore, either the number of plants that TKWs actually construct is reduced or they use cheaper material, which would cut costs, but adversely affects the quality of construction.

Similarly, reduction in the allotted target means that the income of the TKWs is reduced. In response, TKWs with access to larger resources (manpower, capital) are forced to take on other programs while those who are mainly dependent on the biogas program (such as individual masons), have to manage the best way they can.

Biogas is not the main source of energy for the poorest of the poor, as it requires that the beneficiary have certain assets like 3 to 4 cattle that he is able to maintain and enough space for a cowshed to house them. The large farmers can afford to use LPG and kerosene (where available) for cooking, so it is basically the small and marginal farmers, who are the prime target for the biogas program. These small farmers are very dependent on agricultural yield for their livelihood. Therefore if the monsoon fails for a couple of years, as is common in western Orissa, these farmers either lose their cattle due to drought conditions or are forced to sell them off to make ends meet. If they already have a biogas plant, it becomes dysfunctional due to lack of dung, and if they do not, they cannot acquire one. Therefore, the success of an entrepreneur as a TKW in the biogas program is highly dependent on the economic condition of the community. Uncertain economic conditions in the area render TKWs vulnerable.

Rural entrepreneurship in the biogas program has improved the financial status of the TKWs (for instance, a number of them have bought motorcycles to travel between villages, some have bought land around their villages, and some have furnished offices and staff). Despite the initial problems in establishing themselves, TKWs have benefited sufficiently from the biogas program to want to continue with it. Most importantly, this venture has developed a sense of self-confidence in rural entrepreneurs to want to explore other entrepreneurial means of sustaining themselves.

Concluding observations on rural enterprise

- The large biogas program implemented by Gram Vikas led to the development of a well-trained, experienced

[28] *Typically, Rs 50 per visit with extra charge for components.*

work force which formed the nucleus for the rural entrepreneurship that developed in Orissa over a period of one-decade.

- The objective of Gram Vikas to 'demystify' biogas technology enabled even the semi-literate and illiterate masons to acquire skills in plant construction, which eventually helped many of these to become rural entrepreneurs.
- The initial financial and institutional support provided by Gram Vikas allowed them to overcome teething problems in establishing themselves in the field.
- GV's withdrawal coincided with emergence of a strong policy in NPBD to promote turnkey workers. This led to active encouragement of rural entrepreneurship by OREDA.
- OREDA's dependence on TKWs (which began with GV meeting a large part of their annual target) also contributed to quick absorption of these entrepreneurs into NPBD.
- The good rapport enjoyed with DRDA while working in GV's biogas program facilitated the expansion of work for many TKWs into other rural development activities
- Acceptance and trust of local communities made the task of TKWs easier in taking up other development programs in the same area.
- TKWs could also bank on the goodwill of local communities that Gram Vikas generated through its biogas program. Also TKW's familiarity with his work-area and the local communities developed during his tenure with Gram Vikas has been helpful in this regard.
- Biogas and rural entrepreneurship has also been attractive for many people because it gave them a chance to have a sustainable livelihood without having to migrate to some other state.
- The success of some TKWs, in terms of financial gains and social recognition, has encouraged others to take up this entrepreneurial activity.

VIII. Institutional Approach in Rural Enterprise

From the experience of various TKWs interviewed during the study, it is clear that the concept of rural enterprise through dissemination of biogas technology, germinating from Gram Vikas's initial efforts and building on their success and credibility, has taken root in Orissa. The rural enterprise activity has also sustained itself primarily by expanding into other developmental activities. However, most of these activities are still part of the heavily subsidized rural development programs of the government. In that sense, the rural entrepreneurs continue to depend on government allocations for various programs to earn their livelihood. The only activity that is independent of a government program is the maintenance and monitoring work many TKWs do on biogas plants for which they earn a small fee. Thus, should the government roll back development programs and remove/rationalize subsidies as part of their overall economic liberalization policy, it would have a profoundly adverse impact on the present pattern of rural enterprise[29]

Nevertheless, promoting enterprise is an efficient way of creating rural employment and boosting rural incomes. It could also be a strong alternative to subsidy-driven, state controlled approaches in providing sustainable energy services in the rural areas. The Gram Vikas's experience in biogas as well as RHEP demonstrates this, and so do a few examples in other parts of the country . Based on this overall feedback, there is a case for promoting rural enterprise in sustainable energy as a national policy. However, such enterprises are unlikely to function in a completely commercial environment since the requisite infrastructure, capital and capacities are largely lacking in the rural areas, and may take a long time to come about. Nevertheless, before such transition takes place, there are a number of steps that can be taken in the meanwhile at the policy, planning and institutional levels to develop rural enterprise. Some of the recommendations that should be considered in this regard are:

Promote energy service companies

In most rural development programs including energy programs, TKWs have till now been playing only a small role in terms fulfilling a pre-determined target against fixed financial incentives, while government has control over all functions in a top-down approach. Instead, a bottom-up approach should be promoted by developing rural energy service companies (RESCOs), which can design and implement programs in a decentralized fashion. These RESCOs could be TKWs, NGOs, entrepreneurs or women's groups, and would provide energy services to be paid for by the people. However, the following measures are necessary to render the concept of RESCOs viable:

i) The government should modify the approach of setting national targets, which are then disaggregated at various levels. Instead, the targets for various programs should be decided at the RESCO level depending on the feasibility and demand in a given geographical area and the capability of the RESCO.

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[29] This 'paradigm shift' seems increasingly likely with reform and restructuring becoming the norm in many sectors of the economy in India. While rural development still enjoys strong patronage from the government owing to welfare considerations, this is likely to change over a period of time.

[30] The experiences of organizations such as Self Employed Women's Association (SEWA), Social Work and Research Centre (SWRC), Solar Electric Light Company (SELCO), etc. are prominent in this regard See, Putti V R (1998). Op.cit Footnote 1.

This would result in realistic targets reflective of real demand, while providing satisfactory services to the people. Success at this level will help in people paying for the services.

ii) In order to enable people pay for sustainable energy services, providing soft loans with long repayment terms could be an option instead of offering people direct subsidies[31]. This approach has been partially adopted in some renewable energy technologies promoted by IREDA (e.g. solar photovoltaics). A uniform policy in this regard will be essential. RESCOs could take up the responsibilities of financial management along with other functions[32] .

Program integration

RESCOs should not be confined to just one program like biogas, but should be encouraged to take up other programs to ensure long term sustainability. In this regard energy services for productive applications (in agriculture, small-scale industries, community services, etc.) should be promoted. Till now renewable energy technology interventions focussed mainly on cooking and lighting end-uses addressing the quality-of-life concerns. People will be willing to pay for the services if they are able to enhance incomes through quality energy supply to productive activities. This will also ensure a better integration of energy initiatives with overall developmental activities .

Institutional support

Given the low infrastructure and scarce resources at the grassroots level, RESCOs will need to be assisted in a concerted manner in the beginning to establish themselves. Long term low-interest loans from rural/ national banks and financial assistance to meet working capital requirements should be considered to create and sustain RESCOs. A major portion of the direct subsidies currently being provided in rural development could be diverted for this purpose.

Capacity building

If RESCOs have to take up supply of energy and other services on a commercial basis, they need to acquire a number of technical, operational, marketing and management skills. Therefore, adequate infrastructure for capacity building should be created at the grassroots level. Organizations like Gram Vikas should be utilized as resource centers to impart these skills and knowledge. This could be a potential area for bilateral and multilateral investments.

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[31] *The procedures for sanctioning loans are usually cumbersome and long winding and act as a disincentive for people. The rural banking system needs to be strengthened and streamlined.*

[32] *SELCO, an energy service company in Karnataka has been promoting solar lighting on a commercial basis successfully for the last five years.*

IX. Conclusion

The experience of Gram Vikas in promoting rural enterprise and the subsequent progress of turnkey entrepreneurs in Orissa has been very positive and has major lessons to be considered for the process of rural development in the country. This is especially relevant in the context of structural changes taking place in the national economy. Efficient resource use and environmental sustainability will be key to development in this scenario of globalization. Enterprise development through efficient development and use of local human capabilities and resources could be key in this scenario. In the context of rural Orissa, the biogas entrepreneurs and Gram Vikas have shown the way.

[33] *A comprehensive program like RHEP of Gram Vikas, which addresses all the relevant issues in rural development is a strong approach to facilitate such integration.*

APPENDIX I

Approach and Methodology

Three basic tools have been used to compile this case study:

i) ***Secondary information collection:*** The detailed records on the biogas program existing at Gram Vikas have been consulted to understand various aspects of the program implemented by GV. In addition, studies carried out on Gram Vikas by organizations like IIM, TERI and IRMA were also referred to.

ii) ***Interviews and discussions:*** Extensive discussions have been held with the Executive Director of Gram Vikas to understand his vision and purpose behind implementing the biogas program and GV's subsequent withdrawal. The (ex)-Coordinator of biogas program was also interviewed several times on the operational and institutional aspects of the biogas program. In addition, discussions were held with several GV employees involved with biogas and RHEP, and the General Manager and Executive Engineer at OREDA. A discussion was held with Mr Anil Dhussa, presently Director at MNES. Also contacted were officials of AFPRO, who interacted with GV at the time of their association. Finally, the sample size for field survey was discussed and agreed upon with the (ex)-coordinator of GV, who had a comprehensive idea of the biogas program.

iii) ***Primary survey:*** Based on the information and advice provided by Gram Vikas, it has been decided to cover 8 districts, divided into three zones. The sample covered biogas supervisors, masons and actual beneficiaries. A checklist covering various items of information was used in the survey (Appendix II). The field study was conducted in two phases: in the first, a small sample of one rural entrepreneur and 11 biogas beneficiaries in Ganjam district was covered. Based on the feedback, the checklist was modified for the second phase. The total sample covered in the study is given below:

Zone	**Districts**	**Interviewees**					**Total**
		Biogas Supervisors	*Independent Masons*	*Dependent Masons*	*GV beneficiaries*	*RE benefi.*	
Zone1	Bolangir, Bargarh, Sonepur	4	2	2	10	10	28
Zone2	Mayurbhanj Balasore	4	2	4	5	10	26
Zone3	Ganjam, Gajapati, Koraput	2	1	2	10	5	20
	Total	10	5	8	25	25	73

APPENDIX II

CHECKLIST FOR THE FIELD SURVEY

Check List for Gram Vikas

Program Initiation

1. When did Gram Vikas undertake the biogas dissemination program and why?
2. Through which agency?
3. What were the agency's objectives?
4. What were GV's objectives? Were there any efforts towards 'horizontal integration' of issues into the plan of operation? If yes, what were they?
5. Did GV implement the biogas program on its own / in partnership with another agency / within another agency's program?
6. What was GV's strategy for the installation of biogas plants?
7. Did GV have a target community? Why did it select these communities?
8. Was the biogas program used as an entry point into the villages?
9. Is there any criteria for selecting beneficiaries? If yes, what are these criteria?
10. Was GV working with any of the beneficiary communities before it initiated the biogas program? If yes, provide details.
11. What was the process that led to the formulation of the project?
12. Did GV attempt a demand based approach?
13. Has equal representation of men and women in the planning process been promoted by the project? How were such efforts viewed by the different partners / stakeholders?

Arrangements Between GV and the Nodal Agency (OREDA / MNES)

1. What were the targets to be met?
2. What was the level and quality of support that GV received from its funding agency?
3. Were there any areas of conflict between GV and the funding agency? If yes, what were they and were they resolved?
4. Was a system of monitoring and evaluating the progress of the program agreed upon by the nodal agency and GV?
5. What was this monitoring system and what was to be its frequency?

Program Implementation Arrangements

Financial

1. What were the financial agreements?
2. Were the beneficiaries suppose to contribute towards the service provided?
3. Was the funding sufficient to meet the set targets?
4. How did the subsidy change over time? What impact did this have on the beneficiaries?

Human Resources

1. How many masons / technicians did GV train?
2. From where did GV hire its technicians and masons?
3. What were the institutional arrangements between GV and the masons / technicians whom they hired?
4. Was training to the masons / technicians imparted

by GV or some other agency with expertise in the concerned field?

5.What were the contents training modules used? What was the duration of these modules?

6. Were there any advanced courses / refresher courses for the masons / technicians? If yes, provide details.

Technical

1.Which biogas models were utilized?

2. Has the model changed? If yes, why?

3. How many biogas plants has GV installed?

4. What percentage of these are functional?

5. What was the system adopted for the operations and maintenance of the biogas plants?

6. How did GV monitor and evaluate the biogas program?

Interaction with Beneficiaries

1. Prior to the biogas intervention did the villagers face a problem in fulfilling their energy needs?

2. How did GV 'sell' the biogas idea to the people?

3. How awareness towards the benefits of biogas plants generated amongst the beneficiary communities?

4. What were the social / economic / environmental conditions prior to the biogas intervention by GV? How has the intervention affected these?

5. Has the biogas intervention had an impact on the socio-economic development of the area?

6. How can disadvantaged groups benefit from the targeted clean and more efficient energy systems?

7. To what degree was the community invited to participate in the planning, implementation and operations and maintenance of the biogas plants?

8. Has the biogas intervention led to other developmental activities?

9. How have household pollution levels changed in the course of the project and what was the impact of the project in this context?

Post-RHEP

1. Did GV aim at decentralizing the biogas program? If yes, then why? What were the steps that it took to enable this?

2. When GV decided to give up the biogas program and take up the RHEP program what did it offer the masons / technicians whose services it no longer required?

3. What did GV do to help them?

4. Is there any continuing interaction between GV and the rural entrepreneurs that it has promoted?

5. Does GV maintain a record of the biogas plants set up by the rural entrepreneurs who have been trained by them?

Check List for Rural Entrepreneurs

In 1994

1. Did the masons / technicians have sufficient skill and knowledge to continue on their own?

2. What percentage of the masons / technicians decided to go ahead on their own with the biogas program as rural entrepreneurs?

3. What were the difficulties that they faced when they set out on their own?

4. Did they receive any inputs in terms of advanced training / loans from GV or the funding agency?

5. How supportive was the funding agency towards these rural entrepreneurs?

6. Did the rural entrepreneurs initially face any resistance from the beneficiary communities?

Present Scenario

1. Did the masons / technicians find the level and qualityof training satisfactory?

2. Were the training inputs sufficient to make each mason / technician an independent worker?

3. How do the RE go about disseminating biogas technology in rural areas? Do they do it on their own or does GV or any other agency help them in approaching the people?

4. How successful have the RE been in installing biogas plants? What is the success rate?

5. Is the subsidy that is provided sufficient?

6. Is rural entrepreneurship in biogas a sustainable means of livelihood?

7. What has the impact of subsidy on the livelihood of the rural entrepreneurs?

8. Were any masons / technicians trained under the rural entrepreneurs? How many? (Male / Female?)

9. Did the masons / technicians trained by GV take up rural entrepreneurship individually or in small groups?

10. Is there any evidence of individual rural entrepreneurs being more successful than the ones who formed small groups, or vice-versa?

11. Not having GV as a link between them and the government, does it create problems? Should GV play the role of a link between them and the government?

12. Have these rural entrepreneurs diversified into any other activities?

Check List for the Nodal Agency

Interactions with GV

1. How did the funding agency select GV to implement its biogas program?

2. Was the funding agency satisfied with the quality of work done by GV?

3. Did the funding agency have a system for monitoring the work done by GV? What did these evaluation reports show?

4. Were any changes made to the way the program was being implemented by GV based on the evaluation reports by the nodal agency? If yes, what were the proposed changes and how were they incorporated in the program?

Interactions with Rural Entrepreneurs

1. Did they receive any inputs in terms of advanced training / loans from GV or the funding agency?

2. How supportive was the funding agency towards these rural entrepreneurs

3. Is the subsidy that is provided sufficient?

4. Should there be any subsidy at all? Elaborate either way.

Perceptions on Rural Entrepreneurs

1. Did the funding agency approve of the promotion of rural entrepreneurs? If yes, what did it do to help them?

2. What is the scope of expansion for a rural entrepreneur?

Check List for Beneficiaries

Perception of the GV Program

1. What was the people's initial response to this program?

2. Prior to the biogas intervention did the villagers face a problem in fulfilling their energy needs? If yes, then has the biogas intervention alleviated this problem?

3. What are the benefits derived from using biogas plants as perceived by the users?

4. Has the introduction of biogas plants improve the quality of life of the users? How?

Interaction with the Rural Entrepreneurs

1. How did the community react to having rural entrepreneurs and not agency's like GV installing biogas plants for them?

2. How did the level of service provided by REs compare with that of GV?

Continuing Demand for Biogas

1. What is the level of demand for biogas plants at the household and community level?

2. What is the opportunity cost of biogas plants?

3. Has the biogas intervention reduced or increased the workload of women?

4. What were their sources of energy prior to the biogas intervention?

5. Has the biogas intervention led to a reduction in the exploitation of natural resources?

6. Has the number of cattle in the village increased since the biogas intervention? If yes, what impact has this had on the environment?

Gram Vikas

Rural Enterprise in Renewable Energy Development:
A case study of biogas programme of Gram Vikas in Orissa

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