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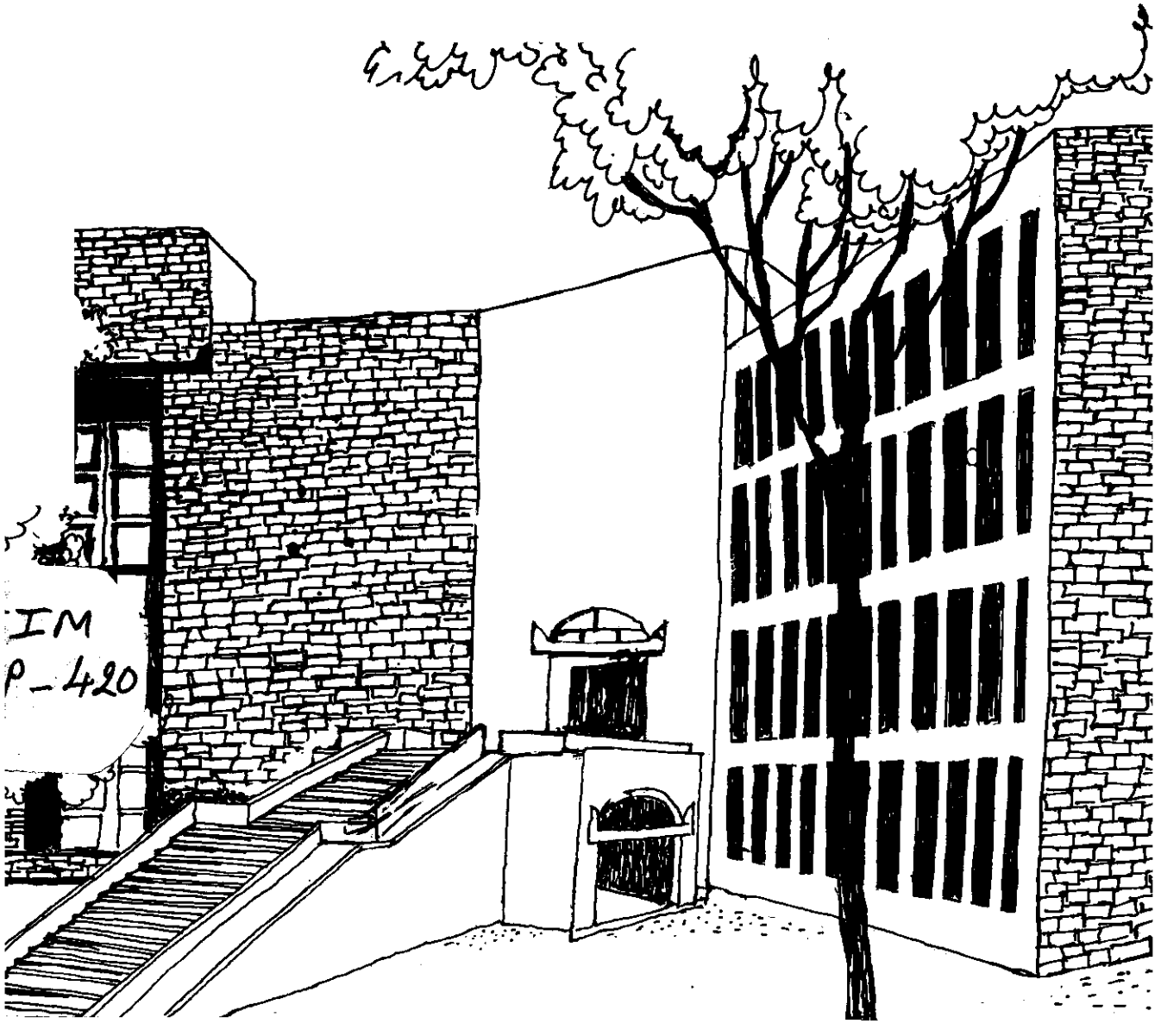

INTRODUCTION OF COMMUNITY BIOGAS PLANT IN A GUJARAT VILLAGE : A CASE STUDY OF TECHNOLOGICAL AND ORGANISATIONAL INTERVENTIONS

By

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INTRODUCTION OF COMMUNITY BIOGAS PLANT IN A GUJARAT VILLAGE : A CASE STUDY OF TECHNOLOGICAL AND ORGANISATIONAL INTERVENTIONS

The Community Biogas plant under the present investigation in Kubadthal village ofAhmedabad district, Gujarat, has been installed and is operated by a voluntary agency, the Vimla Gram Seva Samaj Trust (VGSS). The VGSS Trust was created by a well-known Gujarati industrialist, Seth Vadilal Lallubhai Mehta with the main purpose of rural development.

The VGSS has adopted nine villages of Daseroi taluka of Ahmedabad district for its rural development programme, of which Kubadthal is one. Mr.Mehta, the Chairman of the VGSS Trust is a very well known person in these villages with a considerable personal influence both as an industrialist and as a Gandhian political worker. In fact, a large number of labour force in his industrial enterprises is supplied from the villages in the region.

KUBADTHAL VILLAGE

The village is situated on Ahmedabad-Balasinor road, about 35 kms away from Ahmedabad city connected by a regular bus route and a pucca road.

The total population of the village is 2376 comprising 534 families. It has an estimated cultivable area of about 778 hectares producing mainly paddy and wheat. More than 50% of the cultivable land has permanent irrigation facilities, mainly the wells. There are

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53 wells and private tubewells and 2 governmenttubewells. In addition to cultivable land, the village has about 210 hectares of grazing land supporting 2320 animal heads of which about 1800 are dung-producing cattle. On the total 534 households in the village, about 175 are backward castes and the rest are caste-Hindus, the dominant Patels. In terms of land ownership structure, the village is comprised of 234 small/marginal farmers, 107 landless agricultural labourers, 12 rural artisans, 39 big farmers. The rest are off-farm labourers. Most of the Patel community are medium and large farmers.

Infrastructurally, the village Kubadthal is well-developed with adequate drinking water facilities (piped water supply controlled by the Panchayat), supply of electricity for domestic and agricultural purposes, a primary school of VII standard, a post office and a primary health centre, only 8 Kms. away from the village. In a survey it was found that more than 90% of the village households had an annual income more than Rs.1000 and more than 35% had an income more than Rs.5000.

PROCESS OF IMPLEMENTATION

As a part of their rural development programmes, the VGSS Trust decided to instal a large size community biogas plant in Kubadthal with the following objectives:

i) to provide better fuel

ii) to provide richer manure

iii) to eliminate environmental pollution

iv) to prevent deforestation

v) to improve the health of the rural families, and

vi) to improve economic conditions of the rural households by providing more leisure for part-time employment.

The VGSS also aimed at a participative community action through the community biogas plants among various class and caste-groups of rural households and specifically to benefit the poorer sections. Given the socio-economic structure of Kubadthal village as described above, it was expected by the VGSS Trust that there would be enogh enthusiasm among the villagers to take the gas connections at a reasonable price. The VGSS commissioned the Gujarat Agro-Industries Corporation Ltd. for a detailed techno-economic feasibility study for a community biogas plant in Kubadthal, which was completed in July 1980. Meanwhile, in May 1980, the Advisory Committee of the VGSS Trust along with its Chairman Mr.Mehta had a meeting with the villagers and the village leaders in order to assess pros and cons of certain operating conditions. In this meeting, the villagers largely agreed to pay for the gas-stove and the gas-meter, while other expenses were to be borne by the VGSS Trust. It was also decided that ultimately a cooperative body with village representatives supervision and control of the plant. In fact, in this meeting itself there were 123 households who indicated their definite willingness for

utilizing biogas. However, even at this stage the Sarpanch of the village was found to be a somewhat reluctant observer in the whole proceedings of the meeting and at times even antagonistic to the whole idea.

However, the VGSS went ahead with the scheme by purchasing 2,000 sq. meters of land from the village owners. From all points of consideration, the VGSS has been fortunate to have a project-site ideally located in relation to its technological and administrative requirements. The total cost of land and its development required for the plant was about Rs.6,800/=

The construction of the plant started in June 1980, undertaken by a contractor under the supervision and guidance of the Gujarat Agro-Industries Corporation Ltd. However, during the construction of the plant, it collapsed twice which prompted to go in for complete RCC construction. The delay in the process increased the construction cost substantially with some serious implications in later socio-administrative arrangements. The plant construction was fully completed and made ready for commissioning in December 1980.

Keeping in view of the needs of the 123 households who showed willingness to have gas connection; the plant was built with a capacity of 140 cmt of gas per day with a daily cowdung requirement of 3457.7 kg. It was also originally planned to construct 12 latrines at the plant site which was expected to supplement cowdung with

225 kg of human excreta. It was expected that 400 to 500 persons would use the latrines daily. However the social resistance about the use of human excreta and other administrative problems developed in the course of operating the plant have prevented the VGSS Trust so far to go ahead with the idea of latrine construction.

ESTIMATED ECONOMIC FEASIBILITY

The economic feasibility of the community biogas plant project at Kubadthal village, as worked out by the Agro-Industries Corporatin, Gujarat, was based on the following assumptions:[1]

a) Subsidy from the State Government — Rs.22,275.00

b) Long term loan @11% r interest from Financial Institutions i.e. Bank (as per RBI directive for Gobar Gas plant finance scheme) — Rs.1,87,741.00

As mentioned before, the daily cowdung requirement for 140 cmt gas production capacity per day was estimated to be 3,457.7 kg. The total availability of dung from the whole village was estimated to 14,341 kg per day, out of which 46,287 kg per day could be made available from the cattle owned by 123 households alone who are willing to take gas connections.

It was assumed, on the basis of villagers' assurance at the initial meetings, that the dung could be made available at the site at a rate of Rs.20 per tonne i.e. 2 paise per kg. Also, the village water supply system controlled by the panchayat assured enough availability of water for the plant. Similarly, it was worked

1 For details of the feasibility calculations, see appendix.

out that the digested manure produced (431.7 tonnes per annum) would be sold at the rate of Rs.60 per tonne, i.e. 6 paise per kg.

The suggested price of gas to be charged to beneficiary families was worked out as under:

a) one member family : Rs.7.75 per month

b) family with 2-3 members : Rs.6.98 per month/member

c) family with 4 or more members : Rs.6.20 per month/member

Taking the pay-back period as 10 years, it was envisaged that the loan amount together with interest at 11% thereon would be repaid in 10 years. It was expected that by the end of 20th year, an amount of Rs.3,22,828/- would get accumulated without considering the interest on each year surplus. This would be a sizeable amount which could more than easily meet all the replacement expenses of pipe-line and gas-holders (assuming 20 years life period).

In the original planned estimates, it was envisaged that the plant could be operated in full capacity from the first year and therefore loan repayment could start from the first year itself. A price of Rs.0.90 per cmt of gas was suggested as against the production cost of Rs.0.827 per cmt. At that point of time the equivalent value of kerosene was 0.94, which was taken as comparative standard of fuel. With this price it was expected that the project would generate a net yearly surplus income of Rs.32,062/- apart from various other tangible and intangible benefits to the villagers, particularly, the poor.

OPERATING SOCIO-ADMINISTRATIVE SYSTEM

The economic feasibility of the community biogas plant as discussed above was based on certain assumption regarding socio-administrative and economic arrangements. It is true that some of the assumptions were arrived at through initial discussion meetings between the VGSS Trust and the villagers. But as the stages of implementation and construction of the plant progressed, some of the socio-economic parameters of earlier assumptions changed drastically, creating thereby severe problems and necessary adjustments.

The problem started with the delay in completing the construction resulting substantial increase in capital cost. At first, the delay occurred due to unwarranted collapse of the wall twice during the initial phase and secondly, due to disagreement between the VGSS Trust and the villagers about some of the socio-economic and administrative arrangements as mentioned later. As a result of the escalation of costs of necessary construction materials during the time-lag, the entire project was overrun by 88%, from the total outlay of Rs.2,10,016/- to Rs.3,94,587/- by the time it was completed (see Annexure 7)

This quantum jump in the capital cost itself brought in several knotty issues to be settled with the villagers de-novo vis-a-vis earlier agreed upon arrangements. The VGSS Trust proposed to

increase the price of gas from earlier agreed upon price of Rs.0.90/cmt to Rs.1.10/cmt, the digested manure price from 6 paise/kg to 15 paise/kg and insisted that the consumers of gas should bear the cost of sub pipeline which was earlier suggested to be borne out by the Trust. Thus, the total initial cost for a household to get gas connection came to around Rs.725 of which Rs.125 as advance security deposit against gas meter and gas bills, Rs.350/- as cost of stove and Rs.250 for installation of pipelines.

These new terms and conditions proposed by the Trust were vehemently resisted by the villagers. Although the villagers seemed to accept the idea of the increase in gas price from 90 paise to Rs.1.10/ cmt but they totally refused to accept any increase in the cost of digested manure beyond 6 paise/kg. However, in a meeting of 19 Decembe 1980, the consumers made their recommendations accordingly. It was interesting to note that it was in this same meeting the consumers showed their willingness to grant gas supply to the poorer landless labourers at a concessional rate of 55 paise/cmt, and to provide gas meter and gas stove at Rs.100 only. The consumers, however, strongly insisted that the expenses for pipelines should be borne by the Trust and the manure to be sold at 6 paise/kg.

In view of the strong insistance and recommendations of the villagers, the Trust decided for the gas rate at Rs.1.10/cm and for manure at 6 paise/kg. But the Trust created a furore and a serious apprehension in the minds of the villagers, when for the

first time it conveyed to the people that the entire investment in the project would be converted into a loan and the consumers would have to repay theloan in instalments at 11% rate of interest. To many villages it was a bombshell out of the blue and a serious breach of trust. Almost all the 83 households who had already given their security deposit of Rs.125 and got the connections as well in August 1980, withdrew their deposits immediately. The plant remained closed for almost 6 months.

This means that the plant construction was complete and in fact was commissioned with initial feeding of cowdung, when it had to be closed down. It was at this stage the villagers also realized the immovable nature of the gas plant already constructed and investment made and also the dependence of the plant on the dung supply from the village for its operation. Taking this opportunity, they demanded higher price of dung than what was agreed upon earlier i.e. 2 paise/kg, along with the threat of stopping the supply of dung completely. The tension reached a point when some executive members of the Trust even thought of buying dung from the nearby surrounding villages and operate the plant to supply gas to the poor landless labourers exclusively at almost free of cost. Even some meetings were held between the Trust and the leaders of the surroundings villages to work out the scheme. Simultaneously, the land owning caste-Hindu households, not being very comfortable at the idea of sharing the same gas and technology with the low-

caste landless people, mounted their pressure and propaganda to keep these poorer section of the village away from opting for taking gas connections. "What difference will be there between us and them", was the argument used by some of the powerful and local caste-Hindu landlords. With the mounting tension, the VGSS Trust ultimately had to agree to theincreased price of dung from 2 paise to 5 per per kg.

Finally, in May 1981, after a lapse of 6 months, a meeting was held between the Trust and all consumers, in which it was decided to start the operation of the plant on the following conditions.:

1) Price of cowdung would be 2 paise/kg and fertilisers at 6 paise/kg for those consumers who sell dung and buys back fertilizers, but for those who would not buy back fertilizers, the price of dung would be 5 paise/kg.

2) Gas charges would be 90 paise/cmt.

3) The expenditure for sub pipelines and house connections to be incurred by the consumers.

4) Charges for gas stove/burners to be borne by the consumers.

5) Meter rent of Rs.5/- will be charged every month.

6) The price fixed above would be on a trial basis for 3 months after which it would be subject to change, if so required.

7) Those who had withdrawn their deposits of Rs.125 would pay back the same to the Trust.

By June 1981, only about 50 families paid back their deposits again and the gas supply started. The socio-economic status of these 50 consuming families is indicated in the table below:-

Table 1 : Biogas Using Families and Their Land/Cattle Holdings

Categories	No. of families	Caste	Total land Holding (in hectares)	Total cattle Holding (in Nos.)
1. Big farmers	25	Hindu	77.57	45
2. Small & Marginal farmers	8	Hindu	4.26	37
3. Agricultural labourers	18	Rabaris	-	140

It was interesting to note that even the landless agricultural labourers having gas connections were not the poor scheduled or backward caste people, but the Rabaris with large cattle-holdings of their own as their traditional occupation.

OPERATING SYSTEM AND PROBLEMS

Be that as it may, armed with a somewhat commonly agreed upon conditions the Trust started operating the biogas plant with largely truncated objective. It was hoped that once the plant started operating and 50 odd households got used to the benefits of biogas as fuel, it would have its demonstration effects and more and more villagers would come forward. But, very soon the Trust faced with several economic, administrative and technological problems.

Economic Constraints

As mentioned before, the Trust was almost forced to accede to the demand for the increased price of cowdung from Rs.20 per tonne to

Rs.50 per tonne. This obviously resulted in the increase in cost of production of gas and manure. While theTrust had to follow the agreed upon price of gas, i.e. 90 paise/cmt, it had to increase the price of manure from Rs.60 per tonne to Rs.150 per tonne. But the villagers were reluctant to purchase manure from the plant at such a high price of 15 price/kg as against the prevailing market price of the compost manure of 8 paise/kg. Not only the villagers were not convinced about the superior quality of the digested manure of the plant as compared to the usual compost manure, but also the farming community of the village i.e. the landed group did not face any real shortage of dung manure even after supplying a portion of the dung to the plant. Given this economic status and cattle-holding in the village, there seemed to be quite a surplus of available cowdung. On the other hand, 5 paise/kg of cowdung seemed to be quite a remunerative price in the village, which brought in easily at the plant site on an average of 3000 to 3500 kgs. of cowdung for sale. For fear of supply problems in future, the Trust had to keep on purchasing whatever daily supply of dung came in. Being unable to sell the digested manure at a price of Rs.150/tonne, the plant had to maintain the increasing stockpile of manure at the plat site with concomitant increase in costs of overhead and maintenance. However, a temporary solution for marketing of manure has recently been worked out by the Trust in which one of the industrial enterprises owned by the Chairman Mr.Mehta of the Trust, the Maize Products Private Ltd., had indicated its willingness to lift the digested

manure at Rs.150/tonne. This arrangement has yet to be effected.

The plant also faced another serious problem from a most unexpected quarter. At no stage in the process of planning and implementation, the Trust anticipated shortage of water, a most essential ingredient for successful running of the plant. In fact, the village Panchayat agreed very early in the process that it would supply free the required amount of water for the plant operation from its drinking water supply system. The reluctant Sarpanch as noted earlier soon came out openly resisting the idea with the observation that it would create shortage in the supply of drinking water to the village households. Neither the Trust planned for a provision of water storage for storing water during the slack period in the day. As a result, the plant could consume only 1500 kgs. of dung out of 3000-3500 kgs. of daily supply affecting the capacity utilization producing only 40-50 cmt of gas per day. Thus, the shortage of water not only reduced capacity utilization, but also necessitated storing fresh dung on the site for 10-15 days before being fed to the digester, which created other technological problems. However, this problem has recently been overcome by purchasing water from a nearby irrigation well of a private landlord at a rate of Rs.1 per 20 gallons. The Kirloskar engine bought by the Trust, which could be run by biogas (80 biogas: 20 diesel), was used for pumping water to the plant. The engine, however, was so far operated by diesel alone.

In this whole process, there has been substantial increase in operating costs, overheads and establishment charges, resulting drastic reduction in revenue generation. As against an annual surplus of Rs.32,066/- according to the original estimated plan, the actual surplus was only Rs.18,046/-, a 44% reduction. This meant that under the present operating system, the plant lead to generate a surplus of approximately Rs.50,000/- as against the present surplus of Rs.18,046/- to repay the loan of Rs.2,94,387/- together with 11% interest thereon within a period of 10 years.

As the plant has been unable to generate enough surplus in order to repay the loan instalment and interest there is no question of creating a reserve of Rs.3,22,828/- at the end of 20th year. On the other hand, at the present level of operation, the price of 90 paise/cmt of gas has not been enough to generate enough surplus to meet the commitment.

ADMINISTRATIVE ISSUES

One of the major objectives of the project was to involve the village community in the management and operations of the plant. So far, it has not been achieved. In fact, there appeared to be no direct or indirect invovement of the villagers in the operation, production and distribution of gas. The plant has been essentially operated by the Trust almost as a commercial service enterprise in a client-management relationship pattern. The Trust has employed

3 labourers, one chowkidar and a supervisor as regular salaried employees under a honorary secretary for the plant management. The annual administrative cost for maintaining the staff was about Rs.10,040/-.

Given the history of the project planning and implementation as well as the serious conflicts, interest groups or class-caste contradictions, it was perhaps difficult to evolve at organisational and operational system for active participation of the village community. The difficulty must have been compounded manifold due to perception of the villagers that since a rich industrialist has been promoting the Trust and its rural development activities, there should not be any economic-administrative responsibilities of the villagers in managing the plant efficiently. On the other hand, it appeared that the VGSS Trust at no stage planned for the kind of sustained educational and extension processes needed for active participation of the community. Rather, facing the contradictions and conflicts, the Trust quickly succumbed to usual administrative delivery system of a giver-receiver relationship. However, it was hoped that as various other developmental activities in the village, such as, milk collection, milk processing, fodder cultivation etc., active community participation would be forthcoming over a period of time.

TECHNOLOGICAL ISSUES

In some ways, the design of the biogas plant in Kubadthal was different from the conventional KVIC design. It had, for example,

no central wall dividing the digester into two chambers. Inside the digester there was a perforated pipe to push hot water and to sitrr the slurry for buddling, a mechanism which so far not yet utilized. Added to the design differences which were not yet time-tested, the plant was constructed as a single large-size digester. As a result, for any defect or maintenance problem, there has been no alternative but to stop the plant operation totally and thereby disrupting the service network.

As observed earlier, due to water-shortage, the plant could not be operated in its full capacity. With 40-50 cmt/day of gas production as against the capacity of 140 cmt/day, the gas supply to the consumers had to be limited to merely 2-3 hours during the day, which the consumers found quite inadequate. Not only the consumers were bothered about the inadequacy of the total supply of gas but also the uncertain and inconsistent nature of the supply, which was reported to be largely due to technical problems.

Firstly, the water-shortage and compulsory buying of the daily supply forced the Trust to stockpile fresh dung for 10-15 days before being fed into the digester. In the process, a large part of the dung was over-dried reducing its gas potential. With the water problem solved, this technical difficulties seemed to have been overcome recently.

Secondly, the digestor was initially reported to have been filled up within 10 days of commissioning without allowing sufficient time for digestion through gradual feeding. Given the capacity and weather conditions, a period of at least 25-30 days would have been required. Added to this was the fact that the plant remained closed for 6 months (December 80 - May 1981) resulting scum accumulation which in turn must have affected the rate of digestion and gas production.

Thirdly, the rate of gas production seemed to be also affected by less than required temperature maintained inside the digestor. While the present temperature ranged between 26°-$2[illegible]^{\circ}$C, the required temperature in the digestor for proper fermentation process should have been 30°-35°C. There could be several technical reasons for the low temperature, such as, excess water in the feedback, large capacity of the digestor without dividing wall, plastic bubble polythene sheet spread on the gasholder preventing direct solar heat and so on. Whatever might be the technological reasons, the fact remained that the low temperature in the digester retarded the fermentation process resulting unfermented slurry output, and even mixed with gas, that is, the loss of gas.

Fourthly, the gas pipeline was often reported to get choked due to accumulation of water. Also, the gas-meter used was not a very reliable kind getting often out of order cutting the gas supply.

Lastly, there seemed to be lot of sand in the feedstock which often choked the inlet pipe. Using pressurized water to clear the sand in the inlet pipe as has been practised made the proportion of water in the slurry more than required.

Some of the technological problems as mentioned above could perhaps be solved with little improvisation, proper maintenance and regular technical supervision. What is crucial, however, is the fact that due to these technical problems, the efficiency and impact of the plant has been greatly limited.

TOWARDS A FUTURE DIRECTION

The foregoing analysis brings us to the possible future development in relation to the community biogas plant in Kubadthal. For, inspite of the fact that the Trust faced and have been facing serious organisational, socio-political, and economic problems and limitations during the course of plan, there have been quite clear indications of positive impact of the biogas plant on the village life. These positive side of the impact need to be focussed in order to chart out future course of action:

(1) The women-folk of the gas-consuming families seemed to be clearly and unequivocally impressed with the usefulness and worth of biogas as a better alternative fuel. On enquiry, these women readily came out with several advantages and benefits of biogas as a fuel as compared to the traditionally used kerosene

dung-cakes and agricultural wastes. They were of course unhappy about the present inadequacy and inconsistency of gas supply which enforced them to keep the provision of alternative traditional fuel ready at hand in case of emergency. Inspite of this shortcoming, there seemed to be quite a perceptible positive feelings about the use of biogas among them, which apart from creating pressure on their corresponding men-folk for favourable decision and attitudes towards biogas, also had demonstration effects on other neighbouring non-user households and women folk. In fact, it was encouraging t note that more and more households especially the women have been approaching the Trust with their deposits for gas connection. Clearly once some of the technological difficulties are overcome and the rate of gas production enhanced, it could be possible to spread the benefits to more households with satisfactory level of supply of gas.

(2) To the consuming households, biogas as alternative fuel seemed to lead to net savings in the expenditure on fuels. A brief investigation revealed that the big farmer families used to spend on an average Rs.900 per year on fuel which came down to Rs.500/- after the introduction of biogas. Similarly, a small farmer saved about Rs.300 per year on fuel expenditure by reducing annual expenditure from Rs.600 to Rs.300/- by introducing biogas. The landless agricultural labourer families so far used dung-cake and agricultural wastes as a part of their wage as well as using own

labour in collection of these fuels. With the introduction of biogas, their average fuel cost came to only Rs.250/- plus all the savings on labour so far used for getting the alternative traditional fuel.

(3) The employment of 5 people on regular basis and engaging many casual labourers for various chores related to plant operation indicated the potentiality of employment generation by biogas plant projects for poorer people.

(4) One of the most perceptible environmental impact of the plant has been the conspicuous cleanliness of the village roads and corners devoid of dung-heaps and dung droppings, as compared to other neighbouring villages in the area. Ever since the cowdung has become a priced commodity within the village at the plant site, everybody in the village, particularly the landless and cattleless labourers have started collecting dung from streets, grazing grounds and farms and sell to the plant. Some of the Rabari families were reported to supply 200-300 kgs. of dung every day and earning Rs.10-12/- per day. In fact, the competition for collecting dung drops among the young children of the poorer section of the population has been conspicuously acute. Fortunately, the village being rich in cattle wealth with more than surplus dung production, the situation has still remained containable without any harmful effects on the poorer section as often apprehended by some people. On the

other hand, the plant certainly helped in income generation through sale of dung among the poor people.

(5) The community biogas plant has exposed clearly the caste-class contradiction and the power structure in the village. This was no less a contribution in the sense that on the one hand it enforced the Trust to understand the limiations of the application of community concept of the plant in the given caste-class contradictions in Indian villages, and on the other hand, it created situation in which the process of minimization of caste-class contradictions could be enhanced either through interdependent organisational mechanisms and sustained extension programme or through creating similar facilities for the poorer sections exclusively. The success of community biogas plant in Indian villages will largely depend on the viable mechanism to resolve this caste-class contradition as much as on techno-economic viability of the plant.

To conclude, the case study of the community biogas plant in Kubadthal village is merely an indication of the nature and extent of problems and prospects in insittutionalizing such programmes in Indian villages. In spite of situational uniqueness of different villages in different parts of India, the experience of Kubadthal project could be fairly generalized for future planning and learning purposes. While the specific response of implementing organisations will vary according to the situations, it is possible to draw some macro-level guidelines for the promotion of community biogas plants in the villages.

COMMUNITY BIO-GAS (KUBADTHAL)

Annexure-1

GENERAL EXPENDITURE

		Rs.	ps.
1)	Civil Construction	112441	00
2)	Pipe Lines	116066	00
3)	Gas Enginer, Air Compressor Water Pump & Weigh Base (scale)	13433	00
4)	Gas Holder and Hot plates	84693	00
5)	Consulting Charges	3210	00
6)	Gas Meters	46202	00
7)	Electric Connections	2815	00
8)	Lift Hand Pump	900	00
9)	Land	11360	00
10)	Pits for collection of slurry	800	00
11)	Bubble pack polythene sheet	700	00
	Total	3,92,620	00

Annexure-2

Financial Arrangements

		Rs.	ps.
A)	Fixed Capital investment	3,92,620	00
B)	Margin Money for 25% working capital to be arranged from Long Term Loan	1,967	00
		3,94,587	00
C)	Financial Arrangement		
	1) Long Term Loan @ 11% (RBI Rate)	2,94,587	00
	2) Subsidy	1,00,000	00
		3,94,587	00

Annexure - 3

DEPRECIATION & INTEREST	Rs.	ps.
A) Depreciation:		
1) Depreciation on Civil Construction @ 2.5% (Civil Construction Cost Rs.112441/-)	2811	02
2) Depreciation on Gas Holder @ 10% (Gas Holder cost Rs.84693/-)	8469	30
3) Depreciation on others @ 5% (cost of other Cap. expenditure Rs.195486/-)	9774	30
Total depreciation	21054	62
	(Say Rs.21055/-)	
B) Interest:		
Interest on long term loan of Rs.294587/- @ 11% p.a.	Rs.32405	57
	(Say Rs. 32405/-)	

Annexure-4

OPERATING EXPENSES

		Rs.	ps.
1)	Cost of dung @ 3804.4 p/day for 365 days @ 0.05ps/per kg.	69430	30
2)	Cost of water for mixing with dung (approximately) and making it into slurry	500	00
3)	5 workers 1 at Rs.200/- p. month 2 at Rs.150/- per month 3 at Rs.165/- per month) for 12 months	10140	00
4)	Other Misc. Expenditure (viz.Oil pump etc)	1200	00
		81270	00

Annexure-5

OVERHEAD EXPENSES

		Rs.	ps.
1)	Repairs and Maintenance	1000	00
2)	Cost of Painting	1000	00
3)	Stationery Printing and other Miscellaneous expenses	1000	00
	Total	3000	00

Annexure-6

WORKING CAPITAL REQUIREMENT

		for 12 months	Working capital on No. of months requirement		Rs.	ps.
1)	Overhead expenses	3000	00	1	250	00
2)	Operating Expenses	81270	00	1	6772	50
				Total	7022	50

25% of the working capital is financed by way of long Term loan ---------- i.e. Rs.1967 00

75% Balance amount to be financed by the Bank @ 16% i.e. Rs.5901. 00

Interest on working capital financed by the Bank @ 16% for one year (i.e.interest on Rs.5901/- @ 16% for 12 months) Rs. 944 16

(Say Rs.944/-)

Annexure-7

COST OF PRODUCTION OF GAS & MANURE

		Rs.	ps.
A)	**Annual Fixed Cost**		
1)	Overhead Expenses	3000	00
2)	Interest on Working Capital of Rs.5901/- @ 16% p.a.	944	00
3)	Interest on Long Term Loan of Rs.294587/- @ 11% p.a.	32405	00
4)	Depreciation on Capital Expenditure	21055	00
	Rs.	57404	00
B)	**Variable Cost**		
	i.e. operating expenses	81270	00
	Rs.	138674	00

Annexure-8

PRICE FIXATION PER UNIT OF GAS

		Rs.	ps.
A)	Total Cost of Production for 51100 cmt. of Gas & manure	138674	00
B)	Income by selling 445.3 tonnes of manure @ Rs.150/- p. tonne	66795	00
C)	Actual expenses on production after deducting income from the sale of manure i.e. (A-B)	71879	00
D)	Cost per cmt. of gas (i.e.71879 ÷ 51100)	1	41
E)	Cost of equivalent value of Kerosene (i.e. 0.62 litres of Kerosene is 1 Cmt of gas. Kerosene price Rs.1.52 p/litre)		94
F)	Selling price of gas per cmt. should be		90

Annexure-9

ESTIMATION OF GROSS SURPLUS

		Rs.	p.
A)	**Revenue**		
1)	Manure of 445.5 tonnes @ Rs.150/- p.tonne	66795	00
2)	Gas 51100 Cmt. @ 90 p. Cmt.	45990	00
3)	Meter charges 123 Meters @ Rs.5/- p.meter	615	00
	Total Rs.	113400	00
B)	**Total Annual Expenditure**		
1)	Overhead expenses	3000	00
2)	Interest on Working capital	944	00
3)	Operating Expenses	81270	00
	Total Rs.	85214	00
C)	Gross surplus i.e.(A-B)	28186	00