

**A PATH OUT OF DRUGERY FOR WOMEN**  
**A Biogas Programme Case Study in the Junagadh Area**

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## INTRODUCTION

The threat of the depletion of non-renewable energy resources has profound implications for the environment. In most of rural India, the primary source of fuel is biomass such as fuelwood, animal dung and crop residues. Unfortunately, the increase in urban energy consumption, unpredictable market forces and fluctuating environmental conditions have reduced the availability of biomass for energy production in the rural areas. Rural people have accommodated for this fuel shortage by using inferior fuels such as poor quality woods, shrubs, weeds and dung cakes. Unfortunately, women, as the gatherers of domestic fuel have had to face the brunt of this crisis. Not only has the time spent on collection doubled, but women and children have been exposed to unhealthy kitchen environments as a result of the use of these inferior fuels.

The Aga Khan Rural Support Programme (India) is a professional development organization working in three underdeveloped districts of Gujarat in the areas of natural resources management and human resources development. AKRSP(I)'s mission in these districts is to enable the empowerment of rural communities and groups, particularly the underprivileged and women, to take control over their own lives and manage their environment to create a better and more equitable society.

Efforts to curb the fuel crises in rural areas include the promotion of renewable energy technologies such as biogas plants and the augmentation of the supply of fuelwood through programmes such as wasteland development, social forestry, watershed development and Joint Forestry Management (JFM). Biogas has been proven as an ecologically sound and appropriate alternative to the use of fuelwood. Biogas is a mixture of approximately 60% methane gas and 40% carbon dioxide that is produced through the fermentation of dung. The product of this process is clean eco-friendly fuel, and a byproduct of slurry that can be used as a rich source of fertilizer.

Biogas technology was launched by the government in 1981-82 in order to conserve and protect the environment. In 1986 AKRSP(I) took this lead by initiating its own biogas programme with the aid of technically qualified civil engineers. Initially, the Biogas Programme was intended to respond to the depletion of forests and to combat the problem of soil erosion due to the salinity ingress in Junagadh. As the programme became more widespread other significant benefits have begun to become evident, which have given a new focus to the programme.

One of the main benefits has been that the Biogas Programme has helped to reduce the drudgery of women's lives. The impact of biogas has been positive particularly for women in terms of time saved in fuel collection and cooking, health, and convenience. Another benefit has been the availability of slurry which can be used as fertilizer to improve agricultural productivity. In recognition of these benefits, mainly to women, AKRSP(I)'s strategy has now shifted to try to motivate women to work as Extension Volunteers (EVs). They are selected to prompt other villagers to utilize biogas plants, distribute materials, maintain stock ledgers and supervise construction. EVs are paid Rs.50 by the beneficiary as incentive. The Biogas Programme thus also contributes towards building the capacity of the women.

The Biogas Programme was also initiated in the other areas that AKRSP(I) has ongoing projects. In 1990 the programme was introduced in Surendranagar, and in 1991 the programme was initiated in Bharuch. Unfortunately, the programme was not as successful in this area as it was in Junagadh. The programme was discontinued in Surendranagar for the following reasons:

1. The Maldharis, who own cattle, migrate during the winter and summer and in drought years abandon their plants entirely.
2. Biogas plants require water, and the availability of water is a problem in this drought-prone district.
3. Fuelwood is easily available from the Prosopsis Juliflora (Ganda Baval) tree which grows on the wasteland.

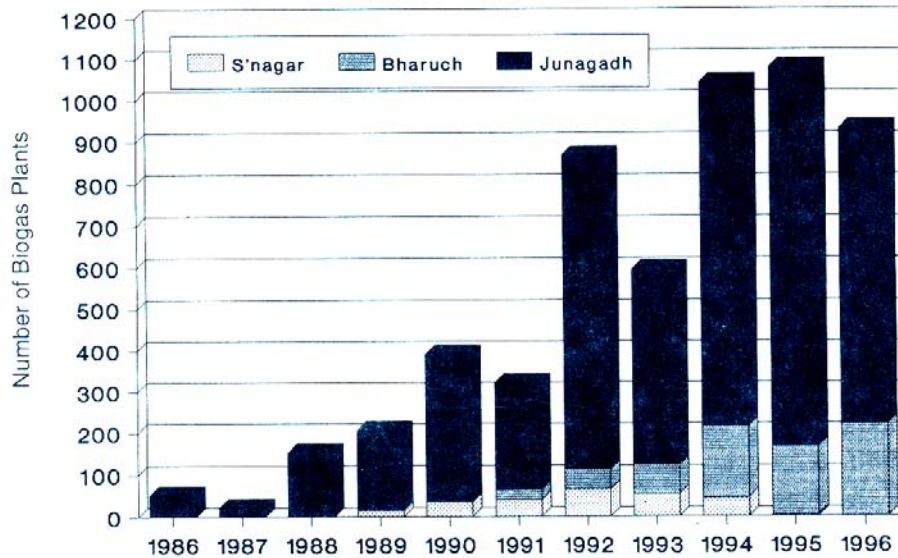
To date, AKRSP(I) has managed to establish the biogas programme as a legitimate source of energy (Table 1).

**Table 1: Number of Biogas Plants**

Year	Bharuch	Surendranagar	Junagadh	Total	Cumulative
1986	--	--	51	51	51
1987	--	--	22	22	73
1988	--	--	153	153	226
1989	--	15	191	206	432
1990	--	35	356	391	823
1991	24	41	256	321	1144
1992	47	65	756	868	2012
1993	70	53	472	595	2607
1994	169	45	829	1043	3650
1995	162	4	913	1079	4729
1996	221	--	709	930	5659
<b>Total</b>	<b>693</b>	<b>258</b>	<b>4708</b>	<b>5659</b>	<b>5659</b>

Source: AKRSP(I) Annual Progress Reports

**Physical Achievements in Biogas Programme by AKRSP(I)**



## **METHODOLOGY**

An in-depth study was conducted in order to gauge the effects of the Biogas Programme. A total of 27 households were randomly chosen and studied; 8 from Janger, 9 from Dedikiyal, 4 from Rahij and 3 from Talodra villages in Junagadh. Of the 27 households, three did not have biogas plants.

The present study is based on the above in-depth study along with other field visits in Junagadh.

## **SAVING TIME**

Women are the primary gatherers of fuelwood. Gathering fuelwood is a time-consuming endeavor. As a result of the development of biogas, not only has time been saved in the collection of fuelwood for energy but cooking time has also been decreased.

The households that utilized biogas plants cut their cooking time from 35 minutes per household member per day to 21 minutes. In comparison, the households which did not use biogas spend 5 hours, on average, per day cooking on the chulha as opposed to 2 hours 30 minutes with biogas. Undoubtedly, the energy expended by chulhas can be saved by the use of biogas plants.

Additional energy is saved through the use of pressure cookers, which are also promoted by AKRSP(I) as part of the Biogas Programme. These reduce not only cooking time but also further conserve energy. The use of pressure cookers in combination with biogas allows women to complete other household duties while cooking.

## **EFFICIENCY OF BIOGAS PLANT**

One thing to remember when dealing with biogas is that the efficiency of the biogas plant is affected by external factors such as seasonality. During the summer and monsoon months biogas plants work well but in the winter there is a significant decrease in the supply of gas, due to the low temperature impact on pressure and therefore supplementary kerosene and fuelwood are used. Another external factor is the collection of dung for the plant which depends upon the amount of livestock, and the time required to collect the dung. Though the overall time spent in fuel collection and cooking may decrease, it is important to remember that dung collection and maintenance of biogas plants are time-consuming activities. However, overall, the time spent on collection of fuelwood and cooking are significantly higher than that spent on dung collection and plant maintenance.

## **ECONOMIC BENEFITS**

The economic benefits attained from the installation of biogas plants are numerous. Compared to the cost of other energy sources, biogas provides an affordable option. Upper class farmers use kerosene if they do not have biogas plants. On average, the per year expenditure on kerosene is Rs.960 in addition to Rs.220 for a stove which needs to be changed every year. But the benefits do not accrue only to better off families: A particular example is that of two landless households in the above mentioned villages who owned animals and built a biogas plant. The slurry created by their biogas plants was used to trade with farmers in exchange for fodder. Initially, these landless households spent Rs.200 per month on fodder. As a result of trading their slurry, the households were able to save money and resources.

A similar incident occurred in Haripur village where a Rabari (animal rearing caste) woman installed a biogas plant. Before installing the plant, this woman used to sell the manure from her five animals. She was only able to sell one truck load of manure, per month for a mere Rs.600. In addition, the woman's husband had to collect 10 kgs of firewood every day, for cooking. After the installation of the biogas plant, she was able to produce two truck loads of slurry, a month, which she then sold for Rs.1200, in addition to saving fuelwood.

As can be seen, an added benefit of biogas plants is the production of fertilizer as a byproduct. Farmers have the double benefit of being able to produce fuel and at the same time produce slurry for composting. Three farmers in Dedkiyal village expressed the view that as a result of the increased quantity and quality of natural fertilizer, there have been fewer pest attacks and the quality of crops has improved. Less weeds also grew, saving both time and money. The following table shows the change in the average utilization of energy as a result of the adoption of biogas plants:

Table 2: Average Utilization of Energy Resources by Sample Households Before and After the Introduction of the Biogas Programme

Resource Utilization (per year)	Before Biogas	After Biogas
Expenditure on fuel (in As.)	845	91
Per day cooking time (hr.)	6	2.5
Collection of wood	37 person days	5 person days
Preparation of dung cakes	16 person days	Nil
Production of manure	6 qt.	24 qt.
Consumption of firewood	60 qt.	Negligible
Consumption of dung cakes	4 cart loads	Negligible
Consumption of kerosene	86 litres	20 litres

Source: Field work, 1995

### ACCESSIBILITY OF BIOGAS

There is a misconception that biogas is only accessible to the better off. This may have been true in the past when the construction of biogas plants relied on the fact that a family was required to have a minimum of five animals for the production of sufficient manure. This was required for the efficient use of 4-5 m<sup>3</sup> biogas plants. The adaptable Deenbandhu model of biogas plants has remedied this problem, producing a smaller quantity of 2-3 m<sup>3</sup> biogas, which can be sustained on the dung produced by 2-3 animals. Therefore, this model is more accessible to lower income farmers. AKASP(I) has been striving to make biogas an affordable reality for most farmers, and non-farmers. Table 3 illustrates the extent to which this has been achieved.

Table 3: Correlation Between Number of Animal and Biogas Plant Size

Number of animals	Number and size of Biogas Plant			
	2 m <sup>3</sup>	3 m <sup>3</sup>	4 m <sup>3</sup>	Total
2-3	6	--	--	6 (25%)
4-5	6	3	--	9 (37%)
6-7	3	1	--	4 (17%)
8-9	--	3	1	4 (17%)
10 and above	--	--	1	1 (4%)
<b>Total</b>	<b>15</b>	<b>7</b>	<b>2</b>	<b>24</b>

Source: Field work, 1995

This table, from the sample of 24 households of 4 villages, shows that 62% of plants require less than five animals and are therefore within the range of poorer households.

## **CONCLUSION**

The introduction of biogas has brought about positive changes in the lives of women as well as being a long term solution to the problem of depleting natural energy sources. The life of a biogas plant can be up to 20-25 years, and only requires minor maintenance regularly, such as the replacement of valves and the cleaning of pipes. In Amarpur village of Junagadh, biogas plants built in 1987 by AKRSP(I) are still in good working condition and are expected to work for at least another ten years.

The biogas programme embodies the environmental conservation notions of reduce, reuse and recycle. The biomass required for the efficient functioning of a biogas plant and its output, serve numerous functions inexpensively. Undoubtedly, AKRSP(I)'s Biogas Programme over the last decade has proved the effectiveness of the use of biomass for energy production as well as for the production of valuable nutrient-rich compost material which is reused as fertilizer. Not only does biogas save time but it also saves energy and improves the quality of life of rural people, particularly women. Increasingly, with improvements in design and efficiency, these significant benefits are also accruing to lower income families.

## **SUCCESS STORIES OF BIOGAS IN JUNAGADH AREA**

### **THE SKY IS THE LIMIT FOR GALIBEN.....**

Forty-year old Galiben is a Rabari woman in Haripur village. Her family came to the village as landless immigrants. Galiben used to earn her living by selling milk produced by her 35 cattle. When disaster struck with the 1987-88 drought, Galiben had to sell those animals. At the end of the drought, she had only five cattle left.

Driven by her inherent enterprising nature, Galiben dreamed up the idea of selling cow dung for money. She could sell a truckload per month for Rs.600. Meanwhile her husband began grazing the cattle of other villagers for 15 rupees per animal per month, earning Rs.300-500 per month. The family had to survive on a total annual income of less than Rs.1 0,000 per year.

In February of 1995, Zubedaben, an MEV for biogas, suggested to Galiben that she construct a biogas plant. It didn't take much time to convince this wise women of the benefits of biogas. Her biogas plant was constructed in March of 1995 and fulfilled all of her cooking needs. Before this plant was constructed her husband used to collect about 10 kgs of fuelwood from the forest each day, for cooking requirements. After construction, no firewood collection is needed at all.

Galiben mixes the slurry from her biogas plant with soil and other waste to compost it. She sells one truck load of compost for Rs.600 every 15 days, improving her monthly income to Rs.1200. Her family's annual income has now increased to above Rs.15,000. Galiben says that apart from the money, there are also intangible benefits she has received from the installation of her biogas plant: no smoke, no need for fuelwood and a clean kitchen environment. The increased income she has received through the biogas programme has enabled Galiben to add to her savings and finance other activities. For example, when she was told about the value of eucalyptus and cacuarina poles, she agreed to purchase and plant saplings in her courtyard. For Galiben, it seems that the sky's the limit.....

## **A CHANGE OF THINKING IN EKLERA.....**

Ranveerbhai is one of those people who lives a life in influence by superstitions, age-old traditions and customs. He had never heard of biogas before AKRSP(I)'s intervention in his village Eklera, and to him, the adoption of this technology was unimaginable. To motivate Ranveerbhai to construct a biogas plant seemed a herculean task. However, after lots of persuasion and an exposure visit to nearby village where a plant was already constructed, he agreed to invest in the technology. For the size of his family, a 3 m<sup>3</sup> plant was required. However, Ranveerbhai did not have sufficient cattle for this. To resolve the dilemma, AKRSP(I) suggested to him to utilize the human waste by attaching his lavatory outlet pipe to his biogas tank. This suggestion seemed to put all the motivational efforts back to square one! His immediate reaction was:

"We don't want to do this dirty work"  
"Our kitchen would smell"  
"We can't offer the food prepared on it to God"  
"We won't take out that slurry"

AKRSP(I) responded to each and every point raised by Ranveerbhai with appropriate explanations and examples. After days of persuasion, he finally agreed to do as recommended. After using the plant for some time he said "Due to AKRSP(I) a change has taken place in my thinking," and added "It has also given 2-3 years of extra life to our women folk". Big changes, indeed, in the attitudes of a traditional man, brought about by the introduction of a Biogas plant.

## **RAMBHAIR GETS CONVINCED.....**

Rambhai Virambhai of Mekhadi village, constructed a 2 m<sup>3</sup> biogas plant in the beginning of the year. He is a small farmer and his land is saline. For him, there is uncertainty with regards to agriculture production, so he supplements his income by operating a flour mill. In the year that AKRSP(I) approached him to convince him to construct a biogas plant, his crop had totally failed. The ideas seemed to him a waste of money, which he didn't have. He was only interested in an investment which would generate extra income for him.

Then AKRSP(I) staff tried to explain that by reducing the expenses on fuelwood, and through the production of good quality compost, he could gain indirect income through savings for him. He became convinced, and actually borrowed money in order to construct a biogas plant. Before biogas, Rambhai used to buy 120 litres of Kerosene and 720 kg of fuelwood, costing Rs.1 ,380 per year. After biogas, this means he has a total saving of Rs.1 ,380 per year on fuel alone. Further, he is able to make compost which he plans to use next year on his saline fields, in order to improve productivity. His wife Rupaben is also a major beneficiary as the biogas plant has made cooking easier for her, and she now has more time to devote to the care of her children.

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