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# Economic viability of gobar gas plants in Coimbatore district of Tamil Nadu

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**Abstract :** A study conducted in Ikkaraiboluvampatty village in Coimbatore district to study the economic viability of Gobar gas (Biogas) plant advocates the popularization of community size plants as the Pay Back Period, Benefit Cost Ratio and Internal Rate of Return were 3 years, 2.75 and 51.66 per cent respectively for 4 cu.m plant, when compared to 15 years, 1.37 and 23.71 per cent, respectively, for the one cubic meter plant due to economies of scale. (*Key Words : Gobar gas plant, Pay back period, Benefit cost ratio, Internal rate of return).*

Gobar gas is one among the renewable energy resources, which constitutes the potential asset base to rural economic growth and development and environmental sustainablility. Gobar gas has often been hailed as the appropriate technology that satisfies several criteria like supply of cooking fuel, optimal use of local resources such as cow dung, plant residues and other organic wastes and promoting local skills and technologies. Economic development is basically a process which relates crucially on the availability of resources such as energy and environmental factor inputs. Therefore, the developmental efforts should pay dividends on the activities that generate energy, while protecting environment from pollutants.

Gobar gas technology in India dates back to 1897. But research into the technology began only in the 1950's, when several Gobar gas plants came into existence. It was only in 1974 that Gobar gas became in issue of public interest in view of oil crisis in the Gulf countries. In India, the per capita population is about 0.4 cattle. It is estimated that 3-5 cattle are needed to run a Gobar gas plant of 2 cubic metre (cum). capacity, which is efficient to meet the cooking fuel requirement of 4-5 individuals. Hence there would be a great demand for the Gobar gas plants in the coming years to meet the yawning energy gap, especially in the rural areas of Indian sub-continent.

Popularization of Gobar gas has long been taken up as one of the alternatives to indeginously meet the energy crisis in the wake of oil price hike and the subsequent developments in the international energy market. The present study covers the aspects such as the cost economics of various sizes of Gobar gas plants, the popularity of different Gobar gas models, the reasons for the poor adoption rate and other related economic parameters. The study will also assist planners and policy makers in developing a suitable energy options and policies so as to meet the present day crisis.

The objectives of the present study were to (i) to analyse the performance pattern of different types and sizes of Gobar gas digesters in terms of its economic feasibility, (ii) to evaluate the economics of different sizes of the Gobar gas plants, (iii) to study the problems encountered in the adoption of Gobar gas plants and (iv) to examine the influence of various parameters on the adoption behaviour of Gobar gas farmers

## Methodology

A total number of one hundred Gobar gas users were considered for the present investigation in Thodamuthur block of Coimbatore District, where the All India Co-ordinated Research Project on Renewable Energy Sources [ORPIE & NSS] is in operation. Data on the size of the Gobar gas plants, cost of construction, source of finance, type of Gobar gas plants, nature of feeding materials were collected, besides the factors affecting the running of the Gobar gas plants. Both percentage and functional analysis were done to estimate the contribution of various components. Under functional analysis, both discounted and undiscounted methods of analysis were followed (For a detailed discussions refer Gittinger, 1972).

### *General characteristics of the respondents*

The present investigation reveals that about 52 per cent of the Gobar gas users belonged to the category of middle age group followed by old age group with 27.62 per cent. Three fourth (72.51 per cent) of the Gobar gas users had upto primary level education followed by secondary level education (12.17 per cent). It is in line with the fact that the dissemination of innovative technologies has significant relationship with educational level.

Majority of Gobar gas users (81.72 per cent) had agriculture as their main occupation. Almost half of the Gobar gas users (57.29 per cent) had a

family size of more than five members. Most of the users (69.75 per cent) possessed a live stock strength of more than five animals. The analysis of the results further shows that many of the Gobar gas users (89.92 per cent) did not have any extension training on Gobar gas. About 91 per cent obtained loan from commercial banks because of lower rates of interest and extension of subsidy through Block Development Officials.

*Perception of gobar gas plants by the respondents*

The present investigation implies the fact that 98.47 per cent users were using Gobar gas exclusively for cooking purposes. The advantages of Gobar gas as perceived by the users were smokelessness (100 per cent), reduction in drudgery (82.17 per cent), easy cleaning of utensils (91.48 per cent) and reduction in the dependability of firewood (87.26 per cent). The main environmental factor associated with the gobar gas in the introduction of substitute of firewood, which indirectly means conservation of forests and decline in air pollution.

*Economic analysis of various sizes of Gobar gas plants*

The discounted methods of analysis (viz., Net Present Worth [NPW], Benefit Cost Ratio [BCR] and Internal Rate fo Return [IRR] as well as the undiscounted method of analysis were undertaken for different sizes of Gobar gas plants. While working out the total cost of operation, both capital and operating costs were considered. The capital cost of the Gobar gas unit covers the cost of civil construction and the cost of pipelines and appliances. The major components of the operating cost of Gobar gas plants were the labour cost for collecting cow dung, operation and maintenance cost and repair and replacement costs of various components of the plant. The cost of dung was taken as zero, since the value of the biodigested slurry is higher than the cost of raw dung. The life span of Gobar gas plant was taken as 30 years#. In the ORP study area, majority of the Gobar gas farmers possessed Deenabandhu type Gobar gas model. The PBP, BCR and IRR for various sizes of Gobar gas plants are presented in Table 1.

From the table, it is evident that the investment repayment period became shorter as the size of the plant increased. The pay back period was very low for smaller size Gobar gas plants at 12.5 per cent discount rate. The BCR compares the discounted benefit stream with the discounted cost stream. The decision criteria is to accept the plants whose BCR is greater than one. The IRR was also calculated to appraise the plants of various sizes and IRR shows the discount rate at which the NPW is equal to zero.

*Operational and structural deficiencies*

Major stumbling blocks for Gobar gas plants becoming non operational were broadly divided into two components. They are structural [ie construction oriented problems] and operational difficulties. About 48 per cent of the non functional plants suffered due to operational problems with structural deficiencies accounting for the rest. In KVIC [Khadhi and Village Industries Commission] model, the corrosion of the metal dome was found to the major problem that led to leakages and it needs frequent repainting.

The KVIC models were reported to have suffered for structural failures. On the operational side, the major problem was the availability of adequate quantity of cattle dung required for initial filling of the digesters. Insufficient availability of dung was reported by 42.57 per cent of the users, which form the stumbling block for the operation of the digesters. The problems encountered during the operation of gobar gas plant were the choking of pipelines by water accumulation. It was reported by 38.42 per cent followed by scum formation in the digesters, which led to clogging of inlets and outlets.

It was revealed by 20.17 per cent of the sample respectively. Lack of technical guidance and service and paucity of funds were perceived by 21.53 per cent and 40.72 per cent, respectively. Even small repairs had forced many to abandon the operationalization of the digesters and 67.54 per cent were of the view that during winter seasons the productivity of gas fell drastically. It might be due to the inactiveness of the bacteria in low temperature. Non-availability of sufficient numbers of cattle due to restricted fodder supply was revealed by 72.47 per cent of the Gobar gas farmers. The study shows that the percentage of Gobar gas plants owned by SC (scheduled caste) farmers were negligible [2.78 per cent]. It might be due to the possession of more number of small cattle and lack of finance to be met the working capital needs of cattle rearing.

**Conclusions and policy options**

From the foregoing analyses, the following policy options were derived for adoption and further research.

Table 1. 1 PBP, BCR and IRR for Various Sizes of Gobar gas Plants

| Size of the Plant | Discount Rate | Pay Back Period | BCR | IRR |
|---|---|---|---|---|
| 1Cum. | 12.5% | 15Years | 1.37 | 23.71 |
| 2Cum. | 12.5% | 7Years | 1.90 | 38.62 |
| 3Cum. | 12.5% | 4Years | 2.53 | 49.74 |
| 4Cum. | 12.5% | 3Years | 2.75 | 51.66 |

➢ To make use of the Gobar gas available to marginal and scheduled caste farmers, who are actually in need of it, cost effective designs of Gobar gas digesters must be fabricated to meet the actual requirements of the target group.

➢ In some cases, even small problems like formations, clogging of inlets and outlets etc., forced many users abandoning the existing plants, which needs rectification and alternate solution to maneuver the problem.

➢ The analysis of BCR implies that as the size of the plant increases, the BCR also increases substantially, which suggests the construction of community Gobar gas plants to economies the dung use efficiency.

➢ Feed back information need to be collected then and there from the Gobar gas farmers to re-orient basic research towards the requirement and make the biogas programme location specific by giving weightage to construction and operation oriented problems.

## References

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# A computer model for design and evaluation of surge flow furrow irrigaion systems

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**Abstract :** Successful performance of Surge irrigation system depends chiefly on the design of Surge Cycle Timing parameters and prediction of the net Waterfront Advance times to reach the furrow tailends within the stipulated duration of irrigation. Extensive expermentation with different practical combinations of furrow inflow rates, furrow sizes, length and gradients for selected Surge Cycle Ratios and Numebr of Surges to complete irrigation has resulted in the development of a comprehensive computer model entitled as Surgemode. Validation of the model surgemode has also revealed that the predicted and the observed values of net waterfront advance times to reach furrow tailends lie in an acceptable range of 5to10% deviation while those of the soil moisture distribution efficiency lie in a range of 3to8%, making the developed model reliable for design and pre-evaluation of surge irrigation systems to suit the conditions prescribed in the text. *(Key Words : Surge flow, Cycle timing, Cycle Ratio, Surgemode, Model, Waterfront advance, Moisture distribution efficiency).*

In Tamilnadu, surface irrigation is accomplished through shortstrip furrow and checkbasin layouts for most crops. In addition to a significant loss of land for cultivation to the tune of 30% and more these layouts also lead to inevitable losses of irrigation water through deep percolation and run-off. The irrigation efficiencies under these conventional systems often lie below 65% owing to