

Subsidy and Biogas Programmes for Five Years

Government Subsidy to Biogas

The first time that the Government provided subsidies to promote biogas installments was in the Agricultural Year (1974/75). The Government had granted a six per cent interest subsidy on loans to farmers from the Agricultural Development Bank for the installation of biogas plants.

Subsequently, in the year 1982/83, under the Intensive Rice Crop Development Programme in Dhanusa, Sunsari, Rupendehi, and Banke districts, the Government provided a grant of Rs 5,500 per biogas plant. A total of 82 plants were established in those four districts with a government subsidy of Rs 4,51,000. Altogether, the Biogas Company installed 281 plants during that year.

Later, in the Seventh Five Year Plan, the Government made a serious policy commitment to encourage the installation of biogas plants in the country by setting an ambitious target of 4,000 plants, and by providing a subsidy of 25 per cent in the construction cost and 50 per cent interest subsidy on the loans from the ADB. However, the Government actually implemented this policy from the fourth year of the plan only and continued only until the end of Seventh Plan period. Although the subsidy was given only in the last two years of the Seventh Five Year Plan, the Biogas Company was able to almost meet the target (3862 plants were installed). The Government provided about 13.43 million rupees as subsidy on construction cost and 7.5 per cent interest subsidy on the bank loans. At the same time the Government, through the Water and Energy Commission, provided a grant of about 1.7 million rupees to the Biogas Company for research and training.

In view of the success of the biogas programme, and considering the need for the protection of forest resources as well as for reduction in the import of petroleum products, His Majesty's Government had agreed to provide a 50 per cent subsidy on the construction cost of biogas plants to promote the biogas programme. But, in 1990/91, the new interim government withdrew all subsidies on biogas. This change in its policy has brought about a big setback in the promotion of biogas and also has abrogated the trust of the people who were assured of the interest subsidy on their previous loans for biogas.

Cost and Benefit Estimation of the Biogas Programme over Five Years

The Biogas Company has estimated the total subsidy needed for the biogas programme, for a period of five years for the construction of 25,000 plants in the country, under two assumptions.

Assumptions:

- (A) 25% subsidy on capital cost and
50% subsidy on bank interest rate
- (B) 50% subsidy on capital cost only

It is also assumed that 50 per cent of the plants would be of 10m³ or of a lower capacity and 50 per cent would be of 15m³ or of a higher capacity. For estimation purposes, only two sizes i.e., 10m³ and 15m³ are taken into account.

Sizes or Capacity (m ³)	Per Unit Capital Cost (Rs)	Subsidy/per plant (Rs)			
		A		B	
		25% of Capital	50% Interest Subsidy (7.5%)	Total	50% of Capital cost
10	20132	5033	4527	9560	10066
15	25961	6490	5841	12331	12980

Source: Biogas Company, Kathmandu, Nepal

Table 3 shows that the installation of 25,000 biogas plants over a period of five years would require a government subsidy of Rs 273.6 million under assumption A and Rs 288 million under assumption B.

Table 4 presents the net additional plant nutrients and their values from the biogas slurry over the pure dung. Here it is assumed that all the dung is applied to the field as farmyard manure. The total additional plant nutrients in the form of Nitrogen (N), Phosphorous (P), and Potash (K) are 32,175 tons, 24,862 tons, and 8,775 tons respectively over a period of five years. The net value of all these nutrients comes to about Rs 628 million.

Table 5 presents the net additional plant nutrients in the Biogas slurry and their values under the assumption that all the dung will be converted into dung cakes for cooking and will lose all its nutrients, apart from some potash. In this table the full nutrients, both nitrogen and phosphorous, are considered to be additional benefits, apart from the potash, and their values are estimated.

Table 3: Projection of Biogas Plant Installation and Subsidies' Estimation for Five Years
(in million Rupees)

Years	10 Cubic Metres					15 Cubic Metres					Grand Total A's (5+10)	Grand Total of B's (6+11)
	No.	A			B	No.	A			B		
		25% Capital	50% Interest	Total (3+4)			25% Capital	50% Interest	Total (8+9)			
1	2	3	4	5	6	7	8	9	10	11	12	13
1	1500	7.5	6.8	14.3	15.1	1500	9.7	8.8	18.5	19.5	32.8	34.6
2	2000	10.1	9.1	19.2	20.1	2000	13.0	11.7	24.7	26.0	43.9	46.1
3	2500	12.6	11.3	23.9	25.2	2500	16.2	14.6	30.8	32.4	54.7	57.6
4	3000	15.1	13.6	28.7	30.2	3000	19.5	17.5	37.0	38.9	65.7	69.1
5	3500	17.6	15.8	33.4	35.2	3500	22.7	20.4	43.1	45.4	76.6	80.6
Total	12500	62.9	56.6	119.5	125.8	12500	81.1	73.0	154.1	162.2	273.6	288.0

Source: Calculated by the authors.

Table 4: Biogas Enriched Nutrients' Slurry and their Values

Years	No. of Biogas Plants	Annual Dung Need Cumulative Amount ('000 ton)	Animal Dung			Biogas Slurry			Addition Nutrients			Values of Nutrients (million Rs)			Total Value of Nutrients (million Rs)
			N	P	K	N	P	K	N	P	K	N	P	K	
			(Tons)	(Tons)	(Tons)	(Tons)	(Tons)	(Tons)	(Tons)	(Tons)	(Tons)	(Tons)	(Tons)	(Tons)	
1	3000	135	675	337.5	675	2160	1485	1080	1485	1147.5	405	15.86	12.25	0.89	29.0
2	4000	315	1575	787.5	1575	5040	3465	2520	3465	2677.5	945	37.00	28.60	2.07	67.67
3	5000	540	2700	1350	2700	8640	5940	4320	5940	4590	1620	63.44	49.02	3.55	116.01
4	6000	810	4050	2025	4050	12960	8919	6480	8910	6885	2430	95.16	73.53	5.32	174.01
5	7000	1125	5625	2812.5	5625	18000	12375	9000	12375	9562.5	3375	132.16	102.13	7.39	241.68
Total	25000	2925	14625	7312.5	14625	468000	32175	23400	32175	24862.5	8775	343.62	265.53	19.22	628.37

Source: Calculated by the authors.

Dung Requirement

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10 Cows Mean Plant = 18 cow/year

15 Cows Mean Plant = 27 cow/year

Nutrients :

Dung

Biogas Slurry

(in per cent)

N	0.5	1.6
P	0.25	1.1
K	0.3	0.8

Price

N	Rs. 1000/ton
P	Rs. 1000/ton
K	Rs. 2100/ton

Table 5: Total Nutrients and Values of Biogas Slurry Except Potash

Year	No. of Plants	Total Nutrients of Biogas Slurry		Value in Rupees		Total
		N (in metric tons)	P	N (in million rupees)	P	
1	3000	2160	1484	23.07	15.86	38.93
2	4000	5040	3465	53.83	37.00	90.83
3	5000	8640	5940	92.27	63.44	155.71
4	6000	12960	8910	138.41	95.16	233.57
5	7000	18000	12375	192.24	132.16	324.40
Total	25000	46800	32174	499.82	343.62	843.44

Source: Calculated by the authors.

The total additional plant nutrients in the form of N and P are estimated to be 46,800 tons and 32,174 tons respectively over a period of five years with a value of Rs 843 million.

Table 6 presents the estimation of total biogas production under optimum conditions and subsequently the total fuelwood saved in cooking due to substitution of fuelwood with biogas. The value of the fuelwood is then estimated. The total amount of biogas produced over five years from 25 thousand biogas plants would be about 70 million cubic metres of methane gas (equivalent to 0.25 million metric tons of fuelwood), worth Rs 241.4 million.

Table 7 presents the estimation of total value from the replaced fuelwood and additional plant nutrients. The total value of the fuelwood + (slurry - dung) comes to about 870.8 million rupees while the total value of fuelwood + (slurry - potash), comes to about 1,084.8 million rupees.

Table 6: Expected Production of the Biogas, the Amount of Fuelwood Saving and their Values

Year	10 Cubic Metre			15 Cubic Metre			Grand Total of Gas Production (⁰⁰⁰ m ³)	Fuel Wood Saved (Tons)	Fuel Wood Values (million Rs)
	No.	Per Unit Optimum Gas Production Annually m ³	Total Gas Production (⁰⁰⁰ m ³)	No.	Per Unit Optimum Gas Production Annually m ³	Total Gas Production (⁰⁰⁰ m ³)			
1	1500	892.0	1338	1500	1402	2103	3441	11940	11.3
2	2000	892.0	3122	2000	1402	4907	8029	27860	26.8
3	2500	892.0	5352	2500	1402	8412	13764	47761	45.4
4	3000	892.0	8028	3000	1402	11917	19945	69209	65.7
5	3500	892.0	11150	3500	1402	16824	27974	97070	92.2
Total	12500		28990	12500		44163	70153	253840	241.4

Source: Calculated by the authors.

Note: One cubic metre of biogas = 3.47 kg of fuelwood
Fuelwood Price is Rs 950/ton

Table 7: Estimation of Total Value from Replaced Fuelwood and Additional Plant Nutrients

Years	No. of Plants	Fuelwood Values in million (Rs)	Nutrient Values		Total Values (million Rs)	
			Slurry-Dung million (Rs)	Slurry - K million (Rs)		
1	2	3	4	5	6 = (3+4)	7 = (3+5)
1	3000	11.3	29.0	38.9	40.3	50.2
2	4000	26.8	67.0	90.8	94.5	117.6
3	5000	45.4	116.0	155.7	161.4	201.1
4	6000	65.7	174.0	233.6	239.7	299.3
5	7000	92.2	241.7	324.4	334.9	416.6
Total	25000	241.4	628.4	843.4	843.4	1084.8

Source: Calculated by the authors.

Table 8 presents the benefits of the biogas programme after deducting the government subsidy. The difference between government subsidies under situations A and B (see page 9) is not much. The benefit of the biogas programme for five years comes to about 800 million rupees after deducting the government subsidy. The total benefit comes to three times the total government subsidy. The lifespan of a biogas plant is about 25 years. With an annual net benefit of 800 million rupees a year, the total projected benefits over 25 years would be about 20 billion rupees.

Table 8: Net Benefit of the Biogas Programme
(in million Rs)

Total Benefit		Government Subsidy		Net Benefit Difference	
		A	B	A	B
1	50.2	32.8	34.6	17.4	5.6
2	117.6	43.8	46.1	73.8	1.5
3	201.1	54.7	57.6	146.4	143.5
4	299.3	65.7	69.1	233.6	230.2
5	416.6	76.6	80.7	340.0	335.9
Total	1084.8	273.6	288.1	811.2	796.7

Source: Calculated by the authors.

Table 9 presents examples of government grants and subsidies. The transport subsidies for fertiliser amounts 300 million rupees for 1990/91. The biogas subsidy requirement is about 25 million rupees for that year. This means that approximately one-twelfth of the government subsidy on fertiliser would have contributed a continuous stream of benefits to the economy for several years.

Table 9. Examples of Government Grants and Subsidies in 1990/91

Items	Amount (in million Rs)
Transport Subsidy on Fertiliser	300.0
Transport Subsidy on Foodgrains	50.0
Petroleum Exploration	93.5
Natural Gas Exploration	3.3
Rural Energy Development through ADB/N	2.0
Community Forestry Programme	116.4
Biogas (a) Actual	0.0
(b) Requirement (50% subsidy on capital cost for 2,200 plants and the training cost)	25.0

Source: Ministry of Finance, HMG, 2047.

The analysis presented above provides strong and convincing arguments for government subsidies of up to 50 per cent of the total capital cost of biogas installations. This would provide a substantial incentive to farmers to install biogas plants because their own initial costs and the amount loaned from the banks would only be about half of the normal costs. At the household level, the cost-benefit analysis of a 10m³ biogas plant indicates that biogas technology is economically viable (see Appendix Tables 1-4) even without subsidy. However, a subsidy would make the proposition of installment very attractive to farmers.

In spite of the positive Net Present Value and 1.38 B/C ratio of biogas investments, there are no immediate cash returns from biogas investment, compared to investments in livestock (milch animals) and other components, for example. There is, however, indirect income generation. The time saved from fuelwood collection, and the burning of cattle dung for cooking do not need cash investments, and therefore, farmers with scarce resources are reluctant to invest in biogas. Besides, rural people have many other priorities to be met. Such national and social benefit programmes receive impetus only when sufficient government interventions are made, either through subsidies or cost reduction.

Subsidies to Biogas in India

The Central Government of India provides a subsidy of approximately 25 to 35 per cent on the cost of plant installation for general category users and 45 to 56 per cent for weaker sections of the community.

In addition to the Central Government's subsidies, the State Governments also make further subsidies available bringing the subsidy on biogas installation up to 70 or 75 per cent. The strong political commitment shown, through the granting of subsidies, has resulted in a substantial number of biogas installations in India. During the Seventh Five Year Plan period (1985-90) biogas installations exceeded the targets set for each year (see Table 10). The Government has set an ambitious target of installing 12 million biogas plants at an annual rate of 800,000, by the year 2001 A.D.

Table 10. Biogas Installation Targets and Achievements in India

Year	Target of Biogas Plants	Achievements
1985-86	1,50,000	1,90,222
1986-87	1,50,000	2,00,833
1987-88	1,20,000	1,73,659
1988-89	1,50,000	1,67,124
1989-90	1,60,000	1,60,000 (expected)

Source: Khandelwal, 1990.

Why Give Subsidies to Medium and Large Farmers?

Often it is argued that only well-to-do farmers can install biogas because they have the required number of cattle to start a biogas plant and so government subsidies go to the rich. This argument could also be used for fertiliser and other commodities that are subsidised. What one should consider here is that biogas has many advantages. It promotes the stall-feeding of cattle, reduces fuelwood requirements by replacing fuelwood in the cooking process, thus decreasing pressure on the forests, adds more plant nutrients to the soil, and improves sanitation by promoting the construction of latrines which can be attached to biogas plants. Thus, the overall benefits to the economy are much more than those accruing from other types of subsidy, from which the benefits are only short-term (for example fertiliser). The environmental impact of this programme is positive, because biogas slurry provides organic manure which helps to improve the texture as well as the structure of the soil, whereas inorganic fertiliser has negative environmental consequences along with bringing about a decline in soil quality.

Employment Generation through Biogas

The other tangible benefit of biogas installation is the creation of employment through this programme. Table 11 indicates that, for the installation of 25,000 biogas plants, the amount of unskilled and semi-skilled labouring time required would be about 1.44 million mandays in five years. The value of these mandays is approximately 50 million rupees. In addition about 1,000 skilled technicians would be

needed on a full time basis annually.

Table 11. Employment Estimates of Biogas Programme

Years	10 Cubic metres			15 cubic metres			Grand Total of Labour	Values ('000 Rs)
	No.	Labour Need Per Plant	Total Labour Need	No.	Labour Need Per Plant	Total Labour Need		
1	1500	45	67500	1500	70	105000	172500	6.04
2	2000	45	90000	2000	70	140000	230000	8.05
3	2500	45	112500	2500	70	175000	287500	102.22
4	3000	45	135000	3000	70	210000	345000	120.75
5	3500	45	157500	3500	70	245000	402500	140.87
	12500		562500	12500		875000	1437500	503.12

Source : Calculated by the authors.

Note: Labour rate - Rs 35/man