

CES/IOE. Renewable Energy Perspective Plan of Nepal (REPPON) – Present Structure of Biogas Sector in Nepal and Vision for Perspective Plan for Twenty Years. Consolidated Management Services Nepal. May 2000. 27p. BSP Lib Temp No. 109.

Introduction

AEPC had entrusted Centre for Energy Studies, Institute of Engineering (CES/IOE), Pulchok Campus of Tribhuvan University to prepare documents on renewable energy perspective plan of Nepal: 2000-2020. In this endeavour, CES/IOE had assigned Consolidated Management Services Nepal (CMS) to prepare above document. First part of this document deals with the comprehensive and consolidated findings on the present structure of biogas sector in Nepal whereas vision for prospective plan for 20 years (2000 to 2020) has been elucidated in the second part of the report.

Main Highlights of the Report

Present Structure of Biogas Sector In Nepal

Institutional Growth

The author mentions that how biogas plant was introduced for the first time in Nepal in 1955 by the effort of a schoolteacher, late Father B R Saubolle at St. Xavier's School, Godavari in Kathmandu. However, owing to World Energy crisis of 1973 a global interest was created in this sector. This crisis caused the formation of a Biogas Development Committee (BDC) as a part of the Energy Research and Development Group (ERDG) under Tribhuvan University in 1975.

The Ministry of Agriculture (MOA) observed the fiscal year 1975/76 as the "Agriculture Year". Biogas was included as a special programme for its effectiveness in controlling deforestation and preventing burning of cow dung which otherwise could be used as fertiliser. Interest-free loans were provided to the farmers willing to install biogas plants. Private contractors under the supervision of the Department of Agriculture, HMG/N, constructed the first 200 family size plants during the year 1975/76.

Agricultural Development Bank of Nepal (ADB/N) played an active role in the promotion of biogas technology since 1974/75 by disbursing loans to the interested individuals for installing biogas plants. The bank was also active in carrying out promotional activities such as training and information dissemination. Similarly, Development and Consulting Services (DCS) of the United Mission to Nepal (UMN), Balaju Yantra Shala (BYS) and Agricultural Tool Factory (ATF) were also amongst the pioneering agencies to make the biogas programme a success.

A project entitled "Study on Energy Needs into Food System" was undertaken in 1976. This project was sponsored by USAID and executed jointly by Department of Agriculture (DOA) and US Peace Corps/Nepal. Under this project, a few Nepalese experts and American Peace Corps American volunteers were trained, a few pilot digesters were constructed and a night-soil community biogas plant was also installed at Tyagol Tole of Lalitpur District.

Gobar Gas and Agricultural Equipment Development Company (GGC) was established in 1977 as a private company (a joint enterprise consisting of DCS of UMN, ADB/N and the Fuel Corporation) with an objective of promoting biogas technology in the country. For about 17 years from its establishment, GGC remained the only organisation involved in the promotion of this technology.

With the establishment of Biogas Support Programme (BSP) in 1992 with the financial support from the Netherlands Development Organisation (SNV/Nepal), the pace of biogas development and number of household size biogas plants have increased rapidly.

Following the government policy to encourage private sector participation and realising the fact that GGC alone with its human resources cannot meet the ever-increasing demand for more biogas plants. To-date 49 biogas companies have been registered with His Majesty's Government of Nepal (HMG/N).

For a long time, there was no responsible government body to oversee the biogas programme in Nepal. Ultimately, this gap was fulfilled on November 3, 1997 by the formation of Alternative Energy Promotion Centre (AEPCC) under the umbrella of Ministry of Science and Technology (MOST). AEPCC as recognized government body has access to support and funds from HMG/N and donors for the promotion of alternative energy in Nepal.

The Ministry of Forestry and Soil Conservation (MOFSC) implemented a project titled Support for the Development of a National Biogas Programme from 1995 to 1996 under the Technical Co-operation Programme of Food and Agricultural Organisation of the United Nations (FAO). The activities included mainly training of government officers, masons and biogas users; utilisation of digested slurry as fertiliser and production of biogas training manual for extension.

The other national and international agencies notably UNICEF, Save the Children Fund/USA, New Era, Dev-part, East Consult, Plan International, Consolidated Management Services (CMS) Nepal (P) Ltd., NPBG (Nepal Biogas Promotion Group), NCBAE (NGO Coalition for Biogas and Alternative Energy), AEPDF (Alternative Energy Promotion and Development Forum), etc. have also made significant contribution in the institutional growth of biogas technology in Nepal.

Technological Growth

Development Consulting Services, after a detailed study of the KVIC approved design recommended two floating drum type plants suitable for both low and high water table areas. From the very beginning until 1987, the floating drum model of biogas plant based on Khadi and Village Industries Commission (KVIC) of India remained popular in Nepal. But for the sustainability of the programme, it became imperative to come up with other alternatives because of various shortcomings experienced in the KVIC floating drum plant. As an alternative to KVIC design, DCS performed preliminary experiments with fixed dome of drumless design at Butwal Technical Institute (BTI) and evolved a new design in 1978. The design was later modified by GGC in 1990, which became popular because of its lower initial investment cost compared to KVIC plant.

In Nepal, the Deenbandhu plant was first propagated by an INGO called South Asian Partnership (SAP/Nepal) in Bardia district in 1991/92. Around 1994, more than 100 units of this design were put forth by this organisation. Deenbandhu plant was actually pre-qualified for subsidy in 1994/1995 under SNV/BSP programme. However, no organisation was interested in constructing this plant. Furthermore, SNV/BSP's calculations at that time indicated that the cost saving compared to the GGC 1900 model were only minimum whereas the construction technique is significantly more complex.

Government Support

Government interest to support biogas programme was noticed first following the World Energy crisis of 1973. The first ever subsidy on biogas came in 1975/1976 (Agriculture Year) as interest free loan for plant installation. The government plan for the construction of biogas plants was first included in the Seventh Five-Year Plan (1985-90) with a target to establish 4,000. During this period, the government had decided to provide a subsidy of 25 percent on the construction cost and 50 percent on the interest of loan from Agricultural Development Bank of Nepal (ADB/N).

Realising the necessity to promote fast development of biogas sector in Nepal, the government had set a target of commissioning 30,000 plants during the Eighth Five-Year Plan (1992-97). The subsidy policy after 1992 has been stable and quite conducive to the rapid development of biogas programme in Nepal. In 1992, following the establishment of SNV/BSP, the government had fixed a subsidy amount of NRs 7,000 in Terai districts and NRs 10,000 in hill districts. Because of the government policy to encourage the privatisation in biogas sector, many new companies and NGOs came into being to participate in the programme. Thus, the target set by the government to construct 30,000 biogas plants in the Eighth Five Year Plan was fully achieved even before the end of the planned period.

The subsidy policy was further revised in the Fiscal Year 1995/96. Accordingly, the government disbursed subsidy amount at the rate of (a) NRs 7,000 in the Terai; (b) NRs 10,000 in the hills connected with roads; and (c) NRs 12,000 in the remote hills that are not connected with roads. These subsidies were provided irrespective of the plant size. Again, based upon the mid-term report of SNV/BSP, the rates have been effectively reduced with NRs 1,000 across the border from July 1999.

Encouraged with the achievement of biogas development programme in Nepal, the government has fixed a target of installing 100,000 plants during the Ninth Five Year Plan period (1998-2002) with assistance from the Netherlands Development Organisation (SNV/Nepal) and co-funding of Kreditanstalt fur Weideraufbau (KfW), a development bank of Germany.

Present Government Policy

The long term objective of the government is to promote the faster development of biogas as an effective alternative energy sources for cooking, lighting and other purposes thereby substituting firewood (saving of forest), imported fossil fuel and chemical fertiliser (saving of foreign currency) with simultaneous improvement in environment, health and sanitation.

Present Situation

With the concerted efforts of SNV/BSP and other international organisations, commercial banks, biogas companies, GOs, INGOS, NGOs, Consulting Firms etc., a total of 60,321 biogas plants have been established in Nepal from 1973 to until 31 August 1999. *However, according to the latest information received from SNV/BSP on the updated figure on biogas plants installed during Mid-May 2000 are 66,250.* So far, 64 districts of the country have been covered by biogas programme. As biogas is not technically feasible in higher altitude because of drastic reduction of gas due to lower temperature, some research has been initiated by SNV/BSP recently to resolve this problem of global inter

Operational Rate of Biogas Plants Versus Users' Satisfaction

Based upon the evaluation made by SNV/BSP about 98 percent of the installed plants are found to be in operation in Nepal. As pointed out earlier, such operational rate is quite high compared to the neighbouring countries. However, it should be borne in mind that a plant being in operational condition does not necessarily mean that the farmers are fully satisfied with it and are deriving the maximum benefit from their plants.

Influence of Biogas on Fuel Saving

Assuming that out of the targeted 100,000 plants to be constructed by 2002, if only 90,000 plants are installed, following savings on firewood, agricultural residues, dung cake and kerosene will take place (CMS/FAO, 1996):

- 34 million m³ of biogas will be produced resulting into a saving of 170,000 metric ton of firewood;
- 8 million m³ of biogas will save 72,000 metric ton of agricultural residues;
- 4 million m³ of biogas will save 40,000 metric ton of cow dung cake that could be used to apply as fertiliser into the soils; and
- If only 15 percent of biogas will be used for lighting, it will save 4.5 million litres of kerosene.

Beneficiaries of Biogas Programme

Majority of the biogas users are found to be rich and well-to-do farmers who possess size of land holding above the national average. On an average, 95 percent of such plant owners derive their livelihood from agriculture by practicing farming. More than 75 percent of the biogas users are educated compared to the national average of 36.6 percent literacy rate.

Potential of Slurry Use

For the promotion of biogas technology in Nepal, besides gas, the potential of slurry use has to

be taken into consideration. There is a need to understand and assess the potential of slurry in terms of agricultural production and reduction of artificial fertiliser. If the 65 percent of the potential (1.3 million family-size plants) is tapped, there is a possibility of producing 4.2 million metric tons of the slurry compost per year from the family-sized biogas plants. If calculated in terms of nutrients, 23,675 MT of N; 14,259 MT P_2O_5 and 28,518 MT of K_2O would be available per year as fertiliser. These qualities of N, P_2O_5 and K_2O would be equivalent to about 37 percent, 59 percent and 18 percent respectively of the fertilising nutrients consumed during 1994/95 from the mineral sources.

Influence of Biogas on Improvement of Health

Health and hygiene of the women who have to undergo drudgery of cooking with firewood are greatly affected. It is known that the obnoxious smoke produced from firewood burning contains harmful substance such as Carbon Monoxide, Benzopyrene etc. which increases in-house pollution. Thus, due to inhalation of the hazardous smoke, the housewives have been suffering from various types of diseases such as Acute Respiratory Infection, eye trouble and heart problem. It has been reported that in some cases older women, who were no longer able to cook on firewood, began to cook again when biogas was introduced. Cooking, working and reading in the clear and bright light of biogas lamp is quite comfortable compared to kerosene lamp that causes pollution.

Influence of Biogas on Improvement of Environment

Various types of fatal diseases have been occurring from time to time in Nepalese community because of haphazardly scattered animal and human excreta as well as the municipal solid left rotting waste in the surroundings. It goes without saying that processing of such bio-wastes into the anaerobic reactors help produce clean, healthy and disease-free environment.

Now-a-days, family latrines are attached to about 40 percent of the installed biogas plants in Nepal. By attaching the latrine to biogas plant, not only the problem of faecal disposal is solved but also the slurry becomes safer to handle as most of the pathogens contained in the human excreta are destroyed during anaerobic digestion process.

In Nepal, fuelwood represents 78 percent of energy consumption and other biomass sources such as agricultural residues and animal waste provide about 10 percent of energy requirement. The fuelwood resources are depleting very fast due to over exploitation and lack of proper management. Thus, utilisation of biodegradable waste especially animal dung as a source of renewable energy will be highly useful to improve ecosystem and the environment through conservation of the forest wealth.

Research and Development (R&D)

So far, less attention has been focused on Research and Development (R&D) of biogas technology in Nepal and the promoters have been mainly concerned in extension and dissemination aspects only. Some areas of R&D that need immediate attention are enumerated below:

- Designs of Biogas Plants
- Cold Weather Biogas Plant
- Slurry Utilisation
- Health and Sanitation
- Alternative Feed-stocks
- Manufacture of Biogas Appliances
- Human Resource Development
- Entrepreneurship Development
- Information Dissemination

Vision for Prospective Plan for 20 Years (2000 - 2020)

Biogas which started for the first time as crash programme in 1974/75 during "Agriculture Year" further gained momentum as a result of the establishment of Biogas Support Programme under

the Netherlands Development Organisation in 1992. As a result of the concerted efforts of various actors, biogas as a renewable energy resource has flourished in Nepal with the establishment of 60,321 plants by 31 August 1999 covering 64 districts of Nepal. The target of third phase of SNV/BSP programme is to establish 100,000 biogas plants. This implies that upon the completion of phase III of SNV/BSP programme, there will be 120,200 plants constructed under SNV/BSP and over 130,000 plants altogether in Nepal.

After the termination of SNV/BSP's programme in 2002, the fate of subsidy on biogas is not still clear until this date. It is but natural that non-availability of subsidy will decrease the rate of biogas plant construction in Nepal. However, due to ever increasing price of the fuel, those people who possess livestock and afford to install biogas will be interested irrespective of the fact whether subsidy is provided or not.

Thus, keeping the above fact into consideration, Prospective Plan for 20 Years has been formulated. It is envisioned that the commercial banks will continue for financing biogas and Biogas Construction Companies will continue to install the plants as per demand of the farmers. It is also expected that the government line agencies particularly Alternative Energy and Promotion Centre (AEPCC) established in 1997 under the umbrella of Ministry of Science and Technology (MOST) will take active role in launching and co-ordinating biogas programme in Nepal.