Domestic biogas for cooking and sanitation

Organisation	Award Category	Technology	Region	Year
Biogas Sector Partnership, Nepal	Health and Welfare	Biogas	Asia	2005

Summary of the Award-winning work

The Biogas Sector Partnership (BSP) in Nepal managed the installation of over 124,000 domestic biogas plants in Nepal between 1992 and 2005. The plants use cattle manure to provide biogas for cooking and lighting. In addition, about 75% of the plants incorporate toilets.

About 80% of the 4.2 million households in Nepal use fuelwood, cattle-dung cakes and agricultural residues for cooking, and kerosene for lighting. Demand for fuelwood substantially exceeds the rate of regrowth, and this is leading to degradation of the land and damage to vital watersheds. Cooking indoors over open fires, and lighting with kerosene, gives dangerous exposure to air pollutants and a high risk of fire, particularly for women and young children who spend much of their time indoors. In addition, women and girls have the drudgery of collecting fuelwood, which typically takes three hours each day.

The Ashden judges commended this project for the many benefits which it provides. The biogas plants replace nearly all the use of fuelwood, and make cooking easier, cleaner and safer. In 20% of houses biogas provides safer lighting as well. This saving of unsustainable fuelwood use also reduces carbon dioxide emissions. The provision of toilets improves sanitation; and the effluent from the biogas plant is a valuable organic compost.

The use of cattle dung to generate biogas is well known in the Indian subcontinent, but in no other place has it been used with such success as in Nepal. The scale of the programme is remarkable. Biogas already serves about one million people (4% of the population of Nepal), and the biogas sector provides about 11,000 permanent jobs in the country. If anyone needed to be convinced that 'small scale can be big' then they need look no further! The Ashden judges also recognised the excellent collaboration between different organisations (BSP, government, construction companies, donors, finance organisations) in order to achieve such outstanding results.

The Award-winning organisation

BSP is a non-governmental-organisation (NGO) which was established in 1992 to manage the biogas programme in Nepal. Its prime roles are to provide training to users and biogas companies, ensure quality and long-term reliability of plants, and manage the programme of subsidies to assist users with the purchase of plants. BSP does not itself install biogas plants, but accredits the work of private installation companies, and this approach has enabled the private biogas sector to thrive. BSP has an independent executive board and currently employs 30 staff, including 14 professional staff. The main funders are the governments of the Netherlands (SNV), Germany and Nepal.

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Technology

Biogas systems take organic material such as manure into an air-tight tank, where bacteria break down the material and release biogas - a mixture of mainly methane with some carbon dioxide. The biogas can be burned as a fuel, for cooking or other purposes, and the remaining material can be used as organic compost.

The design of the digesters used in this project was developed in Nepal based on the Chinese fixed-dome plant. The digester is built in a pit in the ground, near to the house. The body of the digester is an underground cylindrical tank, built from bricks and mortar. The fixed hemispherical dome, which acts as a gasholder, is made from concrete, cast over an earth mould on top of the tank. The inlet to the digester is a cylindrical brick-built tank with a hand-operated rotator, used to mix cow dung and water which is fed in through a pipe. The current designs of digester need the dung from at least two cattle (24 kg per day) to function properly. Villagers are used to handling cattle dung and using it as a fuel, since it has traditionally been made into flat dungcakes, dried and burned on the cooking fire. All digesters are supplied with a second inlet pipe to connect to a toilet. Even if this is not initially used, it is available so that a toilet may be added later.

The manure and toilet waste are decomposed anaerobically (without oxygen) by bacteria in the digester and produce biogas, which is a mixture of mainly methane (60-70%) and carbon dioxide (30-40%). The gas is piped to the kitchen inside the house, where it is used for cooking on specially-designed burners, and sometimes for lighting as well. The gas pressure pushes digested effluent out from the base of the digester into a reservoir tank, from where it is collected and used as fertiliser.

The digesters are made in four sizes, with total volume from 4 to 10 m^3, and each produces between 1.2 and 1.5 m^3 of biogas per day. The capacity and gas production depends on the number of cattle supplying dung, and also on the location of the biogas plant. In cooler places gas is produced more slowly, and a larger volume tank is needed.

BSP have also provided design guidance and other advice for the installation of around 100 larger (50 m^3) biogas plants in schools and hospitals in Nepal.

How users pay