

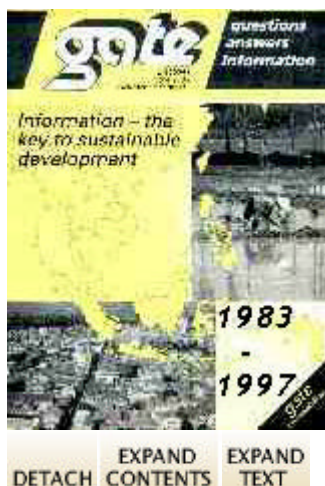
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GATE - 1/91 - Integrated household energy supply

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Domestic uses of biogas

by Christopher Kellner

A household biogas unit only makes sense if it satisfies a family's normal cooking energy requirements. Under normal circumstances a family that has a biogas plant will not need any additional energy sources for cooking.

A few approximate values will be quoted here to give an idea of how much fermentable biomass is needed to supply a household with energy. However, as biogas technology is heavily site-dependent the values given are only a rough guide. However, GATE has an extensive biogas library which can usually be relied on to provide answers even to detailed questions.

A family of five living in a rural part of Asia or Africa needs 5-8 kWh of energy per day for cooking. On average, a cow weighing 300 kg produces 4 kWh per day if all its manure and urine is used in a biogas plant. So the manure produced by two head of cattle is enough to cover the cooking energy needs of a small family. There is even a surplus to cover fluctuations in use.

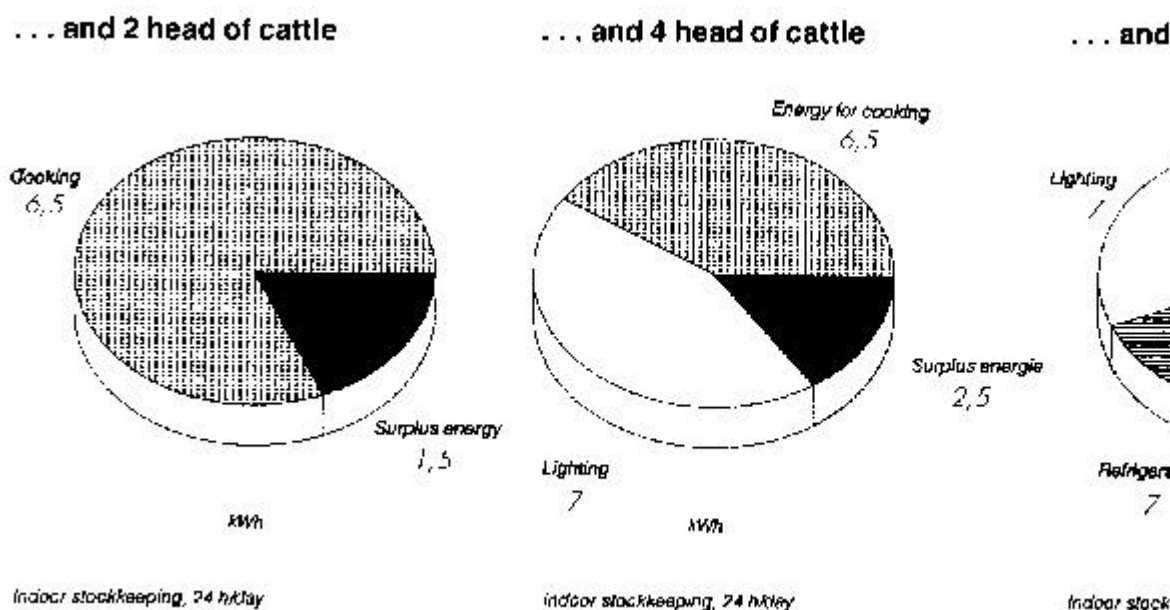
Biogas lamps: gas guzzlers

Demand for biogas lamps is high. Women often give priority to biogas for cooking, while men tend to decide in favour of lighting. In Kenya and Tanzania there are several hundred family biogas plants in use, and most households use the biogas to run a cookstove and one or two lamps. However, the gas consumption of biogas lamps is relatively high, because the gas produces a lot of heat and only little light.

Thus, operating two additional lamps for 4 hours a day each consumes approx. 7 kWh. This relatively high energy requirement is due to the low efficiency **of** the gas lamps. Taking the case described above, a biogas plant will only cover the household's energy needs if there are at least 4 head **of** cattle **in** the cowshed. If the household also has a refrigerator, a further 8-10 kWh has to be provided.

If the cattle are not kept **in** the cowshed for the whole day, but only at night, the minimum number **of** animals needed increases by a factor **of** 2 or 3. Night housing usually means that the animals are put out to graze during the day: indoor stock keeping does not always make sense. Vegetation growth **in** a given region is the factor which decides whether it is more economic to take the forage to the livestock and thus enjoy the benefits **of** indoor stock keeping, or let the animals graze and thus exploit the land extensively.

Both these livestock management systems are basically suitable for biogas exploitation. But there are often limitations, since grazing areas tend to be **in** dry regions and water (or the livestock's urine) is needed to operate biogas plants.



Biogas utilization **in** household with 5 persons ...

Costs

The larger a biogas plant is, and the more efficiently it is exploited, the more positive the cost-benefit ratio will be (economy **of** scale). While family-size plants may often seem too expensive or even unaffordable to potential customers, they can **in** fact pay for themselves within 3 to 6 years. The most important component, the digester, will last for 20 years or more, especially if it is built with a minimum **of** steel.

The payback period is far shorter if surplus energy is used productively. **In rural** areas, for example, biogas technology makes farm activities possible which it would otherwise not be easy to establish. There are examples **of** biogas-powered poultry breeders, chick and piglet incubators, biogas-powered mills and pumps, cheese dairies, bakeries and coffee roasting plants. No hard and fast distinction can be drawn between "household plants" and "large-scale plants".

Effects

The better energy supply **of** households which have biogas plants enhances the attractiveness **of rural** life as compared to traditional farming methods. For a start, farms with household biogas plants can be improved. Large-scale ecological benefits, however, are only possible with a high distribution density **of** the technology. Such benefits include not only fuelwood savings **of** 7-10 kg **of** firewood, 3-4 kg **of** charcoal or 0.8- 1.2 kg **of** bottle gas per day, but also the establishment **of** forage grass plantations close to the stabling. Vegetation growth and ground covering are improved and indoor stock-keeping is facilitated **in** particular when digested sludge is used for intensive forage plant production.

Outlook

The more autonomous the dissemination **of** biogas technology through private entrepreneurs becomes, the more priority will be given to clients who have money. But the technology also makes sense for small farms. **In** the long term, therefore, dissemination concepts must be based on a diversified approach. Private entrepreneurs **in** developing countries cannot be expected to undertake training **in** biogas technology, advertising and research. But nor can they forgo their profits just because some members **of** the target group-the smaller farmers-are less prosperous. **In** such cases public authorities must intervene with guidance and support. Only when the political will has been formulated and resources have been mobilized can small farmers, with state support, reap the benefits **of** biogas technology.

Abstract

A biogas plant makes sense for a household if it meets the family's normal requirements for cooking energy. If biogas is also required for lamps and a refrigerator the number **of** animals kept must be increased. The author advocates state support to make biogas technology affordable for poorer farmers.

Résumé

Une installation au biogaz n'a de sens pour un ménage que si elle permet de couvrir ses besoins normaux en énergie pour la cuisine. Si, en plus, cette énergie doit servir au fonctionnement de lampes d'éclairage et d'un réfrigérateur, le nombre des animaux être d'autant plus important. L'auteur plaide en faveur de mesures étatiques qui mettraient la technologie du biogaz à la portée des paysans défavorisés.

Extracto

Una instalación de biogas es útil para un hogar al poderse cubrir mediante la misma la demanda normal de la familia en lo que se refiere a la energía para cocinar. Si se desea que las lámparas y el refrigerador funcionen también por medio de dicha instalación, hay que considerar en el momento de determinar el número de animales que se debe tener. A fin de que la tecnología del biogas esté también al alcance del bolsillo de los campesinos pobres, el autor pide que se tomen las correspondientes medidas estatales.



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