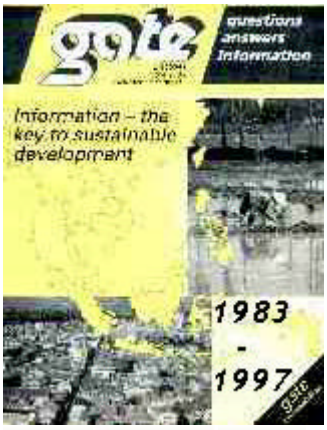

by Peter Pluschke

In view **of** the manifold efforts **in** the field **of** research and development over the past years one can state today that biogas technique (cf. "Catchword" on page 8) is on the threshold **of** being implemented on a broad scale. This fact is reflected not only **in** the successful national programmes **of** disseminating biogas technology **in** India and the People's Republic **of** China. However, **in** order to develop strategies how to spread this technology's application more comprehensive information must still be gathered and various concepts adapted to specific conditions be tested. **In** this context, the Federal Ministry for Economic Cooperation (BMZ) has commissioned GATE with starting a programme to disseminate biogas technology. This programme contains an additional element, namely spreading the **use** **of** fuel-wood saving, so-called smokeless cookers.

During the past months GATE has put together four teams to carry out the biogas programme. Each team consists **of** one technician/engineer, one expert on agriculture and one on socio-economic affairs. These teams will, as a matter **of** principle, cooperate **in** the country **of** assignment with local partner organisations which **in** the course **of** time will then take over responsibility for the implementation **of** the programme.

The Programme's Objectives

The advisory activities **of** the biogas teams are designed to enhance first initiatives to disseminate biogas technology **in** the partner countries. **In** this connection, biogas technology is understood to be a means to make better **use** than hitherto **of** locally available resources for the generation **of** energy. Thus, it can contribute. **in** the long run towards coming to grips with the energy problem. It can moreover help strengthen decentralised ways **of** development and support development processes likely to be self-supporting.

At the same time, biogas technology contributes to producing high-quality **organic** fertiliser. It is furthermore **of** importance **in** connection with improving sanitary and hygienic conditions; aspects **of** environmental protection, too, must be seen **in** this context - specially with regard to pig farm waste disposal. **In** some places, non-energy aspects **of** biogas technology are valued higher than its contribution to the energy supply.

The introduction **of** biogas technology which, as a rule, does not belong to those techniques people are already familiar with, gives rise to substantial cultural and socio-economic problems; it is not the aim to create development islands but to arrive at a genuine diffusion **of** this technology. If biogas

plants to be set up are to be **in** line with basic requirements **of** an appropriate technology (AT), they must be congruent with local conditions **in** terms **of** their technical standard and their mode **of** application. Their introduction must at the same time, however, be seen as an innovation which will entail a whole chain **of** changes:

- intervention into the economy **of** the site area (new jobs as a result **of** construction, maintenance and operation **of** biogas plants; steps towards modernisation **in** this field; considerable financial burden resulting from constructing biogas plants; provision **of** **organic** fertiliser material through the plant, etc.);

- social consequences to be drawn from owning biogas plants and/or knowledge **of** the technology (value as status symbol; significance for all sectors **of** training, etc.);

- changes **in** the labour organisation (e. 9. Iinkage **of** farm labour organisation with processes required for the functional operation **of** a biogas plant; need **of** reliable and regular maintenance, new possibilities for fertilising, etc.);

- influence on cultural aspects (e. 9. as a result **of** changed cooking habits, i.e. gas cookers instead **of** open wood fire; modification **of** the traditional way **of** dealing with faeces/waste materials, etc.);

These items are just an indication **of** the complexity **of** the tasks arising **in** connection with the programme **of** disseminating the **use** **of** biogas. **In** view **of** the fact that, with the exception **of** the Indian and Chinese programmes, there is as yet no such national programme that could be considered as having a genuine multiplying effect, the approach adopted by GATE still contains many research aspects. It is principally a matter **of** doing comparative studies **of** different concepts and the testing **of** various technologies. Accordingly, projects were selected with a view to covering as broad a spectre **of** approaches to **use** biogas as possible.

Project Approaches

In January 1981, various projects under German technical assistance were provided with information on the biogas programme with the aim **of** finding out possibilities to incorporate biogas technology elements either **in** the project or-**in** components connected with it. On the basis **of** proposals received, seven sites were selected for the biogas programme:

1. Thailand

Activities will, initially, center on Chiangmai **in** the north **of** the country. The Faculty **of** Agriculture **of** the University **of** Chiangmai intends to set up a number **of** biogas plants **in** order to carry out a research programme and, within the scope **of** an information programme going outside the university, make **use** **of** the plants for teaching and demonstration purposes, thus promoting the dissemination **of** biogas plants.

Initially, four plants **of** different types are to be installed and monitored **in** terms **of** comparing investment costs. The operation **of** the plant is to be monitored through a comparative measuring programme; the fertilizer thus produced will be subjected to field tests.

Parallel to installing these demonstration plants, investigations and studies will be made- initially **in** the immediate neighbourhood **of** Chiangmai, and, at a later stage, also **in** the project area **of** the Thai-German Settlement Project - **of** the general socio-economic conditions governing the **use** **of** biogas on a broad basis (types **of** animal husbandry, **use** **of** biomass, consumption and cooking habits, **use** **of** fertilizers, fuel demand, types **of** cooperation among the people, offers **of** plant material **in** the market, etc.).

The results achieved will then form the basis for deciding whether the Settlement Project is suited to become part **of** the biogas programme, i.e. whether types **of** plants can be found or developed which can be purchased and used by the approximately 10,000 families to be resettled.

In the medium run, it is planned to install some 20 plants for demonstration purposes **in** the settlement area (the implementation **of** this programme is not linked directly to the presence **of** the German team).

A third component **of** the Thailand programme concerns the cooperation with the Population and Community Development Association (PDA); this is a non-governmental organisation with experience **in** the field **of** community development, and works on a broad scale (family planning, hygiene, **rural** water supply). Biogas technology is meant to contribute towards the development **of** a village community. The task to be fulfilled **in** this connection is to check very carefully any socio-economic consequences to be expected as a result **of** installing biogas plants and to determine a type **of** plant that can easily be operated and is suited for that particular region.

2. Tanzania

In this country, the team will work within the project "Training Centre MATI Nyegezi", a centre **of** agricultural training facilities. The school **in** Nyegezi near Mwanza on Lake Victoria is specialised **in** providing training for agro-techniques and irrigation farming. It has been intended since long to teach the approximately 200 students **of** the school also **in** possibilites **of** using alternative sources **of** energy. Within this general set-up, the biogas programme team is faced with the following tasks:

This small water turbine developed **in** Nepal, can be produced at little technical expense. The model pictured here **of** such a stream turbine (one **of** about 30 different types existing meanwhile) is being used within the scope **of** a GATE project to supply energy to a remote village **in** Ecuador.

- development **of** a concept to impart the technical, agro-economic and socio-economic aspects **of** biogas technology within the framework **of** the MATI-training programme ("development **of** curricula");

- dissemination **of** biogas technology to other sites and places;

- further development **of** biogas technology against the background **of** conditions prevailing **in** Tanzania (e.g. Iack **of** construction material, extremely high prices **of** sheet metal, etc.).

The dissemination **of** biogas technology **in** Tanzania will have to be a long-term project. Special importance must be attached to train the agricultural labour force to enable them to identify and determine, **in** their environment, potentials for using biomass **in** biogas plants, and to work out technical and economic ways and means **of** constructing biogas plants.

3. Turkey

Here, short-term expert assignment is envisaged to support the project "Production **of** Biogas Plants through the Employers Association Yahtas A.S. **in** Yahyali (Sivas Province)." This project was sponsored by the Centre for International Migration (CIM) upon whose commission a first model plant was set up.

Yahtas A. S.'s activities are aimed at developing this plant up to a mature technical level and then put it on the Turkish market. The difficult climatic conditions **in** the mountains **of** Anatolia give rise to special technical problems. It is therefore important to provide for an effective heat insulation **of** the plant and a safe functioning **of** the heating system.

Apart from the mere technical aspects one has to examine very carefully the economic conditions for disseminating such plants; advisory services on the integration **of** the biogas plant **in** agricultural production processes will be necessary (especially regarding the **use of** sludge as fertiliser). A concept how to organise the monitoring and maintaining **of** the plant (which is to be a community plant) and how to finance it has already been worked out.

4. Upper Volta

The assignment **of** a biogas advisory team **in** Upper Volta will take place within the scope **of** IREN (Institut de Recherche en Energies Nouvelles) activities; this institute will be set up under the Upper Volta Speciai Programme on Energy. Via the CNRST (Centre National de Recherche Scientifique et Technologique), an umbrella organisation, an agreement was concluded with IREN on the training phase for the francophone biogas team **of** GATE.

This training phase - an introduction to the specific aspects **of** biogas technology under Sahelian conditions - will then be followed by an assignment **of** experts for some months to support IREN **in** working out a concept for, and initiating, a national programme to disseminate biogas technology.

IREN has already established a general concept on the dissemination **of** biogas plants **in** Upper Volta; this concept is aimed at training a cadre **of** skilled workers who would then be able to construct under their own responsibility plants which would be economically viable and self-sustaining. Within the framework **of** this concept, IREN would take over further research and development tasks as well as monitoring functions

The biogas team will carry out the following tasks, **in** particular

- continuation **of** the collection and evaluation **of** data on the biomass potential **of** Upper Volta; regional study to determine possibilities **of use** most likely to succeed;

- setting up **of** demonstration plants; further development **of** biogas plants which are geared to the specific conditions prevailing **in** the Sahelian zone; comparison **of** types **of** plants; - advisory services **in** connection with the establishment and operation **of** an analytical laboratory.

5. Burundi

The assignment planned for Burundi follows a request made within the scope **of** the project "Promotion **of** goat-breeding and -keeping **in** the Ngozi Region". Already **in** 1981, a small test plant was set up there which operated successfully. As cattle is kept as well **in** the same area, it is intended to construct a larger plant for the fermentation **of** cattle dung.

The demonstration effect **of** the plant is to be used to support the further dissemination **of** biogas plants **in** the region. This project can be given additional support by the extension service which is presently being established. The agricultural organisation **of** the government, named SRD, could act as the local partner organisation.

6. Nicaragua

In Nicaragua it will be the task **of** the biogas team to assist the activities **of** CITA (Centro de Investigacion de Technologia Apropiada) to introduce and promote biogas technology. CITA works under the Ministry **of** Agriculture and, accordingly, is predominantly engaged **in rural** development projects.

The break-down **of** the tasks is as follows:

- working out **of** a concept for, and execution **of**, an investigation programme to check the suitability **of** agricultural waste materials;

- assessment and dissemination **of** methods to analyse the suitability **of** waste materials for anaerobic fermentation; implementation **of** a measuring programme;

- elaboration **of** studies on the functioning and kynetics **of** the different types **of** plants;

- participation **in** the training **of** biogas technicians;

- working out **of** financing concepts for specific projects.

7. Barbados

Project plans on Barbados are based on contacts with the Caribbean Development Bank (CDB) whose Technology and Energy Unit (TEU) is already assisting biogas projects **in** the Bank's business area on the Caribbean islands. Hitherto, such measures were almost exclusively concentrated on relatively large plants and plants **in** the agro-industrial sector.

The biogas programme is designed to help set up a scheme for the development and commercialisation **of** small plants for households and small farmers (especially pig farms). It is planned to set up a demonstration plant on all suitable islands and to establish a network **of** Caribbean organisations to disseminate the technology and cater for the plants.

Documentation and Evaluation

An information brochure which is expected to appear regularly every two months will provide reports on the biogas programme. With the help **of** this newsletter contact will be maintained between the experts working **in** the various projects and all other persons taking part **in** the planning and implementation process.

Moreover, this publication might help to inform, to a limited extent, also the profession and trade on problems and success **in** connection with disseminating biogas technology.

At the end **of** the Programme's first year, a seminar will be held **in** Eschborn where experiences will be evaluated and conclusions drawn on future concepts to disseminate this technology.

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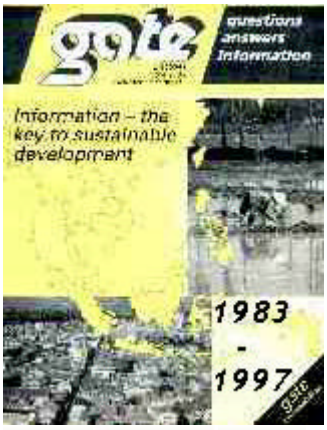

Catchword : "Biogas"

Biogas is a mixture **of** gases: methane (CH4, c. 60-65%), carbondioxide (CO2, c. 30-35%) and small amounts (less than 2%) **of** nitrogen (N2), hydrogen (H2) and hydrogen sulphide (H2S). The higher the methane content **of** the gas, the higher its calorific value.

Biogas is formed by the anaerobic decomposition **of** **organic** materials (proteins, carbohydrates, fats, etc.). It is a bacterial process **of** putrefaction which takes place sealed from the oxygen **of** the air. Decomposition must take place **in** a gaslight, airtight container; the rotting material must have a high water content (over 50%) and a pH value **of** between 6.8 and 7.6. Maximum output **of** gas is achieved if a temperature **of** about 30° to 37° is maintained.

In principle, any **organic** matter can be used. Suitable materials occurring **in** agriculture are: Pig manure (semiliquid), poultry manure, straw, agro-industrial **residues** such as coffee pulp, sisal **residues**, etc. **Residues** from slaughter-houses and sludge from sewerage works may also be used.

The **use** **of** biogas plants has four advantages **of** roughly equal weight:

1. The production **of** biogas as a source **of** energy (with a calorific value **of** c. 5100 kcal/Nm³);

2. the production **of** valuable natural fertiliser (compared with stable manure compost, the nitrogen content may be as much as five times higher); A biogas plant containing a large fermentation room and gas container **in** Latin America.

3. the treatment **of** manure **in** a biogas plant helps to improve sanitary conditions (killing pathogenic germs, reduction **of** pests);

4. from the environmental point **of** view, a biogas plant offers substantial advantages, for example, **in** eliminating undesirable smells. Provided decomposition was complete, a practically odourless sludge can be raked out.

The technique **of** producing

biogas has been known for decades. It was used principally **in** industrial countries for the purpose **of** sewage disposal **in** large communal plants (energy production normally played only a secondary role).

At the beginning **of** the fifties, a series **of** experiments was carried out

on the **use** **of** biogas plants **in** other fields, including agriculture. However, at this stage, they were found to be not economical given the extremely low cost **of** oil. Consequently, with very few exceptions, operations were discontinued. Interestingly enough, about the same time, the first attempt to introduce biotechnology **in** China on a large scale failed.

Since the mid-seventies, with energy prices rising, biogas technology has again become the object **of** attention. **In** the meantime, many different types **of** plant have been developed which are currently being put through rigorous testing. A wide spectrum **of** technologies is involved, from electronically operated plants to the very simplest kind. The size **of** the plants varies from a few cubic metres to several thousand cubic metres **of** decomposition capacity. The price **of** a plant varies from about 1000 DM for the smallest plant, to several million DM for the large plants.


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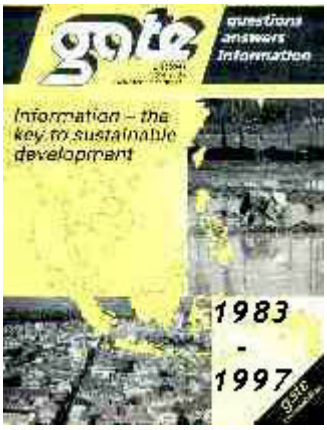

Biogas plants in the FRG

Some 40 new biogas plants have been built on farms **in** the Federal Republic **of** Germany **in** the last few years; another twenty were nearing completion **in** autumn 1982.

According to the Federal Ministry for Research and Technology (Bonn), the Government **of** the Federal Republic **of** Germany believes that biogas plants have an interesting contribution to make to the wise **use of** energy.

The Ministry has made 1.1 million marks available to the Technical University **of** Munich **in** order to be able to provide advice on operating the plants. The funds will be used to look into the advantages and disadvantages **of** the various types **of** biogas plants operating on German farms. On the basis **of** the study, it is hoped to enable farmers and investors to chose the type **of** plant best suited to their purposes.

In the years ahead the Federal Ministry for Research and Technology intends to allocate an amount **of** 150 to 160 million marks annually to sponsor investigations, studies and model projects **in** the field **of** renewable energies.

Germany's highest solar plant **in** full swing

The Federal Republic **of** Germany's highest solar plant has just started to operate at full capacity.

It stands at an altitude **of** 2963 metres, on the summit **of** the Zugspitze **in** the Alps, where it supplies power to the German Federal Post Office's radio relay station. The plant consists **of** 48 solar collectors (with 55 m² collecting surface), two heat containers **of** a capacity **of** 2500 litres each, one heat pump and heat exchangers for the recovery **of** heat from the outgoing air from the building.

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