
Biogas
Programs

Information and Public Relation Campaigns

Implementation campaigns

The biogas concept must be promoted at national, regional and communal levels. The basic prerequisite for successful, comprehensive introduction of

biogas technology is the effective motivation and mobilization of potential target groups. Motivation and mobilization are the two main pillars of the actual development process. The subsequent factual existence of biogas systems is merely the logical result of that process.

Thus, implementation campaigns can only be advanced and materialized in a decentralized manner by those concerned. Information campaigns, in contrast, can be planned and controlled in a centralized manner and carried out with lower participation levels on the part of the target group.

A successful PR campaign builds on experience in implementation, on direct contact with the target groups and on the confidence of having developed a sound and appropriate technology. Information transmitted in such a campaign must react to the doubts, limitations, fears of the potential users as they are encountered in the field. Typically, a fully fledged PR campaign starts at the end of a pilot phase and runs throughout the implementation phase of a biogas program.

Information material and PR channels

Magazines, newspapers, films, radio programs, posters, leaflets and manuals are suitable vehicles for the dissemination of information on biogas. It is not always possible to arrive at a clear distinction between information and advertising. The best publicity effect is achieved by providing a steady stream of information:

- on the technology per se
- on the economic effects for the household
- on the impacts on life quality
- on the overall economic and ecological impact

Of major importance in that context is the effective use of information vehicles such as local agricultural fairs, roadside billboards, market-square posters and, of course, the ubiquitous "grapevine". It must be regarded as unfortunate that no internationally recognizable biogas symbol or "logo" has been introduced to date; therefore, the development of national symbols is the more important.

Targeting information

Somewhat simplified, the target groups for information campaigns could be stratified on three levels: The national level, the regional or district level and the local or village level. In supporting or accepting biogas, all these levels play a role but must be approached in different ways.

The language of information should always be close to the language of the respective target groups. Those who read the printed information are more likely to be the top-echelon multipliers, not the semi-literate - or illiterate -

ultimate consumers. The type of information and the complexity of information will vary from level to level, so does the presentation of information.

National level

PR work targets government (various ministries), national and international development agencies and companies with commercial interest in biogas. Vehicles for information flow would be high-level meetings like conferences and invitations to project area visits. Articles in the national press, radio programs and TV programs also contribute to create awareness on this level.

Regional or district level

The campaign targets government authorities on this level, churches and grass-root organizations working in development, environment and appropriate technologies. Suitable approaches are workshops, contribution to agricultural fairs and integration of the program into agricultural and development committees. The media (press, radio, TV) also have an impact on this level. On this level, agricultural colleges and high schools are approached as well. Demonstration plants for communal and industrial use are conceivable.

Local and village level

On this level, the end-users of biogas technology are directly approached through demonstration- or pilot plants, public meetings, billboards, leaflets and other means of mass-communication. On the village level, TV and print media are of lesser importance. Radio programs, in contrast target mainly the village level.

Costs of campaigning

Information campaigns are expensive. While the spread of general information is usually dependent on the availability of public or project funds, the private industry can often be persuaded to promote biogas plants or accessories in their commercial advertising. The media are often committed to developmentally relevant themes. Editorial contributions are not expensive but require a great deal of work. As a rule, the concept for a radio program portraying biogas farmers, for example, must be worked out by the biogas program.

The production of posters, leaflets or videos will have to be fully covered by the PR budget of the project. The most efficient, but also the most expensive and time consuming PR activity for biogas is the building of demonstration plants and organizing farmers to visit these plants. As much as possible, demonstration plants should be 'normal' biogas plants

operating on a farm to save on building and operation costs. The farmer operating a demonstration plant cannot be expected to be the 'tour guide' for frequent visitors. Some kind of arrangement, e.g. free maintenance and repair, must be offered.

Demonstration plants

No potential biogas user can be expected to blindly trust in biogas technology, if none of the more respected members of the society has taken that risk before and succeeded. But demonstration plants are risky: any malfunction in a demonstration plant will have negative consequences for the entire program. Thus, demonstration plants are also a last test for the maturity of the technology. Since some demonstration plants serve no other purpose than that of a showpiece, the maintenance aspect is often in danger of being given insufficient attention, an eventual malfunction is practically inevitable. It is therefore highly recommended that several demonstration plants are installed at the same time in different locations, preferably on farms which have a keen interest in operating the plant. Organized maintenance services should be guaranteed for a period of at least the first three years. The cost of personnel, equipment and transportation must be included in the cost calculation for the demonstration plant, and it must ensured that the required funds are actually provided when needed. Past experience has shown that system malfunctions are frequently the result of minor deficiencies requiring no extensive repair work. Consequently, the housewives (and only

subsequently their husbands) must from the very start be put in a position to perform minor repairs themselves, whereby the requisite knowledge base can be provided by the maintenance personnel.

Model farmers

As a rule, the more prosperous farmers need little prodding to install a biogas system, as long as they are provided with adequate information and guaranteed support in case of arising problems. The group that was targeted in early, poverty-oriented biogas programs, namely the less prosperous small farmers, are inherently reluctant in their commitment, because they cannot afford the cost of investment and are afraid that they may not be able to keep up the payments on a loan. In addition, few of them own enough livestock for generating the required amount of substrate. Rich farmers do not act as a model for small-holders, they are known to have connections and funds that a small farmer will never be able to acquire. Experience of the last decade of rural biogas dissemination has closed this gap between the rich model farmer and the poor 'target-farmer'. First, model farmers are selected from the more successful farmers among the potential users. They should be outstanding to some extent, but other farmers should be still able to accept them as a role model. Second, the target group of recent rural biogas programs has shifted upwards. Biogas technology is no longer regarded as a means to alleviate poverty.

Biogas
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Criteria for the Dissemination of Biogas Technology

Following, are the criteria (excluding or critical factors) which make biogas dissemination in developing countries impossible or more difficult. The ideal project location will rarely be found. The "ideal conditions" are

stated to make the individual factors clearer.

Excluding factors

If only one of the following criteria is evident, then the widespread dissemination of simple household biogas plants is not possible. As an exception, suitable farms in the region could allow individual measures that make biogas a feasible technology.

- too cold or too dry region
- very irregular or no gas demand
- less than 20 kg dung/day available to fill the plant or less than 1,000 kg live weight of animals per household in indoor stabling or 2,000 kg in night stabling
- no stabling or livestock in large pens where the dung cannot be collected
- no building materials available locally

- no or very little water available
- integration of the biogas plant into the household and farm routines not possible
- no suitable institution can be found for dissemination

Critical factors

Each of the following factors will lead to severe problems in biogas dissemination. Accompanying measures, particularly modified technical developments, high financial promotion or additional organizational structures within the dissemination program are necessary to guarantee project success.

- low income or unstable economic situation of the target group
- unfavorable macro- and micro-economic conditions
- gas appliances not available regionally or nationally
- irregular gas demand
- very good supply of energy throughout the year, therefore only moderate economic incentives for the biogas plant

- high building costs
- low qualification of artisans
- counterpart organization has only limited access to the target group
- weak structure of the counterpart
- no substantial interest of the government is evident

Ideal conditions

If each of the following conditions is fulfilled then household biogas plants will definitely be a success. A dissemination program is then strongly recommended.

- even, daily temperatures over 20C throughout the year
- regular gas demand approximately corresponding to gas production
- full stabling of animals (zero-grazing) on concrete floors
- at least 30 kg/day dung available per plant
- dairy farming is the main source of income
- use of organic fertilizer is traditionally practiced

- farmers are owners of the farm and live primarily on the farm. Farm products are their main source of income.
- plants can be located in favorable positions to the stables and to the point of gas consumption
- operating the biogas plant can be integrated into the normal working routine of the house and the farm
- gas utilization and attendance of the plant can be clearly regulated within the household
- moderate price of plant in relation to the income of the target group
- economically healthy farms open to 'modernization'
- insufficient and expensive supply of fossil sources of energy
- building materials and gas appliances available locally
- qualified artisans exist locally
- counterpart organization has access to and experience in contact with the target group
- efficient counterpart organizations with the experience in cooperating

with the private sector

- counterpart organization has experience in programs comparable to biogas dissemination
- political will of the government to support biogas technology and other small and medium-scale farm technologies
- secured financing of the dissemination structure

Biogas

Programs

Educational and Training Programs

Theoretical and practical training

One of the essential elements in the implementation of a biogas program is the proper training of those to be responsible for planning, constructing, operating and repairing the plants. Theoretical and practical training must therefore be regarded as an indispensable part of the implementation strategy. Training, in contrast to education, focuses on those who are actually in touch with biogas technology, either as part of the biogas program or as end-users.

Target groups for practical training

In addition to the general knowledge conveyed in vocational programs, special training centering on the practical skills required for everyday plant operation should be made available to:

- the owner-operators of biogas systems, mainly housewives and farmers;
- servicing and maintenance personnel;
- masons, fitters, plumbers and factory personnel involved in the construction or manufacture of biogas systems and system components;
- planners of biogas units and developers of biogas technology;
- organizers, promoters and multipliers, whereby the latter may be a social worker, the head of a biogas task force, foundation or self-help organization, or even a reporter or film producer working on a biogas-related project.

Teaching methods

Depending on the objectives of a particular training program, not only the content, but also the teaching methods involved must be tailored to the respective target group. The success of a training program is largely dependent on the time and duration of its presentation. The target group must be "available", i.e. most housewives can only spare time for

instruction during certain hours of the day, and then only directly at or close to home, and farmers can rarely afford the time during harvesting season.

Relevance for the target group

The content of a biogas training program must also reflect the real needs of the individual for more information. The construction of biogas systems, for example, if taught to masons, should not be given mere theoretical treatment. On-the-job training combined with theoretical teaching (half day each over four weeks) has proven successful in training courses for engineers in Tanzania. The information being conveyed must be of direct and recognizable relevance for the target group. It is of particular importance that training seminars offered to craftsmen and servicing personnel, combine practical demonstration and practicing with simple theory.

The first few seminars held in a region usually involve certain difficulties due to a lack of teaching aids, illustrative material or classrooms. It may also be difficult to convince a farmer that students of a training course want to build a biogas digester on his farm. In many instances, the use of school rooms during school vacation and a single demonstration plant will have to suffice in the beginning. Most technical and agricultural schools will gladly offer their support.

Educational programs

Educational programs are defined as formal know-how transfer in schools, colleges or courses for the general public and potential users. They create awareness about biogas technology which goes beyond of what is transmitted in PR campaigns. Educational programs must be professionally supported, integrated and administered on a national, regional and communal scale by the respective ministries and authorities responsible for agriculture, education, health & hygiene and other relevant fields. Private educational institutions or the biogas program itself can as well get operational in carrying out educational programs.

Curriculum development

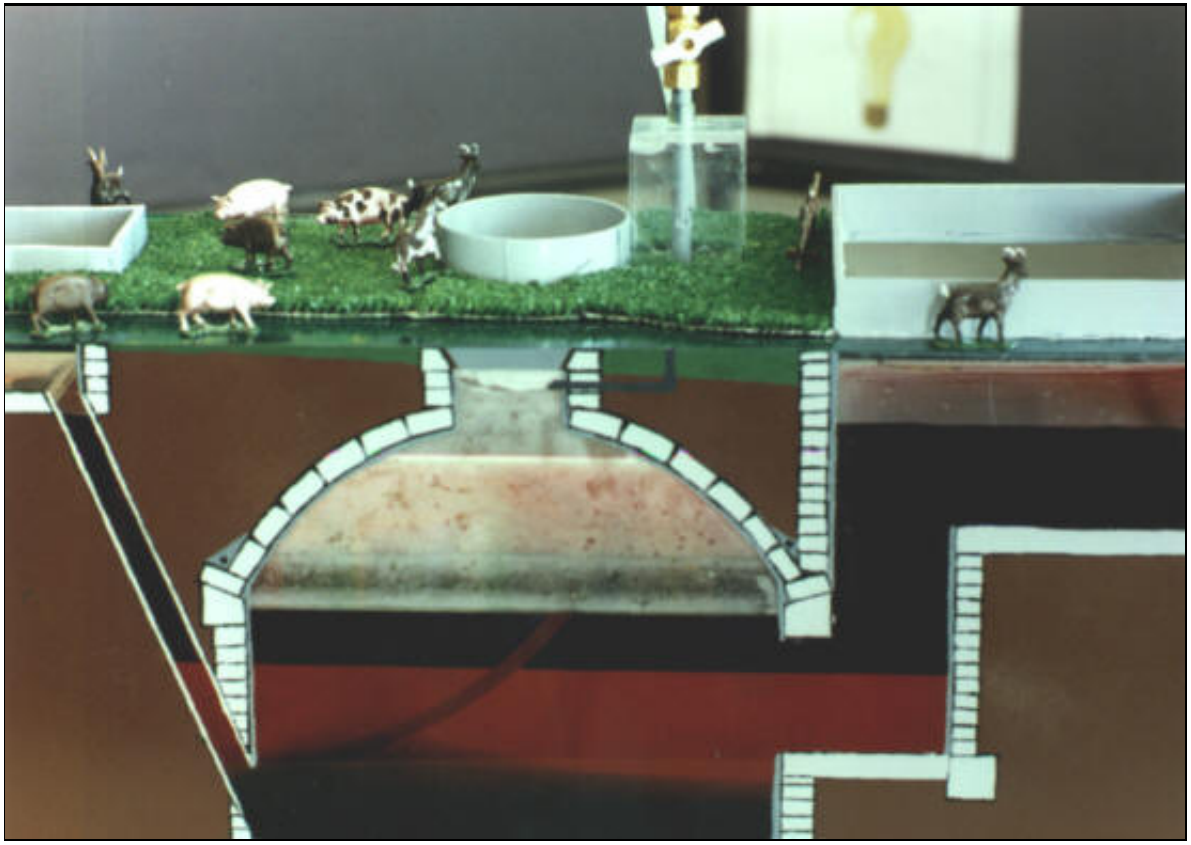
Biogas technology can be included in the curricula of elementary and secondary schools in two ways: first, it can be included in subjects such as biology, physical science, chemistry or agriculture. Second, it can be taught in a block, to which the mentioned subjects 'donate' time and teaching capacity. Teachers would need to be educated first, in order to develop a curriculum together with the biogas program.

Often, individual schools are not free to develop their own curricula. To create a conducive atmosphere for integrating biogas technology into school curricula, this has to be lobbied for on the national level, where

nationwide applicable curricula are developed.

Agricultural colleges and universities are more free to offer specific biogas-courses than schools. Here, it is more the personal enthusiasm of lecturers and deans of faculties that plays the decisive role if or if not biogas technology is taught in a course. At least the practical use of biogas systems should be included in the curricula of medical schools. The professional know-how of planning and constructing a biogas plant should be conveyed within the framework of technical/vocational school training.

Demonstration models of biogas systems should be available in schools which have included biogas in their teaching. Excursions to nearby biogas plants will greatly awaken the interest of students in biogas technology.



Model of a biogas plant for instruction purposes in schools

Photo: Bender

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Biogas Programs

Financial Promotion and Public Support

Sources of financing

The investment costs necessary for the construction of biogas plants frequently exceed the means at the disposal of the investor. They cannot be covered from his regular income or savings. This could also apply to the larger investments occurring at certain intervals during the economic lifetime of the plant. Besides the non-recurring, periodical costs, the running costs of the plant have to be borne. These expenditures, however, should be set against income in the form of regular revenue. A liquidity analysis can show how far the net expenditures have to be financed from outside and how much contribution can be expected from the expected income. Usually the construction of biogas plants demands financial means which can only be covered by outside capital. In general the following can be seen as sources:

Running, maintenance and repair costs

The financing of investments and of the operation of the plant should be realistically assessed at the planning stage. It has to be ensured that the quota derived from public funds is carefully calculated in the budget. Special attention has to be paid to the question of how the running, maintenance and repair costs can be financed. Funds for servicing and

repairing are often forgotten but are of essential importance in order to make full use of the economic lifetime of the plant and also to insure the confidence of the user in the reliability of the plant.

Financing by credit

When financing by credit the questions of liability and debt provisions should be clarified. The borrower should always be able to bear the possible risk or be immune to this risk by having state credit guarantees. The debt provisions should be worked out so that they conform to the development of cost and yield. Credit repayment terms are frequently much shorter than the lifetime of a biogas plant e.g. 5 years compared to 15 - 20 years. The re-payment of credits in this rather short time often becomes an invincible barrier for the farmer.

State support

When the profitability of biogas plants is negative on a private scale (financial analysis), but are favorable on a national scale (economic analysis), state support measures would make sense economically.

In principle, the following measures can be seen as supportive measures for the dissemination of biogas systems to an extent that would make them macro-economically feasible and politically desirable:

- the creation or alteration of structural conditions for individual investment decisions in favor of biogas plants, e.g. more critical control of firewood consumption and tree-felling, regulations concerning the treatment and disposal of substrates (waste water, feces)
- the subsidizing of private, institutional and community biogas plants by means of grants or inexpensive credits
- the construction and operation of biogas plants as public utility enterprises especially as municipal community plants through appropriate support to the municipalities.

Families with low income

The more biogas plants are constructed by families with low income, the less can the costs for construction and operation of the plant be met by contributions from the users. With village community plants in India, providing energy for households, practical experience has indicated that not even the running costs can be met by user fees. Consequently, not only the investment costs but also a proportion of the running costs has to be covered by general tax revenue. The resolution of the Indian

Government provides a guideline for the extent of public support whereby from case to case 50 to 100% of the cost for community biogas plants are subsidized.

Research and Development

Financial promotion from public or development funds is always necessary for research and development and for the organizations concerned with the implementation of biogas programs. Only in exceptional cases have private companies carried out research and product development, but even then, they sometimes relied on assistance from external donors. Research and development on the following aspects of biogas technology are particularly worthy of sponsorship:

- reducing the cost of system construction
- increasing the gas yield, most notably of dome-digester systems
- storage and application of digested sludge
- socio-economic prerequisites and consequences
- financial analysis of biogas units and economic analysis of biogas programs

- plant design and operation modifications to suit locally available materials

Subsidies

Subsidies for biogas plants may consist of grants, low-interest or no-interest loans and/or supplies in kind (materials). The response of the target group will usually depend to a large extent on the types of subsidies, the amounts available, and bureaucratic obstacles in gaining access to funding. The popularization of a subsidy program naturally plays an important role, too. The perceived reliability of the subsidy program is essential. Subsidy arrangements should therefore be underpinned by binding agreements with several years validity.

Graduated subsidies, the granting of which depends on, for example, the type of fuel in use prior to system installation or on the social situation of the applicant, are conceivable. In practice, this leads to socially justifiable differentiation in the extent of support granted.

Economic benefits for the target group

The most important incentive for any potential investor are the monetary returns to be gained by installing a biogas system. Promotional programs

and subsidies for biogas systems should therefore be oriented along the lines of the benefits to be expected.

The economics of a biogas system depend, first, on the type of construction and cost of operation and, second, on the resultant benefits and/or cost savings provided by the system. Since the savings can be quite considerable in relation to the cost to the individual, even modest subsidies can yield a net economic advantage for households considering biogas as an option. If, on the other hand, individual expenditures for fuel and fertilizer were relatively low, higher subsidies will be required. Thus, the subsidies should be geared to the respective regional and social situation. Financial assistance for individual households should not be based on fictitious market values for gas and fertilizer, but rather on the actual costs and benefits involved.

Financial incentives

As a rule of thumb, financial incentives can be regarded as an essential prerequisite for the success of a large scale biogas program. If at least 70% of all households within the target area are to be supplied with biogas, all investors should be granted special allowances. The process of discussion requisite to defining the range of participation within the target area or community can, in itself, have a favorable impact on the project. Nonetheless, the maximum possible personal contribution should, as a matter of principle, be demanded of each household involved in a

subsidized program. A maximum of contribution from the owner during construction of the biogas plant is conducive to the personal involvement of the system's future owner.

Biogas

BIOGAS Digest

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Biogas plants constitute a widely disseminated branch of technology that came into use more than 30 years ago in developing countries. There are hundreds of thousands of simple biogas plants now in operation, and each one of them helps to improve the living conditions of people in rural areas. Biogas systems are an efficient way of dealing with organic waste, dung and crop residues while making optimal use of their energetic as well as nutrient content.

In addition to generating renewable energy, biogas systems help to stimulate ecologically beneficial closed-loop systems in the agricultural sector while improving soil quality and promoting progress in animal husbandry and farming.

While the main focus is on biogas systems of simple design, the technology is nonetheless complex enough to warrant close attention to its proper application, planning and construction. Only a well-planned, carefully constructed and properly functioning biogas system will fulfill its purpose of improving living conditions in rural areas.

You will find useful and detailed information about all aspects of

biogas plant design and maintainance, biogas appliances, social, political, economic and ecological framework conditions, planning and dissemination of biogas systems and last but not least country- and project-specific information.

Biogas Programs

Biogas - Organizations and Networks

Funding Organizations

International Organizations

United nations Environment Programme (UNEP)

General Services Section
P.O.Box 30552
Nairobi Kenya

National Organizations

Bangladesh: Food and Agriculture Organization of the UN

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Bolivia: Food and Agriculture Organization of the UN

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Indonesia: Indonesian Chamber of Commerce &Industry

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Jamaica: Scientific Research Council SRC

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Vietnam: Renewable Energy Center

Planning and advisory services
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Networks for biogas and anaerobic digestion

Networks are built to share experiences on several issues, in this case on anaerobic digestion (AD) of agricultural and industrial biomass and

communal and industrial wastes. Databases can cover AD experts and organizations, biogas plant design, research and funding organizations, literature and further information. The main objective of AD networks is information exchange on the performance of technically and commercially successful AD facilities and findings of scientific research on AD.

Name (Country)	Focus	Contact
AD-Nett (Europe)	Anaerobic digestion of agro-industrial wastes, less the generation of energy; mainly network of users, producers in agriculture and	Herning Municipal Utilities Enghavevey 10 DK 7400 Herning Tel.: +45 99 26 82 11 Fax: +45 99 26 82 12 Email: hkvadm@post4.tele.dk Dr. Pat Howes ETSU Harwell Didcot

	agro-industry; data-bank: agricultural plants; contacts	OX11 0RA UK Tel.:+44 12 35 43 28 10 Fax: +44 12 35 43 39 90 Email: pat.howes@aeat.co.uk
ANESAPA (Bolivia)	Asociacin Nacional de Entidades de Servicio de Agua Potable y Alcantarillado Seminars on waste water treatment	Av. Villazon 1966 P-7 La Paz Bolivia
	Association of German NGOs and consultants active in the field of	German AT-Association

AT Verband (Germany)	Appropriate Technology, also biogas technology; promotion of socially and environmentally appropriate technologies	Alexanderstr. 17 53111 Bonn Germany Tel.: +49 228 631421 Fax: +49 228 431427
BORDA (Germany)	Bremen Overseas Research and Development Association Promotion of low-cost biogas systems in developing countries.	Breitenweg 55 D-28195 Bremen Tel: +49 421 13718 Fax: +49 421 165 5323

	Newsletter: Biogas forum	
CEPIS (Peru)	Centro Panamericano de Ingeniera Sanitaria y Ciencias del Ambiente dissemination of information, technical advice, promotion of regional programs, network of cooperation centers, education;	Los Pinos 259 Casilla Postal 4337 Lima 100 Tel.: +51 1 4377081 Email: scaporal@cepis.org.pe

FAO/SREN (EU)	European Sustainable Rural Environment and Energy Network working groups: 'Bio-Mass for Energy and Environment', 'Environmental Aspects of Anaerobic Treatments' publications: Newsletter; 13 volumes in **FAO/REU**	Rainer Krell FAO/Regional Office for Europe Viale delle Terme di Caracalla I - 00100 Rome Email: rainer.krell@fao.org

	Technical Series; organization of workshops, electronic mailing list on Anaerobic Technology	
German Biogas Association ("Fachverband	Promotion and dissemination of biogas technology as a sustainable technology link within the nutrient circle; organization of excursions, seminars, conferences, exhibitions; provision of know-	Biogas Association Germany Am Feuersee 8 D-74592 Kirchberg/Jagst

Biogas") (Germany)	how and experts - technology transfer; working groups: public relations, safety standards, organic waste fermentation, agriculture	Tel: +49 7954 1270 Fax: +49 7954 1263
	International Association on Water Quality anaerobic digestion; operation and costs of large/small wastewater	Chairman: Prof. E.R. Hall, Dept. of Civil Engineering;

IAWQ (United Kingdom)	treatment plants; pretreatment of industrial waste-waters; pulp and paper industry waste-waters; water and waste technology and management strategies for developing countries	University of British Columbia, CAN Secretary: Prof. K.J. Kennedy, Dept. of Civil Engineering, University of Ottawa, CAN
RECBAM (Colombia)	Red Colombiana de Biotecnologa Ambiental	Olga Rojas Ciudad Universitaria Melendez Colombia Tel.: +57 2 3312175 Fax: +57 2 3392335

		Email: olgaro@petecuy.univalle.edu.co
RISE-AT	Regional Information Service - Center for South East Asia on AT Focal point for expert network South East Asia on anaerobe technology Biogas Advisory Unit	Institute for Science and Technology Research and Development (IST) Chiang Mai University P.O.Box 111 50202 Chiang Mai Thailand Tel.: +66 53 892189 Fax: +66 53 892224 Email: cnxnsmwm@chiangmai.ac.th
	objective: industrial	

Waste for Energy Network (EU)	exploitation of waste for energy three sectors: wood & paper, household waste, biogas; organization of seminars and workshops	Centro da Biomassa para a Energia, Olvia Matos
WEDC (United Kingdom)	Water Engineering and Development Centre countries; dissemination to practitioners and	Dr. Jeremy Parr WEDC Loughborough University Leicestershire LE11 3TU Tel: +44 1509 222618

	researchers; registration possible to receive regular information	Fax: +44 1509 211079 Email: jeremy.parr@boro.ac.uk

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Biogas

Biogas - Program Implementation

Dissemination of biogas technology

Even if today the technical performance of biogas plants no longer constitutes a problem, and even if regions favourable for biogas can be relatively easily identified, the establishing of an efficient and sustainable dissemination structure continues to remain the key problem of numerous biogas projects. In various countries, experiences with the dissemination of agricultural biogas systems exist. To get more informations about this topic, see "The dissemination of biogas systems in various countries". Depending on the stage of biogas development in a country or region, the structure of a biogas programme reflects the phases of implementation:

- Research and development
- Pilot programs
- Dissemination
- Networking

A criteria list with excluding, critical and ideal factors for the dissemination shows if, in a concrete case, the building of biogas plant is advisable.

Reference information and addresses of organizations concerned with **funding**, **implementation** and **networking** in the field of biogas development can be found under "**Organizations and Networks**".

Implementation planning

Dissemination and implementation of biogas technology has to be organized and planned. Biogas projects are usually quite complex as multiple disciplines like construction, agriculture, economics, sociology besides planning and management are involved. It is advisable to create a program of implementation that contains the problem analysis, the objectives, region of dissemination, target groups, the strategy, necessary activities, achieved outputs, required inputs etc.

Regional level

Biogas projects may have general or specific objectives. In general it has been proven that the energy aspect alone does not justify the cost for biogas technology. The overall objective, to which biogas technology contributes is the environmental amelioration which includes energy-related objectives and the improvement of living conditions (including economical conditions) of biogas users.

The following aspects have to be taken into account at regional level to

prepare biogas dissemination:

- region with the favorable climatic conditions
- existence of a potential target group
- private sector involvement
- informal sector involvement
- government involvement
- organizations/networks to cooperate with
- economic viability on micro- and macro level
- financing program and the cost of program
- material requirements
- technological standards
- available know-how on planning, management, technician and artisan level
- the role of subsidies
- kinds of information, propagation, awareness creation

- assessment of sustainability

Local level

The ultimate goals of any biogas program are to make maximum use of the available organic material and to provide benefits of biogas technology to as many families as possible. In particular, measures must be developed for those whose economic situation so far does not allow their participation in the biogas program.

Representatives of the local population must be involved in finding the most workable solution. The idea of constructing a community biogas plant should not be forced upon the group concerned, even if only by the power of persuasion.

If a decision is made to attempt a blanket coverage with biogas technology, various organizational measures must be taken at the local level to successfully execute the program:

- Assignment of a person responsible for the program (frequently, that person will be the promoter himself).
- Verification of basic data concerning the availability of dung and other suitable substrates, the anticipated gas consumption figures, the size

of standard plants and the economic/financial aspects.

- Assessment of the capacities of local craftsmen, of the limitations of material supplies at the right time and the assignment of any work to be contracted.
- Training of personnel and organization of maintenance and repair services.
- Selection of suppliers for accessories and spare parts.
- Securing of loans and subsidies at the time required.
- Securing of binding pledges for all self-help activities.
- Stipulation of the sequential order of construction of the individual biogas system as agreed between all parties concerned.
- Ensuring that all those concerned are willing and able to gather sufficient amounts of substrate.

Factors for a successful dissemination

Cost of investment

An obvious obstacle to the large-scale introduction of biogas technology is the fact that the majority of the rural population cannot afford the cost of investment for a biogas plant. A further difficulty is that the overall social advantages can only take hold for the individual in the case of blanket implementation. This applies in particular to the preservation of forests, the improvement of hygiene, energy access for the poorest groups of the population and to the promotion of artisan business, training systems and service facilities. Such advantages cannot be secured for all through the installation of a few biogas plants that only better-off farmers can afford. The gap between their standard of living and that of the poor would thus become even more apparent.

Benefits of biogas technology

The essential benefits of biogas plants are not manifested in individual cost-efficiency calculations. They can only take effect on a general economic scale, and then only when entire areas have become fairly well "saturated" with biogas systems. Thus, individual decisions to invest in biogas plants can contribute little to the propagation of biogas technology, even if its introduction already appears necessary from a general economic standpoint. Public measures for the promotion of biogas technology are therefore indispensable, whereby special attention should be paid to widespread introduction.

If the installation of biogas plants is to serve as part of a social

development progress, the decision in favor of biogas has to be made by the future users or owners of the plants themselves. In order to achieve that goal, the following prerequisites must first be met:

- the technology must be made known;
- the advantages for the economy in general and the economic benefits for the individual must be adequately quantified and publicized;
- the technical conditions for the construction of plants must be appropiate;
- maintenance and repair services must be provided within a reasonable radius and made available without an excessive amount of time-consuming official procedure;
- investment costs must be reasonable and the necessary loans and subsidies must be accessible.

Biogas programs that do not satisfy these conditions can only be materialized by persuasion, political pressure or exaggerated financial assistance.

A successful implementation strategy will require steps within the following

fields of activity:

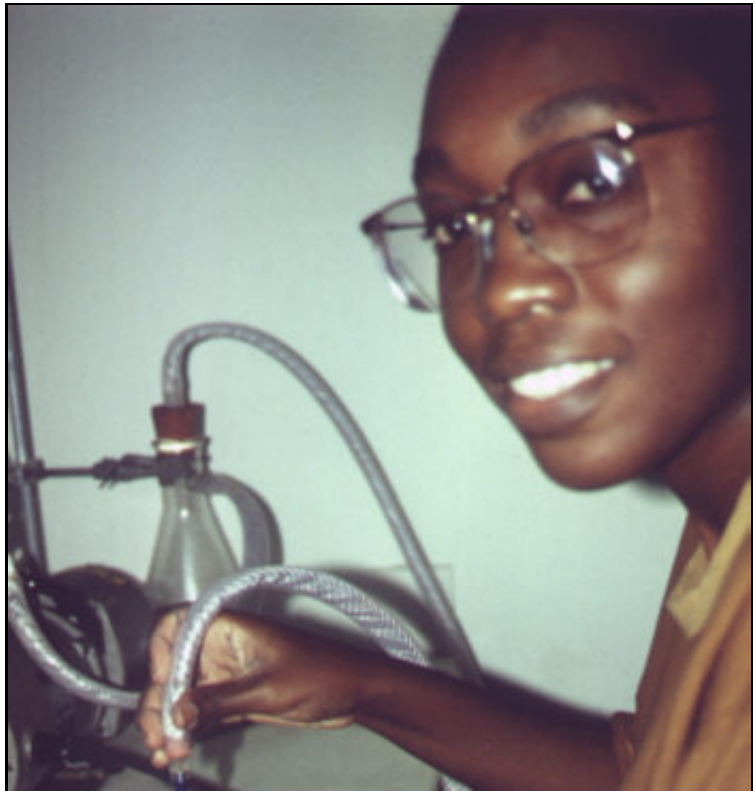
- Information and public relation campaigns
- Educational and training programs
- Financial promotion
- Politico-administrative and organizational aspects
- Social acceptance

Biogas

Programs

Biogas Programme Structure

The structure of a biogas program depends on the stage of biogas development in which the program operates. We have listed below a number of typical forms of biogas programs with their important structural elements. In reality, these programs often represent stages of a longer biogas program. For example, a biogas dissemination program can have a research and development (R&D) phase, a pilot phase, a dissemination phase and a follow-up phase. Often, these phases have large overlaps.



Biogas research and development programs

Test of the biochemical methane potential (BMP-Test): The bench-scale method is used to adapt and analyse wastewater and an inocculum for anaerobic treatment. *Photo: Verink*

R&D programs do not aim at widespread dissemination of the technology. They work on improving existing technologies, on innovative designs or on optimizing bio-technological processes. In such applied research it is desirable to communicate and cooperate closely with the potential target group. The laboratory and the research construction sites should actually be on a farm rather than in an isolated compound in town. R&D programs can be attached to implementation programs, they can be part of a national or international agricultural research center or they can be an independent supra-regional project doing research for biogas projects in the region.

Typical structural elements of an R&D program would be:

Central Laboratory to examine chemical composition of substrates,

slurry, biogas. To examine qualities of building materials, paints, pipes etc. The head of the lab should be an experienced, practical chemical engineer.

Mobile Laboratory to do on-farm research.

Construction Team consisting of a civil engineer and a small team of technicians and artisans to build and test innovative technological solutions under farm conditions.

Agricultural Team consisting of an agricultural engineer and agro-technicians to research on the use of slurry and stable designs.

Data Bank and Monitoring Unit to collect and process data from the own research and from literature.

Communication Unit headed by the program manager to link the program with international research and implementation programs.

Biogas pilot programs

Pilot programs operate in countries or regions where biogas is not known and biogas technology is not tested. They rely largely on an existing and tested technology which has to be fine-tuned to be fit for widespread dissemination. At the same time the suitability of the region and the

selected target groups is counterchecked. The main objective of pilot programs is to receive a constructive feedback of target groups and to alter the technology accordingly. To gain experience under a variety of conditions, typical climatic, topographic and ethnic areas are selected. Their main objective is to make the technology and dissemination approaches fit for widespread dissemination.

Typical structural elements of a pilot program are:

Construction and Agriculture Units for the designated pilot areas, headed by a civil engineer, each consisting of a small team of technicians and artisans. The construction teams may have a store in the respective pilot area with a stock of material and appliances. They construct pilot plants, set up slurry-use facilities and follow-up closely the performance of pilot biogas units.

Training Unit organizes training courses for artisans, technicians and for the pilot farmers. The training unit also uses training facilities in neighboring countries.

Communication Unit is responsible for the communication with NGOs, churches, government institutions and private enterprise in the region. They also keep in touch with international developments.

Data Bank and Monitoring Unit collects data from pilot plants and data

from research and literature.

Biogas dissemination programs

At a stage when the development of biogas technology is mature enough and target group parameters seem conducive, widespread dissemination can be envisaged. Parallel to the widening of the scope should start a reduction of direct program involvement. In particular the construction part, but also advisory service, planning and follow-up should be increasingly (and the earlier the better) handled by private entrepreneurs. Farmers do not risk technology failure anymore, for that reason they can be expected to carry most of the cost of their biogas unit.

> ***Commercialization Unit*** develops approaches to make biogas dissemination increasingly independent from program inputs. Elements of their work can be the setting up of credit schemes for biogas farmers and biogas constructors, equipping biogas constructors with tools and other facilities, training entrepreneurs in pricing and accounting and linking biogas enterprise with potential customers.
>
> ***Quality Control Unit*** monitors built biogas units and gives feedback to constructors. If necessary they advise on re-training or sanctions against unreliable constructors.

Public Relations Unit supports the biogas entrepreneurs with PR campaigns to advertise for biogas technology. The PR unit keeps in touch with various government departments to create a conducive atmosphere for biogas.

Data Bank and Monitoring Unit (see above).

Biogas networking program

Networks usually operate at a supra-national level. They support ongoing initiatives, research and private enterprise in the countries of their region. They normally do not get operational at farm level. Typical tasks would be to organize workshops, training courses or conferences to enhance a south-south technology and know-how transfer. Typical structural elements would consist of:

Documentation Center including a library and a data bank.

Organizational Unit to prepare, organize, carry out and follow up workshops, seminars and conferences. This unit supplies the communication unit with documentation on their activities.

Communication Unit to lobby at a government level and with international organizations for biogas, to disseminate relevant

information among biogas promoters and researchers in the region and to keep in touch with international developments.