



National Biogas Programme, Ethiopia

Biogas for Better Life

Brief Programme Profile

December 2007

Published by:

Ethiopia Rural Energy Development and Promotion Centre (EREDPC)
P.O. Box 8063
Addis Ababa
Ethiopia
T 251 (0) 11 5153689
E eesrc@ethionet.et

and

SNV/Ethiopia
P.O. Box 40675
Addis Ababa
Ethiopia
T 251 (0)11 4654386/7/9
F 251 (0)11 4654388
E snv@ethionet.et
W www.snvworld.org

Name of sector:
Domestic Biogas

Contributed by:
Dr. Getachew Esthete, SNV
Camilla de Stoop, Consultant

Addis Ababa, December 2007

1. Programme Title

National Biogas Programme Ethiopia

2. Background and Justification

Access to modern energy is a key element in rural development. However, despite all attention given to energy issues in Ethiopia in the past, rural communities continue to be deprived of basic energy services. Modern forms of energy are simply not available in rural areas while traditional sources are rapidly being depleted, thereby deepening the rural energy crisis.

Woody biomass represents the principal form of cooking and lighting fuel in Ethiopia's rural areas. An increasing fraction of the population is being confronted with the difficult choice between eating its food poorly cooked and travelling long distances to collect fuel for cooking. The scarcity of fuel wood has led to an increased utilization of dung and agri-residues for cooking, which could otherwise have been used to enhance the nutrient status and texture of the soil and contribute positively to agricultural production.

Biogas offers an attractive option to replace unsustainable utilization of wood and charcoal. It complies with the principles put forward in the country's Energy Policy and Environmental Protection Strategy, and closely meets the terms of the Plan for Accelerated and Sustained Development to End Poverty (PASDEP) as well: it is a local, renewable resource that addresses the basic needs of rural households amongst which energy; it supports decentralised access to household energy; its by-product – bio-slurry – enhances agricultural productivity and promotes organic farming, thus offering opportunities for niche markets and export. On the whole, it ensures environmental sustainability and its use as domestic fuel improves development conditions and opportunities for women and girls. Last but not least, it lends itself to commercial development, hence contributing to the development of the private sector and the technical and human capacity of the Technical Vocational Education and Training Centres (TVETs).

Biogas technology was introduced in Ethiopia as early as 1979. In the last two and a half decades, around 1000 biogas plants were constructed in various parts of the country. Presently, approximately 40 % of these plants are not operational due to a lack of effective management and follow-up, technical problems, loss of interest, reduced animal holdings, evacuation of ownership and water problems. Other reasons for the limited success of the technology in Ethiopia include the adoption of a project-based stand-alone approach without follow-up structure in place, variations in design, and the absence of a standardized biogas technology.

Due to the renewed interest in biogas, and in order to unleash the potential for this bio-fuel in Ethiopia, a feasibility study was commissioned to assess the prospects for domestic biogas in the country. This study led to a formal partnership between the Ethiopian Rural Energy Promotion and Development Centre (EREDPC) and

SNV/Ethiopia, and in 2007 a joint EREDPC/SNV team was established to develop a programme implementation document. An extensive stakeholders' consultation process at both regional and national level resulted in more than 120 representatives of the government, non-governmental organisations, and the private and financial sectors gaining awareness about the features and functions required for a national biogas programme (NBP), and providing ample inputs for the development of the programme.

The NBP envisages a first – pilot – implementation phase with construction of 14,000 biogas plants in four regions and development of a commercially viable biogas sector in the country. The lessons learnt from this phase will be used to design strategies for up-scaling the construction of biogas plants covering more areas.

The development of a biogas sector requires a number of functions to be implemented. These functions will be executed by multiple stakeholders, each of whom will take on responsibilities best suited to its objectives and in agreement with the other programme stakeholders. The Ethiopian Rural Energy Development Centre (EREDPC) at the national level and the Mines and Energy Agencies (MEAs)/Energy Departments at regional level will be the lead institutions. A National Biogas Programme Coordination Office (NBPCO) and regional Biogas Programme Coordination Offices (RBPCO) will be established to ensure the operational management of the programme.

3. Objectives of the Programme

The overall goal of the NBP is to improve the livelihood and quality of life of rural households in Ethiopia through the exploitation of market and non-market benefits of domestic biogas such as replacement of unsustainable utilization of wood and charcoal for cooking and lighting; use of the high value organic fertilizer from the bio-slurry; and improvement of health and development conditions for rural households.

The **main objective** of the first phase of the Programme is to develop a commercially viable domestic biogas sector in Ethiopia.

The **Specific objectives** are to:

- attract and strengthen institutions and organizations for the development of a national biogas sector;
- construct 14,000 biogas plants in the four selected regions over a period of 5 years;
- ensure continued operation of the biogas plants installed under the NBP;
- maximize the benefits of all biogas plants installed.

4. *Description of the Programme*

The approach of the NBP will be market-oriented, with the user of the biogas technology in central position. Through private sector competition, potential users will benefit from reduced costs while the private sector can be ensured of growing business opportunities through an increasing demand for biogas technology.

The programme comprises eight major components: promotion and marketing, training, quality management, research and development, monitoring and evaluation, institutional support, extension, and gender mainstreaming.

To enable potential users to make an investment decision, they will be provided with full information about the benefits of biogas technology, including financial incentives and benefits, installation and maintenance costs, operational issues, guarantee and after-sales service, Contribution to construction cost, support structure, quality assurance and durability.

The private sector (biogas companies, cooperatives, and biogas appliance and component manufacturers) will be called upon for house-to-house promotion of the technology, construction of the biogas plants and after-sale service provision. A support structure will be developed, which will provide a contribution to construction cost to promote the biogas technology, enable access to microfinance, support promotional and extension activities, and ensure that a minimum level of quality is maintained so as to safeguard the reputation of the biogas technology.

Microfinance will make domestic biogas affordable by supplying long-term credits to farmers wishing to purchase the technology at a low interest rate. NGOs, construction cooperatives and private sector companies will assist the biogas users in acquiring micro-credit.

Major outputs of the Programme will include promotional and extension materials; various studies related to biogas adoption, financing and social, economic and environmental impact; standard designs for biogas plants; trained, certified and registered masons; three regional training and resource centres established within existing vocational training institutions; and formation of several construction cooperatives/companies. This is in addition to the 14,000 biogas plants (with slurry pits and indoor cooking facilities) that will be constructed and a minimum of 7,000 domestic toilets to be attached to the plants.

5. Location of the Programme

To promote the uptake of domestic biogas, the first phase of the programme will be implemented in selected *woredas* in Oromia, Amhara, SNNP and Tigray regional states. The selected *woredas* include:

- In Oromiya: Adaà, Dugda Bora, Hetosa, Ambo and Kuyu
- In Amhara: Bahir Dar Zuria, Dembia, Gondar Zuria, Fogera and Dangla
- In SNNPRS: Dale, Mareko, Meskan, Arba Minch Zuria and Derashe Special Woreda
- In Tigray: Hintalo Wajirat, Raya Azebo and Western Tigray

The rationale for starting in these four regions is based on several factors: (i) the four regions have most of the human (> 70 %) and livestock population (~ 70 %); (ii) the loss of vegetative cover as a consequence of severe deforestation, resulting in a huge rural household energy imbalance; (iii) the regions' status with regard to educated human resources and technology adoption experience; (iv) the availability of relatively well-documented information; (v) a woody biomass consumption that exceeds annual increment in more than two-thirds of the *woredas* located in the highland areas in those regions.

6. Cost and Financing

The total budget requirement for the implementation of the pilot phase of the National Biogas Programme is €16.7 million, or ETB 208 million, over a period of 5 years (and without taking inflation into consideration). The budget is stated in Euro, based on the September 2007 exchange rate (1 € = 12.5 ETB). An overview of the programme's budget is presented in table 1.

Costs include the investment costs for the household (construction cost and financing cost), programme support costs (promotion and training, finance, training, extension, programme management, etc.) and technical assistance (advisory, knowledge brokering, networking and advocacy). For the budget calculation the price level for an average 6 m³ biogas plant is used.

Table 1. Summary project budget (not corrected for inflation)

NBP pilot phase summary project budget in Euro						
	1	2	3	4	5	total
Farmer investment	81,967	491,803	1,147,539	1,721,309	2,295,079	5,737,697
Credit financing costs	17,907	170,444	250,702	376,052	501,403	1,253,508
Contributions to construction cost	38,433	230,597	538,061	807,091	1,076,121	2,690,303
Regional Biogas Support programme (RBPCO)	433,598	554,694	618,618	758,237	849,408	3,214,554
National Biogas Support programme (NBPCO)	365,630	367,837	366,812	385,337	377,160	1,862,775
Technical Assistance	412,300	442,300	423,100	335,300	290,500	1,903,500
Total project	1,349,835	2,194,675	3,344,832	4,383,326	5,389,671	16,662,337

Proposed contributors to the costs of the NBP include the farmers, the federal government, the regional governments, external donors (Biogas for Africa Initiative) and SNV/Ethiopia. The contributions to construction cost are borne by the federal government (10 %) and external donors (90 %). Through the mobilisation of carbon credits, revenues will be generated that could contribute to the financing of the Contribution to construction cost and future up-scaling of the National Biogas Programme.

7. *Benefits*

The benefits of domestic biogas are divided over multiple levels (micro, meso and macro) of the society and differ in the extent to which they can be translated in direct economic gains (formal versus informal).

Some 14,000 households will reap direct benefits from domestic biogas through the reduced use of traditional fuel sources, access to clean energy, reduced workload and health improvement—all resulting in improved living conditions, from which particularly women and children will benefit, and through improved soil fertility owing to the use of quality bio-fertilizer and resulting in improved agricultural output.

As table 2 shows, the benefits of biogas are not limited to the rural households only. Biogas contributes to job creation and skills enhancement (masons, managers, technicians, extension staff), private sector development (at least 20 biogas SMEs per region, 12 construction companies/cooperatives, 4 appliance manufacturers), saving of foreign exchange as a result of a reduced use of kerosene, economic return for the public (economic internal rate of return of 78% for Ethiopia), slowing down of the rate of deforestation, and greenhouse gas reduction.

Table 2. Biogas benefits matrix

Level	Informal	Formal
Macro	<ul style="list-style-type: none"> - Reduced indoor smoke-induced illnesses - Reduced poor-sanitation induced illnesses - Reduced drudgery from fuel wood collection - Reduced pressure for illegal forest encroachment - Reduced drudgery from weeding fields - Reduced workload for food-preparation - Reduced soil erosion/degradation - Improved opportunity for education 	<ul style="list-style-type: none"> - Reduced direct medical costs - Reduced expenses on conventional energy sources - Reduced chemical fertilizer expenditures - Increased opportunity for (small-scale) organic agriculture - Improved agricultural yields - Increased family income
Meso	<ul style="list-style-type: none"> - Reduced risk of erosion and landslides in mountainous areas - Improved forest quality and quantity - Reduced pollution of the environment as a result of uncontrolled dumping of animal waste 	<ul style="list-style-type: none"> - Increased employment and income-generating opportunities - Opportunity to develop markets for (organic) agricultural produce
Micro	<ul style="list-style-type: none"> - Reduction of illness-induced production losses - Improved biodiversity - Increased non-marketable (non-timber) forest products availability - Reduced mortality - Improved human resource base - Reduced risks resulting from global warming 	<ul style="list-style-type: none"> - Reduced (forex) costs on medication - Reduced health system expenses - Reduced (forex) costs on chemical fertilizer - Reduced (forex) costs on fossil fuels - Increased availability of marketable (non-timber) forest products - Increased agricultural production - Increased tax revenues - Generating Clean Development Mechanisms revenue

8. Institutional Arrangement

As an apex organization EREDPC is responsible for monitoring and evaluation of the overall programme activities. It is also responsible for the approval of annual plans and reports.

For the day-to-day coordination of the programme, EREDPC will delegate responsibilities to a semi-autonomous National Biogas Programme Coordination Office (NBPCO). This office will initiate, coordinate, and monitor the activities within the biogas sector, and be responsible for accounting, financial procedures, and staff management. Reporting to EREDPC, the NBPCO will work with both the private and public sectors of the programme stakeholders/partners. Representatives of the main national level programme actors will form a Biogas Sector Steering Committee for advising on policy and programme matters that relate to programme implementation.

SNV-Ethiopia and other local capacity builders will provide technical assistance through advisory services, resource mobilisation and knowledge brokering.

At regional level, the MEAs/Energy Departments will play a role comparable to that of EREDPC, while the regional Biogas Programme Coordination Offices will coordinate, facilitate and monitor day-to-day programme activities; also, they will establish partnerships with the Bureaus of Agriculture and Rural Development (BoARDs) for the promotion of biogas technology through the extension network of the BoARDs at the zonal, *woreda* and *kebele* levels. In a similar way as at a national level, all biogas activities will be periodically monitored and advised by a regional Biogas Sector Steering Committee (RBSSC). Figure 1 illustrates the institutional arrangements.

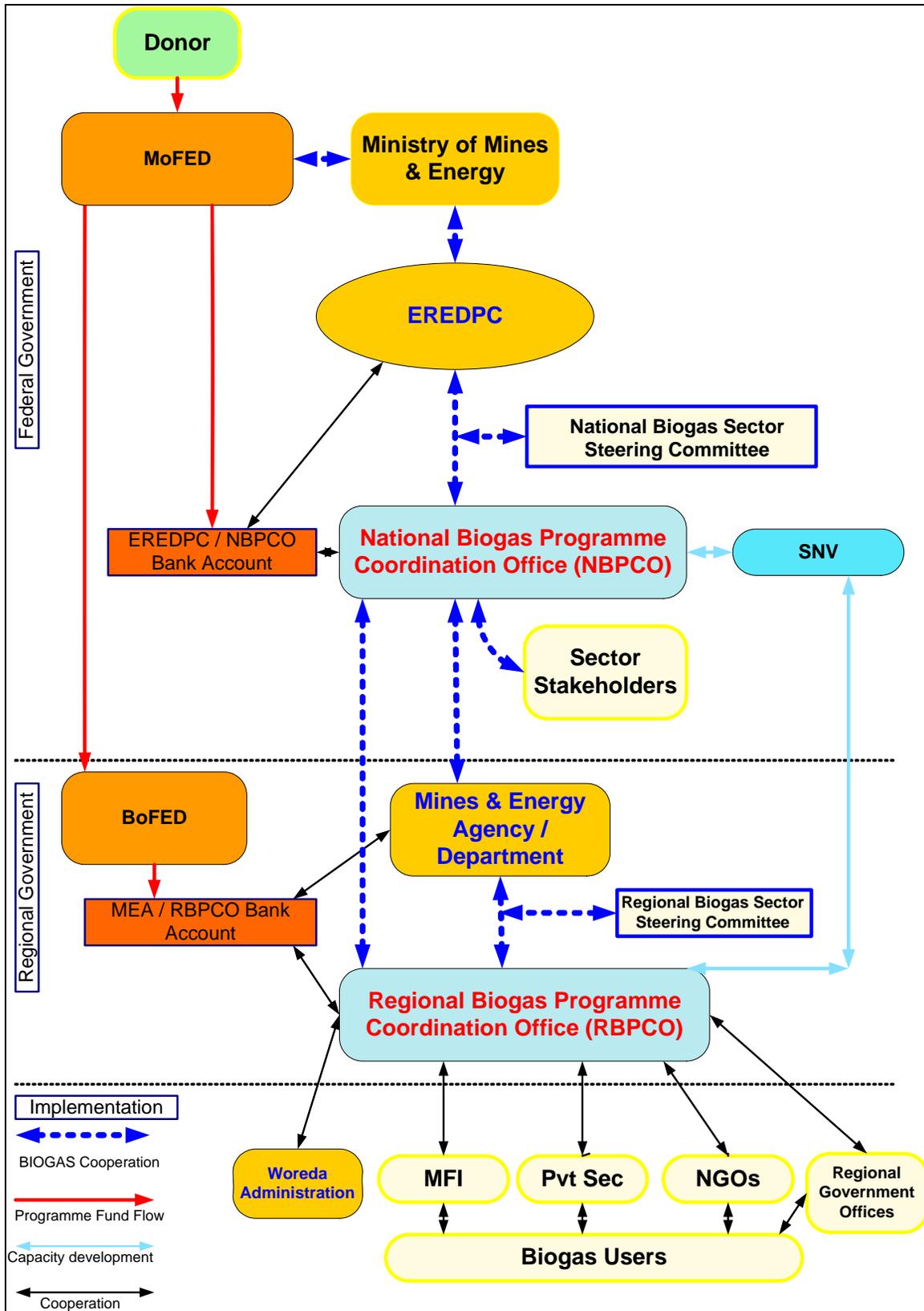


Figure 1. Institutional arrangements

9. Status of the Programme

A detailed programme implementation document (PID) has been prepared following upon the positive prospects for biogas development in Ethiopia as revealed by the feasibility study. A consortium of several international donors formed in May 2007 in Nairobi – Biogas for Africa – has declared that it considers funding the programme. The four regional governments have made a commitment to integrate the programme in their yearly budget planning. The Association of Ethiopian Microfinance Institutions (AEMFI) has expressed a keen interest to build a long-term partnership with the National Biogas Programme and develop a credit line for domestic biogas.

10. Duration and Implementation of the Schedule

A total of 5 years is envisaged to implement the first phase of the programme, starting in 2008 and ending in 2012. Implementation will start with the launching of a demonstration phase, with construction of 100 biogas plants in eight selected *woredas* in the four regions. Up-scaling construction to 100,000 biogas plants is foreseen for a subsequent phase.

The major activities, with costs involved and the share of financing in the programme are given in tables 3-7.

Table 3. Annual Contribution to construction cost requirement

	1	2	3	4	5	[Euro] Total
# of plants	200	1200	2800	4200	5600	14000
Contribution to construction cost requirement	38.433	230.597	538.061	807.091	1.076.121	2.690.303
National Government share						
Contribution national government	10% 3.843	10% 23.060	10% 53.806	10% 80.709	10% 107.612	10% 269.030
Donor share						
Contribution donor	90% 34.590	90% 207.538	90% 484.255	90% 726.382	90% 968.509	90% 2.421.273

Table 4. Proposed budget breakdown and financial contribution

Proposed Budget				Proposed Financing			
	Euro	per plant	Euro share		Budget total	/ plant	[Euro] share
Plant Investment cost	9.681.508	692	58%	Farmers	6.991.205	499	42%
Programme Support	5.077.329	363	30%	National Government	269.030	19	2%
Technical assistance	1.903.500	136	11%	Donor	2.421.273	173	15%
				National Government	467.722	33	3%
				Regional Government	540.885	39	3%
				Donor (RBPCO)	2.673.669	191	16%
				Donor (NBPCO)	1.395.053	100	8%
				Total SNV	1.903.500	136	11%
Total	€ 16.662.337	1.190	100%	Total	€ 16.662.337	1.190	100%