



Development of Biogas Plants in Latin America and Africa

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About Biogas

What is Biogas?

mixture of gases:

- methane (60% - 70%)
- carbon dioxide (30% - 40%)
- a small amount of N_2 , CO , H_2 , O_2 etc.

Renewable Energy: can be used as fuel.

Energy content:

1m³ of Biogas = 0.66l diesel fuel
= 0.75l petrol (or gas)
= 0.85 kg coal

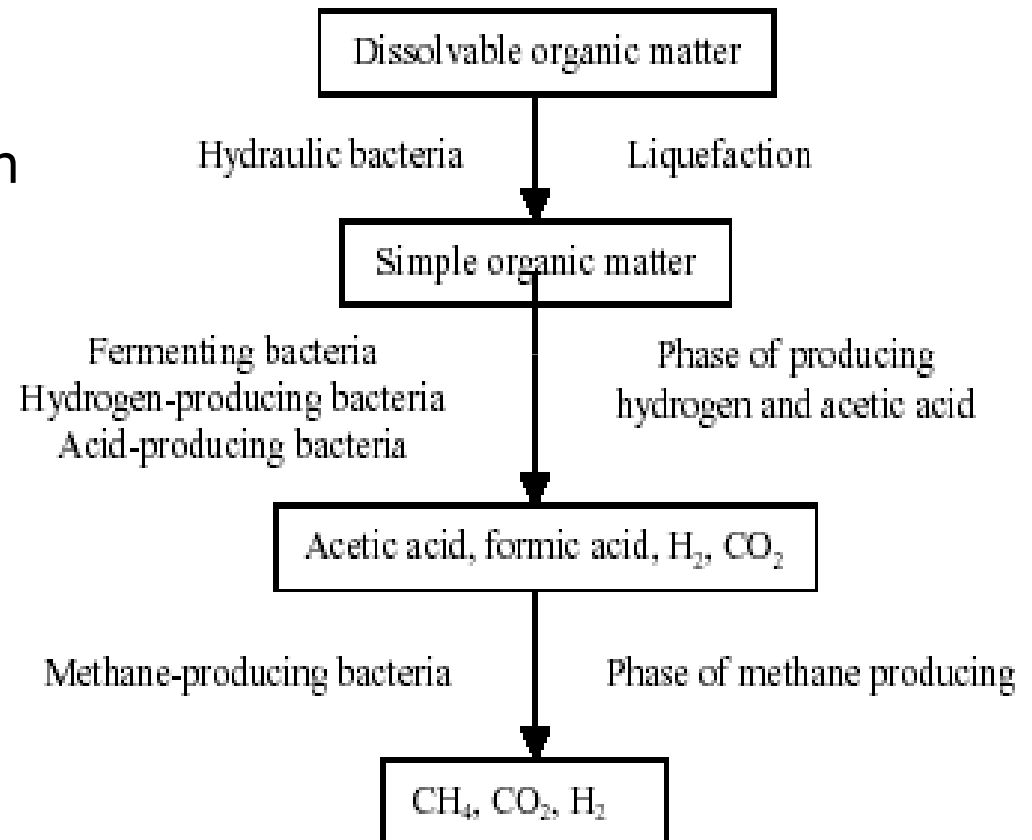


Production of Biogas

The producing process of Biogas : Anaerobic Digestion (without O₂)

Three Stages:

- Hydrolysis
- Acidification
- Methane producing



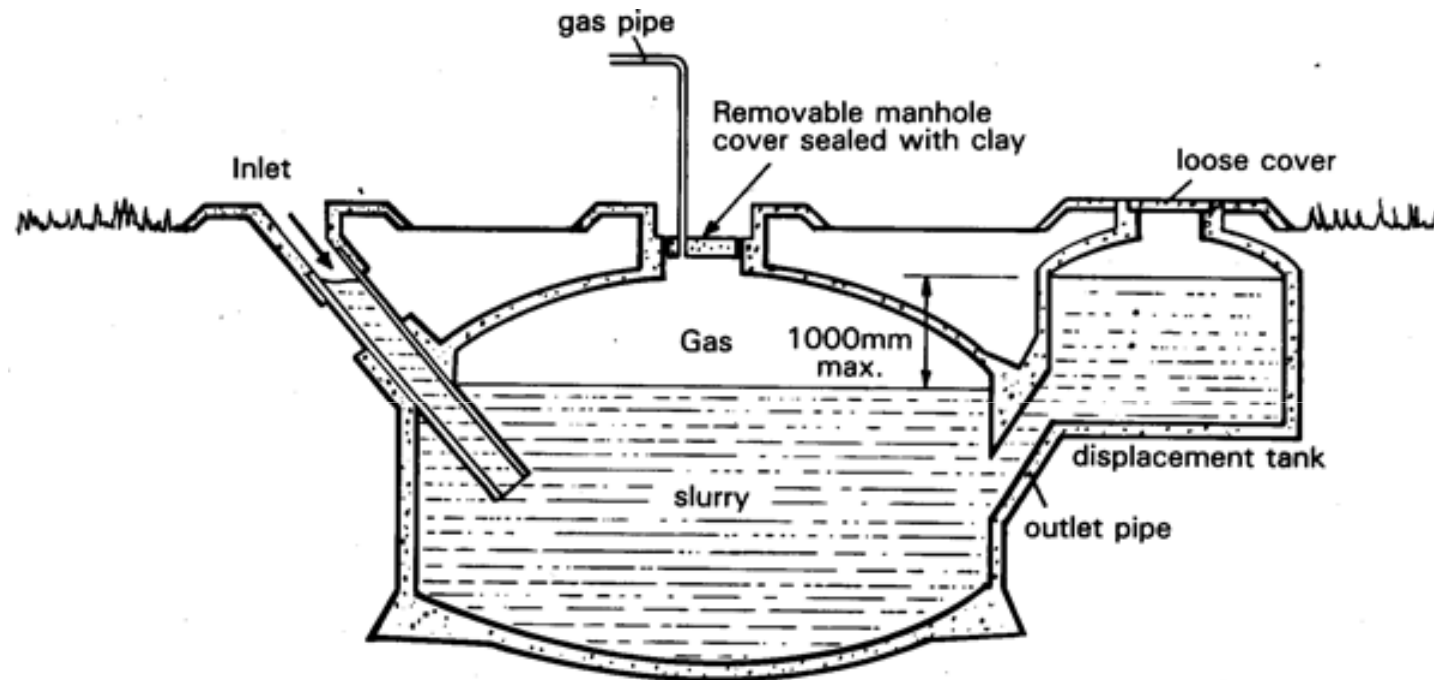


China: biggest biogas consumer in the world

- Start: at the End of 1960's
- by the end of 2007, ca 26 million household biogas consumers
- And more than 4 million new consumers are increasing each year.
- More than 8 provinces have more than 1 million biogas consumers
- by the end of 2007: annual biogas production has reached to 10.4 billion m³.



Household biogas digester in china



- The volume of these household digesters is ca. 6-8 m³.
- Digester can be used for 15 years.
- Productivity: 0.15 - 0.25 m³ per m³ digester per day



Biogastechnology in Latein American and Africa

Conditions:

- optimal climatic condition
- Abundant substrates available

Status:

- only a few thousands existing plants.
- Out-of-date biogas plants built in the 80s or 90s
- Many current references, theses and dissertations dedicated to biogas technology
- Growing importance attached to training and popularization on the subject of anaerobic techniques



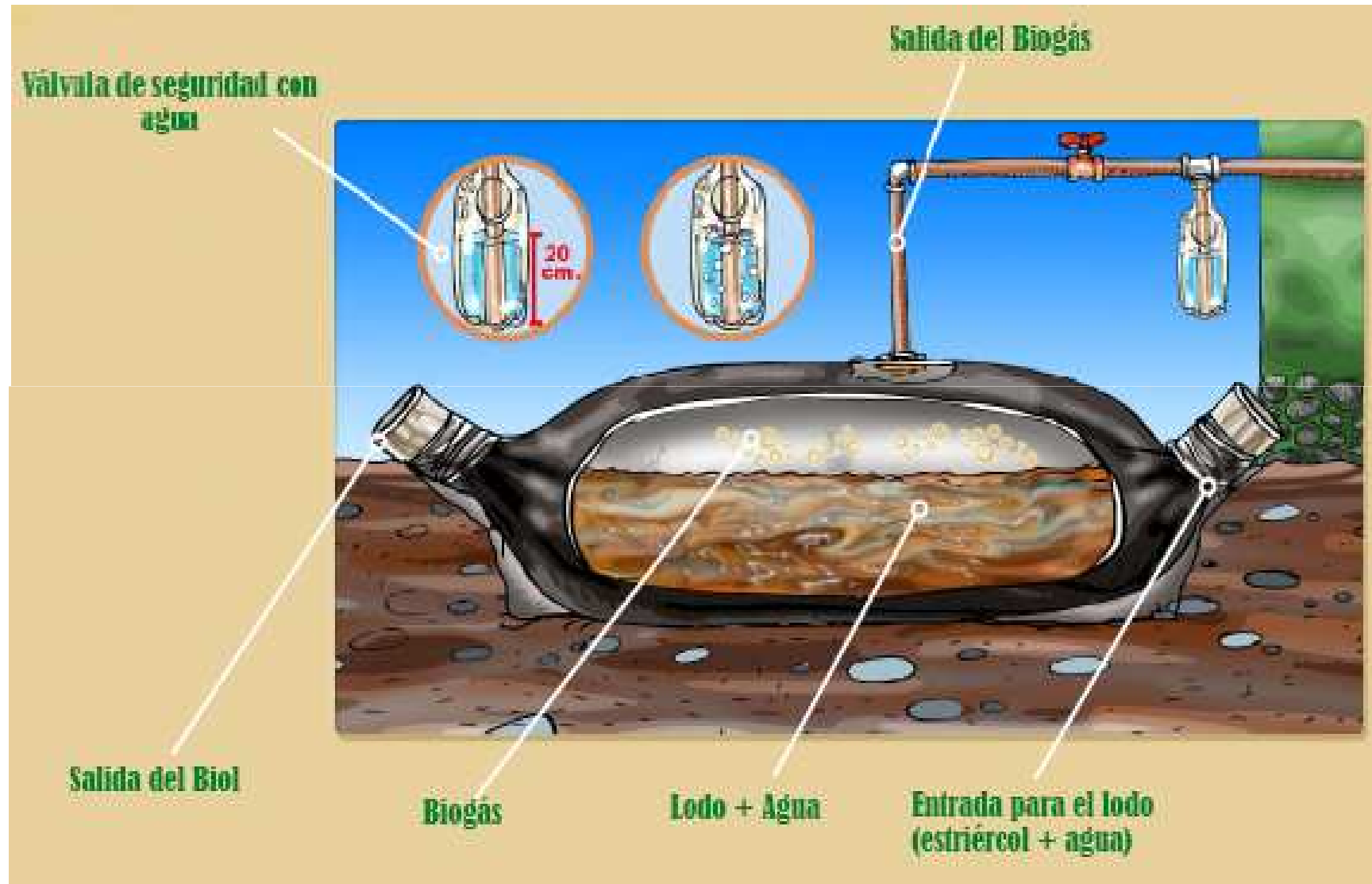
Biogastechnology in Bolivia

- total area of 1,098,580 km²
- 10 million inhabitants
- most of the population live on an area with only 30 percent of the total area of the country

- 1986: first biogas project, 27 plants
- Until 1992: ca. 100 plants
- In 2002: draft of biogas digesters for the regions above 2000m in Bolivia
- In 2003: tubular biogas digester was installed in the Altiplano, 4100 m over sea level
- Until now more than 1000 biogas digesters



Biogas Digestor in Bolivia





Biogas digester in Bolivia





Biogas in Bolivia: Input and Output





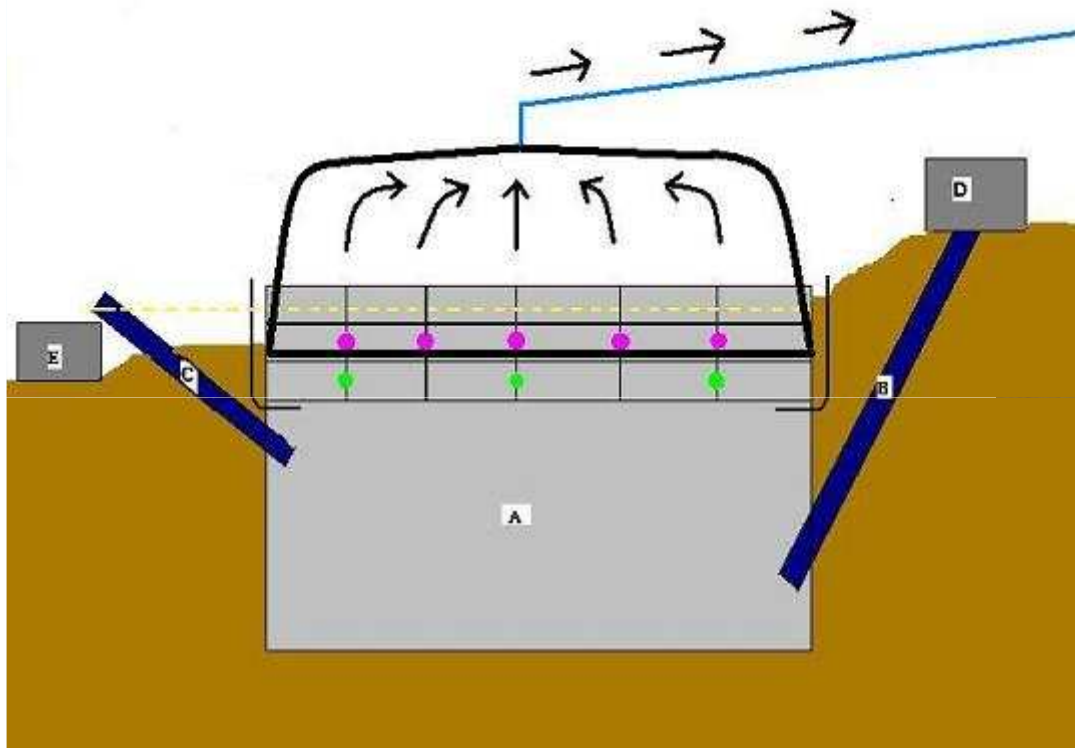
Biogastechnology in Costa Rica

With the aid of a donation from the UN Women's Group in Vienna, Austria and the technical assistance of the Agriculture Ministry office in Guatuso, the Santa Fe Women's Group was able to build 16 biodigesters in 2006.

They are still dedicated to increasing energy independence through biogas by extending the privilege of a biodigester to other deserving families in Santa Fe and the greater Guatuso area.



Biogas Digester in Costa Rica





Biogas Digester in Costa Rica





Biogas Digester in Äthiopien

- totally area: 1,097 million km²
- 79.1 million population, 16% of them in urban area
- largest livestock population in Africa

- History of the biogas technology since 1979
- Around 1,000 biogas plants with capacities from 2,5m³ to 200m³ built countrywide
- Since 2007: Hilfe with SNV
- Since 2008: IGNIS Project: Implementation with Pilot projects
 - Youth group biolatrine pilot project
 - Dairy farm waste project



Biogastechnology in Lesotho

- total area of 30,000 km²
- population of almost 1,800,000: 84% of them in the rural areas
- average annual temperature: 15 ° C.

- 1980 and 1990: ca. 80 biogas digesters
- 2002, TED with the main focus on dissemination of fixed-dome biogas digesters.
- Now, TED has built more than 70 digesters; all of them are in operation.
- the digester was used for the untreated wastewater to solve the sanitation problem
- some of these digesters are also fed with organic solid waste or animal dung.



Biogas Digestor in Lesotho

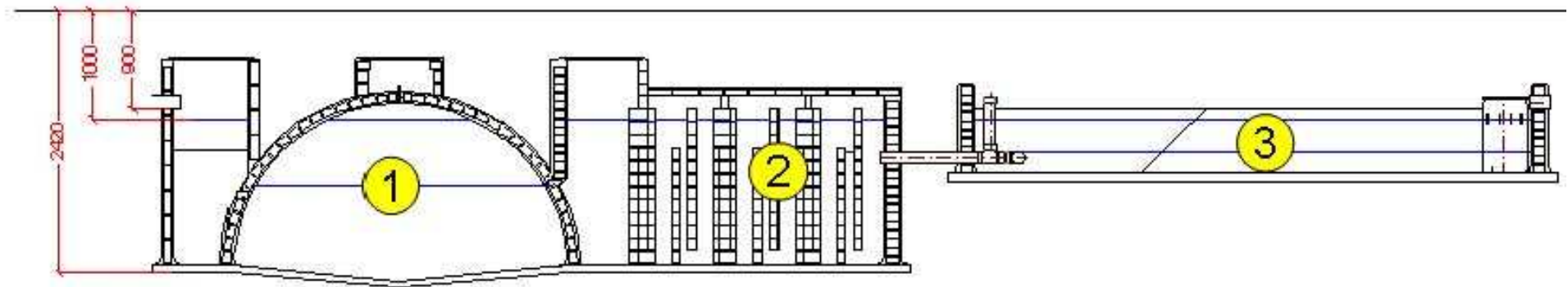
Dome inlet

Gas outlet

Dome outlet

ABR

PGF





Biogas Digester in Lesotho: Construction





Biogas Digestor in Lesotho





Biogastechnology in Tanzania

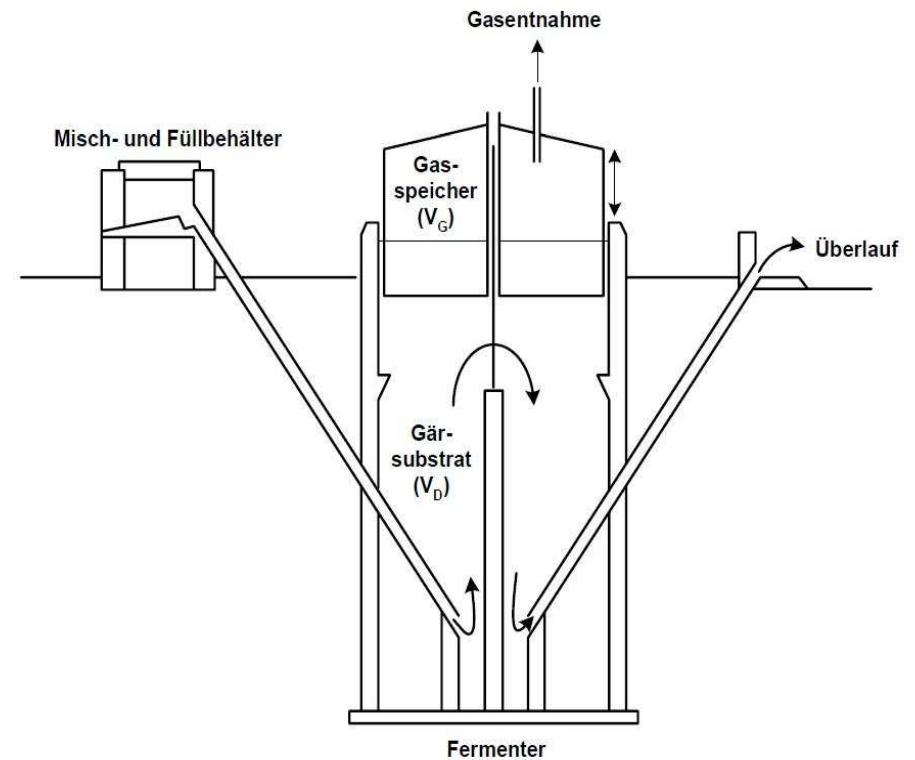
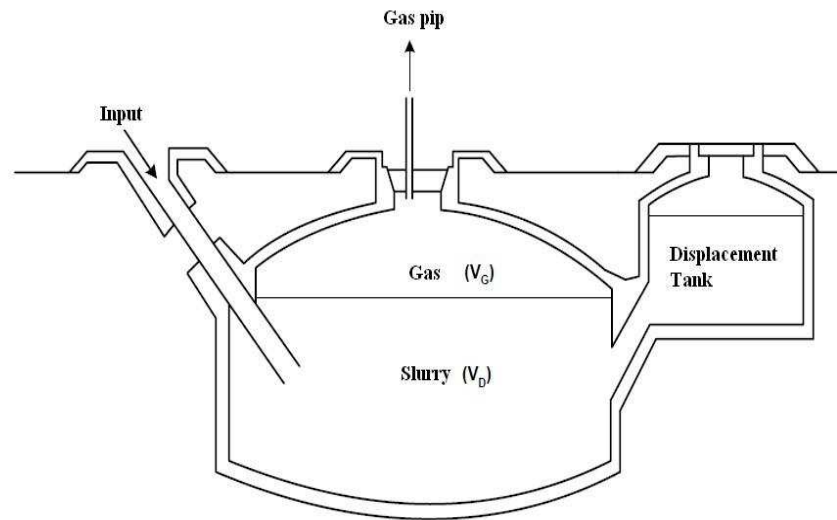
- 945 thousand km².
- 41 million inhabitants.
- 26.5 to 30 ° C average temperatures.

- early 90s: several small biogas plants were established by the Tanzania with Danish partner organization.
- Since 2008: BiogaST for the development and construction of decentralized small biogas plants to use of biogas as an energy source for cooking and other energy applications



Biogas in Tanzania

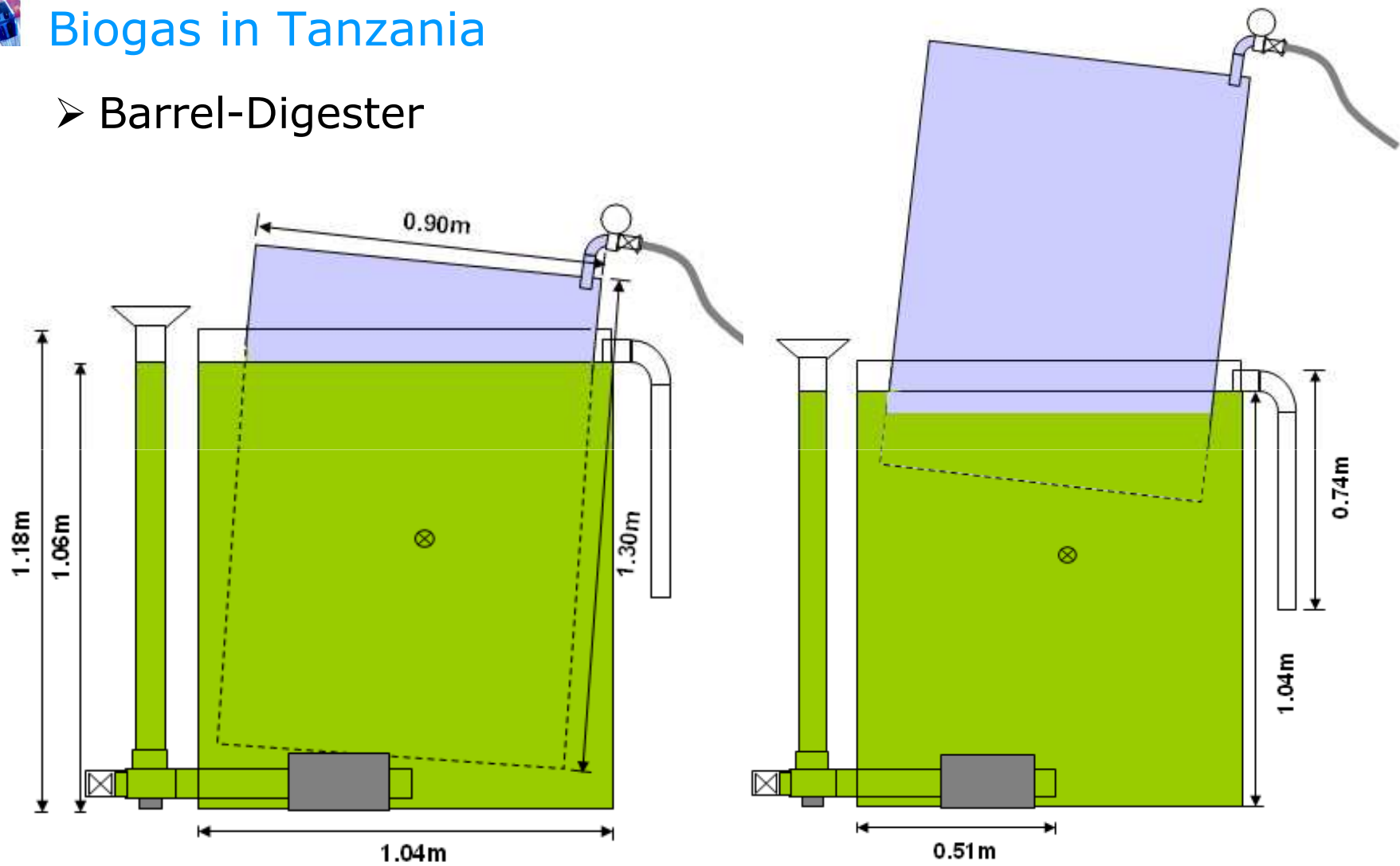
- foil digester
- floating drum biogas digester (Gobar-Biogas digester)
- Fixed dome digester





Biogas in Tanzania

➤ Barrel-Digester





Biogas in Tanzania





Reasons for the inadequate dissemination

- lower population density
- High investment costs
- Lack of legal framework
- The operators / users were not sufficiently trained (information about handling and maintenance was inadequate)
- Lack of motivation of the operator / user
- Material errors and technical defects
- reduced animal holdings
- Evacuation of ownership and water problems etc.



Summary and Outlook

- Biogas technology: impact on aspects of energy, environment, agricultural production, socio-economic development, and health and sanitation.
- For solutions of the environmental problems and covering the energy gap in Latin America and in Africa.
- establish of organizations; started a series of the national and international biogas programs to facilitate the biogas development.
 - GTZ UTEC,
 - SNV,
 - Swiss contact,
 - SEQUA and RELUX have initiated some cooperation with local partners in Latin-American and Africa for the use and dissemination of biogas technology.



Thank you very much !