
Sanitation and Biogas Production

Sanford Kombe, Arusha / Tanzania

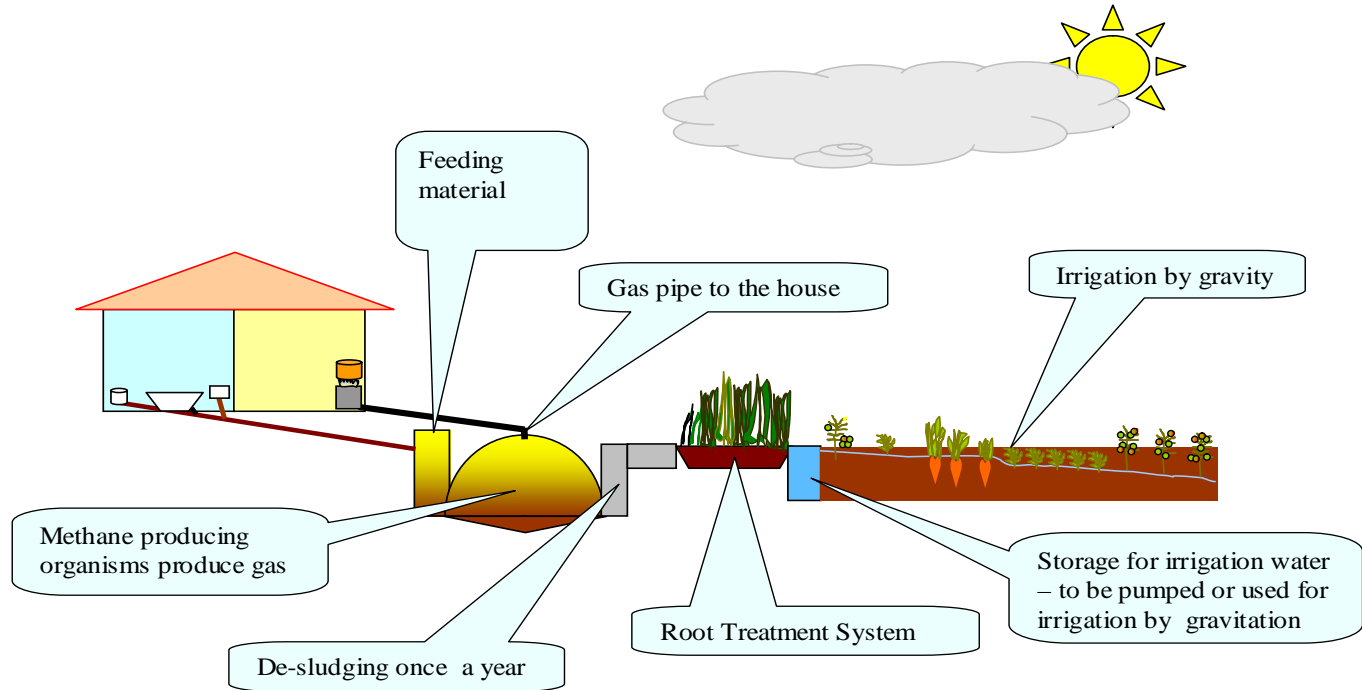
Introduction

- **Domestic or Commercial use of Biogas is compatible with the Bruntland Definition by:**
 - **covering household or institutional energy demand and generates savings and /or income**
 - **replacing chemical fertilizer and improving soil fertility by application of bio-slurry**
 - **reducing ground and surface water pollution**
 - **reducing dependence on fire wood therefore pressure on forest resources**
 - **reducing dependence on imported energy and promotes renewable energy technology**
 - **reducing greenhouse gas emissions**

Ecological Sanitation and Anaerobic Digestion (Biogas)

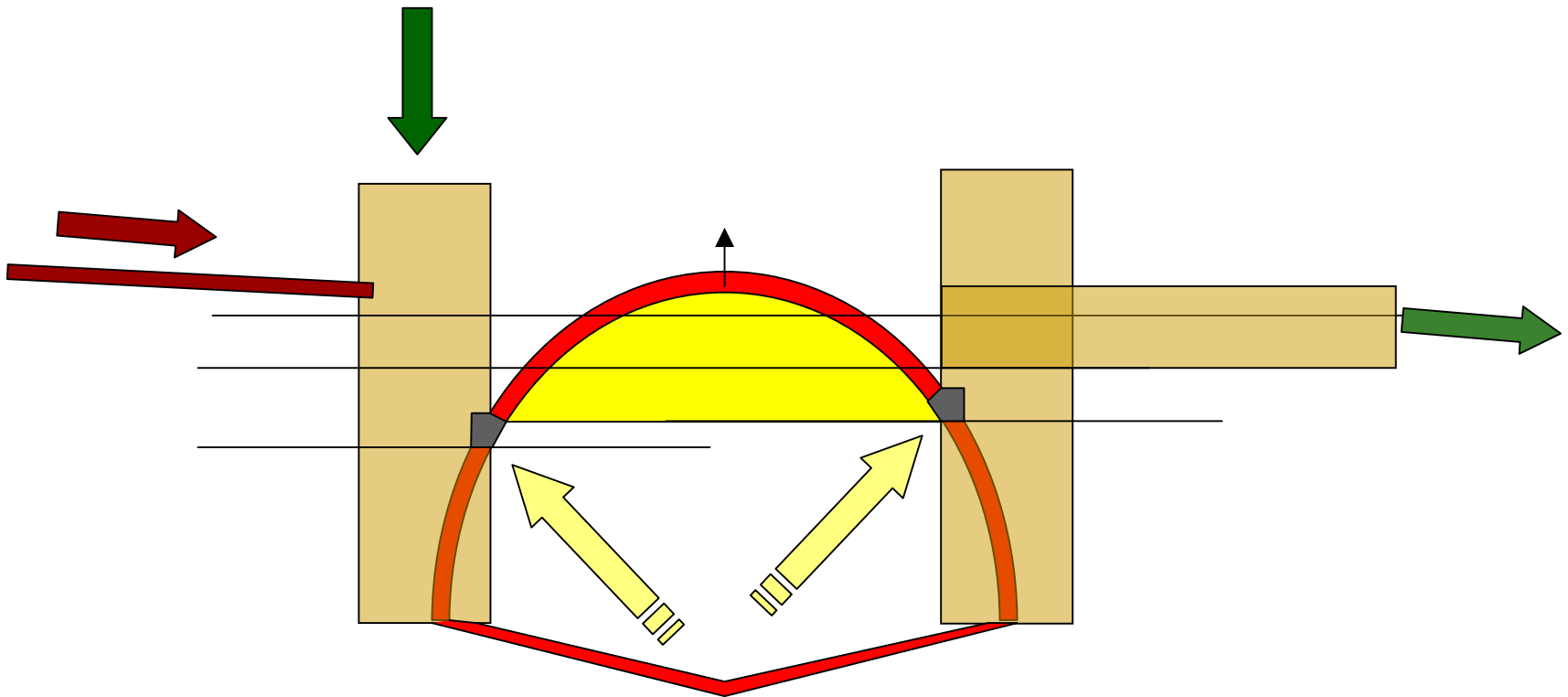
- **The new approach in Sustainable Sanitation (EcoSan) is recognizing human excreta and water from households not as a waste but as a resource that could be made available for reuse.**
 - **It is based on an overall view of material flows as part of an ecologically and economically sustainable sanitation system can easily modified to the needs of different users and to specific local conditions.**
 - **Anaerobic Digestion (Biogas) is one technical module to treat domestic and commercial wastewaters.**
 - **The by-products of the Biogas Technology contribute mainly to the cost recovery and income generation**
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Small Biogas Plant For Wastewater, Kitchen And Garden Waste



Sketch of biodigester replacing a septic tank. Wastewater as well as kitchen and garden waste enter the digester and are broken down to biogas and fertile water.
The advantages: No more emptying of septic tank. Reuse of all water in the garden.
Less cost on cooking energy.

The Core Module of the System



Simple Fixed-Dome Biogas Digester for Wastewater Treatment

Construction Steps of a Biogas Plant



Institutional Biogas Plant of 124 m³:

1. excavation works, brick production for the dome,
2. construction of the cylindrical digester body, the spherical dome and the 2 expansion chambers,
3. casting of the lid, biogas piping
4. assembling of suitable biogas appliances

(Pictures show Gachoire Girl's High School EcoSan Pilot Project, Kagwe / Kenya)

Biogas Appliances for Households



Biogas stoves locally produced by artisans.

(top: Rwanda, right top: Kenya)



Commercially produced modern stove with piezo-ignition.

Shenzhen Puxin Science and Technology Co. Ltd., China (Right below)



Biogas Appliances for Households



A variety of commercially available Biogas appliances - household level:

- Small scale 600 W Motor-Gen-Set to produces electrical energy
- stoves, lamps, water heaters with piezo-ignition

Product illustrations:

New World Stainless Steel Ltd., Nairobi / Kenya
Shenzhen Puxin Science and Technology Co. Ltd. / China

Biogas Utilization on Commercial Level



**Biogas System
H-UASB with
60 kW Generator**

Biogas Potentials

■ 1 m³ Biogas of 60% Methane (CH₄) Content is equivalent to about:

- | | |
|---------------------------------|----------------|
| ■ · Diesel / Kerosene | approx. 0.8 l |
| ■ · Fuel Wood | approx. 1.3 kg |
| ■ · Cow Dung (kg dry matter) | 1.2 kg |
| ■ · Hard coal | 0.7 kg |
| ■ · Electricity by Motor-Genset | 1,5 kWh |

Benefits achievable

- **Social benefits**

- Job creation for local artisans**

- Health improvement due to better sanitation and reduced in-house pollution**

- Reduces work load of women collecting fuel wood**

- Lifestyle improvement through modernization of household appliances**

- **Health benefits**

- Health improvement due to better sanitation and reduced in-house pollution**

- **Economic benefits**

- Energy savings on both private and national level**

- End products replace not available or expensive chemical fertilizer**

- Pays back investment and covers maintenance costs**

- Replacing chemical fertilizer and improving soil fertility**

- Various use of end product**

- Income increase**

Environmental and Ecological Benefits

One Biogas digester of

8 m^3

=

3.5 m^3 of fuelwood

Biogas Protects Forests

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Thank you very much! Asante Sana!

