



Digestori a tamburo galleggiante a piccola scala: alcuni esempi dall'Africa

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ARS ambiente srl

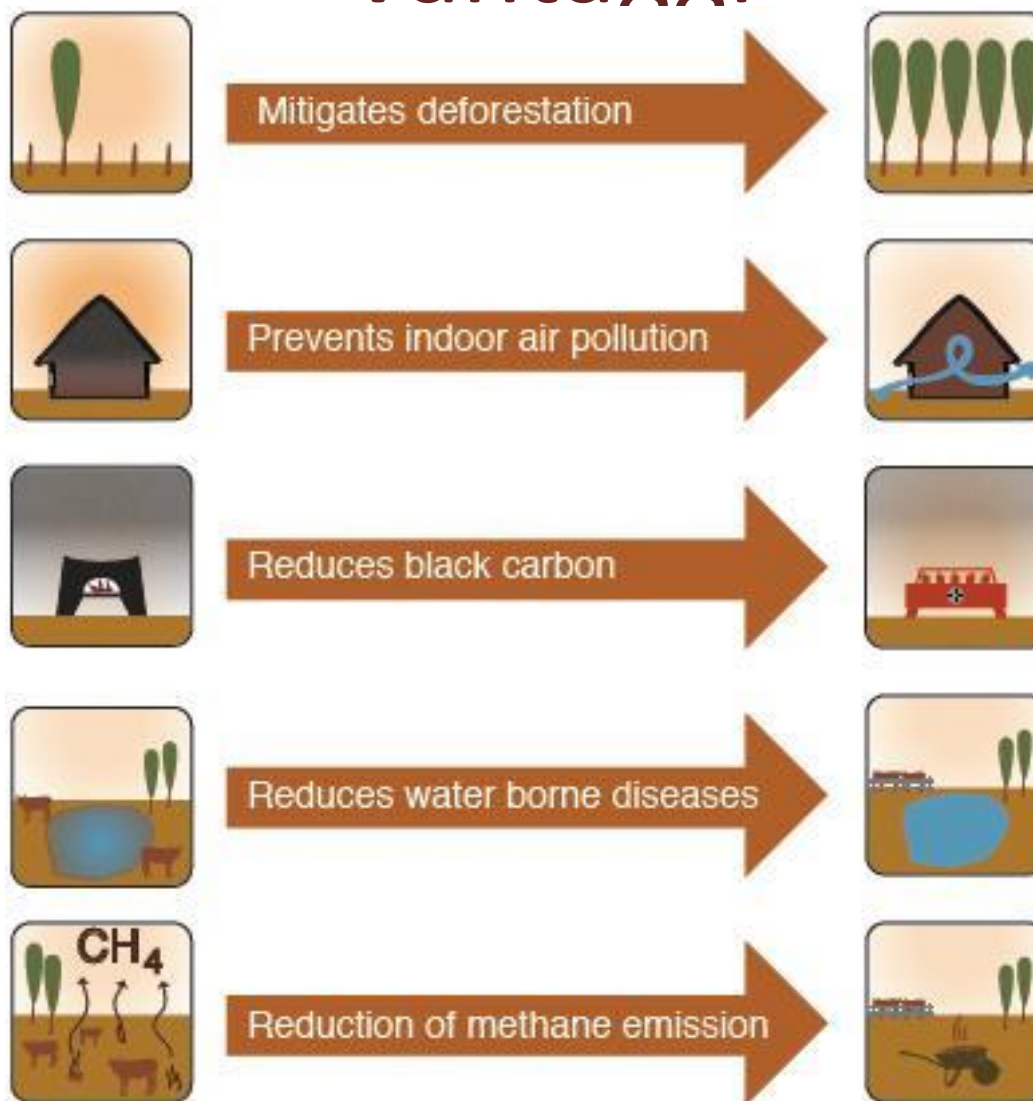


- ISWA International Waste Manager
- Socio CAST ONG



BIODIGESTORI A MICRO SCALA

Vantaggi



Diffusione nei paesi in via di sviluppo

The three main types of digesters that have been implemented in developing countries are:

- the fixed-dome digester,
- the floating-drum digester
- the tubular digester,

All of them are **wet** digestion systems operated in **continuous mode** under **mesophilic** conditions.

Basic features:

- inexpensive,
- built with locally available material,
- easy to handle,
- do not have many moving parts, thus being less prone to failure



**Anaerobic Digestion of Biowaste
in Developing Countries**

Practical Information and Case Studies

<http://www.eawag.ch/forschung/sandec/publikationen/swm/dl/biowaste.pdf>

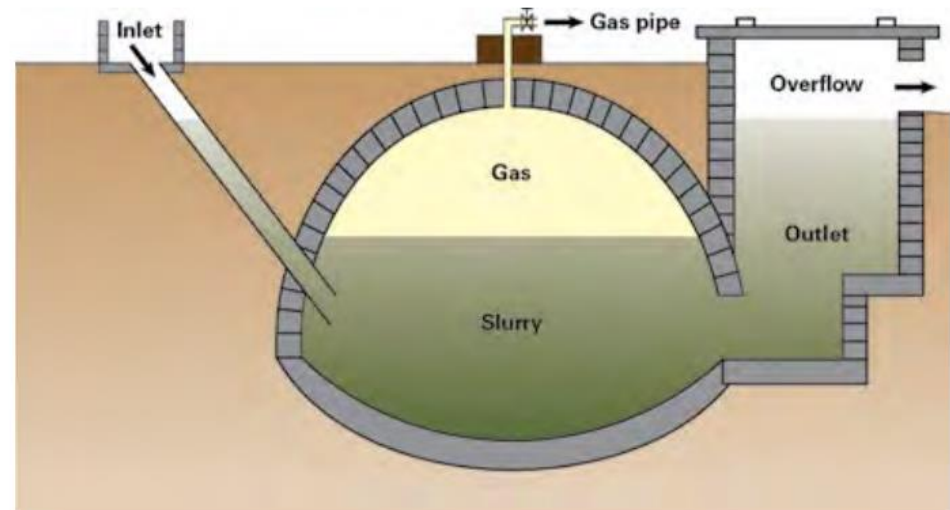
Fixed-dome

Advantages

- Relative low construction costs
- Long life span if well-constructed
- Absence of moving parts or corroding metal parts
- Underground construction saves space and protects the digester from temperature fluctuations
- Local construction provides opportunities for skilled local employment

Disadvantages

- Certain specific technical skills are required to ensure a gas-tight construction
- Fluctuating gas pressure depending on volume of stored gas
- Special sealant is required for the inside plastering of the gasholder (e.g. bee wax-engine oil mixture, acrylic emulsion)
- Gas leaks may occur when not constructed by experienced masons
- Difficult to construct in bedrock
- Difficult to repair once constructed as the reactor is located under soil



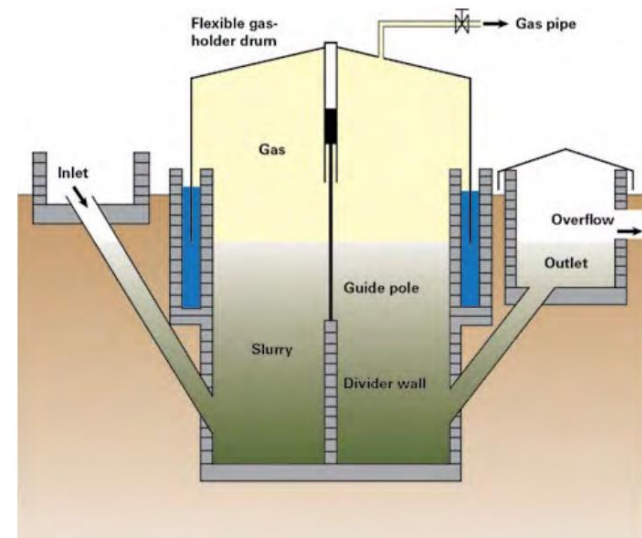
Floating drum

Advantages

- Simple and easy operation
- The volume of stored gas is directly visible
- Constant gas pressure
- Relatively easy construction
- Construction errors do not lead to major problems in operation and gas yield

Disadvantages

- High material costs for steel drum
- Susceptibility of steel parts to corrosion (because of this, floating-drum plants have a shorter life span than fixed-dome plants)
- Regular maintenance costs for the painting of the drum (if made of steel)
- If fibrous substrates are used, the gasholder shows a tendency to get "stuck" in the scum layer (if gasholder floats on slurry)



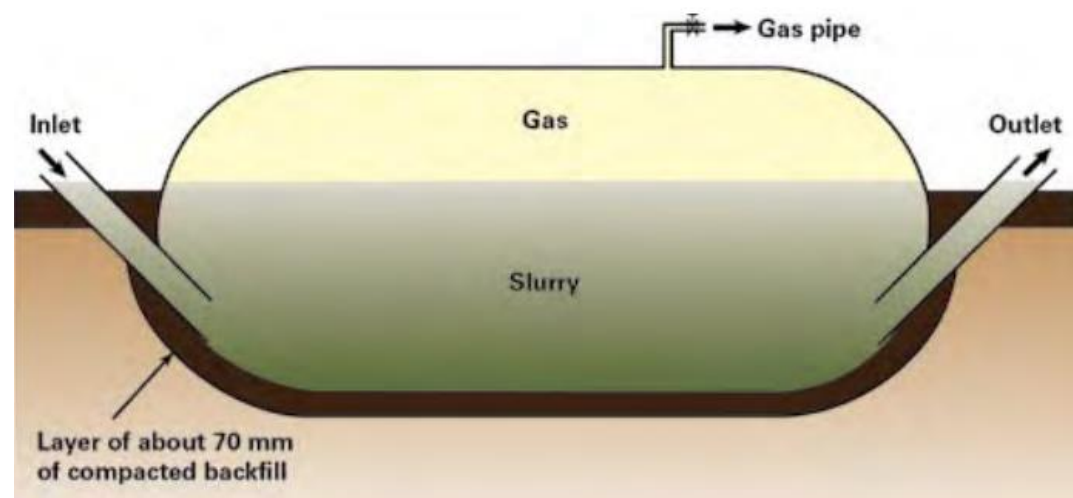
Tubular

Advantages

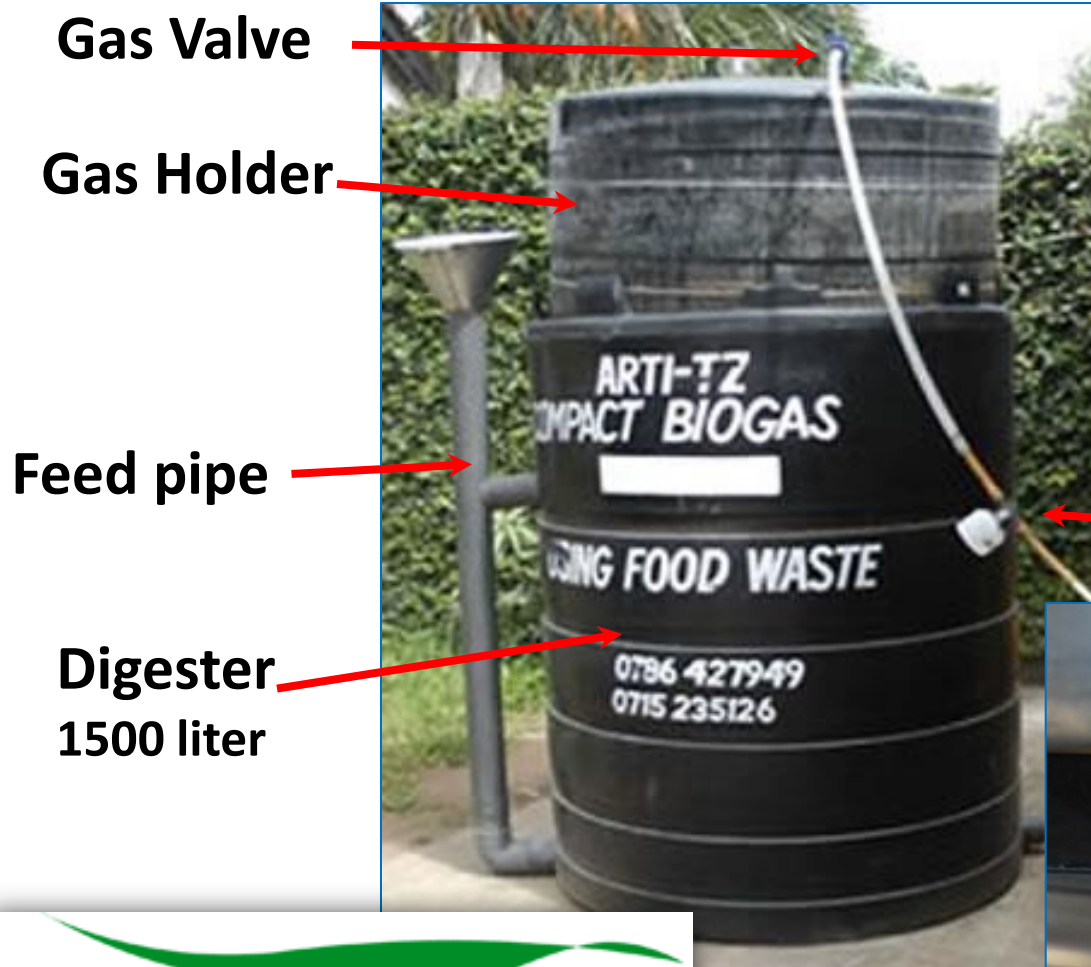
- Low construction cost
- Ease of transportation
- Easy to construct
- High digester temperatures in warm climates
- Uncomplicated emptying and maintenance
- Shallow installation depth suitable for use in areas with a high groundwater table or hard bedrock

Disadvantages

- Relative short lifespan
- Susceptibility to mechanical damage
- Material usually not available locally
- Low gas pressure requires extra weights
- Scum cannot be removed from digester
- Local craftsmen are rarely in a position to repair a damaged balloon



the ARTI Compact Biogas Digester



Requires 1.5m² of level space in a sunny location within 10m of kitchen.

Gas Capacity: 760 litres or 2hrs or more cooking time per day on a single burner stove.



the ARTI Compact Biogas Digester

ARTI – Appropriate Rural Technology Institute: NGO based in Pune, India

Short Description

- Problem: Cooking fuel, waste disposal, inefficiency of traditional biogas cattle dung digesters
- Idea: A very efficient process of biomethanisation thanks to high calorie content of the waste used for the bacteriological digestion. The system is usable by any household.
- Difficulty: Construction: easy to medium, use: easy. The digester should be kept at temperatures between 32 & 37°C (89.6-98.6°F)
- Price Range: About 100\$ with new material
- Material Needed: 2 plastic water tanks, one of 1cubic meter, the other of 0,75 cubic meter content, flexible pipe, stable horizontal base, frame to stop the gas tank rise, inlet and outlet fittings
- Geographic Area: Global, in temperate to cold climates, the plant has to be heated
- Competencies: Simple plumbing skills
- How Many people? 2
- How Long does it take? From three to max. ten hours construction time, two weeks to start the methane production



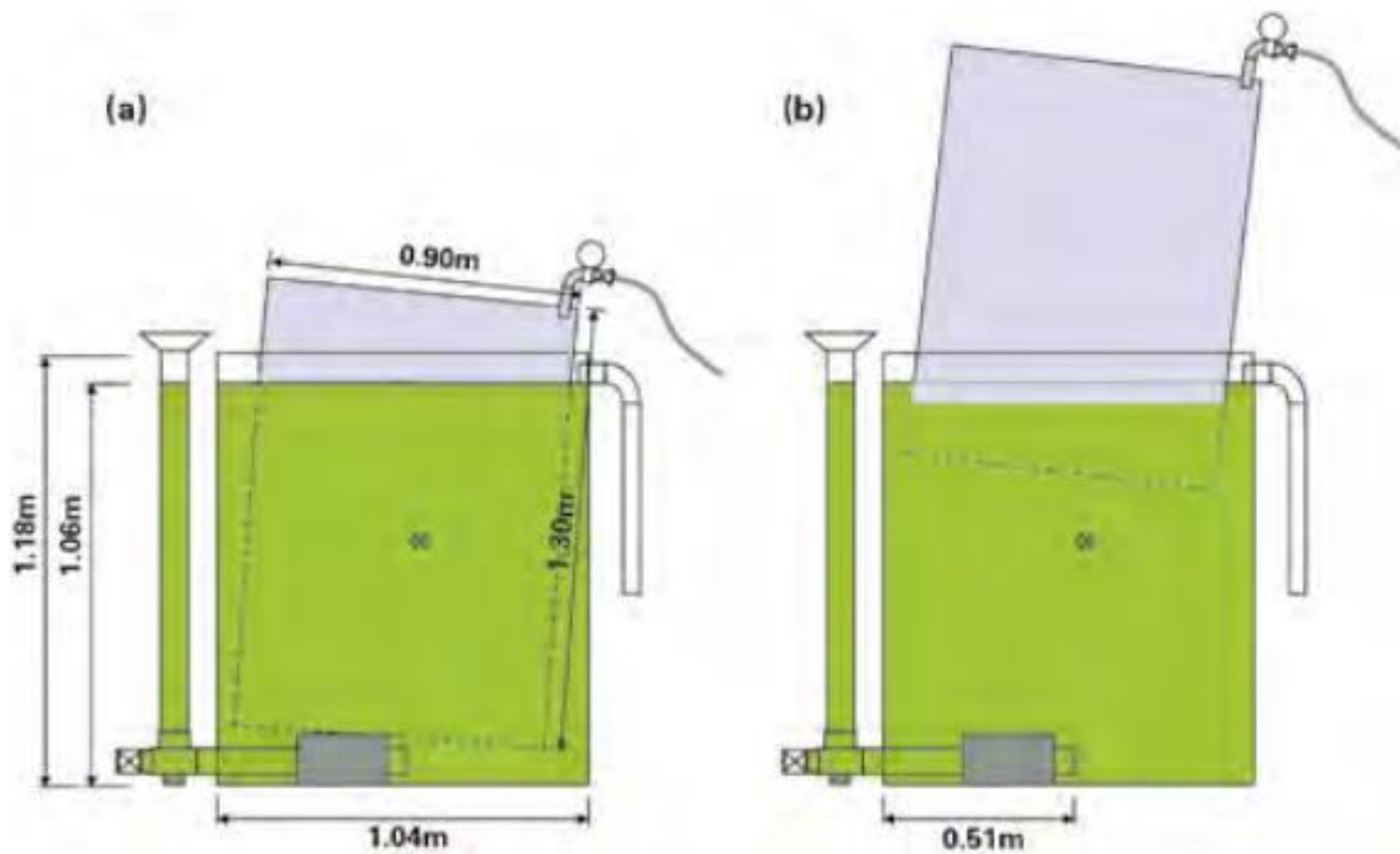


Figure C1: ARTI compact biogas plant scheme ((a) gasholder empty, (b) gas-filled).



SimGas



SimGas

sim gas
Nishati Yetu

HARAKA. SAFI. GHARAMA NAFUU.

Jinsi ya kutumia taka za chakula kulengeneza biogesi ya Gesi550

KUTOKA KWA WATENGEEZAJI WA **SIMTANK**

746-427
Tigo 0658
Airtel 0684
Zantel 0779
747-427

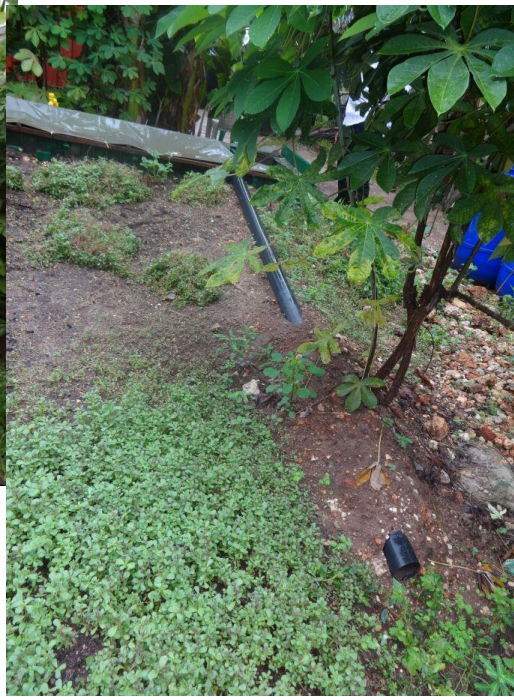
Barua pepe: info@simgas.com
www.simgas.com



SimGas “shamba”



SimGas “shamba”



SimGas: vantaggi

- No gioco tra le due tank (sono su misura, con guide di scorrimento)
- Miglior sistema di alimentazione (no intasamenti)
- Differenza tra SimGas Gesi e Shamba:
 - tempo di ritenzione (44 gg nel shamba, 20 nel Gesi)
 - Modularità (shamba costruito con moduli imbullonati, possibilità di espanderlo)
 - Shamba più idoneo per utilizzo con scarti agricoli + latrine

Utilizzo in ambito rurale

- Una possibile integrazione nella filiera della **trasformazione della cassava**
- Cassava: coltura antichissima, non esigente, tubero molto ricco di amido. Ma: elevata deperibilità. Occorre trasformarla.
- Progetto: CAST ONG, Laveno Mombello (VA). Food Security in Songea, Tanzania



Cassava



Sbucciatura (15%, cianosidi)



Grattugia



Pressatura



Cassava



Essiccazione



Macinatura

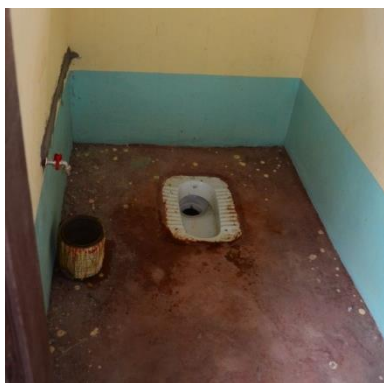


Trasformati

Cassava, biogas e eco carbone



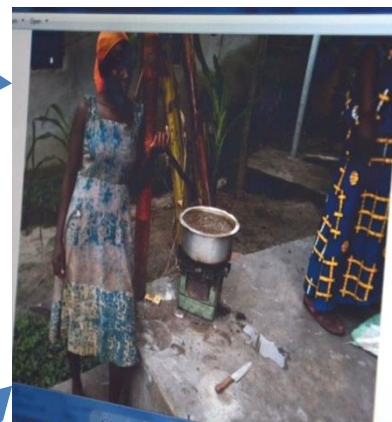
Bucce



Latrine



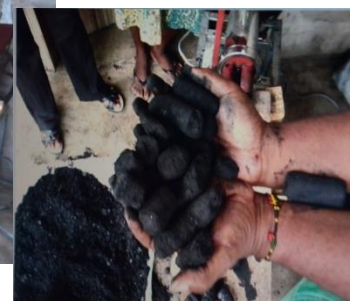
Miglioramento essiccazione



Cassava glue bollitura



Gassificazione scarti mais



Utilizzo in ambito urbano

- Floating drums ARTI e SimGas: venduti principalmente in aree urbane (anche ARTI India)
- SimGas: anche microcredito dai paesi ricchi
- Problemi:
 - mancato pagamento del canone mensile
 - Distribuzione del biogas agli utilizzatori limitrofi

Middle/Upper

Location: Mbezi Beach, DSM

Population: 50,000+

Initial Units: 150 homes

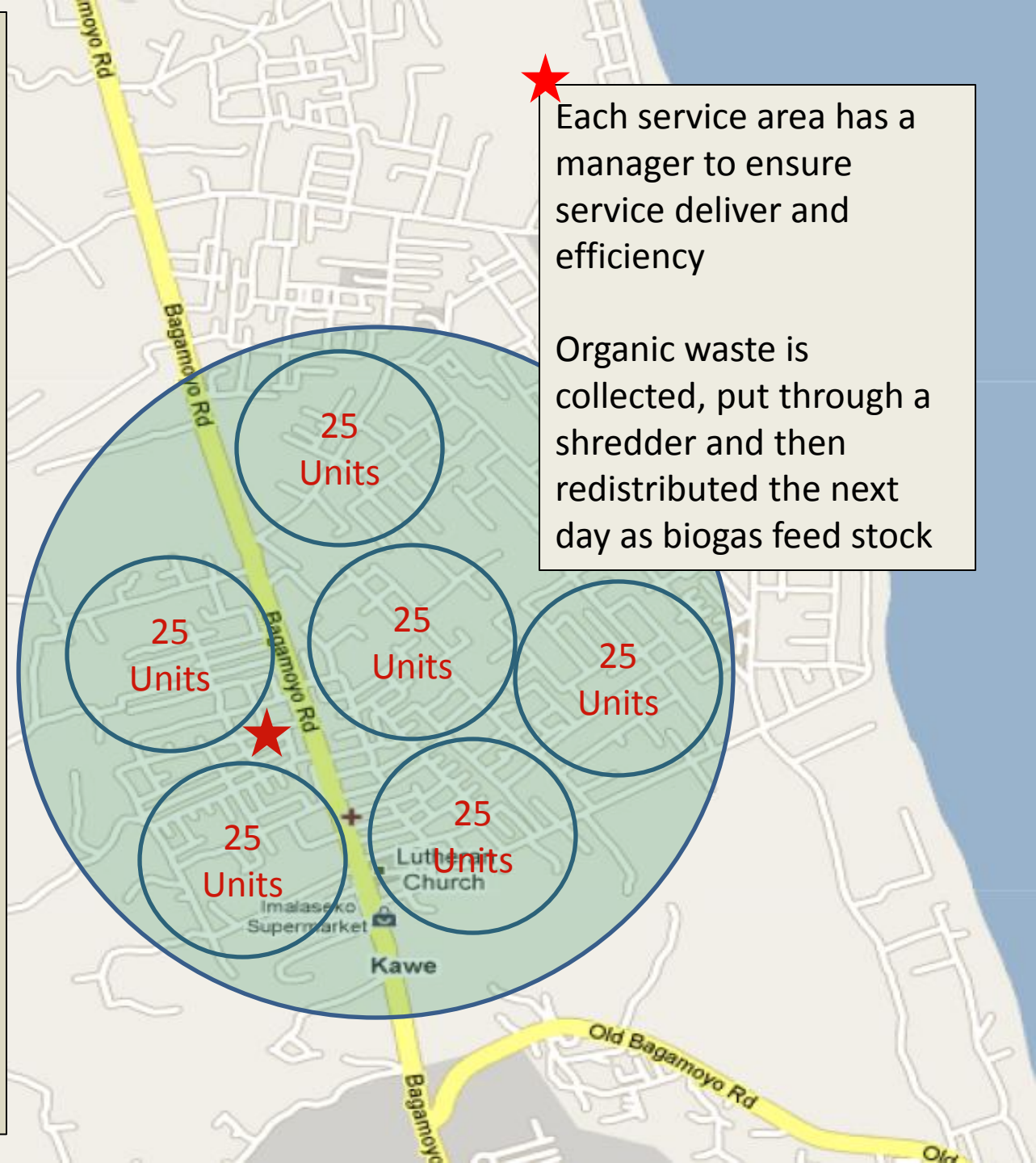
Jobs Created: 6-12

Waste Treated/mo:

27,000kg

Process:

- 150 units divided into 6 service routes each managed by 1-2 persons
- Daily visits by service provider to collect organic waste and fertilizer (overflow), and feed system 6kg feed stock
- Fertilizer bottled and resold
- Service provider collects monthly payment at end of month
- If payment not made, biogas is disconnected



Each service area has a manager to ensure service deliver and efficiency

Organic waste is collected, put through a shredder and then redistributed the next day as biogas feed stock

MISSING LINK TECHNOLOGY

Biogas backpack

- [Commercialized by \(B\) Energy](http://www.be-nrg.com/)
- <http://www.be-nrg.com/>
- Ms Katrin Puetz
- Based in Addis Ababa



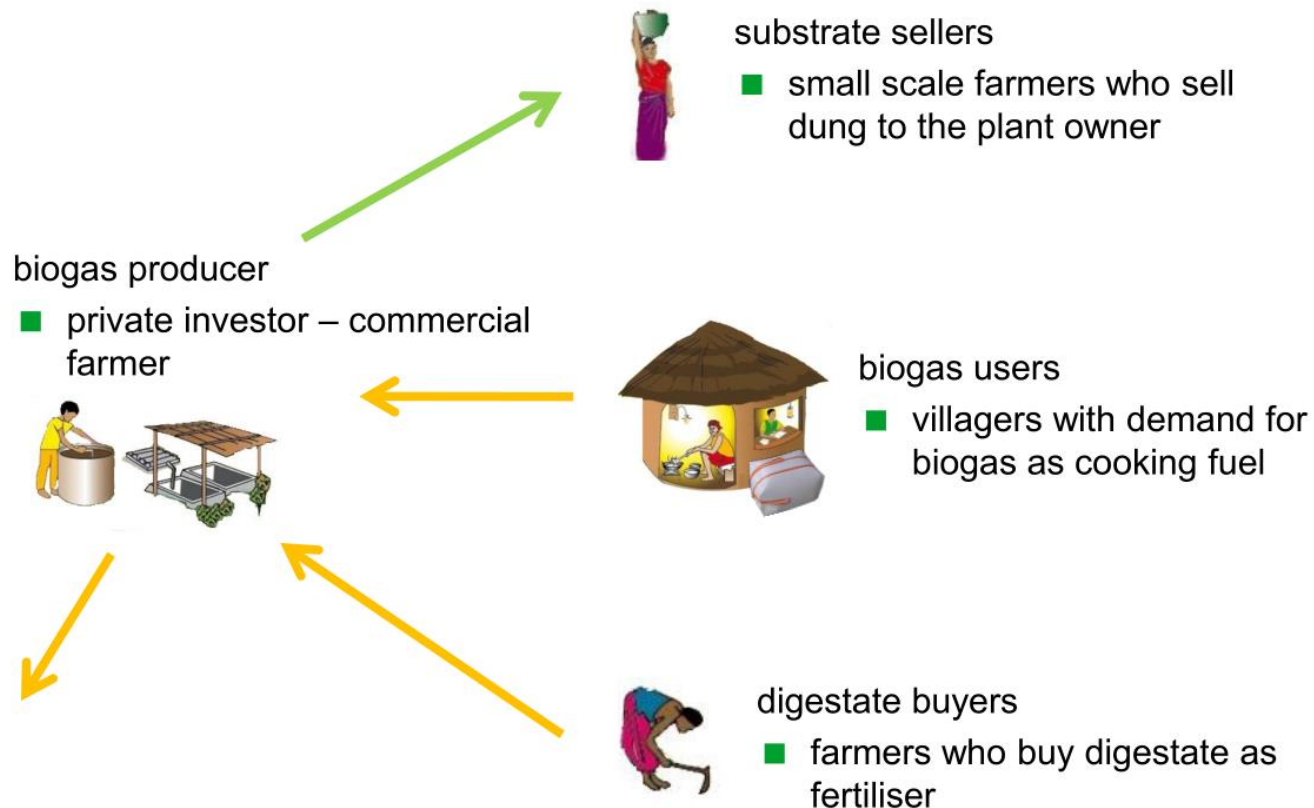
Biogas backpack



Biogas backpack



- alternative concept
biogas as business

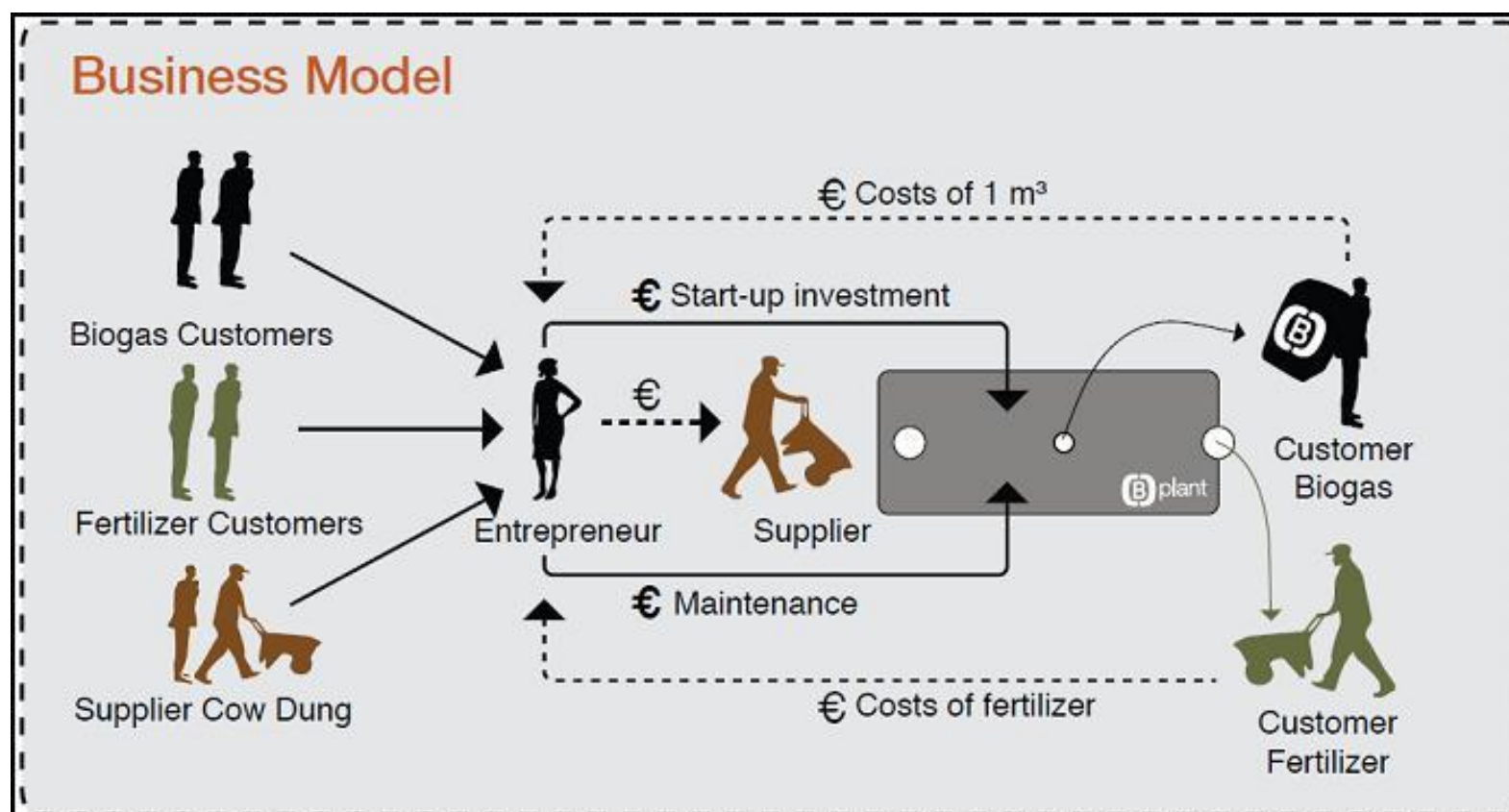


Biogas backpack

- Capacity: 1.2 m³ biogas
- Weight: 4.4 kg
- PE liner: permeability for CO₂ 4-7 fold higher than CH₄ (transmission rate: CO₂ 840 ccm /m².d, CH₄: 200 ccm/m².d), partial “upgrading”
- 1 cubic metre -> 2 hours cooking time



Backpack business model



First trials

- The biogas backpack was introduced to 3 test households in Nakuru, Kenya. The pilot project was financed by UN IFAD whose aim was to make biogas portable.
- From existing domestic biogas digesters; the biogas producing households were introduced to the entrepreneurial idea of selling excess gas to one household in their neighbourhood.
- Due to the severe energy scarce situation in this area, family members have to walk far distances to **buy fuel wood & charcoal at significant prices of up to 50% of their monthly income.**
- The introduced business idea has become a win-win situation for both parties. Backpack users refilled their pack every 2-3 days and the negotiated price was a balance between good business for the biogas supplier and a significant saving for the biogas buyer.
- **Lessons learned:** The biogas backpacks were given to the households for free. Lack of ownership and responsibility resulted for the backpacks to be damaged after several months. Despite the large demand for cooking energy the biogas trade has come to a halt.

Another idea: Biogas bottling

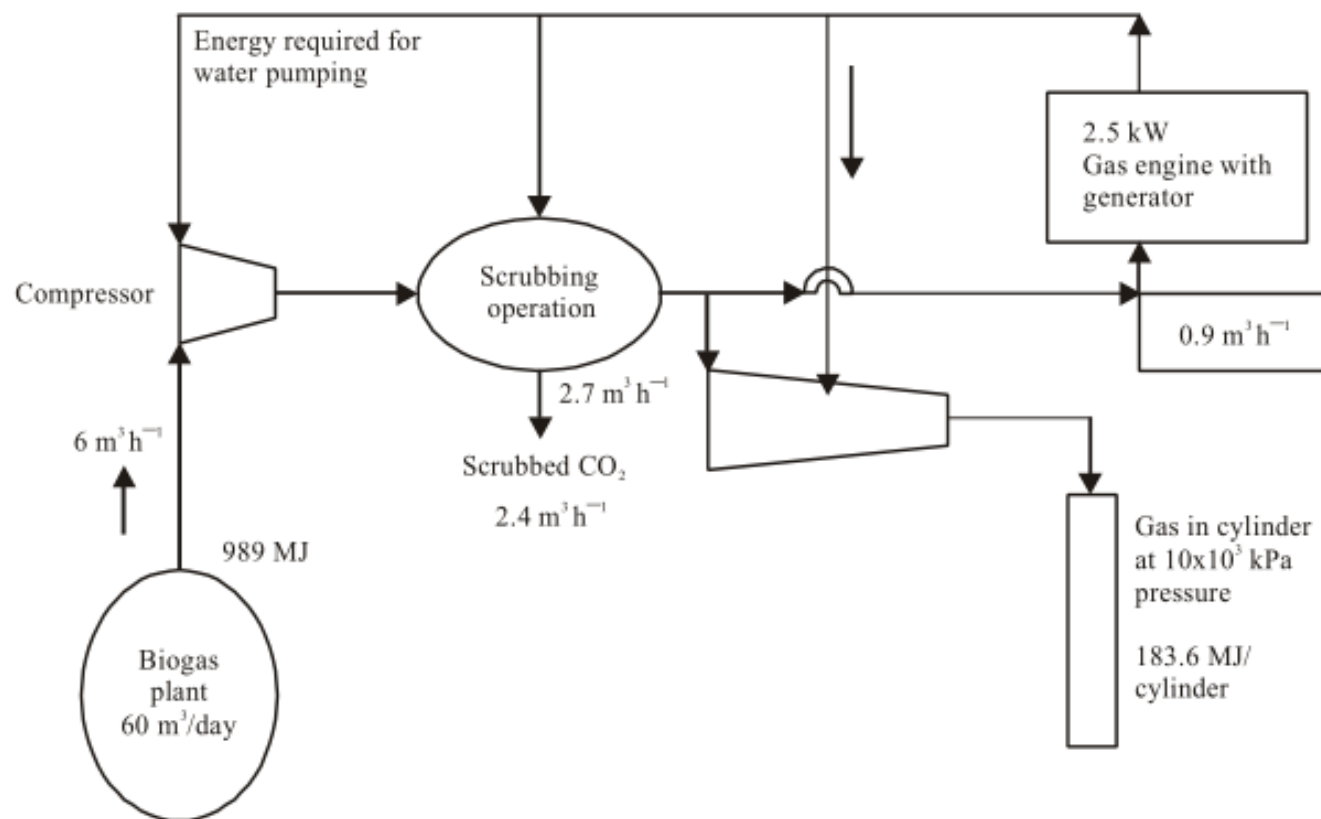


Fig. 1: Energy balance for purification and compression of badgas

Grazie

- www.arsambiente.it
- Progetti CAST: www.cast-ong.org



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