IWRM-Indonesia Fact Sheet

Floating roof bio-gas in cluster-mode (rural concept)

General Data

Plant type:	***Floating roof bio-gas in cluster-mode***
Location:	Pucanganom, Kabupaten Gunung Kidul, Province of Yogyakarta Special Region, Indonesia (110.681611°E / -8.049990°S)
Operated since:	June 2013
Operator:	Private households

Operating Data for one pilot Biogas plant

Connected households	3
Connected toilets	1 (4 people)
Cow dung per cow and day	ca. 8 kg (total 2 cows)
Produced amount of gas	480 l/d
Consumption of gas	50 l/h per gas cooker
Duration of use	3 h/d per household

1 Objective

In the frame of the R&D project “IWRM Indonesia”, water quantity was successfully enhanced using an innovative approach in terms of underground hydropower driven water supply to deliver water from the 100 m deep karst aquifer without use of external energy. Thus, it was possible to continuously secure the water supply for some 75.000 people. After the foremost problem was solved and water quantity was enhanced, further questions had to be addressed such as water distribution, waste water treatment and water quality assurance.

It was determined that the best system for this region is a semi-centralized anaerobic system (Fig. 1) by closing the nutrient and water cycle as well as producing renewable energy by treating black water together with cow dung and bio waste. The biogas system is based upon Floating-Roof-Digesters with a gas-dome made of fiber. For the production of sludge, cow manure as well as human feces, night soil and bio waste will be used. The digester unit is a water- and gas-tight chamber where an anaerobic reaction occurs. One end product of this reaction is biogas which is delivered to households with a simple gas pipe system. The second end product is the so-called digestate. It is treated in the sludge bed and used as fertilizer. Three pilot plants with an average of three connected households were successfully implemented in a cluster mode in the project village of Pucanganom.

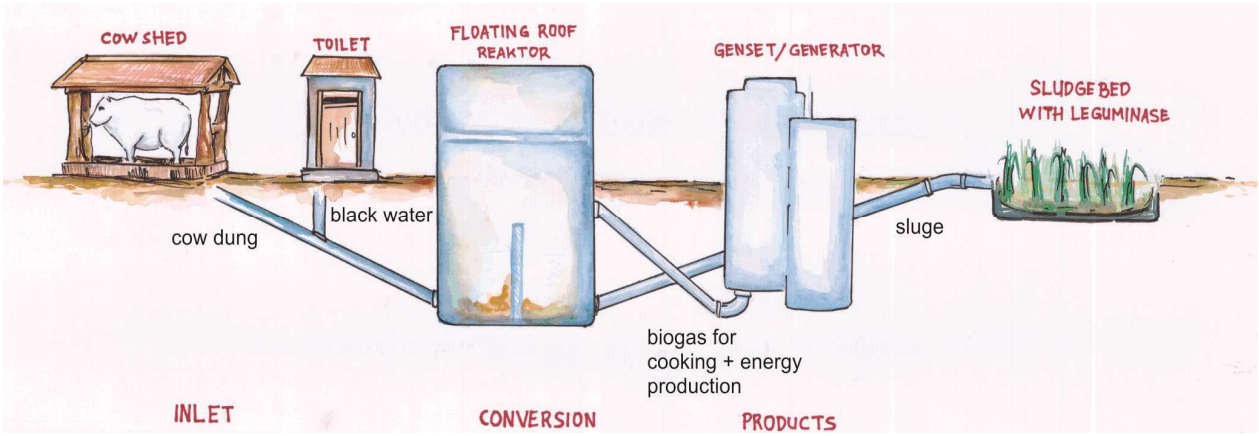

Fig. 1. Schematic description of the floating roof bio- gas

2 Implementation and Results

The realization of each plant took about two months including earthworks, formwork as well as gas pipe networking. The construction of the digesters was performed by locally available materials and workers. Two digesters were made of reinforced concrete and one is a brick construction. The two digesters build in reinforced concrete posed a challenge to the local workers as they were not used to work with reinforced concrete. The brick construction in contrast proved to be easier and faster to build than the concrete unit. Locally available clay stones were used as base material.

Fig. 2. Schematic description of the floating roof bio- gas

The addition of black water as part of a co-digestion to the biogas plant was difficult as local people want to avoid contact with sewage water. The first plant was not connected to any toilet due to technical issues. The second plant is only connected to one toilet which has been running since

then without any issues. To the third plant, five toilets were connected. At the beginning, plant users refused to use the biogas because they feared contaminations of the biogas. However, after accomplishment of further awareness raising campaigns and workshops the biogas was used without any complaints.

Since the successful implementation of three pilot plants in 2013 (Fig. 2) the produced gas is used for cooking. The best running system (Bio 2) produces an average gas yield of 480 l/d. The produced amount of gas in all three plants ensures that each household can cook for up to three hours per day. According to comprehensive surveys carried out by KIT this amount is sufficient for their daily needs.

The developed Floating roof concept achieves the following objectives:

- System without any outlet
- Utilization of organic waste
    - energetically
    - as fertilizer
- Use of locally available material
- Participation of local people (users)
- Simple construction, operation and maintenance

3 Project Partners

Karlsruhe Institute of Technology

Ministry of Public Works and Public Housing

Province of Yogyakarta Special Region

National Nuclear Energy Agency

Local Government of Gunung Kidul Regency

4 Contact

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