

Applied Research Partnerships with Developing and Transition Countries

Swiss Universities of Applied Sciences and Universities of Teacher Education

Project title

AUTONOMOUS ENERGY PRODUCTION FROM BIOMASS WASTES AND IMPROVEMENT OF THE ENVIRONMENTAL SITUATION IN JAVA

Thematic focus

Renewable energy, biogas research, ecology

Year

2012

Project location

Java, Indonesia

Swiss Institution

Dr. Rolf Warthmann, ZHAW Zurich University of Applied Sciences, Institute for Biotechnology / Center of Environmental Biotechnology, Wädenswil, Switzerland

Partner Institution

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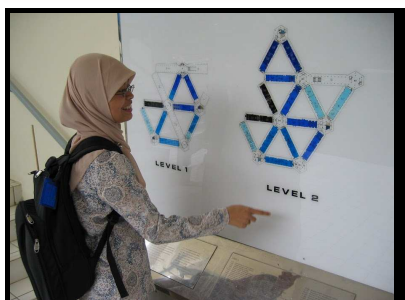
Description

Indonesia has a huge potential of biogas energy which is not used. From about 685 MW of bioenergy (calculated mainly with agricultural wastes) only a very small quantity is actually used so far. The focus of the Indonesian Center for Agricultural Engineering Research and Development was until now mainly to vulgarize small biogas plants on small farms with Chinese biogas technology showing capacities of less than 20 m3. Because of low biogas production, electricity still has to be produced by diesel engines, if no local provider of electricity is available. Access to electrical energy is something everyone is entitled to, and furthermore a vital condition to create more prosperity.

The aim of this project is to identify together with the local partners the regional potential of organic wastes and waste waters additional to animal manures suitable for biogas production and to identify possible locations for medium size plants on sites with small and medium size food industries producing biogenic wastes. In the current research project, biogas plants will be developed and adapted to the specific application and subsequently constructed in a second phase of the project. The project, i.e. this preliminary study presented here, is intended to be a first step in a long-term cooperation between Indonesia and Switzerland.

Development relevance

The proposed project in rural biogas production addresses several MDG's: Improving environmental sustainability by saving CO2 and CH4 emissions and water resources, improving health and hygiene as well as creating employment. Creation of global partnership addressing special problems of the partner country, and making the benefits of new technologies available for the partner country.




Dr. Munti Yuhana and colleagues are looking forward to a fruitful research collaboration between Bogor Agricultural University and Zurich University of Applied Sciences in Wädenswil.



photo about a rural biogas plant using agricultural waste for biogas production and nutrients recycling.

KFH

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Main features of the project

Aim of this preliminary project is joint research on biogas production from organic wastes in Indonesia, focusing on organic wastes from small food industries and agriculture. Therefore, it seems to be most important, to develop a simple and reliable biogas plant design, which is capable to digest a reasonable amount of such wastes in order to produce enough energy to cover the needs of small villages, remote farms or food industries.

Biogas substrates may include substrates with a high biogas potential, but not used so far in Indonesia, such as: Fish processing waste (e.g. fish innards, shrimp peelings), crop residues (e.g. from cassava), manure from animal husbandry, solid wastes from food industry and organic market wastes. Available substrates, substrate amounts and substrate composition will be analyzed on site. Parameters such as dry mass, digestibility and gas production yield will be measured at the local university. A concept of the utilization of the whole chain of organic residues and the nutrient recycling (P, N) will be established and tested in laboratory experiments.

At the actual state of knowledge, fish farming – as encountered all-around in coastal regions of Java - seems to be for example a very interesting object to be looked at: There is a need for electricity for aeration purposes and there are wastes from fish processing, which arise environmental and hygienic problems if just dumped. The final result of the preliminary study is to identify sites for plant construction and to determine the sizes and requirement profiles of the plants, which will be developed and constructed in a following step.

In a selected region of Western Java, a biomass flow analysis will demonstrate the availability of waste biomass from agriculture, coastal fish farming, dairy cattle, organic market waste and other sources. Mass flows (in t/month) will be displayed on a scheme including the geographical distance of the sources. Where necessary, the available biomass will be analyzed in laboratory for volatile organic carbon (VOC), dry mass (DM), nutrients content (NH₄-N, Total P) and tested for its biogas potential (CH₄/CO₂) in a standardized test. The test gives a biomass to biogas conversion ratio (BBCR) for the specific substrates. These data will be the basis for planning of a biogas pilot plant for electricity production. Besides natural science research, the acceptance and socio-economic side-effects of renewable biogas-technology in Indonesia will be investigated in a future project phase.



Mid-sized biogas plants for energy production can be built under involvement of local craftsmen as this example from Tanzania demonstrates. The value added chain of biogas production can create sustainable employment and a reliable energy supply.



Location: The project is based in the western part of Java, Indonesia with Bogor Agricultural University as the research partner.