Biogas Production from Municipal Solid Waste and Agricultural Waste by Participation of Bangnangli Community

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Abstract: The biogas from municipal solid waste and agricultural waste were produced in local community of Bangnangli,Amphawa,Samutsongkram province in Thailand. Because of the large amount of agricultural waste such as coconut husk, pummelo peel around 15-20 tons/year and municipal solid waste around 1-2.5 tons/day. These kinds of waste are needed for a proper management and make some profit back to the community. Biogas from municipal solid waste and agricultural waste were established and the biogas product was transferred back to each household. The feasibility of this project was evaluated from several factors which were the brainstorming for the suitable type of the biogas production using questionnaire, participation and total satisfaction from the local community. In this program, 2 of 5 clusters in bangnangli sub district were participated in this program. The production rate of biogas from coconut shell, pummelo peel and municipal solid waste were 2.8- 111.7, 1.1 – 111.6 and 3.8-74.4 mg/kg/day, respectively and last until 19 day per batch. The evaluation results in this program indicated that 80% of the local community were more understand in the biogas production,90% of the local community were satisfied by this program,70% the local community want to expand the biogas production into larger scale and 75% of the local community were participated in every activities. The evaluation in this program was evaluated from the level of attention, questionnaire and level of participation from the local community.

Keywords: Biogas, Agricultural Waste, Municipal Solid Waste, Community

1. Introduction

Nowadays, management agricultural wastes procedures involve considerable expenses in collection, treatment and disposal, to attenuate negative and harmful impacts on the environment. Otherwise agricultural wastes contain considerable and valuable chemicals compounds and energetic and fertilizing properties which are lost in land filling or incineration, without any profitable use or valuable income of its potential (Liang et al,2009) . This management model is already recognized as inefficient and unsustainable and a change toward a better style of life and sustainable growth is under promotion. This requires a change of mentality of all the people in relation to wastes, an evolution of attitude on use of natural resources and implementation of more efficient procedures for waste separation, recovery and recycling of relevant components (Ren et al. 2010).Anaerobic digestion is a recognized powerful technology for organic biodegradables waste treatment, both in liquid or dry form, generating a methane rich biogas and a stabilized digestive (Callaghana et al. 2002). Its application, if combined with digestive in land application or composting, provides several benefits in terms of Renewable energy production, waste treatment, greenhouse gas (GHG) emission and fertilizer production. This process was initially applied as multiple substrate technology (Cho et al. 1995 and Appels et al. 2008).

Ninety percent of waste and sewage produced from household activities in sub district Bangnangli, Amphawa, Samutsongkram province in Thailand were eliminated within home itself. The least of 10% were put in a plastic bag for the municipal services. Household waste water will be drained

Away the river except waste water from some restaurant, the grease in waste water was trapped. Trapped grease because the problem to the community and environment due to lack of appropriate treatment and even some household or restaurant had no grease trap.

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The previous study suggested that the production of renewable energy from vegetable about 50-70 liters and there was found from the field research that waste management is the major problems in 11 tumbols, especially in some area which has no trash can. From the public hearing in November 2010 arranged of Suan Sunandha Rajabhat university researcher. It was found that the proper value – added waste management in their community is needed. In this study, the community involvement collaboration in waste and sewage management into renewable energy was conducted as another alternative to prevent and resolve the environmental impact and other area further. The aim of study,**t**o create the community involvement in the management of garbage and waste water into renewable energy and evaluate the level of involvement in the production, use of the biomass in Bangnangli, Amphawa, Samutsongkram province.

2. Material and Methods

2.1. Experimentation site

The biogas production pilot unit is located in Bangnangli, Amphawa, Samutsongkram province .

2.2. Experimental design

The installation is made up of three continuous-type digesters

The digesters, buried unit made of Poly vinyl chloride(PVC) , measure 4000 m^3 and were designed to provide the anaerobic environment essential for the bacterial activity that produces the biogas.

Experiments were carried out during warm season (30–40°C) and repeated three times. Substrates were municipal wastes, nata coconut and aquatic weeds.Three hundred kilograms dry weight for substrates of water , cut into small pieces of 5 to 10 cm pieces,and 1,000 kg dry weight of fresh cow dunk (3/1 ratio) were diluted in 20 m^3 of liquid and introduced into the digester. The gas is collected and stored in the storage tank (Hartmann et al. 2005).

2.3. Experimental procedures

First of all, this study was focused to create the collaboration within the community in the collection and waste management in their area and converted into biomass energy for their community. Second, Restaurant and household were 100% chosen to participate in this program also the involved agency and volunteers are included Brainstorming of the people in the community was conducted to create collaboration in this program and choose the pioneer group and area. Moreover, waste sample collection areas were created and the ways to handle the waste samples were investigated. The behavior activities of type and design of the biomass production from waste and sewage were recorded in statistical value such as average, percentage and frequency.

After that, training and demonstration in the production of biomass from household waste and wastewater also the energy utilization were enforced. Finally, monitoring and evaluation of this program about participation and satisfaction of the community by questionnaire, monitoring and describe in statistic as in average, frequency and percentage.

3. Results and Discussion

The result was found that this program were truly beneficial for the community in the waste management 66% need to reuse material in the area 36% wants to convert waste and aquatic weed in to biogas, and 29% want to have grease trap at their home.

It was found that one of the medium-size factory in their area that produced waste water in this area which was a nata coconut factory. The waste water was produced at rate of 2,000 L/day.

There were three types of renewable that can produce from the source in this area which were bio- diesel from used vegetable oil and garbage, waste water and aquatic weeds, respectively, a shown in fig. 1

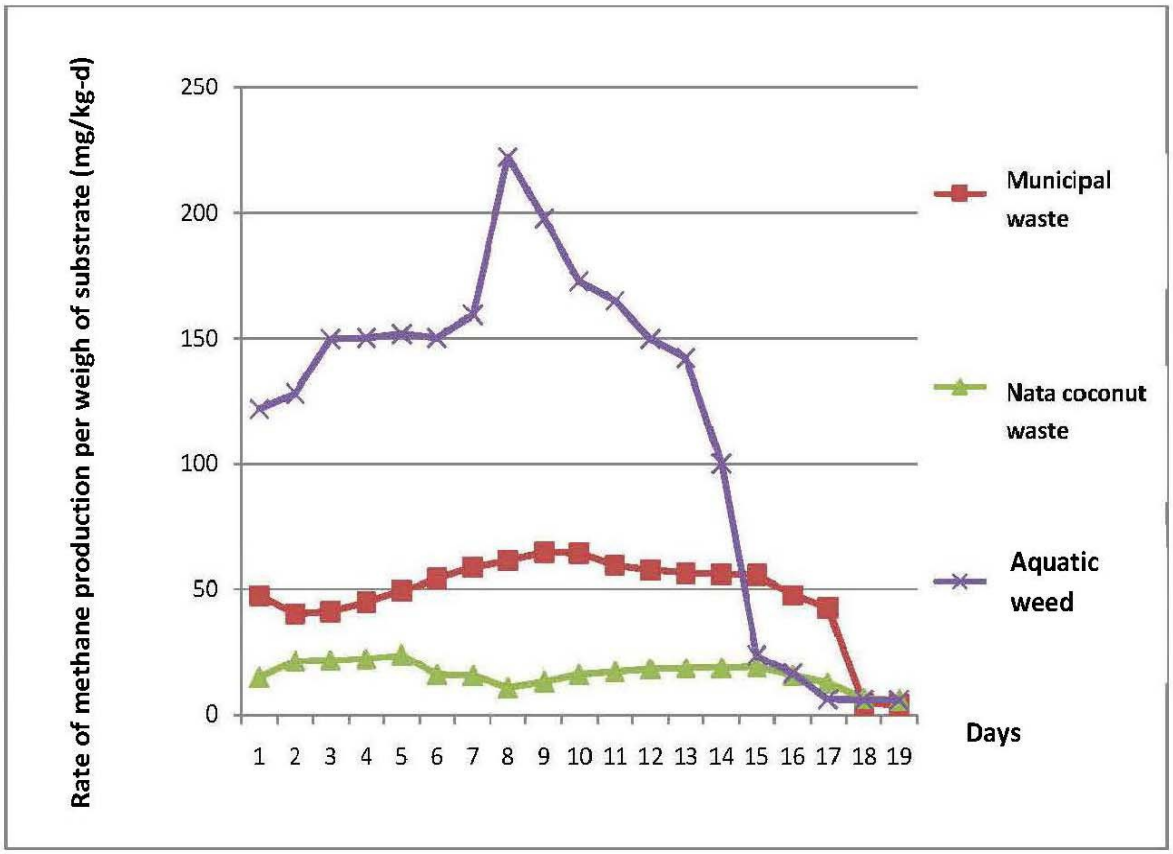

Fig. 1 Production of Methane from wastes

Assessment for the collaboration of the community was shown that 80% of the participants gained more knowledge about biogas. Ninety percentages of the participants satisfied in this program while 70% want to expand biogas production scale and the average of the overall participation was at 75%. The pictures of participation in the community were show in Fig. 2 – 4.

Fig. 2 Conducting participation in the community

Fig.3 Co-Design and construct the biogas system.

Fig. 4. Demonstration, Testing and utilization of biogas

Achievement of this program are based on the three strategies which were evaluate level of participation in the community, collaboration in the community and show the result of this program. The selected renewable energy in this program should be fast, simple and fit in everyday life style of the community.

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