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Production of Bio Gas Using Food Waste for Domestic Use

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ABSTRACT: A biogas is a modern energy source and is suitable to necessities of the future with the appropriate application of the digestion technology. The project aims at creating and establishing a fair evaluation system, capable to evaluate and compare efficiency of biogas plants by means of energetic, economical, ecological and socio-economic criteria. Thus, characteristic and objective parameters have been defined, which consider the overall production chain of biogas system, from the cultivation of energy crops, to bio conversion (digestion), on to final gas utilization and use of digested sludge. Detailed data has been collected from plants (banana stem), which generate green electricity by means energy crops, manure, and organic waste.

The production of biogas by anaerobic digestion of organic waste is a mature expertise that may clear enough benefits to the former. In addition through the utilization of biogas technology banana stem, cattle waste can be properly handled through anaerobic digestion, the generation of natural fertilizers and ultimately lead to an increase in output and income. Anaerobic digestion not only gives renewable energy, but also improves fertilizing qualities of manure and thus is way of manure treatment that offers the possibility for an environmentally friendly manure management.

I. INTRODUCTION

Society today is confronted with an increased demand for energy. The conventional energy resources appear not to able to meet this ever increasing demand. This is partly due to the ever increasing population and the dwindling sources of fossil fuels, the high cost of extraction of these fossil energy resources and the effect of harnessing these energy resources on the environment. Renewable energy sources is the recently noticed attention due to non harassment off environment during utilization.

Biogas is generated bacteria degrade biological material in the absence of oxygen, in a process known as anaerobic digestion. Since biogas is a mixture of methane (also known as marsh gas or natural gas, CH_4) and carbon dioxide it is a renewable fuel produced from waste treatment.

Anaerobic digestion is basically a simple process carried out in a number of steps that can use almost any organic material as a substrate – it occurs in digestive systems, marshes, rubbish dumps, septic tanks and the Arctic Tundra.

Biogas is best used directly for cooking/heating, light or even absorption refrigeration rather than the complicationandenergy waste of trying to make electricity from biogas. We can also run pumps and equipment off a gas powered engine rather than using electricity.

II. LITERATURE REVIEW

This chapter deals with the experimental studies about production of biogas from food waste, increasing the yield of biogas generation, optimization of end usage and various methodologies involved in increase biogas yield by bacterial adhersion.

Wojciech J. Florkowskia, Anna Usb, Anna M. Klepackac(2018) Food waste in rural households support for local biogas production in Lubelskie Voivodship (Poland) examines self-reported food waste volume generated by a sample of rural households in Lubelskie Voivodship in Poland accounting for four different categories of food waste. Food waste does occur and some of it is unavoidable leading to the question how to manage it. This study identifies factors responsible for the volume of self-reported food waste by category, but also identifies factors influencing the decision

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to collect food waste in household for the purpose of local biogas production. Tobit technique is applied to identify factors, demographic and socio-economic characteristics of consumers and their households that influence the percentage of wasted food by type. A separate decision equation identifies supporting or limiting factors influencing the decision to sort food waste for biogas production. Education, gender, age, household size, and employment status have been identified as relevant characteristics determining the volume of wasted food and the decision to support using food waste for biogas generation.

Households reporting a high income level are likely to waste lower amounts of fruits and vegetables and have less leftovers, but generate waste in "other food" category. Earlier studies show inconsistent effects of income on total food waste and this study suggests that, in terms of income, a future food waste study needs to consider further disaggregation of the "other food" category, possibly recognizing a different variety of foods consumed, including prepared foods, by high income households. Employment generally led to less waste in the current study, except for farm households which waste relatively more bread and bakery goods. Reasons for the observed differences are not readily obvious and should be addressed in a future study.

The prospects for possible collection of food waste for biogas production are reasonably good given the study results. Rural residents of Lubelskie Voivodship with higher income, higher educational attainment levels, having part-time employment and women are likely to sort their food waste for the purpose of local biogas production. The willingness to undertake sorting is essential because mechanical sorting is too costly according to some studies (Halloran et al., 2014). "Local biogas facility" implies that any transportation distance is relatively short. Earlier studies suggested that rural areas compare favorably in their biodegradable waste energy potential (Huopana et al., 2013) and food waste can complement other locally available biowaste. The construction of biogas facilities in rural areas of LubelskieVoivodship(PAP, 2016) offers real opportunities to utilize household food waste.

AyhanDemirbas, ErolPehlivan, TurkanAltun(2006) Potential evolution ofTurkish agricultural residues as bio-gas, bio-char and bio-oil sources, study has been conducted to evaluate the potential power production from the pyrolysis for bio-oil and bio-char, and anaerobic digestion (for bio-gas), of agricultural residues in Turkey.

III. METHODOLOGY

- To collect food waste from houses nearby.
- Segregation of food waste required as feed.
- To Select optimum mixing ratio by conducting various sampling
- Determine the quality of gas produced by testing the chemical combination

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IV. EXPERIMENTAL RESULT

The biogas production of all the three experiments was experimentally taken and the gas is tested for its chemical composition in the Lab.
In experiment 1, the composition of Cow dung, Food waste and water is in the ratio of 54.6:0:25.3was fed to the digestor and the gas was collected on
23.03.2019 and sent to lab under the reference S1- 23/3. The test result is as below.

From the chemical analysis of sample -1 **,** the methane content is about 55%, Carbon di oxide content is about 35%, Nitrogen present in the gas sample was 6% and water vapour is 4%. Our requirement is 50-75% of methane and the result shows the methane content is up to the required level.
In experiment 2, the composition of Cow dung, Food waste and water is in the ratio of 9.0:53.33:14 was fed to the digestor and the gas was collected on
03.04.2019 and sent to lab under the reference S2- 03/4. The test result is as below.
From the chemical analysis of sample -2 , the methane content is about 57.5%, Carbon di oxide content is about 32.75%, Nitrogen present in the gas sample was 6.25% and water vapour is 3.5%. Our requirement is 50-75% of methane and the result shows the methane content is up to the required level. The addition of food waste along with cow dung yields more methane content than cow dung alone also the nitrogen content also increased due to the enriched nitrogen in the food wastes.
In experiment 3, the composition of Cow dung, Food waste and water is in the ratio of 0:72:13.3 was fed to the digestor and the gas was collected on 23.03.2019 and sent to lab under the reference S3- 17/4. The test result is as below.

Fig .6.3 Result-3. From the chemical analysis of sample -3 , the methane content is about 53%, Carbon di oxide content is about 28.8%, Nitrogen present in the gas sample was 13% and water vapour is 5.2%. Our requirement is 50-75% of methane and the result shows the methane content is up to the required level. The addition of food waste alone reduces the methane generation but increased the nitrogen and water vapor generation due to the presence of enriched nitrogen in the food wastes.

Table 6.1 Composition of gas collected from digestor

Sl. No	Composition	Methane	Carbon Di oxide	Nitrogen	Water
	(CD:FW:W)	CH_4 (%)	CO_2(%)	N_2(%)	vapour
1.	54.6:0:25.3	55	35	6	4
2.	9.0:53.33:14	57.5	32.75	6.25	3.5
3.	0:72:13.3	53	28.8	13	5.2

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v. CONCLUSION

Biogas is an old methodology and developing technology inRecent energy trends. Food wastes having high potential of biogas production if properly mixed with cow dung because of rich nitrogen and carbohydrates content. Food wastes are easily available; over 150 tonnes of food waste are dumped into ground every day. By using these materials waste to useful form of energy can be converted. This project reviewed that mixture of food waste with cow dung gives required quality of biogas and daily feed of the same will give good biogas yield and we can save the LPG consumption oh household applications and provide the waste as manure for gardening. The following conclusions can be drawn from the study presented in this project.

- The test results gives that the food waste mixed with cow dung for producing biogas gives 4.55 % of increased methane content than the methane obtained from the Cow dung alone.
- The charging of Food waste alone produces biogas which is 3.6%lesser methane content than the methane obtained from the biogas from cow dung.

It is better that the biogas produced from mixing of food waste along with cow dung produces better quality of biogas when compared with only cow gung or only food waste as the feed.

FUTURE SCOPE

- Size of the biogas digestor can be increased for increased gas generation and storage should be also increased accordingly.
- Instead of Cow dung, poultry litter can be also used as a starter for biogas production.
- Trials to be taken on various mixing ratios to determine the better quality of biogas which is rich in methane content.

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