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Biogas From Cowdung: Its Scope And Prospect In Sivasagar District: A Case Study

Mrs. Bristi Dutta
Department of Zoology, S.P.P. College, Namti, India
Dr. Sontosh Kumar Singh Abujam
Department of Life Sciences, Dibrugarh University, India

Abstract:

Despite rapid growth of commercial energy, biomass remains principle energy source in rural and traditional sectors and contributes a third of India's energy. Biomass energy constitutes wood fuels (including charcoal, wood waste wood), crop residues (such as bagasse, rice husk and crop stalks) and animal dung (including biogas). The anaerobic digestion of animal manure for the production of biogas has many potential advantages. Biogas is another source of renewable energy, it is produced when biomass is subjected to biological gasification and a methane-rich gas is produced from the anaerobic digestion of organic materials (Sambo 2011). The clean and sustainable biogas stoves are more efficient then wood-fired mud-stoves. The present study will focus on generation of biogas from cowdung to address the household energy demand in an environmentally and user friendly way and its prospect and utilization in Sivasagar District. The cow dung yields biogas in the digesters that can be used for cooking and lighting and the digester slurry is a good manure. There are approximately more then 500 villages in the district. For the present study, only village areas were selected for the availability of cowdung. Only 13 stations have been selected for the present study from where a few villages have been selected for the present purpose. Although, due to availability of cowdung there is a lot of scope of production of biogas, only a few people in certain houses found to be involved in this practice. But most of them has discontinued this practice as they thought it to be labourious and time consuming. But it is high time to think about such an alternate source of energy and to remove the misconception from people's mind.

Keywords: *Cowdung, Biomass, Biogas, Digester, Biogas stove*

Introduction

Despite rapid growth of commercial energy, biomass remains principle energy source in rural and traditional sectors and contributes a third of India's energy. The national biomass policy however has a two decades of history, emanating with the rural energy policies. Historically, biomass has been a major source of households energy in India. Biomass meets the cooking energy needs of most rural households and half of the urban households despite significant penetration of commercial energy in India during last few decades, biomass continues to dominate energy supply in rural and traditional sectors. Biomass energy constitutes wood fuels (including charcoal, wood waste wood), crop residues (such as bagasse, rice husk and crop stalks) and animal dung (including biogas). The anaerobic digestion of animal manure for the production of biogas has many potential advantages. Biogas is another source of renewable energy, it is produced when biomass is subjected to biological gasification and a methane-rich gas is produced from the anaerobic digestion of organic materials (Sambo 2011) Biomass is the biological organic materials that are renewable and can be recycled to produce biogas. These range from the safe disposal of manure and to the production of electricity and heat. The present paper mainly focuses on the prospect of biogas produced from cowdung. The cow dung yields biogas in the digesters that can be used for cooking. The residues can be used as agricultural fertiliser. The small biogas digesters ($2m^3$) are made of local materials and use of agro-residues (mainly cow dung) as in input; this process produces biogas for the purpose of cooking. The goal of the present study is to replace common but inefficient wood-fired mud stoves with ones that run on clean, sustainable biogas stove. Biogas is produced from a three-phase process namely, hydrolysis, acid-forming and methane-forming phases. It is a biological engineering process in which a complex set of environmentally sensitive micro-organisms are involved. The gas is typically composed of 50-70% Methane, 30-40% Carbon dioxide, 1-10% Hydrogen, 1- 3% Nitrogen, 0.1% Oxygen and Carbon monoxide and trace of Hydrogen sulphide (Mshandete 2009). Biogas is also a waste management technique because the anaerobic treatment process eliminates the harmful micro-organisms. It is a heap source of energy due to the feed stock is usually waste materials. Biogas when further refined burns as well as liquefied gas, but does not add to global warming like liquefied natural gas (Akpabio et al., 2002). Flammable gas which helps in reducing deforestation (Nagamoni, 2007) can be produced through the conversion of animal dung into biogas. One of the by-products

of biogas production is nutrient-rich substrate that can be used as agricultural fertilizer. This substrate can be used in the fields in the same way as cow dung without compromising the humus balance. is claimed that its value as fertilizer could double crop yield. Assam is a state where most of the people live on farmng. Rice is the staple food of Assamese people and bullock is the main animal used in rice fields for ploughing. Thus, there is a lot of scope of production of biogas in Assam. In some districts of Assam, it has been practiced, but it must be practiced in a broader scale; because such practice will be beneficial for the people. This practice may also reduce the cutting of trees for firewood and also help to get rid of from the shortage of LPG. The present study will focus on generation of biogas from cowdng to address the household energy demand in an environmentally and user friendly way and its prospect and utilization in Sivasagar District.

Objective

- To observe and study the existing use of cowdung in Sivasagar.
- To study the existing method practiced to produce biogas from cowdung.
- To study the scope of biogas power plant from cowdung in Sivasagar district.

Materials And Methods

Study Area

Sivasagar is an administrative district of Assam (NE India), situated between 94º25' and 95º25'longitude East and 21º45' and 27º15' latitude North. It has an elevation of 86.8 meter above the sea level. It carries a pleasant weather throughout the year. The temperature ranges from 8ºC in winter to 35ºC during summer. The Sivasagar district covers about 162921 sq km of geographical area. The district is characterized by the highly humid climate with abundant rains. The annual rainfall is about 2000-2300 millimeters, with nearly 69-80% of the rainfall occurring during the monsoon months (June-August). Sivasagar district is one the leading industrial area in Assam where some major establishments of heavy industries like Oil and Natural Gas Corporation Limited at Nazira, Gas Authority of India Limited at Lakwa, Oil India Limited at Moran, Lakwa Thermal Power Station at Maibela and Tea Gardens covering big measurable area in different locations are present which are contributing towards development of the nation. There are approximately more then 500 villages in the

district. For the present study, only village areas were selected for the availability of cowdung.

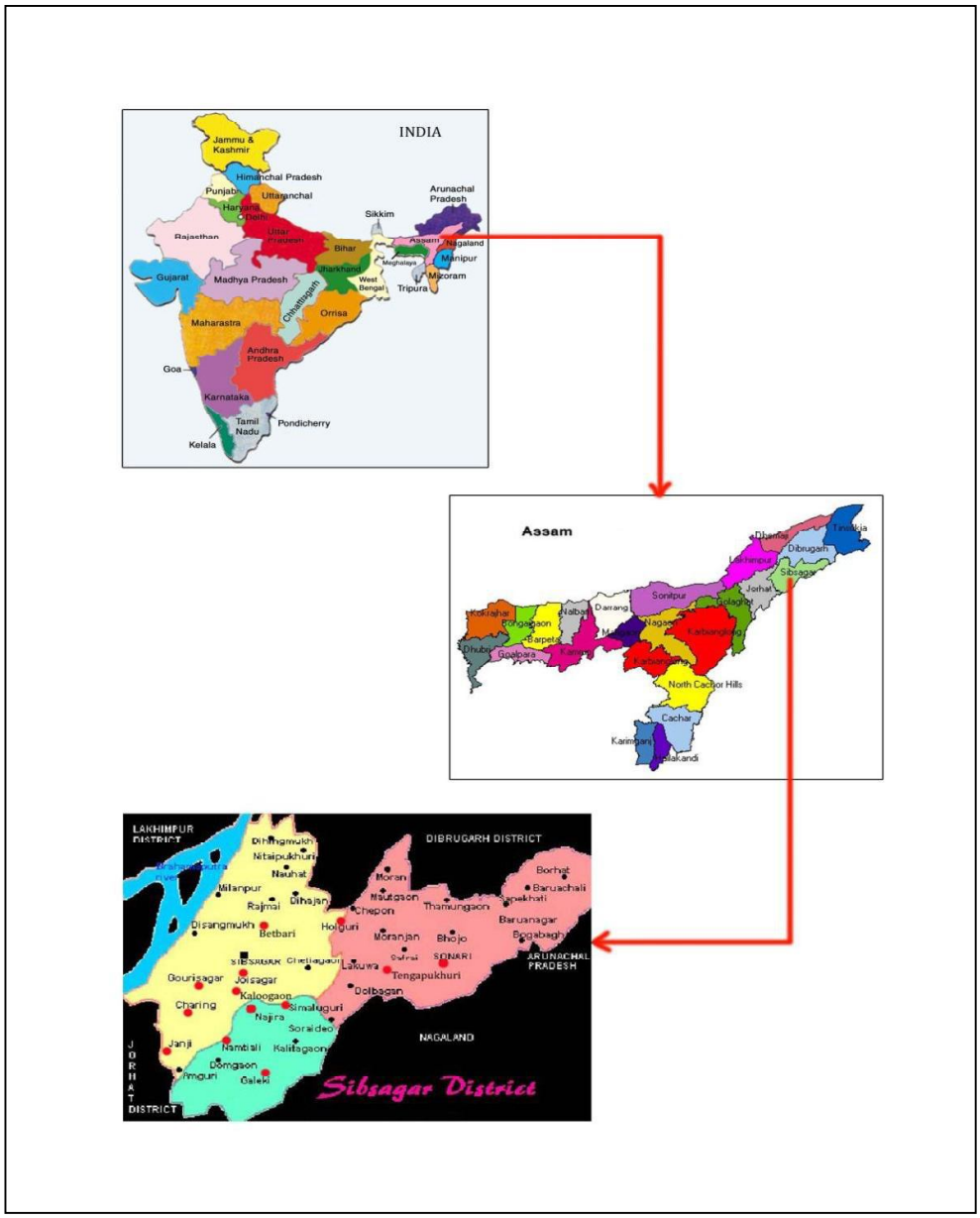

Figure 1: Map of study area (Red spots indicates the studied stations)

Site selection

As it was not possible to visit and study all the villages of Sivasagar district, only a few stations were selected where limited numbers of villages were visited for the present study.

The selected stations

Station I: Sonari

Sonari is a sub-divisional mid-sized town and a municipal board in Sivasagar district. It is a major town and the head quarter of Charaideo Sub-division, Sivasagar district, Assam. The nearest railway station is Bhojo. It is located about 45 km away from the Historic town Sivasagar.

Station II: Simaluguri

It is near Nazira town and towards 12 km away from Sivasagar town. It is famous for the railway station.

Station III: Nazira

Nazira is a historical town on the bank of River Dikhow in Sivasagar district in Assam. It is around 18 km from Sivasagar city, 3 km from Simaluguri Jn. and 78 km from Jorhat Airport. It is Sub-divisional Head Office of Nazira Sub-division. The HQ of ONGC, Assam

Station IV: Kaloogaon

It is a village area and around 3 km from historical Joysagar tank and 9 km. south from Sivasagar town. There are approximately 15 villages in this station.

Station V: Hologuri

It is a village area. It liesaround 2 km. away from the Joysagar tank and 6 km. from Sivasagar tank.

Station VI: Namtiali

It is a village area and 14 km away from Sivasagar town. There is a college in this station.

Station VII: Galeki

It is a tea estate and also a village area nearby Nazira. It is at a distance of 22 km. from Sivasgar town.

Station VIII: Joysagar

It is a small town named after the famous historical lake Joysagar situated on the fringes of the town of Sibsagar in Assam. The lake is not a natural one but was created by one of the Ahom rulers. The lake is reputed to be one of the largest man made lakes of the country. It lies at a distance of 5 km from Sivasagar.

Station IX: Gaurisagar

It is a village area which is 6 km. westward from historical Joysagar tank. This station is famous for Namdang Hillar Hanku (Rock bridge).

Station X: Tengapukhri

It is a village area and lies between Sonari and Simaluguri which is 6 km. away from Simalugri.

Station XI: Betbari

It is a village area. It is located at distance of 4 km from Sivasagar town.

Station XII Charing

It is a village area between Gaurisagar and Janji which is at a distance of 12 km. from Sivasagar town.

Station XIII: Janji

It is a village area nearby Gaurisagar and 15 km away from Sivasagar town.

Questionnaire Method

20-30 houses per village of the selected stations were randomly selected and the residences of those houses were taken interviews following systematic questionnaire method. They were asked about their economic conditions, their source of earning, about their life style, whether they use L.P.G. or wood for cooking and have they heard about biogas plant.

Observation And Studying The Method Usually Practiced In These Areas To Produce Biogas

It was noticed that Biogas production from cowdung has been practiced in 2 villages of Hologuri and a few villages of Gaurisagar, 3 villages of Simaluguri, 2 villages of

Charing and 2 villages of Janji. But most of them has discontinued this practice as they found it to be labourious task and also time consuming.

Result and discussion

Usual Utilization Of Cowdung In The Studied Households

Among the studied households, it was found that 80% of the people use to domesticate cows. It was noticed that cows and bullocks are mainly domesticated here for their milk and for ploughing in the rice fields. It was noticed that most of them use to remove the cowdung daily and apply them in the crop fields as such or allow to dry in sun rays and then utilize in crop fields. It was seen as a regular practice in these stations. It was seemed to be wastage of a large amount of cowdung; because there is a lot of scope of production of biogas from cowdung due to availability of cowdung in these areas. It has been noticed that in a few villages of Hologuri, Gaurisagar, Charing and Janji try to produce biogas from cowdung in a very small scale utilizing very easy methods which was seem to be a beam of hope. But, most of them have discontinued this practice where there is a point to think how they restart the same and how the practice become popular among the people.

Why the practice of biogas production from cowdung is very little in these areas?

Through systematic questionnaire and interviews, it was known that most of them mainly people of rural areas are ignorant about this practice. In certain houses of a few villages of Hologuri, Simaluguri, Gaurisagar, Charing, Jaanji it has been noticed that they gone through this practice but now most of them have discontinued this practice. They could not continue the same because they found it to be laborious, time consuming and also expensive . It has been noticed that, 50- 60% of them use LPG for cooking, and those who can not effort LPG, they use firewood, for their cooking purpose.

Usual Practice Used To Produce Biogas From Cowdung

Biogas is mainly comprise of hydrocarbon which is combustible and can produce heat and energy, when burnt. Biogas is a byproduct of decomposition of cowdung (or other organic wastes) by anaerobic bacteria. It is composed of 60% methane. The production of biogas from cowdung in a small scale does not require much

expenditure and people. It can be done with a little expenditure as seen in certain houses. In this practice cowdung is deposited regularly in a covered tank called digester (Fig: I and II) where it is kept for 45 days. During this period cowdung undergoes automatic microbial fermentation and as a result of these fermentation methane gas will be released which is then allowed to pass through a pipe attached to the tank (Fig : III) and in turn utilized for cooking purpose (Fig : IV). After releasing the gas the residue called slurry can be allowed to pass outside through a drain and can be utilized as an efficient manure in crop field. The slurry is a good fertilizer. It is claimed that its value as fertilizer could double crop yield. This program reduces the time spent collecting firewood and, since they are no longer exposed to the indoor smoke from burning of firewood in traditional stoves, it also dramatically improves the health of women and children. Other important benefits of the program are lessening the pressure on deforestation and reducing greenhouse gas emissions. Thus this practice is environmental friendly. This program may be beneficial for those people chiefly in rural areas, who can't access or afford to use modern cooking fuels such as LPG and have been buying kerosene or charcoal, or collecting firewood Thus, there is multiple benefits associated with this practice .

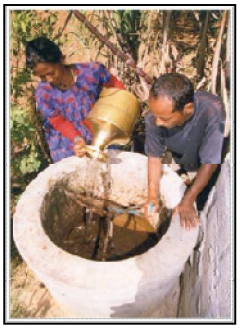

Figure I : pouring of water into digester filled with cowdung

Figure II: Covered tank or digester

Figure III : Pipes for passage of biogas

Figure IV: cooking utilizing biogas from digester

Prospect of this practice in Sivasagar District

in the visited villages it was found that 80% or more people domesticate cows and bullocks. Minimum four cows were found to be domesticated per house. If one cow can yield 10-15 kg dung per day, then there is plenty of cow dung for biogas production. Besides, throwing the cowdung as such or utilizing as raw in crop fields it must be used in biogas production. Most importantly, it provides an alternate source of renewable energy and thus reduces the burden on the use fossil fuels or natural resources as a source of energy. Besides in stoves, Biogas can also be used for lighting.

Discussion And Conclusion

The benefit of biogas are now well recognized. It has resulted in smoke free and ash free kitchen. Biogas can be used for stove and lighting and the digester slurry remaining after digestion is rich in valuable nutrients and can be used as good fertilizer that guarantees better crops and unlike synthetic fertilizer imparts no negative effect on soil as well as environment. These factors contribute to protecting the forests and allowing the forests to regenerate. The In certain rural areas, as we seen, where there is no electricity supply, or they can not effort electricity bill, the use of biogas as a source of light, will help them to a large extent. As most of the houses in the study areas have been observed and people were taken interviews, we came to know that, 50- 60% of them use LPG for cooking, and those who can not effort LPG, they use firewood, for their cooking purpose. Cutting of firewood undoubtedly causes deforestation. Besides, smoke emitted during burning of wood, is the main source of indoor air pollution.(WHO,2004). This smoke contains pollutants and particulates that adversely effect the health of women and children. These pollutants are the major causes of bronchitis and lung diseases. (WHO, 2004). Again, in case of LPG, we can see that gradually there is shortage of LPG and due to which supply has also become limited. Thus, increased population give so much load on the natural resources that one time will come that it can not fulfill human requirement, which is also applicable for LPG. Thus these problems can not be reduced or solved without providing alternatives to the current way of cooking. Generation of biogas from cowdung which is available in plenty may be considered to be one such alternative. So the people must be aware of the above said problem and they should practice biogas generation from cowdung. Government has to take initiative in this

programme. NGOs and various institution related to environmental conservation programmes can organize awareness programmes to attract people towards this practice. Students may also take steps with the help of their teachers. The misconception about the production of biogas from cowdung must be removed from their mind.

Reference

1. Akpabio I.O, Etuk SE (2002). Relationship between Solar radiation and sunshine duration for one of Nigeria, Turk. J. Phys., 27: 161-167.
2. Adeyanju AA (2008). Effect o0f seeding of wood-ash on biogas production using pig waste and cassava peels. J. Eng. Appl. Sci. 3: 242-245
3. Department of energy and mineral resources. 2004, The internationalworkshop on biomass and clean fossil fuel power plant technology: Sustainable energy development & CDM. Jakarta, January, 13-14, 2004
4. Mshandete AM, Parawira W (2009). Biogas technology research in selected sub-Saharan African countries - A review. Afr. J. Biotechnol. 8: 116-125
5. Nagamani B, Ramasamy K (2007) "Biogas Production Technology: An Indian Perspective" Fermentation Laboratory, Department of Environmental Sciences, Tamil Nadu Agricultural University, Coimbatore 641 003, India
6. Saev M, Koumanova B, Simeonov IV (2009). Anaerobic co-digestion of wasted tomatoes and cattle dung for biogas production. J. Univ. Chem. Tech. Mtlgy. 44: 55-60.
7. Sambo AS, Effion O (2011). Energy conservation through efficient combustion of Agricultural waste (cotton stalk). Nig. J. Solar Energy, pp. 28-31.
8. Uzodima EO, Ofoefule AU, Eze JI, Onwuka ND (2007). Biogas production from blends of agro-industrial wastes. Trends Appl. Sci. Res. 2: 554-558