BUSITEMA UNIVERSITY

FACULTY OF ENGINEERING

DEPARTMENT OF AGRICULTURAL MECHANIZATION AND IRRIGATION ENGINEERING

INVESTIGATION OF THE CO-DIGESTION OF COW DUNG WITH SWEET POTATO WASTE AND CASSAVA WASTE FOR BIOGAS PRODUCTION.

BY

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APPROVAL

This Final year project report by **SEBWAMI LAWRENCE** has been prepared by me and is now ready for presentation to the Department of Agricultural Mechanization and Irrigation Engineering of Busitema University for an award of a Bachelor's degree with my approval.

Mr. KAVUMA CHRIS

Signature: .... Date: ....

Ms. NABATEREGA RESTY.

Signature.. Date............

DECLARATION

I SEBWAMI LAWRENCE declare to the best of my knowledge that this final year project report is as a result of my research and effort. It has never been presented or submitted to any institution or university for the award of the B.Sc. Agro processing engineering.

Signature...

Date....26th / MAY / 2017..........

DEDICATION

I dedicate this project to my parents Mr.Mboowa Joseph and Ms. Nalweyiso Justin, my sisters and brothers espencially Mr. Mugalu Ronald for all the financial, moral and spiritual support they have always offered to me whole heartedly to complete this course. May God almighty bless them abundantly.

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ABSTRACT.

Biogas refers to the mixture of different gases produced from anaerobic digestion of organic substrates for example cow dung, agricultural wastes and so on. It is an environmentally friendly source of fuel that is methane which is converted into energy.

Co-digestion is when several substrates are digested simultaneously in an oxygen free environment and this is believed to increase on the volume of methane produced according to the different researches that have been done. This can be attributed to the positive synergetic effect established in the digestion medium. There are a number of substrates that give different significant volume of methane without even mixing them together.

However, co-digestion does not mean increased methane volume.

The objective of this research was to investigate the co-digestion of cow dung with sweet potato and cassava wastes/peelings.

The substrates used were cow dung, sweet potato wastes/peelings and cassava peelings and a mixture of sweet potato and cassava wastes each with cow dung in different combinations and also making a three mix co-digestion. The substrates were collected, dried, sorted and crushed mechanically to form a paste to provide a favorable area for microbes attack. They were mixed with water in the ratio of 1:1 before feeding them into the 1.5 litre bottle digesters. This experiment stood for 30 days. A liquid displacement method was used to determine the volume of methane produced.

The three mix co-digestion gave the highest volume of methane of 0.13litres/g-VS followed by cassava waste+cow dung with 0.11litre/g-VS and control (cow dung alone) with 0.09litres/g-VS. Sweet potato+cowdung gave the least volume of the methane of o.07litres/g-VS.

Analysis of variance was carried out to test the treatment difference which was significant to the substrate used.

However this experiment was carried out at ambience from 23-27^{0}C. Research says that the higher the temperature (mesophilic range `23-40^{0}C) the more stable the microorganisms be and produce more gas within a short retention time.

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CHAPTER ONE: INTRODUCTION.

This chapter comprises of the background, problem statement, justification, objectives, and scope of the study.

1.1 BACKGROUND.

The total global tuber crops production was estimated at 414 million tonnes per year in 2007 (Lebot, 2007). Sweet potato production being 30% and Cassava making about 55% of the total production (Lebot, 2007a). , the world cassava production is projected to reach 275million tonnes by 2020 (IFPRI, 2008), with Africa contributing about 62% of the total production (Fremont et al 2009). In Eastern Uganda, Jinja Municipality inclusive about 373,000 households grow cassava producing about 3.3 metric tonnes/hectare (Kawuki, 2013).

On the other hand, Africa's sweet potato production is estimated at 72 million tonnes per year (Low, et al 2009) with Uganda being the biggest sweet potato producer in Africa in terms of area harvested and production (FAO, 2007). Sweet potato is a major crop in Uganda, ranking third with a total of 578,000ha in cultivated area following plantains/banana and cassava (Aritua et al., 2007). The Eastern region, Jinja Municipality inclusive, has the highest portion of sweet potato production in Uganda of (57%) (Haggblade, et al 2010).

Jinja municipality population is estimated at 93000 persons generating total solid wastes of up to 239 tonnes per day together with its immediate neighborhood of Njeru (Otim, et al 2014). Only 45% of the waste generated is dumped at different open dumping grounds, the rest of the waste is poured into drainage channels, open streams causing flooding due to repeated blockage of drainage channels. 70% of the waste is food waste that is sweet potato peelings, cassava peelings, banana peelings which is biodegradable. (Otim, et al 2014). The major sources of these wastes are markets, institutions, households, restaurants and shop.

Furthermore, Cassava and sweet potato wastes being bio-degradable that is organic in nature having lower lignin content of about 4% (chandler *et al*, 1980) can be utilized for biogas production to manage sweet potato and cassava wastes. Biogas refers to a mixture of different gases produced as a result of the action of anaerobic microorganisms on a given substrate(s).

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