Biomass

Estimate the biogas production potential of agricultural wastes and manures generated in Haiti. Based on our assumed 70 and 95% scenarios, 340 and 461 million m³ of methane can be generated annually from manures and human wastes. Furthermore, anaerobic digestion of different kinds of agricultural wastes, human and animal manures generated in the country can produce enough methane to meet around 17% of the total energy demand of the country. Two scenarios using 70% and 95% of available biowastes were evaluated, between 340 and 461 million m³ of methane can be generated annually from manures, human wastes, and major crop residues.

Introduction

Biomass supplies around 70% of the total energy consumption in Haiti while the remainder is mostly provided by imported oil and its derivatives. A typical Haitian farmer can produce enough gas to meet their energy needs for cooking purposes if all wastes generated on the farm are converted into biogas. In market places of big cities where large amounts of wastes are produced, every day, a substantial quantity of methane can be produced through anaerobic digestion. In conclusion, implementation of anaerobic digestion technology in Haitian rural sectors can provide sufficient energy to displace a substantial amount of firewood, thus reducing deforestation and improving air quality. Furthermore, this technology offers a sanitary solution to manage human and animal wastes, while producing a mineralized fertilizer for soil management and sustainable crop production.

Methodology

Statistical data for the number of livestock animals and agricultural production was used to assess the amount of substrates available for anaerobic digestion. IPCC guidelines (2006) were used to obtain the amount of volatile solid (VS) produced per animal per day. Amount of crop residue was evaluated using the ratio of straw grain. Methane production was estimated in a second scenario where 95% of all wastes is fed to the digester. Methane production potential was evaluated using values from IPCC (2006) and Deublein and Steinhauser (2008).

Objectives

Analyze the current energetic situation of Haiti. Estimate the biogas production potential of agricultural wastes and manures generated in the country. Evaluate the potential contribution of anaerobic digestion technology to the energetic patterns of Haiti.

State of the Environment

Haiti Overview

Figures 3 and 4. Socio-economic indicators of Haiti, adapted from IBSI (2009).

Figures 5 and 6. Deforestation in Haiti. Every year between 15 and 20 million tons of wood are cut down for the production of charcoal, cooking and others purposes (UNEP, 2010).

Discussion

Based on our assumed 70% and 95% scenarios, 340 and 461 million m³ of methane can be generated annually from biowastes, which corresponds to about 302 to 410 Ktoe, respectively. Potential biogas production from biowastes can contribute 17% to 23% of the all energy consumption in Haiti and over 65% of the energy consumption in rural areas.

Animal manure and human wastes are the best candidates for anaerobic digestion in Haiti, examined in this study.

Additional biogas can be obtained by increasing the mass of feedstock, particularly from crop residues.

Anaerobic digestion can be used on small farms or on a larger scale to produce energy and low cost fertilizer.

Other advantages of anaerobic digestion include prevention of waterborne diseases, reduction of indoor air pollution and environmental protection.

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References


Figure 1. Benefits of anaerobic digestion of biowastes

Figure 2. Anaerobic digester appropriate for Haitian rural areas

Figure 3. Methane potential from crop residues. Assumption of 70% of crop residues are collected for anaerobic digestion

Figure 4. Methane potential from manure and human waste. Assumption of 70% of manure are collected for anaerobic digestion

Figure 5. Satellite image of the border between Haiti (left) and the Dominican Republic (right), showing the intensity of deforestation within Haiti. Image credit: NASA

Figure 6. Methane potential from manure and human waste. Assumption of 70% of crop residues are collected for anaerobic digestion

Figure 7. Methane potential from manure and human waste. Assumption of 70% of crop residues are collected for anaerobic digestion

Figure 8. Methane potential from crop residues. Assumption of 70% of crop residues are collected for anaerobic digestion

Figure 9. Percent contribution to total Haitian energy demand by methane from the anaerobic digestion of biowastes. Assumptions of 70% (left) and 95% (right) of all biowastes are collected.