The potential of agro-industrial residues for production of biogas and electricity in Tanzania

Author(s)

Amelia K. Kivaisi, M.S.T. Rubindamayugi

Abstract

This paper gives an overview of the energy demands in Tanzania, and highlights the current serious shortage of electricity. Government strategy to alleviate the problem include exploitation of the country's big natural gas reserves for power generation, and utilization of the renewable energies such as solar, wind and biogas. Important agro-industrial residues with a large potential for anaerobic conversion into biogas and electricity are identified, and their production and locations are described. Tanzania generates a total of 468,100 tonnes organic matter from coffee, sisal, sugar and cereal residues annually. Laboratory scale determinations of methane yields from the residues gave 400 m^3 CH_4/ton VS of sisal pulp; 400 m^3 CH_4/ton VS of sisal production wastewater; 650 m^3 CH_4/ton VS of **Robusta** coffee solid waste; 730 m^3 CH_4/ton of**Arabica** coffee solid waste; 230 m^3 CH_4/ton VS of sugar filter mat and 450 m^3 CH_4/ton VS maize bran. Based on these results the estimated total annual potential electricity production from these residues is 1,135 million kWh. The total oil substitution from these residues has been estimated at 0.32 million tonnes crude diesel oil per annum equivalent to 2 % of the total energy consumption in Tanzania. Case studies on the coffee and sisal processing factories indicate that exploitation of the residues for the production of electricity on site these factories is feasible. Utilization of agro-industrial residues for biogas production has a big potential for reduction of environmental pollution. The potential substitution of fossil fuel with biogas represents an annual reduction in the net CO_2 emission to the atmosphere of approximately 1.05 million tonnes. By treating the residues in controlled anaerobic systems it is possible to reduce the methane emission by about 189 million m^3, and at the same time reduce contamination of surface and ground waters.

Keywords

Tanzania;

agro-industrial residues;

bioenergy potential;

green house gases reduction