

Abstract

The global drive towards meeting the sustainable development goals coupled with the persistent energy-intensive lifestyle presents an overwhelming need for exploring and exploiting new sources of energy that are both renewable and eco-friendly. Bioconversion of selected feedstock for energy production is a promising option for exploiting the huge potential offered by the underutilised residual waste streams. In Kenya, there exists an abundant supply of unexploited agricultural residues having substantial capacity to cater for the increasing energy demand. Indeed biogas technology offers a very attractive route to valorise various categories of biowaste and presents multiple benefits to the users and community besides meeting the energy needs, resource conservation and environmental protection. However sustainable application of biogas technology demands a sound understanding of the feedstock characteristics. The purpose of this research was therefore to contribute knowledge towards enhanced understanding of the characteristics and value of agro-residues in the context of biogas feedstock. The objective of this study was therefore to characterise different types of agricultural residues from maize, coffee, cotton, sugarcane and bananas so as to evaluate their suitability for biogas production and nutrient recovery in Kenya. The quality of the biogas produced as well as the mineral fertilizer replacement properties of the digestate are also evaluated following bio methane potential assay and spectrophotometric analysis. Results from the study demonstrate that maize, coffee, cotton, sugarcane and banana residues are quite suitable for biogas production whereas their digestate is very promising for nutrient recovery. While the focus of the research is Kenya, the implementation of the research findings has the potential impact of helping many energy deficient communities in world to significantly meet their needs for secure, affordable, reliable, clean and sustainable energy supply. Besides, exploitation of the potential presented by the agro-residues can spur an energy revolution hence resulting in a major economic impact in many countries.