

**DEVELOPMENT AND ASSESSMENT OF A LOW
COST PORTABLE KILN FOR PRODUCING
BIOCHAR AT COTTAGE LEVEL**

A dissertation submitted to the
Faculty of Animal Science and Export Agriculture
Uva Wellassa University

In partial fulfillment of the requirements for the award of
Bachelor of Science Honours in Palm & Latex Technology and Value
Addition

By

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**Palm & Latex Technology and Value Addition Degree
Programme**

Faculty of Animal Science and Export Agriculture

Uva Wellassa University of Sri Lanka

2019

ABSTRACT

Biochar belongs to the array of black carbon which is produced in a controlled thermal process in the absence or minimum presence of oxygen by burning organic waste materials taken from agricultural and forestry sectors. There are several different methods of processing biochar and these methods will generate renewable energy in the form of gas and oil in addition to resulting biochar. When unattended, the surplus of unused crop residues frequently interferes with the preparation of soil and, crop establishment. Therefore, the residues are usually burnt on the field, causing environmental problems and major nutrient losses. Several research have proposed that having an energy efficient portable charcoal kiln would serve the primary purpose of preventing bio wastage and utilize these materials effectively for agronomic and environmental uses. The objective of the present study was to develop and assess a low cost portable kiln for producing biochar at cottage level. A portable charcoal kiln, which had a capacity to store 200 L volume of material, was designed and fabricated. Biochar was produced using three different precursor materials (coconut husk, *Gliricidia* wood, rice husk) at the temperature ~500 °C. Produced biochar was exposed to thermo gravimetric analysis (TGA), particle size analysis, Furrier transmission infra-red (FTIR) analysis and pH test. As per the output biochar production efficiency ranged between 25.4 and 45.6% (coconut husk - 30.8%, *Gliricidia* - 25.38%, rice husk = 45.6%). The resulted whole biochar outcomes were in alkaline range. The TGA analysis identified that among the three types of nutrient biochar, high ash content was recorded in coconut husk biochar (19.52%), while fixed carbon concentration was found to be high in *Glyricidia* biochar (26.46%) and rice husk biochar (17.82%). As a result of this developed oven, all three types of bio-char contain less moisture (<6.875%). With the FTIR results, these resulted biochar plants contain essential nutrients (C, O, N, H, and S). In this study the pH of rice husk biochar (9.76) was slightly lower than that of *Gliricidia* (10.42) and coconut husk (10.44) biochar. In conclusion, the developed portable biochar kiln can be used for producing biochar at the cottage level with some further testing. Efficiency has to be increased by setting up an appliance to collect waste oil (bio oil) and syngas. The pyrolysis temperature can be accurately measured with several digital thermometers installed.

Keywords: Biochar, Portable, Charcoal, Kiln, Physico-chemical