COMPREHENSIVE SEMESTRAL REPORT AT PHILIPPINE CENTER FOR POSTHARVEST DEVELOPMENT AND MECHANIZATION (PHILMECH) FUNDED PROJECT IN CENTRAL LUZON STATE UNIVERSITY

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An Undergraduate Field Practice Report Submitted to the Faculty of the Department of Agricultural and Biosystems Engineering, College of Engineering, Central Luzon State University, Science City of Muñoz, Nueva Ecija, Philippines in Partial Fulfillment of the Requirements for the Degree of

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ACCEPTANCE SHEET

This undergraduate field practice report entitled, "**COMPREHENSIVE SEMESTRAL REPORTON FIELD PRACTICE AT PHILIPPINE CENTER FOR POSTHARVEST DEVELOPMENT AND MECHANIZATION (PHILMECH) FUNDED PROJECT IN CENTRAL LUZON STATE UNIVERSITY**" prepared and submitted by **YVAN JOSHUA G. MARIANO** as partial fulfillment of the requirements for the degree of **BACHELOR OF SCIENCE IN AGRICULTURAL ENGINEERING (AGRICULTURAL PROCESS ENGINEERING)** is hereby approved:

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BIOGRAPHICAL SKETCH

Yvan Joshua Guevarra Mariano was born at Cabanatuan City, Nueva Ecija on May 01, 1997. He was raised in simple and God fearing family. Youngest son of Mr. Rolando Mariano and Mrs. Anacleta Mariano. He has an elder sister named Kristene Joyce Mariano. He currently lives at San Pascual, Talavera, Nueva Ecija.

He attended his elementary education at New Horizon Montesorri Academy at Poblacion Sur, Talavera Nueva Ecija in 2009. After completing his secondary education at Talavera National High School at Talavera, Nueva Ecija in 2013. He passed the entrance exam at Central Luzon State University in Muñoz, Nueva Ecija in 2013 and took up Bachelor of Science in Agricultural Engineering degree.

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ABSTRACT

MARIANO, YVAN JOSHUA G., Department of Agricultural and Biosystems Engineering, College of Engineering, Central Luzon State University, Science City of Muñoz Nueva Ecija, **June 2019. COMPREHENSIVE SEMESTRAL REPORT AT PHILIPPINE CENTER FOR POSTHARVEST DEVELOPMENT AND MECHANIZATION (PHILMECH) FUNDED PROJECT IN CENTRAL LUZON STATE UNIVERSITY.**

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The field practice was conducted at Central Luzon State University. The field practice was composed of two activities; (1) production of biochar as alternative fuel using pyrolysis carbonization method and (2) production of hydrochar using hydrothermal conversion process. Pyrolysis as a biomass conversion technology is particularly low suited to moisture organic wastes. Thus, if biochar proves a valuable by-product, it could induce more use of pyrolysis conversion that would be applicable to over half the unutilized wastes identified in the state biomass inventory. The objectives for the production of biochar as alternative fuel using pyrolysis carbonization method were to (1) produce fuel pellet from biochar of cacao pod husk, (2) determine the physical characteristics of pelletized cacao pod husk in terms of shatter resistance and durability. The objectives for the production of hydrochar using hydrothermal conversion method were assist in the preparation and hydrothermal conversion (HTC) process of cacao pod husk.

The treatments in activity 1 were made in evaluation of the physical characteristics of CPH pellet were different binder proportion and different compaction pressure were used as parameters. The binder is used to strengthening and binding of pellet, 1:15 and 1:20% binder proportion were used in the study. Compaction pressure of 1, 2, 3, 4, 5 and

6 kg/cm^2 were used to test the strength of the pellet. The treatments were analyzed using Completely Randomized Design (CRD) and comparison of means was done using Least Significant Difference (LSD). Hydrothermal carbonization method was done using a 20 liter capacity hydrothermal reactor and the cacao pod husk were carbonized for 12 hours with a temperature of 180°C to produce hydrochar.

Results show the significant differences and their effects on the response variables. The higher resistance values as indicator of durability with 97.4 % after drop test were observed on higher percentage of molasses binder (20%) and higher compaction pressure 6 kg/cm^2. Pellet samples subjected to 2 kg/cm^2 compaction pressure resulted to the highest flame temperature of 185°C. Pellet subjected to 20% molasses and compacted at 1 kg/cm^2 resulted to the highest coal temperature of 416°C. Ash weight of pellets subjected to 5 kg/cm^2 compaction pressure resulted higher mean weights of 3.5 grams. Lab test results of the carbonized cacao pod husk have a higher heating value of 24.55MJ/kg, a moisture content of 1.55%, a fixed carbon content of 48%, and ash content of 23.54%

The moisture content of the hydrochar was found to be 12.35% with volatile combustible matter of 58.59%, fixed carbon of 8.43 %, and an ash content of 32.98%.

Keywords; biochar; hydrochar; pyrolysis; hydrothermal carbonization; cacao pod husk

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