DESIGN, FABRICATION AND PERFORMANCE EVALUATION OF CASSAVA STAKES CUTTER

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ACCEPTANCE SHEET

This undergraduate thesis entitled **"DESIGN, FABRICATION, AND PERFORMANCE EVALUATION OF CASSAVA STAKES CUTTER"** prepared and submitted by **JAIRIES FAE P. BATAS,** in partial fulfillment of the requirements for the degree of **BACHELOR OF SCIENCE IN AGRICULTURAL AND BIOSYSTEMS ENGINEERING (AGRICULTURAL MECHANIZATION AND RENEWABLE ENERGY),** is hereby accepted:

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BIOGRAPHICAL SKETCH

The researcher, JAIRIES FAE P. BATAS, was born on the 16th day of November, 1997 in a small town of Dingalan, Aurora. She was the only daughter of Marissa Pujeda-Batas and Jaime V. Batas Jr. She only have one sibling who, he is Francis Von Scire P. Batas.

She finished her basic education at Paltic Elementary School in 2010 where she graduated as the class valedictorian. She entered High School at St. Patrick's Academy where she also graduated as valedictorian. In 2014 the researcher decided to pursue her tertiary education at CLSU where she took up Bachelor of Science in Agricultural and Biosystems Engineering.

In her five years of stay in CLSU she has been consistently participating in university intramural games as college indoor volleyball and beach volleyball varsity. She also joined some competitions like the intercollegiate Literary-Musical (LitMus) 2016, where she won 1st place at Dagliang Talumpati. Her rank in LitMus 2016 serves as her ticket to join the Regional Development Council of State Universities and Colleges (DCSUC) to represent CLSU in Dagliang Talumpati, there she bagged 6th place.

The researcher decided to join Society of Agricultural Engineering Students Philippine Society of Agricultural Engineers, SAGES-PSAE which provide her many opportunities like attending and facilitating convention and seminars namely, "21st PSAE-PPG Luzon Convention – Engaging PSAE-PPG Towards Agricultural and Bio-systems Engineering for Global Practice," "Lecture Series in Technoprenuership – Startup: Innovation and Technology Entrepreneurship Forum,". In this organization she also had

the privilege to serve as their treasurer A.Y 2018-2019. Being a member of SAGES-PSAE also given her the opportunity to be a part of University Electoral Board or UEB 2018.

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LIST OF TABLES

LIST OF APPENDIX FIGURES

ABSTRACT

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Given its the potential to replace most of the staple food like rice and corn, cassava (*Manihot esculenta Crantz*) is one of the most carbohydrates producing crops in the Philippines and the world. One of the process in cassava production is cutting the stalks into planting material called cassava stakes , therefore, a study was conducted to improve the manual act of cutting cassava into stakes to increase the efficiency and capacity of work.

The general objective of the study was design, fabricate and evaluate the performance of Cassava Stakes Cutter. Specifically, the study aims to (1) design a cassava stakes cutter, (2) fabricate Cassava Stakes Cutter with the use of locally available material, (3) test and evaluate the performance of the stake cutter produce in terms of the machine's output capacity, efficiency and percent damage; and (4) perform a cost analysis.

The machine is has a total dimension of 600mm x 500 mm x 1,000 mm. it was powered by a 1.5 Hp electric motor to facilitate cutting of cassava stalks. The machine has several major parts namely: inlet platform, feeding roller, cutting unit, and discharge chute, however, during the course of the fabrication several parts added to improve the machine's ability to cut. The following additions are: Fly wheel, belt tensor and timing sprocket.

The machine was tested by cutting cassava stems from Dingalan, Aurora and to further evaluate the machine two factors are considered in evaluation, Cutting Speed (factor A)

and Cutting Time (Factor B). Factor A has three levels, 100 rpm, 120 rpm and 140 rpm, while Factor B has two, cut 1 week after harvesting and cut right after harvesting. The experiment was laid in CRD 2x3 Factorial with sources of variation presented in standard ANOVA while comparison among means was tested in LSD at 5% level of significance.

The machine shows highest capacity of 3254 stakes/hr when the speed of the cutting unit is at 120 rpm in the stalks right after it was cut while the lowest capacity was recorded when the speed is at 100 rpm in the stalks that is harvest one week after it was harvested, 1252 stalks/hr. Meanwhile, highest efficiency of 90.10% was when the rotational speed of the cutting unit is at 120 rpm in the freshly harvested stalks while the lowest efficiency of 69.94% was attained when the rotational speed of the cutting unit is at 100 rpm in a stalks that is harvested one week before it was cut. In order to further test the machine's functionality the percent damage was taken into consideration the machine the highest percent damage, 30.06% during the time when it runs at 100 rpm and cut stalks that are harvested 1 week before it was cut while it attains lowest percent damage,9.90%, when the machine cuts stalks right after they were harvested and runs at 120 rpm.

The financial viability of the machine was shown in the cost analysis. It states that the machine needed to produce 3384 stalks to break even. The cost curve shows that which only indicates that farmers who produce more than 3384 stalks can buy or rent the machine but it wouldn't be practical to buy the machine if the farmer only needs less than 3384 stalks per year simply because the cost of operation outweighs the profit.

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