DEVELOPMENT OF UNMANNED SOLAR POWERED RICE PADDY MIXER

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ACCEPTANCE SHEET

This undergraduate thesis entitled **"DEVELOPMENT OF UNMANNED SOLAR POWERED PADDY MIXER,"** prepared and submitted by **AUDREY MAE M. HABIL** and, **KIMWEL A. LAZO**, in partial fulfillment of the requirements for the degree of **BACHELOR OF SCIENCE IN AGRICULTURAL AND BIOSYSTEMS ENGINEERING (AB MACHINERY AND POWER ENGINEERING)**, is hereby accepted:

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BIOGRAPHICAL SKETCH

Audrey Mae M. Habil was born on 11th of June 2000 in Caloocan City, Metro Manila. She is the second child of Mr. Jessie G. Habil and Mrs. Aurora M. Habil, living in a small town of Meycauayan City. Bulacan. She entered Marychild Academy in 2007 for her primary education. She then transferred at Children of Mary Immaculate College in 2013 for her secondary education. She studied at Manila Central University in 2017, under Science, Technology, Engineering and Mathematics (STEM) strand in Senior High school. In 2019, she decided to leave her 'city girl' lifestyle to pursue the Bachelor of Science in Biosystems and Agricultural Engineering program in Central Luzon State University.

Away from her comfort zone, she thrived as she experienced new things and connect with other people. She became active when she represented her block mates from her 1st year up to her 4th year of college, join the Students' Rights and Welfare Committee and be a Case Advocate from 2021 to 2022. became a CEn Councilor in 2022, and a member with some organizations such as Kilos Ko Youth, American Society of Agricultural and Biosystems Engineers, Student Council Alliance of the Philippines, and Online SDG Action Forum.

She still continues to learn and grow with the people who supports her.

Kimwel A. Lazo was born on November 14, 2000, in Cabanatuan City, Nueva Ecija. He is the third-born child of Mr. Jesus M. Lazo and Mrs. Estrella A. Lazo. The parents nurtured him in a small town in San Isidro, Nueva Ecija where he also started his academic pursuits at General De Jesus College, where he completed both his elementary and high school education.

In his pursuit of knowledge, Kimwel continued his educational journey at the College of the Immaculate Conception for Senior High School, laying the foundation for his passion for an engineering degree. Currently enrolled in the Bachelor of Science in Agricultural and Biosystems Engineering program at Central Luzon State University, Kimwel is dedicated to exploring innovative solutions to agricultural challenges.

Kimwel's leadership skills and commitment made a positive impact on his community. From 2020 to 2021, he served as the College of Engineering Councilor for the USSC (University Supreme Student Council). Kimwel took on the role of Public Information Officer in the USSC from February 2022 to May 2022. Kimwel with his pursuit for the development of the community led him to be the Senior Publicity Associate under the Education and Research Committee of USSC From 2023-2024 In this capacity, he played a vital role in disseminating information and fostering a sense of unity and awareness among the student body.

Beyond his academic and leadership pursuits, Kimwel is known for his dedication to community service and his passion for agricultural innovation. With uncertainties and hardships ahead, Kimwel A. Lazo continues to balance academic excellence with a commitment to positively impact his community and in the field of Agricultural and Biosystems Engineering.

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KIMWEL A. LAZO

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ABSTRACT

HABIL, AUDREY MAE M. & LAZO, KIMWEL A., Department of Agricultural and Biosystems Engineering, College of Engineering, Central Luzon State University, Science City of Muñoz, Nueva Ecija, Philippines, **February 2024, DEVELOPMENT OF UNMANNED SOLAR POWERED RICE PADDY MIXER**

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Sun drying for fresh harvested paddy is a wide practice but a labor-intensive operation among developing countries because it requires less investment. To prevent the risks that may be encountered during this operation, this study was aimed to design, fabricate, and evaluate an unmanned solar powered rice paddy mixer.

The machine is a 163.50cm × 64.0cm frame attached with two 12V DC motors, two 15.42 Ah batteries, 300W PV panel, wheels, a 165cm rake that's carried by a linear actuator, AC charging module, and electronic enclosure. A microcontroller was utilized to operate the machine remotely using a smartphone application.

With a total of 5700 hand hulled grains, the conventional method produced 16.85% broken, 27.52% cracked, and 55.63% whole grains. While the machine generated 9.33% broken, 34.85% cracked, and 55.82% whole grains. Independent Sample t-tests showed that there was a significant difference of 0.010 for broken grains between the two treatments.

The machine can be controlled within a 100-meter radius via Bluetooth. It can travel at 5.4 kph while the rake was raised and operates while the rake is lowered at 4.46 kph. The battery charge may last for 2 hours and 48 minutes before it reached a 50% battery

charge and a 6 days of continuous 7-hour per day operation, however charging via solar or an AC converter may take up to 48 hours.

The initial investment of ₱43,857.390, the cost analysis showed the machine's annual operating cost of ₱53,901.59. As the machine operates on a cavan basis, the customs rate was applied in caravans at ₱8.05 per cavan. With this pricing, we can expect the breakeven point to be at 5,445.24 cavans while having a payback period of 2.712 years or 54.24 days of operation. The machine has the potential to yield savings of ₱54,099 annually compared to the traditional mixing method. Furthermore, the reduced labor requirement plays a significant role in achieving these savings, thereby reducing post-harvest operation costs.

Key Words: Paddy sun drying; Unmanned Solar Power Paddy mixer; Cracked Grain; Whole Grain; Broken Grains; Charging duration; Discharge amount.

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