PERFORMANCE EVALUATION OF SOLAR POWER – DRIVEN PUMP IRRIGATION IN GENERAL M. NATIVIDAD, NUEVA ECIJA

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ACCEPTANCE SHEET

This undergraduate thesis entitled **"PERFORMANCE EVALUATION OF SOLAR POWER – DRIVEN PUMP IRRIGATION IN GENERAL M. NATIVIDAD, NUEVA ECIJA,"** prepared and submitted by **NEALE NATHAN G. RUBA**, in partial fulfillment of the requirements for the degree of **BACHELOR OF SCIENCE IN AGRICULTURAL AND BIOSYSTEMS ENGINEERING (AB LAND AND WATER RESOURCES ENGINEERING)**, is hereby accepted:

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BIOGRAPHICAL SKETCH

Researcher Neale Nathan G. Ruba, born on November 1, 1999, in San Jose City, Nueva Ecija, is the youngest child among the three offspring of Mr. Arturo B. Ruba and Mrs. Agnes Cristina G. Ruba. His education began at Sto. Tomas Elementary School, where he completed his primary education, laying the foundation of his academic pursuits. He continued in Junior High School at Caanawan National High School, wherein he was awarded best in ICT or Information and Communications Technology, and was also the first best actor at the CINEMANAHAW. He graduated with a strand STEM or Science and Technology, Engineering and Mathematics at Central Luzon State University. The researcher is currently pursuing Bachelor's Degree in Agricultural and Biosystems Engineering at Central Luzon State University.

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ABSTRACT

RUBA, NEALE NATHAN G., Department of Agricultural and Biosystems Engineering, College of Engineering, Central Luzon State University, Science City of Muñoz, Nueva Ecija, Philippines, February 2024, **PERFORMANCE EVALUATION OF SOLAR POWER-DRIVEN PUMP IRRIGATION IN GENERAL M. NATIVIDAD, NUEVA ECIJA**

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The study is about the performance evaluation of solar power-driven pump irrigation system in General M. Natividad, Nueva Ecija. The performance evaluation of solar power-driven pump irrigation consists of 3 trials. The first trial starts at 9:00 am and ends at 9:30 am. The second trial starts at 12:00 pm and ends at 12:30 pm. And the last trial starts at 3:00 pm and ends at 3:30 pm. The ambient condition, PV temperature, solar array, solar input and output, and discharge are the data collected every minute within the 30-minutes duration of every trial.

The average of 3 trials in ambient condition for surrounding temperature was 31.25°C and 30.94% for RH. For solar radiation, the average was 603.87 W/m^2. For PV temperature, the data was 42.59°C. The solar input in voltage was 624.02V and for ampere, the data was 12.51A. For solar output the voltage was 391.74V, for ampere the average was 12.52. And for the discharge, the data was 49,050.8L/h.

The data collected during evaluation was needed to compute the total head and system efficiency. The first was determining the pipe that has 2.65 m/s, 2.74 m/s, and 2.72 m/s. After that, use the Reynolds number formula that has 265,664.2. With this, the data was considered as turbulent flow, then after that identify the friction coefficient using the moody diagram. After getting the data, the head loss was able to be calculated and come

up with the result which was 2.87 head loss and 28.24 m for total head in trial 1, 1.51 m head loss and 27.91 total head for trial 2, and 2.47m head loss and 27.87m total head for trial 3. After getting the total head and head loss, the data was able to get the system and pump efficiencies in the first trial which was 74.90% pump efficiency and 18.40% system efficiency. For the second trial, the pump efficiency was 77.75% and 15.85% for system efficiency. And for the third trial, the pump efficiency was 76.77% and 18.26% system efficiency.

The water drawdown is determined before and after the pump operation through the use of solinst 101 P2 water level meter. At 8:00 am, the first water level meter that was collected has a value of 5.12 Mbgs. The next data was collected at 12:00 pm which has 5.19 Mbgs with the declination of 0.07 meters. The last data was collected at 4:00 pm with the value of 5.28 Mbgs with 0.16 declination from first data, and it has opened the SPIS in eight hours.

The setting up of a 10-hectare field will be irrigated by a Solar Power-driven Pump Irrigation System (SPIS). In order to avoid or reduce losses during irrigation, the system uses direct water transfer through pipes to the field. The cropping season is planned according to the Philippine National Standard PNS/BAFS/PAES 217:2017 ICS 65.060.35, with a staggered schedule of one week. The rice growth phases are used to determine the cropping schedule for both rice and maize.

The study uses the Blaney-Criddle Method to precisely calculate potential evapotranspiration (PET) in order to optimize irrigation schedule. Furthermore, PET is calculated using Thornthwaite's approach using predicted weather information from the PAGASA 2024 Weather Outlook. The goal of the research is to improve crop productivity and water use efficiency by matching irrigation techniques to the unique needs of maize

and rice crops. With the help of defined guidelines and climatic projections, this methodical approach guarantees sustainable agricultural operations.

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