PERFORMANCE EVALUATION OF SOLAR POWER - DRIVEN PUMP IRRIGATION AT QUEZON, NUEVA ECIJA

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ACCEPTANCE SHEET

This undergraduate thesis entitled **"PERFORMANCE EVALUATION OF SOLAR POWER - DRIVEN PUMP IRRIGATION AT QUEZON NUEVA ECIJA,"** prepared and submitted by **VINCENT JAMES O. VILLANUEVA**, 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 Vincent James O. Villanueva, born on January 28, 2000, in Villasis, Pangasinan, is the first child among the three offspring of Mr. Odylon and Mrs. Lorna Villanueva. He lives in Maturanoc, Guimba, Nueva Ecija, His education began at Guimba East Central School, where he completed his primary education, laying the foundation for his academic pursuits. He continued his Junior and Senior High School at Bartolome Sangalang National High School where he graduated with honors as a STEM or Science and Technology, Engineering and Mathematics student. Currently pursuing Bachelor's Degree in Agricultural and Biosystems Engineering at Central Luzon State University.

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ABSTRACT

VILLANUEVA, VINCENT JAMES O., 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 AT QUEZON, NUEVA ECIJA**

Adviser: **JOHN PAULO C. SACDALAN, Ph.D.**

The study evaluated the efficiency of the solar power-driven pump irrigation system in Quezon, Nueva Ecija. The performance evaluation of solar power-driven pump irrigation consists of three trials. The first trial begins at 9:00 a.m. and ends at 9:30 a.m.; the second trial begins at 12:00 p.m. and ends at 12:30 p.m.; and the third trial begins at 3:00 p.m. The ambient condition, PV temperature, solar array, solar input and output, and discharge data were gathered every 1 minute for a total of 30 minutes. The materials used in the research included measuring tape, a temperature humidity meter for ambient conditions, an infrared thermometer for PV temperature, a clamp-meter for voltage and ampere measurements, a camera for documentation, and a static water level meter for drawdown. The average of three trials in ambient conditions was 34.47°C and 29.24% RH, solar radiation was 514.95 W/m2, PV temperature was 45.03°C, solar input voltage was 530.92V and ampere was 7.43A, solar output voltage was 283.91V and ampere was 8.02, and discharge was 31,621.56 L/h. The data acquired throughout the evaluation was required to calculate the total head and system efficiency. The first was determining the velocity through pipe that has 1.77 m/s, 1.76 m/s, and 1.71 m/s, after that Reynolds number formula was used that has 177,443.60, with this the data was considered as turbulent flow,

then after that identify the friction coefficient using the moody diagram. After gathering the data, the head loss for trial 1 to trial 3 was 0.63m, 0.62m, and 0.58m. After computing the total head loss of trial 1 to trial 3. the value was 16.03m,16.02m and 15.98m. With these values, we were able to compute for system efficiencies; in trial 1 the pump efficiency was 60% and system efficiency was 6%, for trial 2 the pump efficiency was 58.67% and 6.47% for system efficiency, and for trial 3 the pump efficiency was 66.57% with 13.8% system efficiency.

The water drawdown was determined before and after the pump operation by the used of solinst 101 P2 water level meter. There are 3 surrounding wells at SPIS from Quezon, Nueva Ecija, the measuring of water level started at 8:00 am before the SPIS starts operating, the initial values for water level which is measured in mbgs (meters below ground surface) was 2.255 mbgs for the 1st well, the 2nd well has 2.265 mbgs, and 3rd well was measured at 2.47, this well varies in elevation and distance from the SPIS. The final measurement of water level was conducted at 4:00 pm with following values of 2.99 in the 1st well, 2.94 in the 2nd well, and 2.77 in the 3rd well. The difference between the 1st well was 0.74mbgs, for 2nd well value at 0.51mbgs, and for 3rd well was 0.30mbgs. Thus, indicating a declination of water level from the water table during the pumping period.

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