

**PERFORMANCE EVALUATION OF SOLAR POWER – DRIVEN PUMP
IRRIGATION SYSTEM AT NIA (DIVISION II)
TALAVERA, NUEVA ECIJA**

NATHANIEL ALDE GONZALES

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and Biosystems Engineering, College of Engineering, Central Luzon State
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in Partial Fulfillment of the Requirement
for the Degree of

**BACHELOR OF SCIENCE IN AGRICULTURAL AND BIOSYSTEMS
ENGINEERING
(AB Land and Water Resources Engineering)**

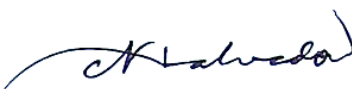
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ACCEPTANCE SHEET

This undergraduate thesis entitled “**PERFORMANCE EVALUATION OF SOLAR POWER – DRIVEN PUMP IRRIGATION SYSTEM AT NIA (DIVISION II) TALAVERA, NUEVA ECIJA,**” prepared and submitted by **NATHANIEL A. GONZALES**, 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:


ELMAR M. VILLOTA, Ph.D.
Member, Advisory Committee

Date Signed


NICASIO C. SALVADOR, M.Sc.
Member, Advisory Committee

Date Signed


JOHN PAULO C. SACDALAN, Ph.D.
Chair, Advisory Committee

Date Signed

Accepted as partial fulfillment of the requirements for the degree of **BACHELOR OF SCIENCE IN AGRICULTURAL AND BIOSYSTEMS ENGINEERING (AB LAND AND WATER RESOURCES ENGINEERING)**


ELMAR M. VILLOTA, Ph.D.
Chair, Department of Agricultural and Biosystems Engineering

Date Signed


THEODY B. SAYCO, Ph.D.
Dean, College of Engineering

Date Signed

BIOGRAPHICAL SKETCH

The author, Nathaniel A. Gonzales, born on December 26, 2000 at Tondo Manila Hospital and grew up in a simple and loving family in the municipality of Sto. Domingo which is situated in the province of Nueva Ecija, where the importance of education and hard work was instilled from a young age. His parents, Jonathan and Annabelle Gonzales, raised him with values of decency, perseverance, a strong sense of leadership and have a strong faith in God. They provided protection and guidance throughout his life.

His pursuit of knowledge began early in life, as he showed a passion for learning. He attended Jose Corazon Elementary School for three years when they were still living in Manila and transferred to Baloc Elementary school to continue his Elementary education, where his dedication to his studies was evident as he earned awards, recognitions and graduated with honors through his academic performances and extracurricular activities. The author continued his secondary education at Sto. Domingo National Trade School and finished his Senior year at REH Montessori and graduated with honors. Here, he continued to distinguish himself through his commitment to his studies, and active participation in various extracurricular activities while discovering his passion.

Drawn to the institution's academic reputation, commitment to excellence, and vibrant community, Central Luzon State University represented not only a center of learning but a haven where his aspirations could take root and flourish. He pursued a Bachelor's Degree in Agricultural and Biosystems Engineering to gain a deeper understanding of agricultural systems and how to contribute on the development of the Agriculture industry to create innovative solutions to help modern day farmers.

Throughout his academic journey, he faced academic hurdles, personal setbacks, and moments of self-discovery. The author overcame obstacles, emerging more determined to make the most of his time at CLSU. He discovered a lot about his skills, hobby, passion by actively participating in extracurricular activities and became a member of four organizations namely; CBI, Artist club, SAGES-PSABE, and ASABE. He also became a Vice governor of the College of Engineering Student Government and a Karatedo player. He actively engaged in leadership and most importantly he showed interest in practical experiences in the agricultural sector, honing his skills as he recognized the importance of innovative solutions to address the evolving challenges in our community and the Agriculture industry.

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To all those mentioned and the countless others who may not be named but have contributed in different ways, I sincerely extend my gratitude. I humbly dedicate this study. All glory and honor belong to God for giving the researcher the strength and the will to face the obstacles in the completion of the study and his academic journey. I made it.

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ABSTRACT

GONZALES, NATHANIEL A., 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 SYSTEM AT TALAVERA, NUEVA ECIIJA**

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

The research focused on assessing the performance of a solar-powered pump irrigation system at NIA (Division II) Talavera, Nueva Ecija. The evaluation comprised three trials: the first starting at 9:00 am and concluding at 9:30 am, the second beginning at 12:00 pm and concluding at 12:30 pm, and the third commencing at 3:00 pm and concluding at 3:30 pm. Various parameters, including ambient conditions, PV temperature, solar array, solar input and output, and discharge, were recorded at one-minute intervals over a 30-minute duration. The average ambient conditions for the surrounding temperature were 30°C, and the relative humidity was 57.03%. The average solar radiation was 414.90 W/m², PV temperature recorded at 34.50°C, solar input voltage at 512.69V and amperage at 19.46A. The solar output averaged 222.14V with an amperage of 3.95A. The discharge rate was measured at 18,774.4L/h. After collecting the data, head loss calculations were performed, resulting in 0.12m and 8.54m for total head in trial 1, 0.13m head loss and 8.55m total head in trial 2, and 0.05m head loss and 8.47m total head in trial 3. Subsequently, the total head and head loss data were used to determine the system and pump efficiencies. In trial 1, the pump efficiency was 57.04%, and the system efficiency was 3.87%. For the second trial, pump efficiency was 52.59%, and system efficiency was 3.85%. In the third trial, pump efficiency was 38.85%, and system efficiency was 7.71%.

Water drawdown data were obtained both before and after the operation of the Solar Power-driven Pump Irrigation System (SPIS). The initial measurement, taken at 8:00 am using a Solinst 101 P2 water level meter, recorded a value of 3.21 Mbgs. By 4:00 pm, the drawdown was measured again, registering a value of 4.82 Mbgs. This indicates a decline of 1.61 Mbgs from the initial measurement, and the SPIS operated the pump for a total of eight hours.

The establishment of a 10-hectare field for irrigation utilizing a Solar Power-driven Pump Irrigation System (SPIS) was undertaken. The cropping schedule adheres to the Philippine National Standard PNS/BAFS/PAES 217:2017 ICS 65.060.35, following a staggered one-week schedule for rice. The cropping schedule is based on the growth phases of rice and corn.

The Blaney-Criddle Method was employed in the study to accurately compute potential evapotranspiration (PET) for optimizing the irrigation schedule. Additionally, PET was calculated using Thornthwaite's approach, utilizing predicted weather information from the PAGASA 2024 Weather Outlook. The research aimed to enhance crop productivity and water use efficiency by tailoring irrigation techniques to the specific requirements of maize and rice crops. With well-defined guidelines and climatic projections, this systematic approach ensures sustainable agricultural practices.

Keywords: evaluation; drawdown; standard; parameters; trial; efficiency

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