

**IoT-BASED CAPACITIVE SOIL MOISTURE SENSOR FOR SMART  
IRRIGATION SCHEDULING IN WHITE CUCUMBER (*Cucumis  
sativus, L.*) CULTIVATION USING DRIP IRRIGATION**

**JERRAND NOLAN DOMINGO ACOSTA  
CHRISTOPHER ALBERT LUCENA JACOBO**

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and Biosystems Engineering, Central Luzon State University,  
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**BACHELOR OF SCIENCE IN AGRICULTURAL AND BIOSYSTEMS  
ENGINEERING  
(AB Land and Water Resources Engineering)**

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**ACCEPTANCE SHEET**

This undergraduate thesis entitled “**IoT-BASED CAPACITIVE SOIL MOISTURE SENSOR FOR SMART IRRIGATION SCHEDULING IN WHITE CUCUMBER (*Cucumis sativus*, L.) CULTIVATION USING DRIP IRRIGATION**” prepared and submitted by **JERRAND NOLAN D. ACOSTA** and **CHRISTOPHER ALBERT L. JACOBO**, 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:

  
**WENDY C. MATEO, Ph.D.**  
Member, Advisory Committee

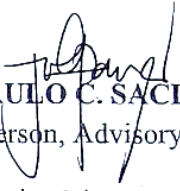
1-25-2024

Date Signed

  
**MAY A. CABRAL, MSc.**  
Member, Advisory Committee

1-24-2024

Date Signed

  
**JOHN PAULO C. SACDALAN, Ph.D.**  
Chairperson, Advisory Committee


1-24-2024

Date Signed

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

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

Date Signed

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

Date Signed

## **BIOGRAPHICAL SKETCH**

Christopher Albert Lucena Jacobo is a 23-year-old resident of Brgy. Bacag West, Villasis, Pangasinan. He was born on February 16, 2000, and was the firstborn of the three children of Engr. Albert G. Jacobo. and Mrs. Benilda L. Jacobo.

From 2005 to 2012, he attended Stars Educational Center in Puelay, Villasis, Pangasinan, starting at the age of five. From 2012 to 2016, he attended junior high school at Don Ramon E. Costales Memorial National High School in Villasis, Pangasinan, and graduated in April 2016. Between 2016 and 2018, he attended Central Luzon State University for his senior year of high school.

Currently, he is pursuing a Bachelor's Degree in Agricultural and Biosystems Engineering at Central Luzon State University.

## **BIOGRAPHICAL SKETCH**

Jerrand Nolan D. Acosta is a 23-year-old college student pursuing a degree in Bachelor of Science in Agricultural and Biosystems Engineering at Central Luzon State University. He was born on the 9th of September in the year 2000 and is the eldest of the three children of Mr. Nolan A. Acosta and Mrs. Winnie D. Acosta, who live at Brgy. IV, San Mateo, Isabela.

He started his academic journey at the age of three at Golden Values Learning Center and later continued his primary and secondary education at La Salette of San Mateo Inc. He continues to thrive on his passion for learning and later on, pursued his Senior Highschool career at Central Luzon State University, took up the Science, Technology, Engineering, and Mathematics (STEM) strand, and graduated on June 13, 2018.

As a college student, Jerrand Nolan D. Acosta is constantly seeking new opportunities for personal and professional growth. He may have a curious mind, always eager to explore new ideas and expand his knowledge not only in the four corners of the classroom but also beyond it.

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## ABSTRACT

**ACOSTA, JERRAND NOLAN D., AND JACOBO, CHRISTOPHER ALBERT L.** Department of Agricultural and Biosystems Engineering, College of Engineering, Central Luzon State University, Science City of Muñoz, Nueva Ecija, **DECEMBER 2023. IoT-BASED CAPACITIVE SOIL MOISTURE SENSOR FOR SMART IRRIGATION SCHEDULING IN WHITE CUCUMBER (*Cucumis sativus*, L.) CULTIVATION USING DRIP IRRIGATION**

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

Traditionally, irrigation scheduling relied on manual observations and estimations, resulting in inefficient water usage as well as potential yield losses. The integration of Internet of Things (IoT) technology and capacitive soil moisture sensors has emerged as a promising solution for precise and automated irrigation management in agriculture in response to these challenges.

This study was conducted to evaluate the IoT-based capacitive soil moisture sensor for automatically scheduling drip irrigation for White Cucumber (*Cucumis sativus*, L.). Specifically, the study aims to: calibrate and interpret the capacitive soil moisture sensor for automatic irrigation scheduling; create a system that automatically irrigates the field based on the set treatments; assess the growth and yield of white cucumber; and conduct a simple cost analysis for the installation of the capacitive soil moisture sensor. Treatment 1 = 40% of AW, Treatment 2 = 45% of AW, Treatment 3 = 50% of AW, and Treatment 4 = Farmer's Practice (Control) for the percentage of MAD.

Calibration involves fine-tuning the sensor readings to match the actual soil conditions, enhancing the precision of subsequent measurements. During the program development in the Arduino IDE, the lowest and highest values were determined and

established as the wet and dry soil references for the system, respectively. Notably, the highest value was assigned to the wet soil condition because the presence of electrolytes in the soil tended to be higher when the soil was dry and lower when it was wet.

The results of the study indicated that the IoT-based smart irrigation system exhibited promising capabilities for optimizing water management, as treatments exhibited significantly higher growth rates than the control. T3 (50% AW) produced the highest yield in terms of weight (13.7 kg) and pieces (62.3 pcs) of White Cucumber produce. In contrast, all treatments have comparable development parameters throughout the study. A Simple cost analysis was done, which yielded a 16.51% return on investment when smart automatic drip irrigation was implemented. For the study alone, a total of ₱9,766.78 was used for the whole production and cultivation.

Keywords: Internet of Things, drip irrigation, white cucumber, irrigation scheduling

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