

**MODIFICATION AND PERFORMANCE EVALUATION OF A KNAPSACK
SPRAYER WITH HORIZONTAL AND VERTICAL BOOM ADJUSTMENT**

IRIS JEWEL B. CASTAÑETO


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ACCEPTANCE SHEET

This undergraduate thesis entitled "**MODIFICATION AND PERFORMANCE EVALUATION OF A KNAPSACK SPRAYER WITH HORIZONTAL AND VERTICAL BOOM ADJUSTMENT,**" prepared and submitted by **IRIS JEWEL B. CASTAÑETO**, 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:


RENIEL ALBERT D. LERON
Member, Advisory Committee


06-28-2024

Date Signed


JEANNIE-ROSE G. FABULA, Ph.D.
Member, Advisory Committee

07-03-2024

Date Signed


JONATHAN V. FABULA, Ph.D.
Chair, Advisory Committee

06-28-2024

Date Signed

Accepted as partial fulfillment of the requirements for the degree of **BACHELOR OF SCIENCE IN AGRICULTURAL AND BIOSYSTEMS ENGINEERING**:


JOHN PAULO C. SACDALAN, Ph.D.
Head, Department of Agricultural and Biosystems Engineering

07-04-2024

Date Signed


ROY SEARCA JOSE P. DELA CRUZ, Ph.D.
Acting Dean, College of Engineering

07-04-2024

Date Signed

BIOGRAPHICAL SKETCH

Iris Jewel B. Castañeto is the youngest daughter of Jennifer Joan and Ismael Castañeto, was born on November 16, 2001, in Novaliches, Quezon City. Her educational journey began at the Little Lights Christian Learning Center in Novaliches, where she graduated as the class salutatorian in kindergarten. A`Iris's formative years were marked by a nurturing environment that fostered her creativity, setting a strong precedent for her future educational pursuits.

For her elementary education, Iris attended Llanera Central School, where she consistently achieved high academic honors, graduating with honors. Her dedication to learning and her inquisitive nature were evident as she actively participated in various school activities and excelled in her studies. Transitioning to Llanera National High School for both her junior and senior high school years, Iris maintained her academic excellence, graduating with honors each year. Her high school experience further honed her skills and interests, particularly in practical and field-based activities, which she found more engaging and fulfilling than purely academic tasks.

Currently, Iris is pursuing a Bachelor of Science in Agricultural and Biosystems Engineering, a field that perfectly aligns with her interests and strengths. She is passionate about working in the field and enjoys the hands-on aspect of fixing things and solving practical problems. Iris's choice of study reflects her commitment to applying her knowledge in real-world scenarios, aiming to make tangible contributions to the agricultural and biosystems engineering industry.

IRIS JEWEL B. CASTAÑETO

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ABSTRACT

CASTAÑETO, IRIS JEWEL B., Department of Agricultural and Biosystems Engineering, College Engineering, Central Luzon State University, Science City of Muñoz, Nueva Ecija, Philippines, July 2024, **MODIFICATION AND PERFORMANCE EVALUATION OF A KNAPSACK SPRAYER WITH HORIZONTAL AND VERTICAL BOOM ADJUSTMENT**

Adviser: JONATHAN V. FABULA Ph.D.

This study focuses on the modification and performance evaluation of a knapsack boom sprayer enhanced with control and sensor systems to optimize agricultural chemical application. The fabrication included the construction of the support frame, boom frame, and height adjustment system. The machine was also integrated with sensors such as an ultrasonic sensor for measuring water level and the distance between the crop tip and the nozzle. Additionally, a water pressure sensor was used to monitor the sprayer's pressure. The distance between the crop and the nozzle, water level, pressure, and solenoid were controlled using a web app connected to a microcontroller.

Performance evaluations were conducted to assess spray coverage, droplet size, volume mean diameter (VMD), and field efficiency for both horizontal and vertical spraying. Results indicated that the top and middle areas achieved high and consistent spray coverage, with the top area reaching approximately 94.10% for horizontal spraying and 94.52% for vertical spraying. The bottom area, exhibited significantly lower coverage, averaging 21.72%, suggesting a need for further optimization. Droplet size analysis showed uniform distribution across different levels, essential for effective application. Field efficiency was calculated at 65.85%, reflecting real-world operational conditions

such as operator fatigue and terrain irregularities. The total cost for fabricating the modified sprayer is Php 12,246.00. The total operating cost per hectare was found to be Php 488.45.

Keywords: Knapsack Boom Sprayer; Automation; Spray Coverage; Droplet Size; Volume Mean Diameter

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