

**DESIGN, FABRICATION AND PERFORMANCE TEST OF BICYCLE
OPERATED SELF-PROPELLED MULTI-NOZZLE SPRAYER**

**LACAS, JOSE ANGELO H.
MANUEL, IVAN P.**

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ABSTRACT

LACAS, JOSE ANGELO H. and **MANUEL, IVAN P.**, Department of Agricultural and Biosystems Engineering, College of Engineering, Central Luzon State University, Science City of Muñoz, Nueva Ecija, Philippines, **June 2023, DESIGN, FABRICATION AND PERFORMANCE TEST OF BICYCLE OPERATED SELF-PROPELLED MULTI-NOZZLE SPRAYER.**

Adviser: John Vincent A. Nate. M.Sc.

Most of the Filipino farmers own small farms, typically around 2 ha, due to financial constraints. Despite the emergence of more efficient modern sprayers, they often rely on traditional ones. However, these traditional sprayer's, such as the knapsack sprayer, require improvements in terms of discharge uniformity, losses and chemical concentration monitoring.

This study aims to design, fabricate and evaluate a bicycle-operated self-propelled multi-nozzle sprayer. It was designed in 2d and 3D formats using Computer Aided Drafting and was fabricated using locally available materials. Performance evaluation was conducted using three different nozzles: 8-hole, 4 hole and 1-hole nozzles. The parameters evaluated included discharge rate, distribution uniformity, application capacity, and field efficiency. The machine operated in an onion farm area at Brgy. Bagong Sikat, Gabaldon, Nueva Ecija for data gathering.

After nine replications, results indicated that among three treatments, treatment 1, which involved the use of the 8-hole nozzle, performed the best in terms of all the evaluated parameters. It has the highest discharge rate, application capacity and uniformity of distribution with .0769 L/s, .117 L/m^2 , and 83.56% uniformity respectively. The 4-hole nozzle followed closely behind, with discharge rate, application capacity and distribution

uniformity of .067 L/s, .103 L/m² and 81.45% uniformity respectively. Additionally, the machine also had an 80% field efficiency.

The developed machine was found to be functional under dry conditions, and its applicability extends to all bicycle-operated farm machineries. However, to make the machine usable in wet conditions, replacing the motor for power provision would be necessary. Furthermore, adjustment to other machine components like increasing its vertical clearance can also expand its range of applications. These changes, however, may raise the machine cost. But considering the broader application to other farming scenarios, the investment in said changes would be worthwhile.

Keywords: bicycle operated self-propelled multi-nozzle sprayer; discharge uniformity; nozzle; moving mechanism; application capacity

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