

**SPRAYING APPLICATION EFFICIENCY AND SPREADER UNIFORMITY OF
REMOTELY PILOTED AIRCRAFT SYSTEM**

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(AB Machinery and Power Engineering)**


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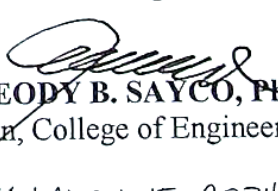

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ABSTRACT

BILLONES, CHRISTINE ANNE A. and SANDOVAL, GABRIELLE T., Department of Agricultural and Biosystems Engineering, Central Luzon State University, Science City of Muñoz, Nueva Ecija, Philippines, **December 2023, SPRAYING APPLICATION EFFICIENCY AND SPREADER UNIFORMITY OF REMOTELY PILOTED AIRCRAFT SYSTEM.**

Adviser: MARVIN M. CINENSE, Ph.D

Drone technology has advanced significantly over the last two decades in terms of flight stability, sensor capability, battery life, and price. Because of these improvements, drones are now more widely available and useful for a variety of industries, including agriculture. However, there aren't many reputable studies on RPAS because they are still relatively new and developing technology. Thus, this study was conducted to evaluate the performance of the RPAS' spreading system and application efficiency of the RPAS' spraying system. The RPAS spreading system was evaluated using distribution uniformity (DU) given its parameters. Performance parameters such as output rate, uniformity of distribution, effective swath width, and application rate were analyzed. The data were analyzed using t-test. Each test had three replicates each at a single pass application of the RPAS to assess the uniformity of the spreading system. A flight height of 3 m at different flight speeds of 3 m/s and 5 m/s were assessed.

The DU value for determining the uniformity of distribution of the RPAS varied from 79.15% at 50% overlap with an effective swath width of 12 meters and 3 m/s forward speed; and 88.50% at 40% overlap with an effective swath width of 11 meters and 5 m/s forward speed for fertilizer aerial spreader application. For the rice seed aerial spreader application, the data obtained were 69.35% and 82.70% at 50% overlap with an effective

swath width of 12 and 11 meters, at 3 m/s and 5 m/s, respectively. The output rate of the RPAS varied from 2425 kg/hr for 3 m/s and 2368 kg/min for 5 m/s for fertilizer; and 507 kg/hr for 3 m/s and 535 kg/hr for 5 m/s for rice seed. The application rate of the RPAS for fertilizer varied from 186.20 kg/ha for 3 m/s and 126.36 kg/ha for 5 m/s. According to Department of Agriculture, 150 kg/ha is the minimum recommended application rate for 14-14-14 fertilizer. With this, 3 m/s showed an efficient result. The rice seed application rate varied from 39.17 kg/ha for 3 m/s and 27.06 kg/ha for 5 m/s for rice seed. According to PhilRice, 40 kg rice seeds is required to be planted in a hectare. With this, 3 m/s showed an efficient result.

The application efficiency of the RPAS spraying system was evaluated by dividing the water stored in the testing area over the water applied. Each test had three replicates each with the RPAS operating steadily above the testing area. Different flight heights were considered in the evaluation of the spraying application efficiency. The application efficiency of the RPAS varied from 50.63% for the 3 meter flight height, and 41% for the 4 meter flight height.

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