MULCH BED IMPLEMENT ATTACHED TO HAND TRACTOR

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ABSTRACT

GALLANO, ISSA MARIE T. and VERGARA, NOLITO G. JR., Department of Agricultural and Biosystems Engineering, College of Engineering, **June 2023, MULCH BED IMPLEMENT ATTACHED TO HAND TRACTOR**

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The use of plastic mulch in vegetable production in the Philippines has shown significant benefits, including faster crop development, higher yields, and improved fruit quality. The application of plastic mulch remains tedious and laborious despite the availability of machinery of such purposes. The adoption of mulch bed implements attached to hand tractors may help farmers reduce labor and time required for mulching, enhancing efficiency and crop outcomes. The specific objectives of this study hence for to design a plastic mulch laying implement that can be attached to a commercial hand tractor, fabricate the implement using local materials and shop skills, evaluate the plastic mulch laying implement in terms of capacity and efficiency, and determine the relative cost of using the developed tool. The implement was designed and fabricated based on the approved design plans, considerations and specifications. It was fabricated from local materials using basic tools. The components of the implement include the frame, mulch laying unit, press wheel, press roller, opener (furrower), soil covering unit, and hitch.

The study found that a forward speed of 5 km/hr, furrow depths of either 10 cm or 14 cm, and a soil covering depth of 16 cm produced the best results, achieving the highest actual field capacity (AFC) of 0.38 ha/hr. The performance indicators in the study focused on evaluating the machine's field capacity and efficiency using different speeds of the hand tractor (low and high), different depths of opener operation, and different depths of soil

covering operation. A total of 8 combinations/treatments were tested, with three replicates each, resulting in 24 plots. The results indicated that both speed and soil covering significantly influenced the implement's performance.

In terms of bed width efficiency, the combination of 5 km/hr (A2), 10 cm (B1), and 16 cm (C2) stood out with the highest efficiency of 99.91%. For soil width cover efficiency, two combinations stood out: 5 km/hr (A2), 10 cm (B1), and 14 cm (C1), and 5 km/hr (A2), 12 cm (B2), and 14 cm (C1), both achieving an efficiency of 99.75%. In terms of time efficiency for laying plastic mulch, the combination of 3 km/hr (A1), 10 cm (B1), and 16 cm (C2) was the most effective, with an efficiency score of 90.28%.

The adoption of mulch bed implements combined with hand tractors for plastic mulch implement proves economically advantageous, with a short payback period of 2.6 months and a break-even point at 1.71 hectares per year. This approach not only ensures a quick return on investment but also indicates the potential for sustainable financial gains when covering a larger land area.

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