PERFORMANCE EVALUATION OF SOLAR-POWERED MULTI-PURPOSE FARM VEHICLE

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ABSTRACT

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Agriculture plays an important role in the Philippine economy. Agricultural mechanization is one of the concerns for agricultural sector. Mechanization involves the use of hybrid machine between power source and work to increase production and minimize losses. It saves labor cost and energy. Also, the use of eco-friendly energy resources such as solar energy is considered for agricultural mechanization. To solve issues and concerns about mechanization, the solar-powered multi-purpose farm vehicle also known as e-Cart was developed by CREaTe. Hence, this study was conducted to evaluate the performance of the solar-powered multi-purpose farm vehicle (e-Cart).

E-cart has total dimension of 2,150 mm x 910mm x 1,740 mm. It consists of prime mover, battery, charging units, mixing and spreading units, and pump. It has a total battery capacity of 8500 mAH and a solar capacity of 220 watts-hours to power the 550 watts DC electric motor, and 280 watts pump.

The performance of the solar powered multi-purpose farm vehicle (e-Cart) was evaluated by measuring the different parameters such as speed and power consumptions. The speed of the e-Cart was measured when using the e-Cart as a service and for the hauling of agricultural products. The performance parameters of the e-Cart as paddy mixer such as field capacity, material capacity, and the determination of the physical

characteristics of paddy were evaluated in comparison to manual drying practices. Further, comparisons among means were analyzed using t-test at 5% level of significance. The discharge of the pump using the solar powered farm vehicle as source of power was determined.

The test results revealed that the minimum speed of the e-Cart on bare road is 13.86 km/hr while the maximum speed is 18.70km/hr. On the paved roads, the maximum speed is 21 km/hr. In evaluation of speed of e-Cart used for hauling of agricultural products, the minimum speed of the vehicle with trailer at maximum loads of 150 kg is 12.11 km/hr., and the maximum speed is 15.08 km/hr. on bare road. While on paved road, the maximum speed obtained of the e-Cart is 16.18 km/hr. and the minimum speed is 13.03 km/hr. The evaluation of the e-Cart as source of power for irrigation pump, the result showed that the average discharge of the irrigation pump is 1.90m^3/hr. Statistical results showed that the e-Cart attained comparable results and had no significant differences with the manual practice in terms of field capacity and material capacity of 972.52m^2/hr. and 108.06cavans/hr., respectively. Furthermore, moisture content reduction, increment in cracked grains, and increment in hulled grains of 1.40 %/hr., 1.11% increment, and 0.44% increment, respectively, were attained while using the machine. The t-test showed no significant differences among means and yielded comparable results with manual drying practices.

Keywords: discharge; paddy mixer; power consumption; speed; solar-powered multi-purposed farm vehicle;

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