

DESIGNING OF A TWO-WHEEL TRACTOR COUPLED RICE HUSK BIOCHAR APPLICATOR FOR LOW-LAND PADDY FIELDS

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Rice Husk Biochar (RHB) is an excellent source of organic soil amendment and a better alternative to inorganic fertilizer, targeting the improvements of physical, chemical, and microbial properties of soil. However, RHB has not been tested for its possibility to be applied with an applicator coupled to a two-wheel tractor. Therefore, the aim of this study was to design a two-wheel tractor-coupled RHB applicator for low-land paddy farming. The conceptual design comprised four components, the hopper, metering mechanism, delivery unit, and power transmission system. Primary tests were conducted to collect the required data for determining design parameters. The bulk density and angle of repose of RHB were 267.3 kg m^{-3} and $43^{\circ}25'$, respectively. Moreover, the optimum tractor forward speed for the RHB applicator was investigated as 4.5 km h^{-1} . The components were designed by considering their compatibility with the tractor and operation. With a capacity of 75 kg of RHB, the hopper was designed as the frustum of a squared pyramid with slant angle of 70° . which results to free flow of RHB under the gravity without bridge formations. The RHB metering system was designed as a stranded type screw conveyor with a capacity of 240 kg h^{-1} . Therefore, the screw pitch (13.3 cm) was equal to the diameter of the screw. The RHB delivery unit has an axial flow fan and two flexible houses to deliver RHB to the field. The metering mechanism and fan were driven by the power of ground wheel axle through a belt and pulley system. The capacity of designed batch type RHB applicator is sufficient to apply RHB equally across the 0.1 ha of low land field. Thus, this design has a potential to develop into a prototype of RHB applicator for lowland paddy fields in Sri Lanka.

Keywords: Angle of repose, Low land paddy farming, Organic farming, Primary test