

DESIGN AND DEVELOPMENT OF A TWO-WHEEL TRACTOR COUPLED BUND PLASTERING AND CANAL (*kiwul-ela*) MAKING EQUIPMENT

E.A.A. Sandaruwan, G.V.T.V. Weerasooriya, and A.J. Fernando

*Department of Agricultural Engineering and Soil Science, Faculty, of
Agriculture, Rajarata University of Sri Lanka, Anuradhapura, Sri Lanka.*

Rice (*Oryza sativa* L.) is the staple food and major crop in Sri Lanka. Improving rice cropping practices and production systems are required to enable a sustainability. Presently bund cleaning, plastering, and *kiwul-ela* constructing are done manually and there is no proper mechanical solution. Thus, this study was aimed to design and develop an appropriate bund plastering and *kiwul-ela* making equipment as a rear attachment to a walking type two-wheel tractor. Design, fabrication and testing were done in Faculty of Agriculture, Rajarata University of Sri Lanka. The main components of the equipment were bund plaster, bund cleaner, *kiwul-ela* maker, depth controller, and main frame. Mild steel box iron and sheets, galvanise pipe and rubber wheel were used to construct the prototype. Permanent and non-permanent fastening methods were used. The total weight, length and width of the equipment were 38.85 kg, 1.2 m and 0.92 m, respectively. The preliminary tests were conducted to evaluate the performance of the prototype and modified using the classical approach of farm machinery design and development. After primary land preparation, a low land puddle paddy field with an average bulk density of 2.144 g cm^{-3} and moisture content of 14.81% were used as the test field. The prototype showed significantly higher comparative performances; 93.93% of time saving and 64.4% of cost reduction over the manual method ($p < 0.05$). Further, prototype showed highly satisfactory field performances; operational speed 2.045 km h^{-1} , draft force 49.08 N, plastering thickness $0.032 \pm 0.002 \text{ m}$, and height $0.21 \pm 0.02 \text{ m}$, theoretical field capacity $52.054 \times 10^{-3} \text{ hah}^{-1}$ and field efficiency 63.6%. Due to the higher performance of this bund cleaning, plastering and *kiwul-ela* making equipment, it could be recommended for paddy farmers. However, the plastering height could be further increased by modifying the mouldboard of this equipment.

Keywords: Bund cleaner, Bund plastering, *Kiwul-ela* making