DESIGN, DEVELOPMENT AND TESTING OF COMBINED MANUAL WEEDER AND MARKER FOR ROW PLANTED PADDY (SRI METHOD)

S.P.K. Maithripala, G.V.T.V. Weerasooriya, P.D. Kahandage and G.A.S. Ginigaddara
Dept of Agricultural systems, Faculty of Agriculture, Rajarata University of Sri Lanka, Puliyankulama, Anuradhapura.

Rice is the staple food of about 50 per cent of the world's population and should be increased by 50 per cent by 2025 with the increasing population[2]. Achieving this task has been a global challenge due to the limited agricultural lands and environmental problems created by modern agriculture. Therefore, increasing the productivity of existing paddy lands is the way to conquer the challenge. The System of Rice Intensification (SRI) is a new methodology for increasing the productivity of irrigated rice, while reducing the burden on environment. Though SRI method increases the productivity and profitability by reducing the cost of inputs and increasing the soil conditions, it is less popular among rice farmers in Sri Lanka due to some reasons; labour consuming practices like marking the rows in the field before planting, transplanting, destroying the weeds, *etc.* Wider plant spacing in SRI method causes the rapid growth of weeds, demanding more manual labour for weed control. The marking of the rice fileds before transplanting, is highly laborious and a labour consuming operation. Lack of appropriate machinery for the marking and weeding of the rice field is still prevailing in SRI cultivations in Sri Lanka. In contrast, dual or multipurpose machinery would be popular among SRI farmers than single purpose machinery. This effort focuses on designing and producing a dual purpose machine that could be used by small scale SRI farmers for marking rows and weeding.

Machine designing criteria in this effort is to increase field capacity, reduction of labor requirement and percentage of damaged plant, easy handling including turning and dual purpose usage. Weeding units were limited to reduce the total weight of the machine, which can even be operated by a female. Weeding units were attached to the frame with required space among them, for efficient weed control and with minimum damage to paddy plants. The width of a single weeding unit was 17 cm and this width cannot be adjusted. The ground clearance could be adjusted using the thread bars and nuts of wheels to suit the plant height in order to minimize damage to paddy plants. When attaching the handle and the adjusting bar to the frame, ergonomic factors were considered in order to apply the manual power efficiency and comfortably. Two adjustable skidders were attached to the frame in order to control the sinking (Figure 01).

All the fabrication work was done at the Engineering workshop, Faculty of Agriculture, Rajarata University. Frame of the device was made using

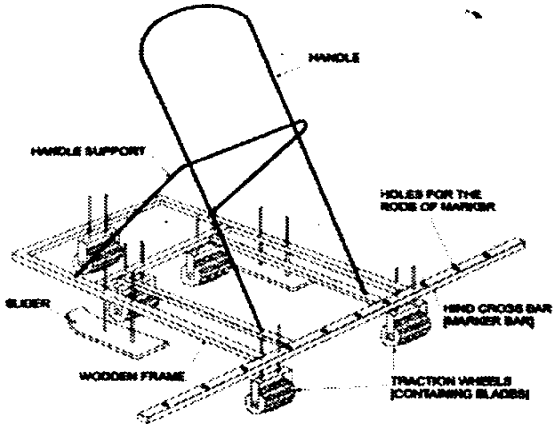

Fig. 01. Major Components of Weeder

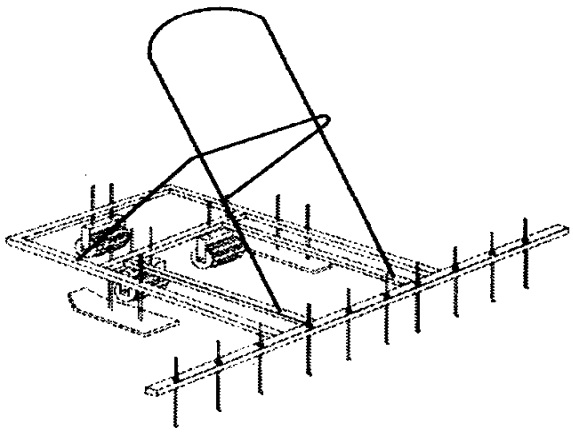

Fig. 2. Application as a marker

1" x 1" x 2 mm metal box bars and all the joints were permanently welded. The hind cross bars were used as the marker attachment and holes were made on it to attach rods when using as the marker. Weeding wheels were made using pieces of metal pipes, sharp blades made with 18 gauge

sheet metal, flat iron bars (1.5"x 3 mm), bearings and tread bars. Eight sharp blades were welded to each weeding wheel alternatively, to avoid overlapping of two grooves with equal distance and axel of the wheel.

was connected to the frame of the wheel via roller bearings. Skidders were made using 18 gauge sheet metal and tread bars and fitted with nuts. The handle and adjusting bar were made with light metal pipes (2 cm diameter and 1 mm thickness) and flat iron bars.

Testing the performance of the machine was done at the experimental paddy fields of Faculty of Agriculture, Rajarata University of Sri Lanka. A lowland field with 10 m x 10 m area was primarily prepared using a tine tiller attached to the four-wheel tractor. Organic matter (paddy straw and cow dung) was added at the rate of (10,000 kg/ha). Secondary land preparation was done using rotovator attachéd to the two-wheel tractor, after 15 days from first ploughing. Transplanting of 8 day-old rice seedlings were done manually, maintaining 10 cm x 10 cm spacing. The first weeding was done after 10 days of planting and required data were collected to find the actual field capacity, theoretical field capacity, field efficiency, suitable forward speed and weed destroying percentage[1]. A suitable forward speed was obtained by averaging the five readings of times taken to complete 5 meters in a straight line. Actual field capacity was determined taking the average of three readings of times taken to complete 25 m^2 of area. In order to calculate the weed destroying percentage, weed count in one meter long, five consecutive rows were taken before and after the machine operation.

Total length, width and height of the device were 125 cm, 100 cm and147 cm, respectively. The length of the marker attachment was 175 cm (figure 02). The ground clearance could be adjusted between 25 cm and 45 cm. The total weight of the equipment was 42 kg. Suitable average forward speed for better operation was 0.078 km/h. The theoretical and Actual field capacities were 0.0064 ha/h and 0.0048 ha/h, respectively. Field efficiency was 75%. The weed destroying percentage was 87.4%. The device should be moved to front and back alternatively, to get higher weed destroying percentage. The results proved the suitability of this machine for marking rows and weeding in small scale SRI fields.

Key words: SRI method, weeding, marking, testing

REFERENCES

1.Alizadeh, R. M. (2011). *Field performance evaluation of mechanical weeders in the paddy field*, Department of Agricultural Engineering, the Rice Research Institute of Iran (RRII), Available online at alizadeh_mohammadreza @yahoo.com, Retrieved on 13.05.2012

2.Kumara, S.G.J.,2006. *A Comparative Study of Nutrient Management in Paddy under SRI and Traditional Methods of Cultivation.* University of Agricultural Sciences, Dharwad. Available online at http//www. fao. org. Rice 2004/en/pdf. badawi. pdf..Retrieved on 26.05.2012