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Research Paper

Development of a walk-behind type hand tractor powered vegetable transplanter for paper pot seedlings

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A 9.75 kW walk-behind type hand tractor powered 2-row fully automatic vegetable transplanter for individual paper pot seedlings was developed by considering the power availability, paper pot dimensions and space availability in the hand tractor after the complete removal of rotavator tillage assembly. It consisted of two sets of feeding conveyor, metering conveyor, seedling drop tube, furrow opener, soil covering device, an automatic feeding mechanism, a depth adjustment wheel and hitching arrangement. Horizontal slat-type chain conveyor was used as feeding conveyor and horizontal pusher type chain conveyor was used as metering conveyor. The automatic feeding mechanism, with a timing shaft, cam and clutch, was used to coordinate the working of feeding and metering conveyors. The vegetable transplanter carried 108 seedlings on two feeding conveyors in upright orientation, fed them to the metering conveyors and planted them in upright orientation in furrows. The performance of the vegetable transplanter was evaluated for transplanting tomato at 45 × 45 cm spacing in the field at a forward speed of 0.9 km h^{-1}. Field capacity of the transplanter was found to be 0.026 ha h^{-1}. It resulted in the saving of 68% labour and 80% time over the conventional method of manual transplanting. The planting rate of the transplanter was found to be 32 pot seedlings min^{-1} with 4% missed planting and 5% tilted planting. The soil covering efficiency of the developed vegetable transplanter was about 81% and the quality of transplanting was satisfactory.

1. Introduction

India is the second largest producer of vegetables with the production of 129 million metric tons and yield of 16.2 metric tons ha^{-1} in the year 2008–2009 (Government of India, 2009). About 175 types of vegetables are grown in India including 82 field vegetables and 41 root (tuber and bulb) crops (Randhawa, 1998; Subramanian, Varadarajan, & Asokan, 2000). Most of the vegetables like cucurbits (*Cucurbita* spp.), beans (*Phaseolus* spp.), okra (*Abelmoschus esculentus*) and leafy vegetables are sown directly in the field. Vegetables like tomato (*Solanum lycopersicum*), eggplant (*Solanum melongena*) and peppers (*Capsicum* spp.) are first sown in nursery beds and later transplanted manually either on ridges or on a well prepared seedbed (Ghai & Arora, 2007). Manual transplanting of seedlings is labour-intensive, expensive, time consuming and

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