



## FOUR WHEEL DRIVE TRACTOR (Mini Tractor) MOUNTED 8-ROW PADDY TRANSPLANTER



Prepared based on the research work of AICRP on FIM, PJTSAU, Rajendranagar, Hyderabad.

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### Nursery Preparation Mat type nursery

For mechanical transplanting, like conventional method, nursery is not raised in plots or fields. The machine can transplant soil bearing seedlings prepared in mat type nursery. For preparation of mat type nursery, a special nursery bed is prepared on a flat piece of land using polythene sheets. Wooden/Iron frames having 50 x 22 x 2.5 cm sized compartments are placed on the polythene sheet. First, the pebbles free fine soil is prepared with the use of large size sieve and fine farm yard manure is mixed with it. This soil is filled uniformly in all compartments and gently compacted up to a thickness of 2 cm. The seed rate is decided according to size of the selected seed variety. The seed rate for small size variety, medium size variety and large size variety is 8-10 kg/acre, 10-12 kg/acre and 12- 15 kg/acre respectively. The selected seed is soaked in water for 24h. Thereafter, the water is removed and allowed to incubation for another 24 h in gunny bags in order to get sprouting. The sprouted seeds are evenly broadcasted on the mats. Then the seed is covered with very thin layer of fine soil. To protect the seeds from birds the mats will cover with straw. Channels will make all around the nursery beds for irrigation and draining out excess water whenever required. First 3 days the water is sprinkled with rose can. From fourth day the straw has to be removed and the nursery seedlings will irrigated twice a day up to transplanting time. Seedlings will be ready for transplanting by 16 to 18 days after sowing, when the height of the plant reaches 10-15 cm with 3-4 leaves can be used for transplanting.

### Transplanting operation

After the land preparation and levelling in the main field, the field was allowed for sedimentation for 24 hours to avoid sinking of transplanter. The 4-wheel drive tractor mounted paddy transplanter has got 2 different pto speeds i.e, pto1 and pto2. The machine was operated at three load (L) forward gear selections i.e., G1, G2 and G3 with the combination of 2 different pto speeds in the field. The machine covers 8 rows with spacing of 23.8 cm between the rows.

Based on the trials conducted during farmers field, it was observed that the field capacity of a machine was 0.188, 0.24 and 0.288 ha/h with field efficiency of 52.80, 60.22 and 60.50 % at an operating speed of 1.87, 2.09 and 2.5 kmph respectively with 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> forward speed in load gear. The optimum hill to hill spacing was observed as 10 cm, 15 cm and 10cm with the missing hill percentage of 6.7, 7.04 and 6.94 were obtained with the combinations of Gear1& PTO1, Gear2& PTO1 and Gear2 & PTO2 respectively. The demonstration of 4-wheel drive tractor mounted paddy transplanter is shown in Fig. 2.



**Fig. 2 Demonstration of 4-wheel drive tractor mounted 8-row paddy transplanter at farmer's field.**

### Recommendations:

1. The head land should be left for 3.5 m to operate the 4 wheel drive 22 hp tractor mounted paddy transplanter.
2. This machine can suitable in light and medium soils only.
3. Skilled operator should be required for the smooth running of the machine in puddle field.

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### Need of the 4-wheel drive tractor mounted paddy transplanter

Rice (*Oriza Sativa*) is the most important cereal crop and staple food in most of the south-east Asian countries. India is the largest grower of rice in the world and it occupies the largest cropped area of 44.2 M ha with a total production of 87.5 Mt and an average productivity of 1.9 t ha<sup>-1</sup>. The manual rice transplanting method gives the desired result but the labour requirement is very high. It involves labour intensive operations like nursery raising, uprooting of the seedlings, transporting and transplanting them in the main field requiring about 280-350 man-h ha<sup>-1</sup>. High labour demand during the peak transplanting period adversely affects the timeliness of this operation, thereby, reducing the crop yield. Timeliness of rice transplanting is essential for optimizing the yield and this can be achieved only through the mechanical transplanting. The performance of the mechanical transplanters were quite satisfactory and labour requirement is also less even though, to breakeven with the cost of manual operation, the mechanical transplanting would be economical if it is used to cover an area of 28 ha and above per year. Thus, it is possible to reduce the cost of paddy transplanting by mechanization to almost half the cost of manual transplanting provided the machines are used for their maximum i.e., 90 hectares in a year. Moreover, the price of machine is very high and majority of the farmers cannot afford to buy. So, a local manufacturing of the machinery may bring down the total cost of paddy transplantation. In view of this a cheap, simple and effective indigenous transplanter is needed under Indian conditions. Therefore, a riding type 4-wheel

drive tractor mounted paddy transplanter was developed, tested and subsequently demonstrated under several locations in Telangana state under Hyderabad center of All India Coordinated Research Project on Farm Implements and Machinery.

### Brief description of the machine

The machine consists of 4-wheel drive tractor along with rubber reinforced metallic wheels, a reduction gear box, float, 8-row transplanting mechanism unit with three point linkage, seedling tray and other associated components. The view of 4-wheel drive tractor mounted paddy transplanter is shown fig 1 and the technical specifications of the machine are given in Table 1.

**Table 1: Specifications of four wheel drive tractor mounted 8-row paddy transplanter.**

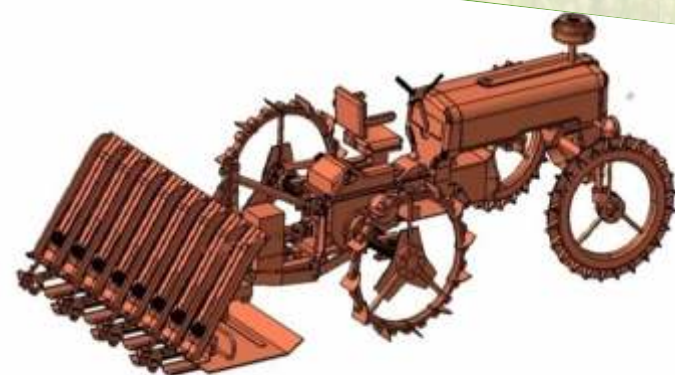
Specifications	Details
Power source	22 H.P four wheel drive tractor
Number of rows	8
Row to row spacing, cm	24
Optimum Plant to Plant spacing, cm	10-15
Type of planting mechanism	Crank type
Overall Weight with tractor, kg	750
Weight of planting mechanism without tractor, kg	260
Depth of planting, cm	2-4
Type of wheels	Rubber rein forced metallic wheels

Type of Seedlings	Tray / Mat type
Dimensions of planting mechanism unit (LXWX H), cm	115 X 192 X 96
Dimensions of ReductionGear box (LXWXH), cm	20x12.5x26
Type of fingers	Fork type
Type of drive shaft	Telescopic propeller shaft

The paddy transplanting mechanism unit is attached to the 4-wheel drive tractor with the help of three point linkages for transplanting operation. The 4-wheel drive 22 hp mini tractor provides power for propulsion as well as for working of the paddy transplanting mechanism unit. Two sets of interchangeable wheels (Pneumatic wheels and rubber reinforced metallic wheels) are provided with the machine. The pneumatic wheels are used during off field transportation and rubber reinforced metallic wheels are used during transplanting operation.

### Working principle of the machine

The machine transplants seedlings of mat / tray type nursery in eight rows in a single pass. The planting mechanism receives power from the Tractor P.T.O through universal joint, reduction gearbox, propeller shaft and transplanting mechanism unit gear box. The float facilitates the transplanter to slide over the puddled surface. The tray containing nursery for 8 rows is moved sideways by a scroll shaft mechanism, which converts rotary motion received from the tractor P.T.O through universal joint, reduction gearbox and propeller shaft into linear motion of a rod connected to the seedling tray having provision to reverse the direction of movement of tray after it reaches the extreme positions at ends. Fixed fork with knock out lever type planting fingers (cranking type) are moved by a four bar linkage to give the desired locus to the tip of the planting finger.



**Fig. 1 View of 4-wheel drive tractor mounted 8-row paddy transplanter**