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Research Paper :

Comparative performance of single pass implement with a conventional machine system

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ABSTRACT

The implement was intended to enable 45-55 hp tractors to complete a seedbed in a single pass for both dry and wet land crops. The combination of rotary tiller and disc harrow was used for seed bed preparation in short time. Comparison of implement performance was done with conventional implements like disc harrow, rotary tiller and MB plough. The prototype clearly indicated a potential for improvement performance in terms of different parameters like time, fuel consumption, field capacity and cost operation. Effect of depth of cut, velocity ratio, and forward speed on mean weight diameter of soil aggregates and draft of the implement was studied. Field studies indicated that the prototype had an effective single pass capability and the average mean weight diameter of the soil clods achieved was 5 mm. The field capacities of the implements for first three same treatments were MB plough + Disc harrow (0.16ha/h), MB plough + rotary tiller (0.19ha/h) and MB plough + Prototype (combination implement 0.25ha/h). The combination tillage implement has the advantage of 0.09 ha/h over the disc harrow and 0.06 ha/h over rotary tiller. In case of other two remaining treatments where primary and secondary tillage operations were covered by direct rotary tiller and direct combination implement. The field capacity was observed 0.34 ha/h for rotary tiller and 0.78 ha/h for combination implement. Thus, there was also an advantage far combination implement of 0.44 ha/h. As for as cost of operation is concerned, the comparison between (MB plough + Disc Harrow), (MB plough + rotary tiller) and (MB plough + Prototype) the prototype implement saved the Rs. 434.52 /ha between disc harrow and prototype and Rs. 298.52 /ha compared to rotary tiller. In case of rotary tiller and combination implement, the combination implement saved Rs. 476/ha compared to rotary tiller in medium black soil.

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Mechanization plays an important role in agriculture for increased production, productivity and profitability through timeliness in operation. During fourth and fifth five year plans, more sophisticated implements were introduced. The major thrust of agricultural mechanization is to reduce drudgery in the field operation and provide better quality of life to rural people. Many changes in tillage practices have been found during the last 15 years. Conservation tillage practices are replacing moldboard plowing and other major seedbed preparation practices on a large portion of the total area under cropping in the developed countries (Harrigan and Rotz, 1995).

Preparation of seedbed includes operations such as ploughing, disking, cultivating and harrowing etc good crop establishment depends on the quality of seeds sown as well as good seedbed and weather conditions. The time span between harvesting and sowing is less although good seeding with fertilizer application is developed. In view of minimizing the total cost of operation on the field, the reduction in the cost of tillage operations without impairing the soil tilth is a must. Therefore, it is the need of the farmers to perform all the seedbed preparation operations by a single machine saving time, money and mechanized tillage. The use of combination tillage implements for land preparation is one such practice that combines multiple tillage operations in a single pass, and thus reduces the number of field trips as compared to conventional tillage practices resulting in a reduction of labour and fuel cost and saving in time.

Most of the studies on draft, energy and tillage performance of different combination tillage implements have been carried out in America and European countries. Several combination tillage implements comprising of rotary and passive elements were developed and found to be more energy efficient than a similar single passive tillage implement when tested in actual field conditions (Chamen *et al.*, 1979, Wilkes and Addai, 1988, Shinners *et al.*, 1990, Shinners *et al.*, 1993, Sigitov, 1992, Weise, 1993 and Upadhyaya *et al.*, 2001).