

Research Paper :

## The field performance evaluation of tractor operated combination tillage implement

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### ABSTRACT

An implement made up of a combination of soil working tools was developed and tested. 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. It was envisaged that such an implement would affect considerable saving of time, fuel and energy. This would also reduce the cost of operation. The combination of rotary tiller and disc harrow for using good seed bed preparation in short time. The prototype clearly indicated a potential for improvement performance in terms of time, fuel consumption, field capacity and cost operation. Effects of depth of cut, velocity ratio, and forward speed on mean weight diameter of soil aggregates and draft of the implement were 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 4.5 to 5 mm. The field capacity of the machine for the first treatment *i.e.* MB plough + combination tillage implement was 0.25 ha/h. In case of other remaining treatments where primary and secondary tillage operations covered by direct combination implement. The field capacity was observed to be 0.78 ha/h. In case of cost of operation in the treatment first *i.e.* (MB plough + combination tillage implement) was Rs. 1200/ha. In case of second treatment for direct use combination implement the cost of operations was Rs. 510/ha in medium black soil.

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Over the next few decades agriculture in our country will be called upon to maintain an increasing level of output in the face of constraints like land, fuel and time.

Mechanization plays an important role in agriculture for increased production, productivity and profitability through timeliness in operation.

Preparation of seedbed includes operation such as ploughing, disking, cultivating, harrowing etc. These operations give better-pulverized soil leading to friable and properly aerated soil ideal for better germination of seed. Many seedbed preparation implements such M.B. plough, disc plough for primary tillage and harrows and cultivators are used for secondary tillage tools.

As farmers turn increasingly to multiple cropping systems to boost their incomes and meet increased demand for their produce, the time available for seedbed preparation has decreased considerably.

### Combination implements:

The concept that a combination of tillage tool in sequence can substantially reduce the total time and energy for achieving a desired soil condition is fairly well established. However most of such equipment which can

prepare a seedbed in a single pass of the tractor has been developed for tractors in the range of 70 to 90 hp. The initial cost of this equipment is also high. The development of combination implements which reduce overall power requirements to enable tractors in the range of 45 to 55 hp to achieve single pass seedbed preparation to suit the economics of Indian farming has not been attempted.

The active elements of combination implements can produce negative draft, which requires further energy inputs to control tractor steering and the three-point hitch and is also harmful to the drive train of tractor (Wismer *et al.*, 1968). A few researchers have also conducted studies on the performance of semi-mounted and trailed type passive-passive combination tillage implements (Bukhari *et al.*, 1981; Yusuf and Asota, 1998). It was observed that the use of combination tillage implements in land preparation outperformed the conventional land preparing practices in fuel consumption, time requirement and cost of operation and did not produce negative draft. A few studies on development and performance evaluation of 2WD tractor drawn active-passive combination tillage implements have also been conducted in India (Kumar and Manian, 1986, Manian *et al.*, 1999; Kailappan *et al.*, 2001a and Kailappan *et al.*, 2001b) and confirmed the