A CASE STUDY

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Development of improved intercultural hoe

■ **B. CHITTAPPA, R. NISHA AND C. NICKHIL**

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See end of the Paper for authors' affiliation

Correspondence to :

B. CHITTAPPA
Department of Agricultural Engineering, College of Agriculture, BENGALURU (KARNATAKA) INDIA

■ **ABSTRACT :** The interculturing operation breaks the upper surface of the soil, uprooting the weeds, aerating the soil, making good mulch, so moisture inside properly retained from evaporation. In the animal-drawn hoe, the implement draft and the capacity of the animals to provide the required power will also affect performance, as will ergonomic considerations related to the comfort of the operator. A intercultural hoe could be easily handled, light, strong, durable, cheap, adjustable for different crops and can be easily manufactured locally. The present bullock hoe consists occupied the space coverage of width 95 cm, total height of 102 cm, three number of tynes and angle 41^0. The shape of blade is rectangular and beam length of 236 cm. The field capacity of the implement was noted to be 0.27 hectares per hour which included the turning losses, the field capacity was found to be 0.17 hectares per hour for the area of 10×20 m^2, which gives the field efficiency of 81.43 per cent.

■ **KEY WORDS :** Field, Implement, Hoe, Bullock, Blade

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In regions where human labour and draft animals are the main source of farm power, timeliness of field operations including seeding operation has been identified as a major factor in increasing the intensity of cropping. Hence, there is necessity to mechanize not only tillage but also the seeding operation. Mechanical methods will remain by far the most widely used means of weed control in the country for years to come. Animal power will play a key role in weed control in upland crops .Efforts should, therefore, be made to develop, evaluate, modify and introduce improved animal-drawn hoe in the entire region. The objective of research was to develop bullock improved intercultural hoe and to study the cost economics of developed hoe.

■ METHODOLOGY

The materials for designing and fabrication of animal drawn three tyne intercultural hoe are flat iron for share (2mm thickness), hollow circular pipe for handle (30mmdia), solid iron rod for tynes (square shape, 15mm side), rectangular shape hollow iron pipe for shaft (60mm × 40mm) and clamps.

Frame :

Frame is the part where all other parts are attached. We have used a rectangular hollow pipe of 8 cm × 4 cm cross section for frame. The parts which are welded on the frame are iron plates to support beam and handle. For beam support, 3 equal length iron flat blade of length 20cm, thickness 5 mm and width 5 cm is used. This flat blade is attached with the beam. Now on the other end of this support, an hollow pipe, slightly bigger in diameter of the beam is welded.

Tynes :

The three square rods of equal length and cross-

Table 1: Performance results of intercultural hoe

Sr. No.	Particulars	I	II	II	Average
1.	Plot size(10×20m)	200	200	200	200
2.	Width of operation(cm)	20	20	20	20
3.	Depth of operation (cm)	10	8	9	9
4.	Time required (sec)	1140	1140	1110	1130
5.	Theoretical field capacity(ha/h)	0.30	0.28	0.28	0.27

section 15mm × 15mm are bent at one end. The bending is done such that to get an angle of approximately 41^0. The bent part is flattened by heating and beating action. Later blade is welded on this part.

Blade :

A flat iron cut into 3 pipes for blade of about 20cm and one side face of the flat iron made sharpen to facilitate for proper penetration in to the soil for effective weeding.

Clamps :

Clamps are used for tightening of tynes on the frame and eye bolts were attached on the clamps. The eye bolts were made by bending the circular rod of about 7mm diameter, welding the ends and then welding it onto the bolt.

Hitch point :

A circular pipe of diameter slightly larger than that of beam is taken in length of around 10 to 12cm. A hole is drilled in the centre of the cylindrical surface and in the beam. This hollow pipe is welded onto the support of the frame and the beam is attached to this pipe by means of bolt passing through the corresponding holes in pipe and the beam.

The theoretical capacity of the implement will be calculated by the following formula :

$$Z \frac{\text{Width} * \text{speed (m/hr)}}{10000}$$

RESULTS AND DISCUSSION

The Table 1 showed that the performance of a hoe depended on the condition of the crop and weed population, soil characteristics, the characteristics of the interface between soil and the soil acting elements of the hoe. The width of cut for single blade was 20 cm, the depth of operation of implement was 8 cm, number of furrow opener was 3, the spacing between furrow opener was 12 cm, depth of cut was 9 cm and the cross sectional area of furrow obtained was 486 cm^2. It was also observed that the weed growing was less. The theoretical capacity obtained was equal to :

$$\frac{0.9 * 3000}{10000} Z\ 0.27\ \text{ha/hr}$$

Cost analysis :

The cost of operation obtained based on fixed and variable cost. The fixed cost (Rs.1560) and variable cost (Rs.670) leading to cost of hoe to Rs.3030.00.

Authors' affiliations:
R. NISHA AND C. NICKHIL, Department of Agricultural Engineering, College of Agriculture, BENGALURU (KARNATAKA) INDIA

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