

Research Paper :

Performance evaluation of bullock drawn ferti hoe and stubble collector

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ABSTRACT

Ferti hoe and stubble collector design by and fabricated by M.A.U. Parbhani was tested for its performance. Depth, draft and field efficiency for ferti hoe was 8 cm, 35 to 40 kg, 84.12 %, respectively and for stubble collector depth was 5.73 cm and stubble collection efficiency was 81.12%. Field efficiency of stubble collector and ferti hoe was 86.61% and 84.21%, respectively.

Key words : Fertihoe, Stubble collector

Indian agriculture basically depends upon bullock power as more than 82 per cent of all farmers hold below 2 ha. farms. Keeping tractor and any other big machinery is beyond the economic capability of these farmers. They prefer to use a pair of bullock with small matching implements.

Fertihoe develop by department of FMP, Parbhani which is useful for functions like hoeing with fertilizer application. It helps to apply the fertilizer near the crop due to which the wastage of fertilizer can be avoided. It requires less labour as compared to traditional method, one labour can do both the jobs at a time.

Stubble collector is an implement used to collect the stubble after harvesting and ploughing. To reduce the drudgery in the operation with saving in the time and to do work efficiency a bullock drawn stubble collector is developed. This implement helps in saving time, work and money at large amount.

METHODOLOGY

Specification of fabricated M.A.U. fertihoe:

- Make : M.A.U. Parbhani
- Type : Bullock drawn, adjustable
- Power source : Pair of bullock
- Main frame : A.M.S pipe 75cm
- Tines : M.S. flat 25x 5 at angle 21°
- Blades : 15,22.5 and 30 cm
- Fertilizer metering : Manual
- Beam : 50 mm diameter pipe,10 feet

Specification of fabricated M.A.U. stubble collector:

- Make : M.A.U. Parbhani
- Type : Bullock drawn, adjustable
- Power source : Pair of bullock
- Width of implement : 1.6 m
- Collecting rate : 26 bars at 5 cm spacing
- Depth control : A flat 5 cm away from tip of rod and hitch
- Man power requirement : 1 person

Field performance of implements:

Fertihoe and stubble collector was tested for its performance evaluation in the field of College of Agricultural. Engineering and farm field Parbhani.

Field test was also conducted at Dry land Research Center and Cotton Research Center MAU, Parbhani. RNAM test code was followed and plot size selected was 20m x20 m.

Moisture content of soil :

The soil sample were taken from 3 places randomly in the field and moisture content was determine by oven dry method.

Draft requirement:

For draft requirement dynamometer was used. The implement was operated and draft was measured for pulling indicated by the dynamometer.

Field efficiency :

Field efficiency was calculated by using formula

$$\text{Field efficiency} = \frac{\text{Actual area covered in 1 hr}}{\text{Theoretical area covered in 1 hr}} \times 100$$

Weeding efficiency:

Collect the weeds from selected plot after and before the operation. It is calculated as

$$\text{Weeding efficiency} = \frac{\text{No. of weeds before operation} - \text{No. of weeds after operation}}{\text{No. of weeds before operation}} \times 100$$

Stubble density:

Mark a 1m x 1m size plot in selected plot measure the number of stubble before the operation and after operation then calculates stubble density by formula.

$$\text{Stubble density} = \text{No. of stubble} \times \text{weight of stubble}$$

RESULTS AND DISCUSSION

The bullock drawn stubble collector and fertihoe was tested in field and following results were obtained.

Fertihoe :

Depth : Depth of operation of implement was 8 cm for fertihoe

Draft : The ferti hoe needed a draft in the range of 35 to 40 kg

Field efficiency : Field efficiency for fertihoe was 84.12 %

Weeding efficiency : Weeding efficiency was obtained 86.42 %

Stubble collector :

Depth: Depth of operation of the implement was 5.73 cm for stubble collector.

Table 1 : Field performance of the Ferti hoe

Sr. No.	Particulars	I	II	II	Average
1.	Plot size (20mx20m)	400 m ²	400 m ²	400 m ²	400 m ²
2.	Width of operation(cm)	40	40	40	40
3.	Depth of operation (cm)	8	8.3	7.5	7.93
4.	No.of weeds before operation (1x1m)	46	59	32	46
5.	No.of weeds after operation (1x1m)	6	8	6	7.3
6.	Soil inversion %	86.95	91.07	81.25	86.42
7.	Distance of fertilizer placement from plant	3	3.9	4.3	3.73
8.	Draft (kg)	36	38	37	37
9.	Time required to cover the area (min)	37	33	39	37
10.	Speed of bullock(km/h)	1.9	2.1	1.7	1.9
11.	Actual field capacity (ha/hr)	0.064	0.072	0.061	0.064
12.	Theoretical field capacity (ha/h)	0.076	0.084	0.068	0.076
13.	Field efficiency (%)	84.21	85.71	89.70	84.21

Table 2 : Field performance of the stubble collector

Sr. No.	Particulars	I	II	III	Average
1.	Plot size (20mx20m)	400	400	400	400
2.	Width of operation(cm)	160	160	160	160
3.	Depth of operation (cm)	6	5.8	5.4	5.73
4.	No. of stubble before operation in 1 m ² .	22	17	15	18
5.	No. of stubble after operation in 1 m ² .	4	2	4	3.3
6.	Soil moisture content	7.53	7.40	7.62	7.51
7.	Stubble collection efficiency	81.81	88.23	73.33	81.12
8.	Bullock speed (km/h)	2.2	2.4	2.5	2.36
9.	Time required to cover the plot (min)	8	7	7	7.33
10.	Actual field capacity (ha/hr)	0.30	0.342	0.342	0.327
11.	Theoretical field capacity (ha/hr)	0.352	0.384	0.40	0.378
12.	Field efficiency (%)	85.22	89.28	85.71	86.61

Draft: Draft requirement for the developed implement was well within the capacity of bullock pair.

Stubble collector efficiency: The stubble collection efficiency was 81.12 per cent.

Field efficiency: field efficiency for stubble collector was 86.61 per cent.

Similar testing and evaluation of agricultural machinery have already been reported by various workers (Mehta and Verma, 1995); Singh *et al.*, 2002; Swain, 2003).

Conclusion:

Considering the problem of availability of labour and need of timely operation, the deptt. FMP has designed and tested fertihoe and stubble collector. Test were conducted as per RNAM test code and following conclusions was drawn

Stubble collector:

- Draft requirement for the developed equipment was within the capacity of bullock pair
- Stubble collection efficiency was 81.12 per cent with reduction in labour requirement
- Depth of operation of the implement was 5.73 cm for stubble collector.
- Field efficiency for stubble collector was 86.61%

Ferti hoe:

- Draft requirement was within the capacity of bullock pair
- The efficiency was more due to placement of the fertilizer cost to plant
- Depth of operation of the implement was 8 cm for fertihoe.
- Field efficiency for fertihoe was 84.21 per cent

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