

Research Paper :

Development of 'V' blade harrow

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ABSTRACT

Efforts are made to develop a tractor drawn 'V' blade harrow at AICRPDA, Solapur Centre. The developed harrow consists of a frame of mild steel and a 'V' shape blade fitted to the frame. The blade is strong and made up of high carbon steel. Due to its 'V' shape it enters easily in the soil. It can be operated by 35 or more H.P. tractor. Field trials were conducted over 20 ha area. The effective field capacity, field efficiency and cost of operation were 0.46 ha/hr, 95% and 416/- Rs./ha, respectively. There was 40 % saving in labour cost than the traditional method. Field coverage and field efficiency was 40 % and 3.78 % more than the traditional method. It removes 95 % weeds. It gives a more desirable tilth in one operation and can replace the conventional practice of 2-3 harrowing and mould board plough once in three years in dryland region. This 'V' blade harrow is found useful for removing weeds and grasses, clod crushing, uprooting and breaking the stubbles.

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Key words : 'V' Blade harrow, Field capacity, Field efficiency

Tillage is defined as mechanical soil stirring actions carried out for the purpose of nurturing crops. The goal of proper tillage is to provide a suitable environment for seed germination, smooth growth, weed control, soil erosion control and moisture control avoiding moisture excess and reducing stress of moisture storage (Pandey *et al.*, 1997). The equipment requirement for conservation tillage varies depending on which type of system is used. Some systems depend primarily on mechanized equipment, while others are also adaptable to animal drawn hand operated equipment. (Indrakumar, 2003). Vertisol in dryland region of Solapur shrinks faster and are very hard to till during off season. The climatic conditions and rainfall pattern suits most growing *rabi* sorghum with either *kharif* fallow or growing short duration pulses in *kharif* condition before sowing *rabi* sorghum. Traditionally, ploughing with mould board is done once in three years, helps to uproot the perennial weeds and to invert the soil. Repeated blade harrowing occasional and deep ploughing not only increase the input energy and cost but also involves the drudgery. Timeliness of operation, precision and reduction of operational cost are the key factors in improving productivity and profitability of rainfed farms. Human and animal resources in these areas are continuously dwindling leading to deficit farm power availability during peak season and unusual increase in cost of operation. Conventional tools and equipments are no longer adequate to meet the needs of precision rainfed agriculture (Mayande *et al.*, 1996). In dryland agriculture ploughing is done once in three years, for land

preparation after harvest of dryland crops like pigeon pea, sorghum, pearl millet, maize etc. There was need of tractor drawn multipurpose implement which could do the work of tilling, pulverization of soil, loosening the soil in addition to harrowing operation and to meet the requirement of conservation tillage. In view of this a tractor drawn 'V' blade harrow was developed at All India Co-ordinated Research Project for Dryland Agriculture, Solapur Centre.

METHODOLOGY

Constructional details:

The details of various components of the developed the 'V' blade harrow are seen in Fig.3. The 'V' blade harrow consists of following major components.

- Main frame
- 'V' blade
- Mounting assembly
- Blade attachment to frame

Main frame:

Main frame is made of rectangular M.S. channel 100 mm x 100 mm x 6 mm size welded together. The other components like 'V' blade, three point hitch mechanism are attached to this frame. (Fig.3)

'V' blade:

This is the main component of the implement. It is made up of high carbon steel. The shape of the blade is like English 'V' letter having angle of 50° between two sides (Fig.3). Provision is made to adjust the angle of

penetration with the help of top link of the tractor. Angle of penetration can be varied between 18 to 25 °. The width of blade is 330 mm and the length of each side is 1640 mm

Mounting assembly:

Mounting assembly with special attachment to the frame is provided for attaching this implement to the three point hitch. It is made of M.S. flat 75 mm x 6 mm size bolted together and fitted to the main frame. (Fig.3)

Blade attachment to the frame:

The ‘V’ blade is attached to the main frame with the help of three M.S. plates. Out of these three plates two side plates are of 75 x 10 mm size and the centre plate is of 100 x 20 mm size. The overall dimensions of the implement are given in Table 1.

Table 1: Specification of ‘V’ blade harrow

Overall dimensions		
1.	Length (mm):	2500
2.	Width (mm)	2000
3.	Height (mm)	1500
4.	Weight (Kg)	185
Blade		
1.	Type (mm)	‘V’ shape
2.	Length (mm)	1270
3.	Width (mm)	2070 mm
4.	Angle between tow sides	50°
Power required		
1.	Tractor, hp	35-45
Dimensions of different components		
1.	Main frame	1220 x 920 x 100 mm
2.	‘V’ shape frame	610 x 100 x 20 mm
3.	Angular lever	75 x 75 x 6 mm
4.	Nut bolt with washer	Ø 1” x 5”
5.	Nut bolt with washer	Ø 1” x 4”
6.	Slotted CSK head screw with nut washer	Ø ½” x 2”
7.	Bush	Ø 22 x 90 mm length

RESULTS AND DISCUSSION

The implement was operated with 35 HP tractor by mounting on three point linkage. The actual attachment of the implement to the tractor and the implement in field operation is seen in Fig.1 and Fig. 2, respectively. The angle of penetration of the blade was adjusted through top link to set appropriate front tip penetration and soil coat.

The field trials of this implement were conducted at

Table 2 : Specifications of different components of ‘V’ blade harrow

Sr. No.	Part	Nos.	Material
1	Main frame (Square shape) (? 100 x 100)	1	M.S.
2	Frame (V shape)	1	M.S.
3	Blade	1	C.I., Hardened
4	Angular lever (Three point link)	2	M.S.
5	Straight lever	2	M.S.
6	Nut bolt with washer Ø 1” x 5”	4	C-30
7	Nut bolt with washer Ø 1” x 4”	6	C-30
8	Slotted CSK head screw with nut washer Ø ½” x 2”	16	C-30
9	Bush	1	C.I.

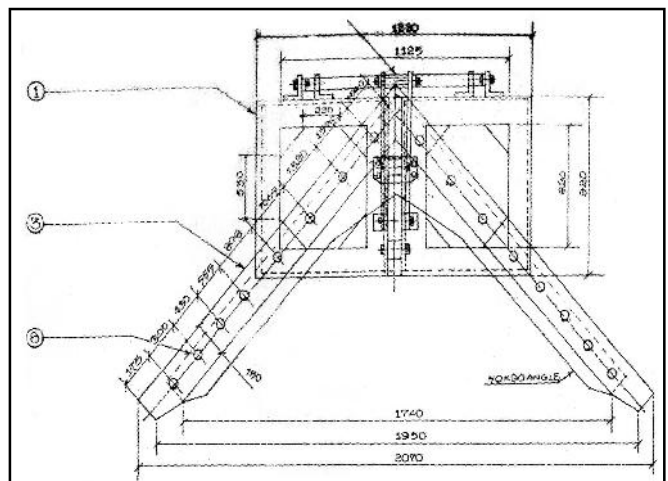


Fig. 1: Tow view

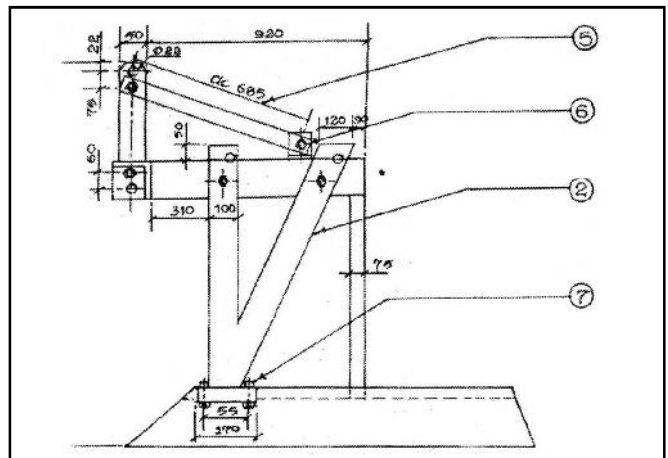


Fig. 2 : Side view

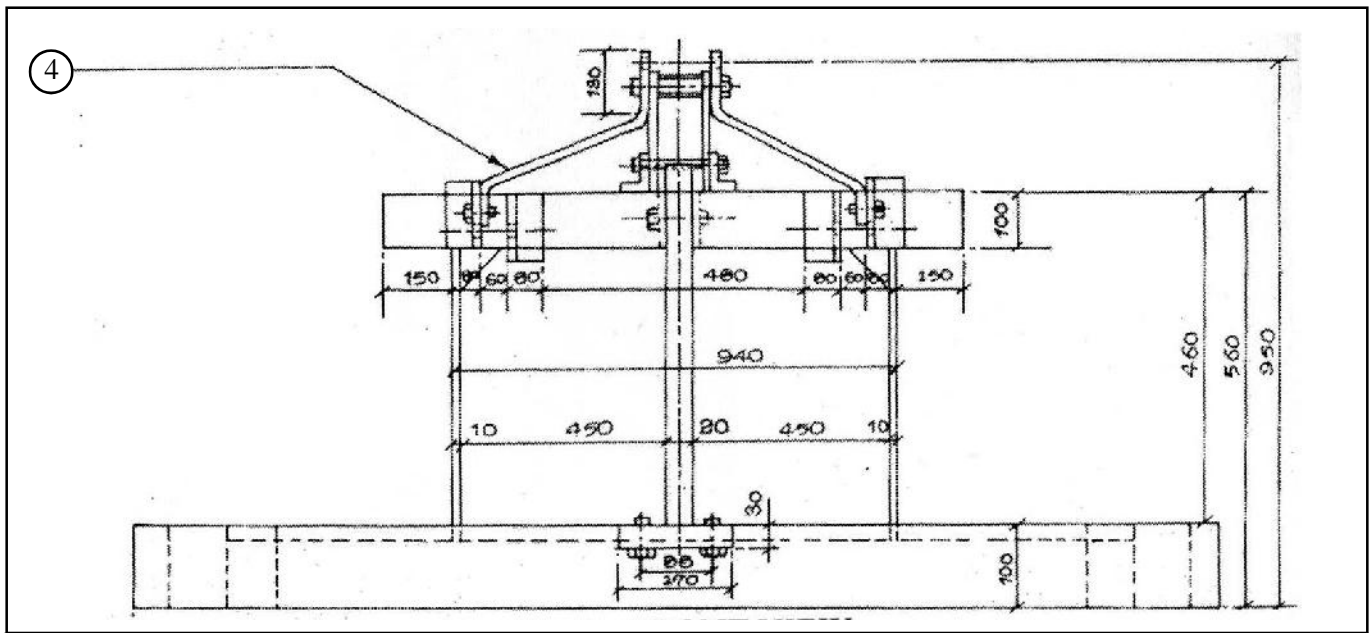


Fig. 3 : Front view

Zonal Agril. Research Station, Solapur over 20 ha area. This implement was found very useful for land preparation in vertisols scarcity zone of Maharashtra pulverization in addition to harrowing operation.. The results obtained are depicted in Table 3 and are discussed as under:

- The average working width of 'V' blade was 2000 mm and the working depth was 150 mm while the working width of traditional practice was 1000 mm and depth was 100 mm (Table 3). It means that the developed 'V' blade harrow covered more area with appropriate depth of operation.

- The speed of operation was also more (4 km/h) as compared to traditional practice (2 km/h.)

- The angle of penetration can be varied between 18 to 25° with the help of top link of the tractor.

- In spite of the fact that the developed harrow does the work of cutting the surface upto 150 mm depth. The 'V' shape of the blade helps in reducing the draft

and the soil cutting force. In addition 'V' shape also helps in clearing of weeds attached on blade surface, saving stoppage time or cleaning the blade. Clods are not formed. It pulverizes the soil well and provides tilth to desired depth; hence it does not require a repeated operation of harrowing and occasional ploughing. This also reduces the intensity of perennial weeds and removes all weed patches.

- The field efficiency of 'V' blade harrow was (95 %) higher than the local harrow (91.54 %), which was 3.78 % more than the traditional method. It is mainly because the local harrow consumes lot of time for cleaning.

- The field capacity of 'V' blade harrow was more effective (0.46 ha/hr) than the local harrow (0.13 ha/hr). The field coverage was 40 % more than the traditional method.

- In case of 'V' blade harrow the weeds besides being uprooted are buried effectively hence the weeding efficiency of the developed harrow is more. It could remove 95 % weeds.

- The cost of operation by local harrow was Rs. 1470/- while for 'V' blade harrow it was Rs. 416/-. This shows that there was about 40 % saving in labour cost in case of 'V' blade harrow than local harrow.

This implement is found very useful for land preparation in vertisols scarcity zone of Maharashtra. Also it gives improved pulverization in addition to harrowing operation.

Conclusion:

The 'V' blade harrow was developed to meet the

Table 3 : Performance evaluation of 'V' blade harrow

Parameters	Local harrow	'V' blade harrow
Width of operation (mm)	1000	2000
Tilling depth (mm)	100	150
Speed of operation (Km/hr)	2	4
Field capacity (ha/hr)	0.13	0.46
Field efficiency (%)	91.54	95
Cost of operation (Rs/ha)	1470	416
Moisture content (%)	28	28
Weeding efficiency (%)		95

needs of a multipurpose implement for dryland region which could do the work of tilling, pulverization of soil, loosening the soil in addition to harrowing operation. It gives more desirable tilth in one operation and could replace the conventional practice of 2-3 harrowing and mould board plough once in three year in dryland region. Also this 'V' blade harrow is found useful for removing weeds and grasses, clod crushing, uprooting and breaking the stubbles.

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REFERENCES

- Indrakumar, N. (2003).** Tillage and seed bed preparation equipments with special reference to dryland agriculture. National Seminar on Revival of Green Revolution through Mechanization of Dryland Agriculture. pp. 11-14
- Mayande, V.M., Katyal and Sriram, C. (1996).** Farm power deficit : A major factor inhibiting dryland productivity. *Proceedings of the International Agricultural Engineering Conference*, 1: 9-31
- Pandey, M.M., Mujumdar, K.L. and Singh, Gajendra (1997).** Farm machinery research digest, AICRP on farm implements and machinery, CIAE, Bhopal

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