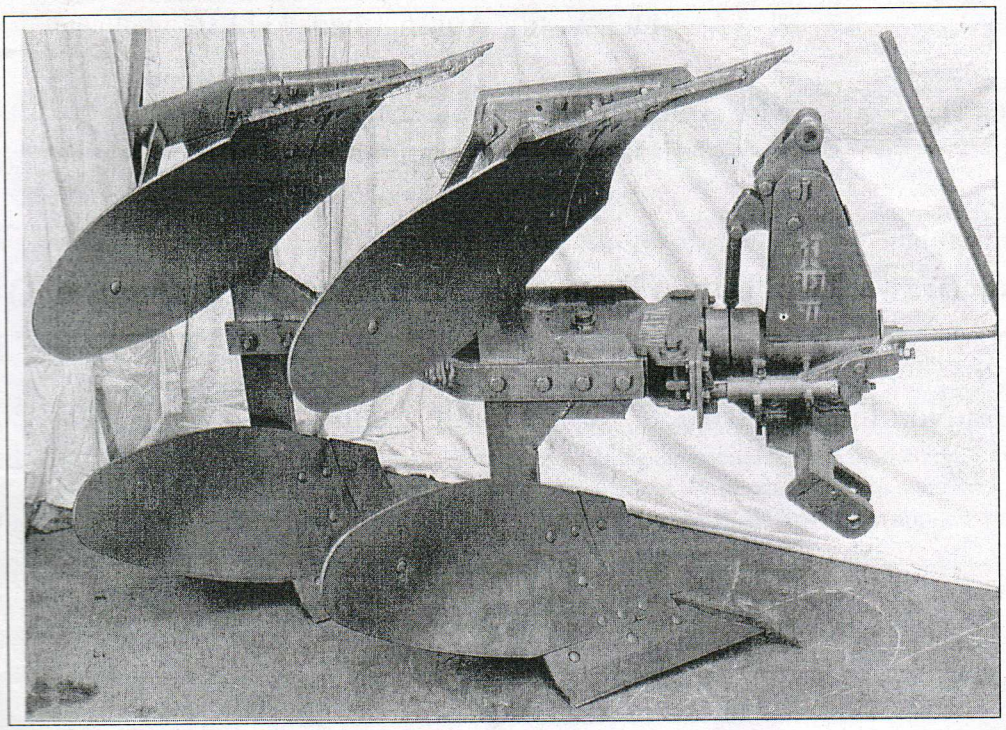
व्यावसायिक परीक्षण रिपोर्ट
COMMERCIAL TEST REPORT

संख्या / **No.: 61/2016**
माह / **Month : August, 2017**



Tractor Drawn Two Bottom Reversible M. B. Plough (Mechanical Type)

भाकृअनुप
ICAR

कृषि यांत्रिकीकरण प्रभाग
भा.कृ.अनु.प.–केन्द्रीय कृषि अभियांत्रिकी संस्थान
नबी बाग, बैरसिया रोड़, भोपाल – 462038 (म. प्र.)

ICAR-Central Institute of Agricultural Engineering
Nabi Bagh, Berasia Road, Bhopal-462038 (MP)
Agricultural Mechanization Division

Telephone: 0755-2521217 Fax:0755-2734016

Manufacturer: M/s Ankita Agro Engineering
K-37 MIDC Waluj, Aurangabad-431136

Applicant: M/s Ankita Agro Engineering
K-37 MIDC Waluj, Aurangabad-431136

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Type of test	Commercial
Name of machine	Tractor Drawn Two Bottom Reversible M. B. Plough (Mechanical)
Test code referred	IS 6288 – 1971) Reaffirmed in 2004), IS10691-1983 (Reaffirmed in 2006 and IS:4468 (reaffirmed in 2001).
Test requested by	Ankita Agro Engineering, K-37 MIDC Waluj Aurangabad-431136
Testing authority	ICAR-Central Institute of Agricultural Engineering, Nabi Bagh, Berasia Road, Bhopal – 462038. MP.
Period of test	2016-17

SELECTED CONVERSION

S No	Units	Conversion Factor
1	Force	
	1 kgf	9.80665 N
		2.20462 lbf
2	Power	
	1 hp	745.7 W
		0.7457 kW
	1kW	1.35962 Ps
	1 kW	1.341 hp
3	Pressure	
	1 psi	6.895 kPa
	1 kgf/cm^2	98.067 kPa=735.55 mm of Hg
	1 bar	100 kPa/10 N/cm^2
	1 mm of Hg	1.3332 m bar

CONTENTS

1.0. SCOPE OF TEST

1.1 Laboratory Test

The scope of test was to check and assess the following:

Checking of specifications

Running-in

1.2 Field Test

Quality of Work

Rate of Work

Labour Requirement

Ease of Operation and Adjustments

Breakdowns and Repairs

2.0. METHOD OF SELECTION

The machine was directly submitted by the applicant for test at this institute. Hence, the method of selection in not known.

3.0. TEST PROCEDURE

IS 6288 – 1971) Reaffirmed in 2004), IS10691-1983 (Reaffirmed in 2006 and IS:4468 (reaffirmed in 2001).

4.0. SPECIFICATIONS

4.1. General

Manufacturer	M/s Ankita Agro Engineering.
Manufacturers address	Ankita Agro Engineering, K-37 MIDC Waluj, Aurangabad-431136
Name of machine	Tractor Drawn Two Bottom Mechanically Reversible Mould Board Plough
Make	Ankita
Model	Mechanical
Year of manufacture	2016
Serial number	AJ 949
No. of plough bottom	Two
Size of plough, mm	2×370
Recommended source of power	Tractor (35 hp & above)
Power source as used	Tractor (HMT6522)

4.2 Constructional Details

As Given in Fig. 1.

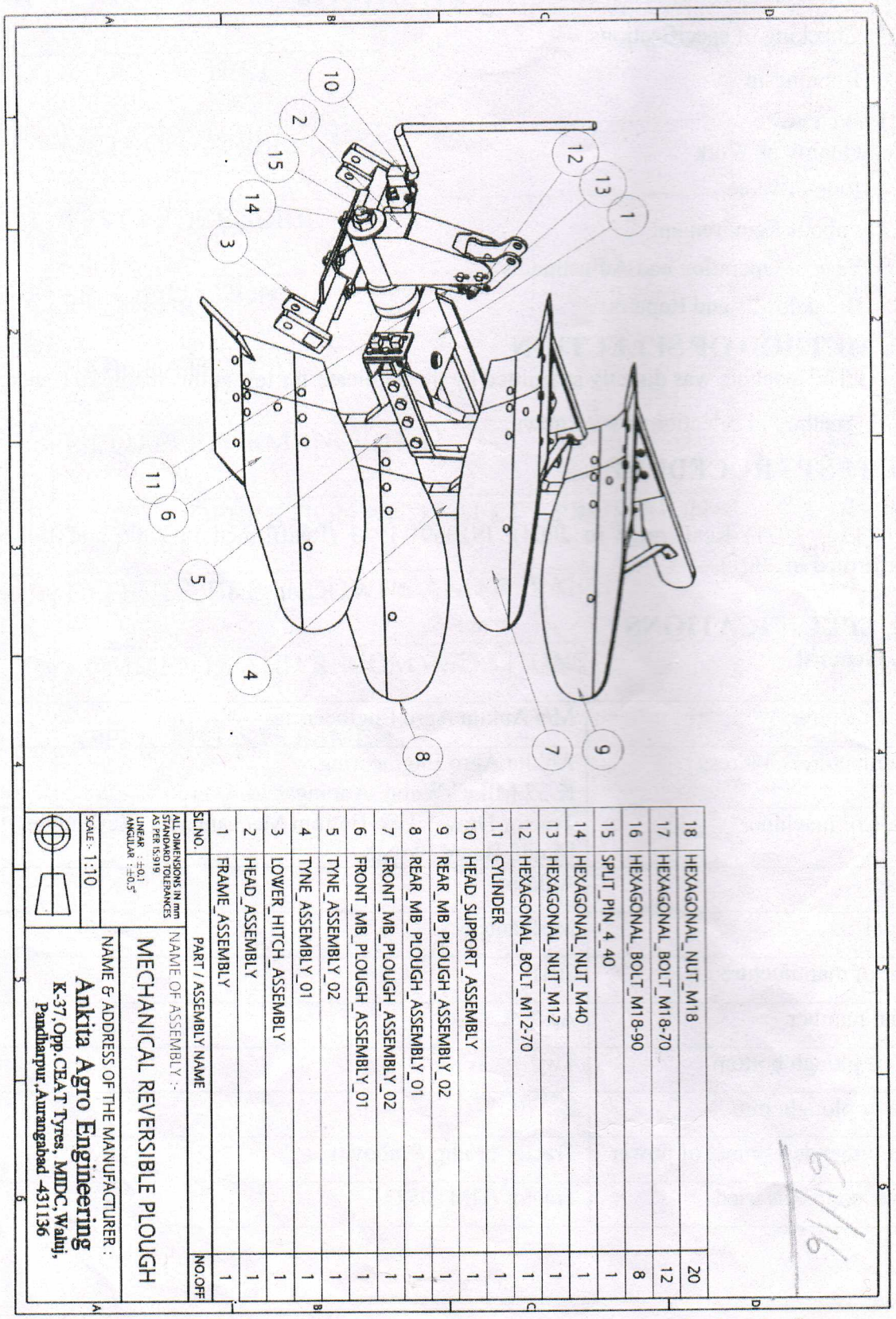

Fig. 1 T D Two Bottom Reversible M B Plough (Mechanical)

4.2.1 Frame

1	Constructional Details	A rectangular box fabricated by welded MS Plate.
2	Length, mm	1065
3	Width, mm	470

4.2.2 Standard

1	Number	Two
2	Material	Mild Steel Plate & flate
3	Type	Common or both the bottom (left front and right rear)
4	Dimensions, mm	
	Projected Length	980
	Width	100 at middle and 66 at tip
	Thickness	40
5	Method of fixing	Standards are centrally bolted and welded to the mainframe and supported by a common brace of MS flate of size 1065x75x20mm. The other eds of standards are bolted to the frog to which plough bottoms are fixed.

Plough bottoms

1	Constructional Details	The plough bottom consists of mould board, share, bar point and landside bolted and welded to the frog.
2	Numbers	Four
3	Type	Fixed
4	Size of plough, mm	2×370
5	Vertical suction, mm	16-22
6	Horizontal suction, mm	6-8

4.2.3 Mould Board

1	Type	General purpose
2	Material	High carbon steel-C45
3	Dimensions, mm	
	Length	780
	Width	325/360
	Thickness	6
4	Angle of inclination of mould board along the line of travel, degrees	23°
5	Method of fixing mould board	Directly bolted and welded to frog with three sunk headed bolts and supported by a brace.

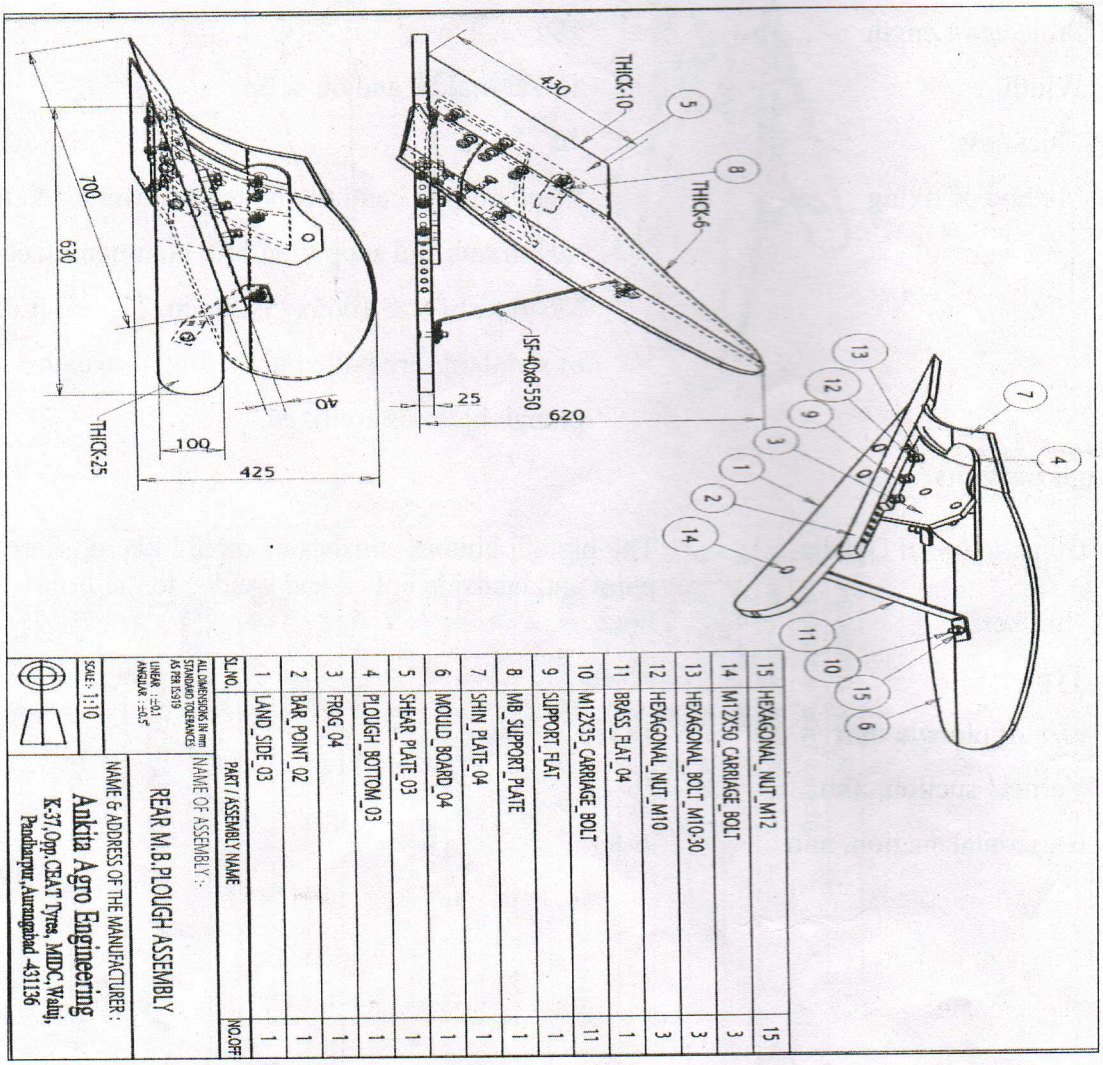

Fig. 2 Parts of Plough Bottom of Two Bottom Reversible M B Plough (Mechanical)

4.2.4 Share

1	Type	Type-6 as per IS:10691-1983
2	Material	High carbon steel
3	Size, mm	370×130×13
4	Method of fixing	Bolts & nuts

4.2.5 Land side

1	Number	Four	
2	Material	Mild Steel Flat	
3	Dimensions, mm	Front	Rear
	Length	440	625
	Width	98	100
	Thickness	25	25
4	Method of fixing of landside	Fixed with frog plate by nuts & bolts.	

4.2.6 Heal of landside

1	Number	2
2	Material	Mild Steel flat
3	Size, mm	370×40.7×10.2
4	Method fixing	Heal Directly welded at bottom of rear landside

4.2.7 Braces

	Number	-
	Material	-
	Size	-

4.2.8 Frog

1	Numbers	Four
2	Material	M S plate
3	Construction details	Profile cutting, drilling and welding

4.2.9 Reversing Mechanism

1	Type	Mechanical type
2	Mode of operation	Manually Hand operated by lever

4.2.9.1 Main shaft

1	Constructional details	Cutting, turning and threading, material C45
2	Method of fixing	-
3	Cross section, mm	Diameter 75

4.2.9.2 Mechanical cylinder Not Applicable

1	Single/double acting	-
2	Length of cylinder, mm	-
3	Diameter of piston rod, mm	-
4	Outer diameter of the cylinder	-
5	Capacity of cylinder, cm^3	-
6.	Working pressure, bar	-
7	Hose diameter, mm	-
8	Hose length, mm	-

4.2.10 Overall dimensions

1	Length, mm	1720
2	Width, mm	850
3	Height, mm	1210

4.2.11 Hitch Pyramid

Constructional Details: Profile cutting, drilling and welding.

Specifications of Hitch pyramid

Sl. No.	Notations	As per IS: 4468-2001 (CatI/Cat II) mm	As measured, mm	Remarks
1.	Upper hitch point			
a)	Diameter of hitch pin (A)	19.00to 19.80/ 25.37 to 25.50	25.50	Conform
b)	Diameter of hitch pin hole (B)	19.3 to 19.5/ 25.70 to 25.91	26	Does not Conforms
c)	Linch pin hole distance (D)	76/93	96	Does not Conform
d)	Width between outer faces of yoke	69/86 (max)	80	Conform
e)	Width inner faces of yoke (F)	44.5/52 (min)	54.4	Conforms
2.	Lower hitch points			
a)	Diameter of hitch pin	21.8 to 22/ 27.8 to 28.0	22	Conforms
b)	Diameter of hitch pin hole	22.4 to 22.65/ 28.70 to 29.00	27	Does not Conforms
c)	Linch pin hole distance	39/49 (min)	64.0	Conform

III	Diameter of linch pin hole			
a)	Upper hitch pin (L)	12/12(min)	12	Conforms
b)	Lower hitch pin (L)	12/12(min)	12	Conforms
4	Mast Height	458.5 to 461.5/ 608.5 to 611.5	525	Does not Conforms
5	Lower hitch point spans (N)	681.5 to 684.5/ 823.5 to 826.5	683	Conforms

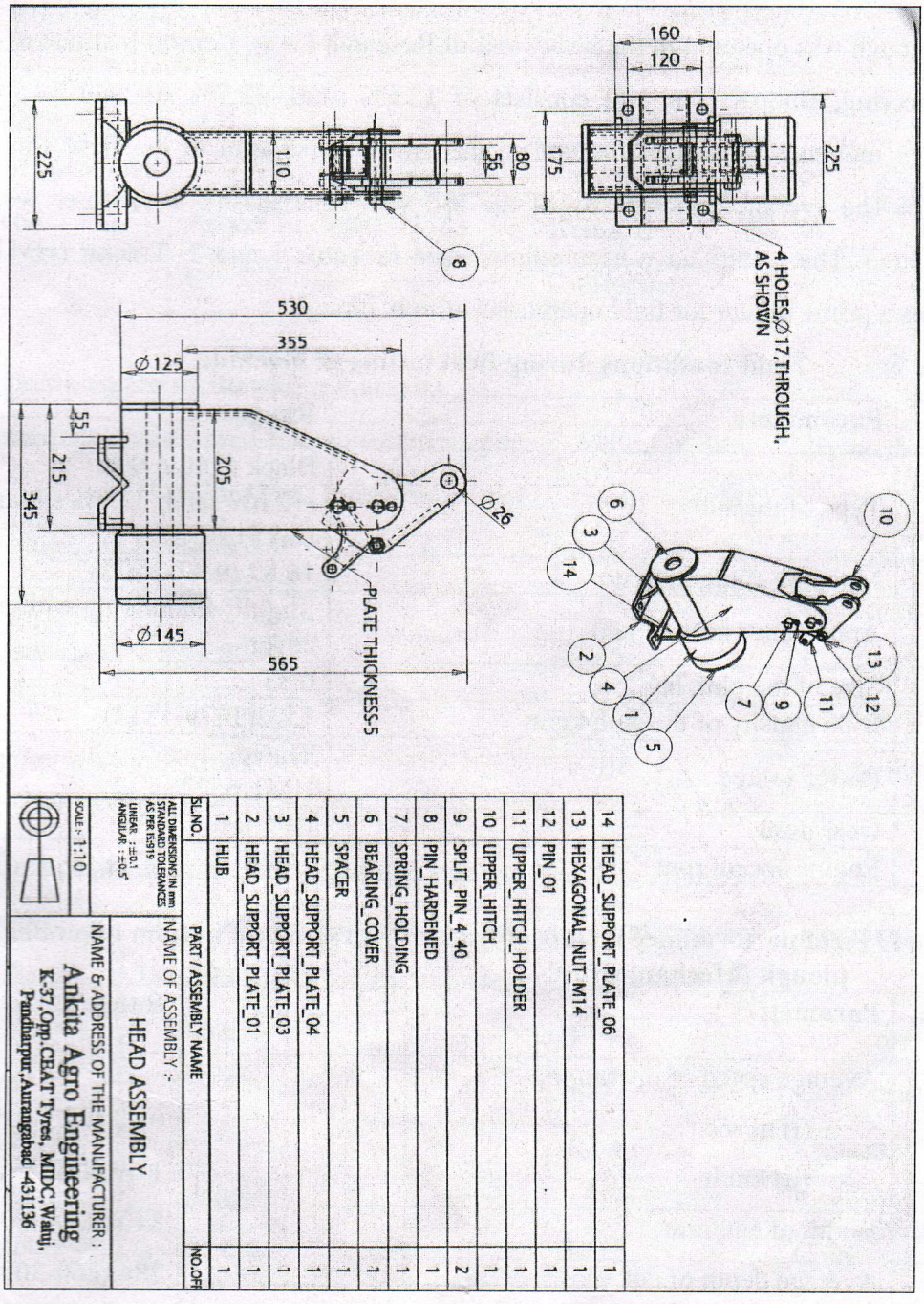

Fig. 3 Hitch Pyramid of Two Bottom Reversible M B Plough (Mechanical)

4.3 Mass of implement, kg: 410

4.4 Colour of implement: Green

5. Laboratory Test

The implement was initially operated in the test plot of Central Institute of Agricultural Engineering, Bhopal and IISS, Bhopal for running in for about 25 hrs to check the initial working and any breakage etc, if any.

6. Field Performance Test

The plough was operated in the heavy soil of Research Farm, Central Institute of Agricultural Engineering, Bhopal. The soil consists of 12.6% sand, 32.7% silt and 54.7% clay. The average moisture content of the soil at the time of operation in the field was recorded as 16.87%.The average bulk density of the soil was 1523 kg/m^3. Total three test trials were conducted. The results have been summarized in Table 1 and 2. Tractor (HMT 6522) was used as a prime mover for field operations of m.b. plough.

Table 2: Field conditions during field testing of machine

Sl. No.	Parameters	Range
1.	Type of the soil	Black Cotton Soil (12.6% sand, 32.7% silt and 54.7% clay)
2.	Moisture content, % db	16.87 (9.87-20.23)
3.	Appearance of the Field	Slightly undulating with minor grass cover
4.	Size of the plot, ha	0.33
5.	Bulk density of the soil, kg/m^3	1523(1479-1513)
6.	Power source	Tractor HMT 6522
7.	Gear used	IIIrd low
8.	Engine speed, rpm	1400

Table 2: Field performance results of tractor operated two bottom reversible m.b. plough (Mechanical)

Sl. No.	Parameters	Range
1.	Average speed of operation,	
	(i) m/sec	0.47 (0.43-0.53)
	(ii) km/h	1.69 (1.55-1.91)
2.	Width of cut, mm	840 (830-860)
3.	Average depth of cut, mm	284 (260-300)
4.	Field efficiency, %	89.6 (84.4-93.6)

5.	Effective field capacity, ha/h	0.126 (0.11-0.15)
6.	Time required for ploughing one hectare area, hours	7.9 (6.7-9.1)
7.	Breakage or maintenance noticed in the implement	Nil
8.	Average wheel slip, %	27.3 (24-6-29.3)
9.	Mean weight diameter of the inverted soil, mm	45.8 (45.4-46.3)
10.	Fuel consumption (i) l/h (ii) l/ha	 3.00-4.22 23.7-27.7

Wear Analysis

Hardness of the share

As Measured	As per IS: 10691-1983	Remarks
464 HB	HB 350 -450	Conforms

Chemical Composition of the share material

Sl. No.	Element	Standard Requirement as per IS:6690 -2002 for carbon steel	Actual results (% by weight)	Remarks
1	Carbon	0.70-0.85	0.73	conforms
2.	Silicon	0.10-0.40	0.19	Conforms
3.	Manganese	0.50-1.00	0.66	Conforms
4	Sulphur	0.05 (max)	0.021	Conforms
5.	Phosphorous	0.05 (max)	0.018	Conforms

Chemical Composition of the bar point material

Sl. No.	Element	Standard Requirement as per IS:6690 -2002 for carbon steel	Actual results (% by weight)	Remarks
1	Carbon	0.70-0.85	0.72	conforms
2.	Silicon	0.10-0.40	0.21	Conforms
3.	Manganese	0.50-1.00	0. 62	Conforms
4	Sulphur	0.05 (max)	0.019	Conforms
5.	Phosphorous	0.05 (max)	0.015	Conforms

Rate of Work

- The rate of work was observed as 0.11 to 0.15 ha/h (Av.0.0.126) at the speed of operation varied from 1.55 to 1.91 km/h.
- The field efficiency of the implement was worked out to be 84.4 to 93.6%.

Quality of Work

- The depth of operation and average working width of implement was measured as 260 to300 mm and 840 mm, respectively.

Labour Requirement

- One skilled operator is required to operate the equipment.

7. Ease of Operation and Adjustment

- The operator can easily adjust and control the implement from operator's seat in the field as the adjustments are within the easy reach of operator.
- The plough can be reversed with the help of direction control valve lever.

8. Defects, Breakdowns and Repairs

- No breakdown was observed during approximately 48.5 hours of operation.

9. Summary of Observations, Comments and Recommendations.

- The average actual field capacity of the implement was found to be 0.126 ha/h.
- Hardness of the share was found to be 464 HB which conforms the Indian standards.
- The chemical composition of material was found to be as per requirement.
- Some of the dimensions of the three point hitch does not fully conforms to requirement of IS:4468 (Part I) (reaffirmed in 2001).

10. Adequacy of Literature

- The manufacturer provided some specifications. But proper catalogue of parts should be provided.
- Operator's manual and service manual was not provided, it should be prepared and supplied with equipment.

11.Testing Authority

M S Khan	**Asst. Chief Technical Officer**	31.8.17
N.S. Chandel	**Scientist and Testing Authority**	
P. S. Tiwari	**Head, Agricultural Mechanization Division**	31.08.17 प्रभागाध्यक्ष / HEAD कृषि यांत्रिकीकरण प्रभाग Agricultural Mechanization Division केन्द्रीय कृषि अभियांत्रिकी संस्थान Central Institute of Agricultural Engineering नबीबाग,भोपाल (म.प्र.)–462038 Nabi Bagh,Bhopal (M.P.)-462038

12.Applicant's comment

- Operator's manual and service manual will be provided by the manufacturer.
- Catalogue of parts will be provided by the manufacturer.
- Dimensions of the three point hitch will be improved as per the Indian standard by the manufacturer.