



## Testing and Training Center of Farm Machinery

(Approved by Govt. of India)

Department of Farm Machinery and Power Engineering

College of Agricultural Engineering and Technology

Junagadh Agricultural University

JUNAGADH – 362 001 (GUJARAT)



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JAU/CAET/FMP/ RKVY/ 1203 /2019  
Junagadh. Date: 25/7 /2019

To

**Shreeji Agro Industries**

Panchasar Road, Nr. Shreeji PVC Pipe, Opp. Shreeji Power Transformer,  
Wankaner-363 621, Dist. Morbi (Gujarat)

**Sub.: To release "Test Report"**

Ref.: Your application dated 15/09/2019

With reference to above cited subject and referred application for the testing of **THREE BOTTOM REVERSIBLE DISC PLOUGH (TRACTOR MOUNTED) "SHREEJI-SAID-333"**, please find attached herewith the "Test Report" of the same.

**Testing Incharge  
and Professor & Head**

**Encl.: As above**

COMMERCIAL TEST REPORT

No.: TTCFMJ/A/254/741

Date of Report: 25/07/2019

This Test Report valid up to Date: 24/07/2026



**THREE BOTTOM REVERSIBLE DISC PLOUGH (TRACTOR MOUNTED)  
"SHREEJI-SAID-333"**

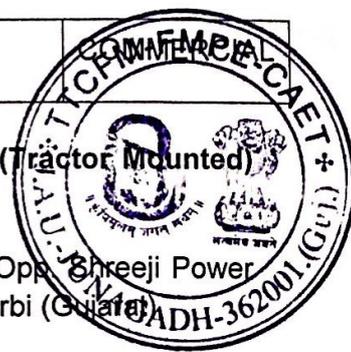


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TTCFMJ/A/254/741

THREE BOTTOM REVERSIBLE DISC PLOUGH  
(TRACTOR MOUNTED) "SHREEJI-SAID-333"

Name of machine : **Three Bottom Reversible Disc Plough (Tractor Mounted) "Shreeji-SAID-333"**

Test requested by (Applicant) : **Shreeji Agro Industries**  
Panchasar Road, Nr. Shreeji PVC Pipe, Opp. Shreeji Power Transformer, Wankaner-363 621, Dist. Morbi (Gujarat)

Manufacturer : **Shreeji Agro Industries**  
Panchasar Road, Nr. Shreeji PVC Pipe, Opp. Shreeji Power Transformer, Wankaner-363 621, Dist. Morbi (Gujarat)

Testing Authority : Testing & Training Center of Farm Machinery  
Department of Farm Machinery & Power Engineering  
College of Agricultural Engineering & Technology  
Junagadh Agricultural University, Junagadh (Gujarat)

Type of test : COMMERCIAL

Test Code /Procedure : IS:10233-1982, IS:6288-2005, IS:4366-2001, IS:9442-2001, IS:9818-2004, IS:9217-2001 and IS:4468-2001 (Part-I)

Test Report No. : TTCFMJ/A/254/741

Date of Release : **25/07/2019**

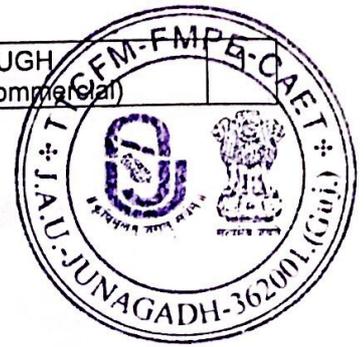
This Test Report valid up to Date : **24/07/2026**

1. The data given in the Test Report pertain to the particular machine submitted for test. The data collected during the test do not in any way attribute to the durability of the machine.
2. The results reported in this report are observed values and no corrections have been applied for atmospheric and site conditions.
3. The Test Report contains only performance data/ parameters obtained for a particular sample. However, this do not communicate/signify the approval/ recommendation of the Govt. of India or the Testing Authority for any Govt. programmes or otherwise.
4. This Test Report should not be reproduced in part or full without prior permission of the Testing Incharge, Testing & Training Center of Farm Machinery, College of Agricultural Engineering & Technology, Junagadh Agricultural University, Junagadh (Gujarat).

#### SELECTED CONVERSIONS

| Sr. No |          | Units                 | Conversion Factor              |
|--------|----------|-----------------------|--------------------------------|
| 1      | Force    | 1 kgf                 | 9.80665 N                      |
|        |          |                       | 2.20462 lbf                    |
| 2      | Power    | 1 hp                  | 1.01387 metric hp (Ps)         |
|        |          |                       | 745.7 W                        |
|        |          | 1 Ps                  | 735.5 W                        |
|        |          | 1 kW                  | 1.35962 Ps                     |
| 3      | Pressure | 1 psi                 | 6.895 kPa                      |
|        |          | 1 kgf/cm <sup>2</sup> | 98.067 kPa = 735.56 mm of Hg   |
|        |          | 1 bar                 | 100 kPa = 10 N/cm <sup>2</sup> |
|        |          | 1 mm of Hg            | 1.3332 m-bar                   |

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## 1. SCOPE OF TEST

### 1.1 LABORATORY TEST :

- ✓ Checking of specifications
- ✓ Hardness of the soil engaging components
- ✓ Chemical analysis of the soil engaging components
- ✓ Wear analysis of the soil engaging components

### 1.2 FIELD TEST:

- ✓ Rate of work
- ✓ Quality of work
- ✓ Draft requirement
- ✓ Labour requirement
- ✓ Ease of operation and adjustments
- ✓ Defects, breakdowns and repairs

## 2. METHOD OF SELECTION

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

## 3. TEST PROCEDURE

The following test codes were referred:

- 1) IS:10233-1982, Specification for Tractor-operated Disc Ploughs
- 2) IS:6288-2005, Test Code for Mould Board Plough
- 3) IS:4366-2001 (Part I), Specification for agricultural tillage discs, Part I-Concave type
- 4) IS:9442-2001, Specification for hot rolled steel plates, sheets and strips for manufacture of agricultural tillage discs.
- 5) IS:9818-2004 (Part-I: General terms) and IS:9818-2009 (Part-II: Terms relating to Equipment), Glossary of terms relating to Tillage and Intercultivation Equipment
- 6) IS:9217-2001, Test code for agricultural discs
- 7) IS:4468-2001 (Part-I), Agricultural wheeled tractor - rear mounted three point linkage

## 4. SPECIFICATIONS

### 4.1 General:

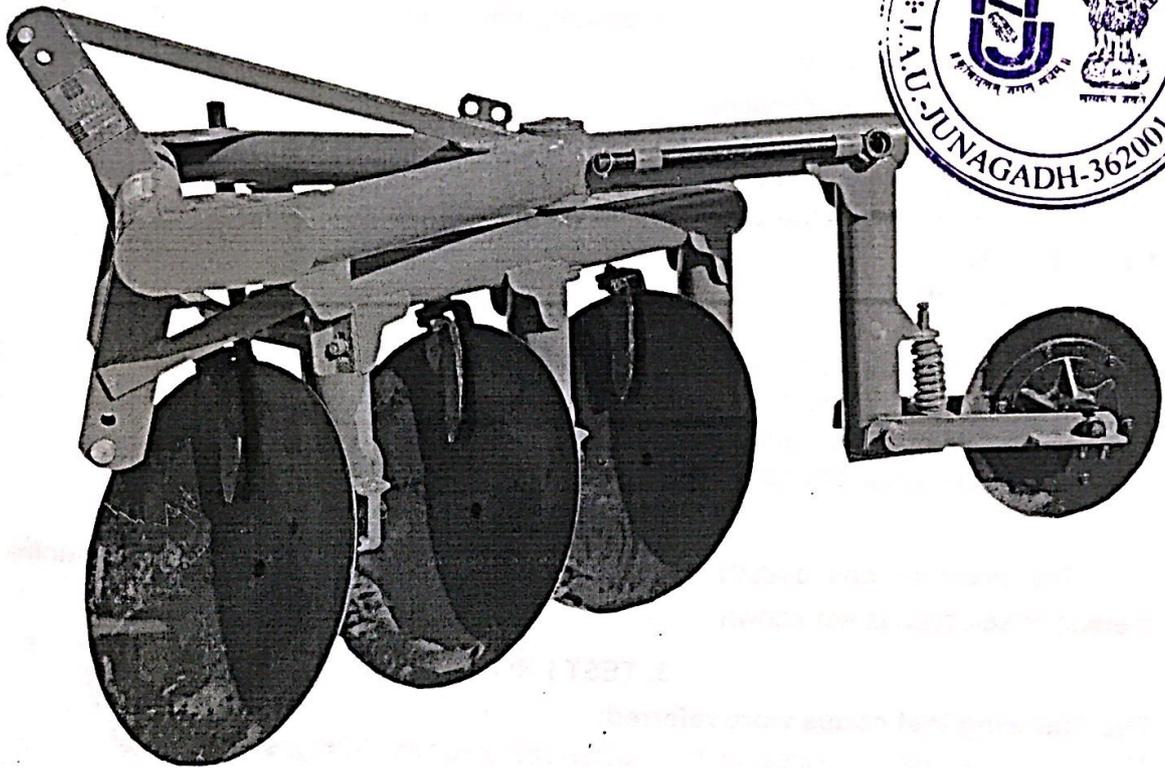
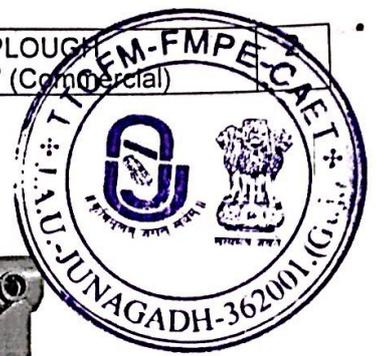
- |   |   |  |
|---|---|--|
| a) Name   | : | Three Bottom Reversible Disc Plough  |
| b) Type   | : | Tractor mounted, Reversible (Mech./Self operated) type                                 |
| c) Make   | : | Shreeji  |
| d) Serial Number                                | : | Not provided   |
| e) Model  | : | SAID-333   |
| f) Year of manufacture                          | : | 2019   |
| g) No. of plough bottom(s)                      | : | Three  |
| h) Size of plough (mm)                          | : | 3-Disc   |
| i) Recommended source of power as per applicant | : | Tractor (45 hp and above), Brief specification of tractor used is given in Annexure-I. |

### 4.2 Constructional details (Refer Fig. 1):

#### 4.2.1 Main Frame:

- |                           |   |   |
|---------------------------|---|---|
| a) Constructional details | : | Fabricated MS round pipe (114 Ø mm) bolted / welded. Standard frame is pivoted (through central axle hub) to the main frame. Hitch pyramid is welded to the main frame. |
|---------------------------|---|---|

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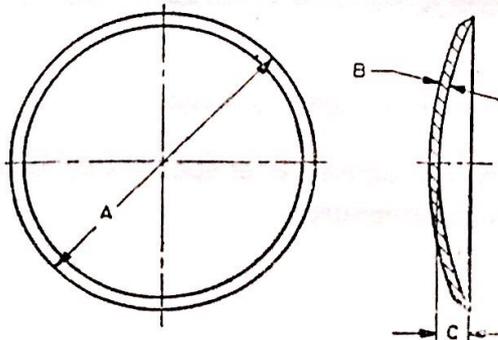
**Fig. 1: Schematic View of Three Reversible Bottom Disc Plough**

**4.2.2 Standard:**

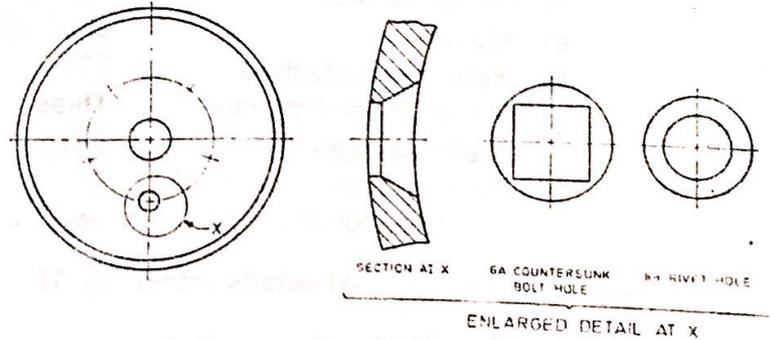
- |                     |   |  |
|---------------------|---|--|
| a) Numbers          | : | 3  |
| b) Material         | : | Fabricated from MS round pipe (as per applicant).  |
| c) Size (mm)        | : | 380x114 Ø (F), 390x114 Ø (M), 390x114 Ø (R)  |
| d) Method of fixing | : | One end of standard is welded to a frame (made of MS round pipe (1145x114 Ø mm) which is pivoted (through central axle hub) to the main frame) whereas another end is bolted to the disc flange holder assembly. |

**4.2.3. Disc (Refer Fig. 2) :**

- |                     |   |   |
|---------------------|---|---|
| a) Type and no.     | : | Concave-Plain, 3  |
| b) Method of fixing | : | Each discs are fixed on the disc flange with the help of 5 nos. round headed countersunk bolts. |



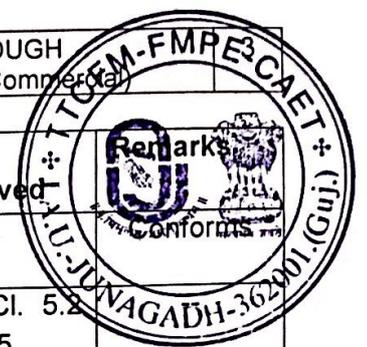
**FIG. 1 CONCAVE PLAIN DISC**



**FIG. 6 DISC WITH SEVERAL FIXING HOLES WITH OR WITHOUT CENTRE HOLE**

**Fig. 2: Dimensions of Concave Plain Disc as per IS**

**Disc with several fixing holes with or without centre hole as per IS**

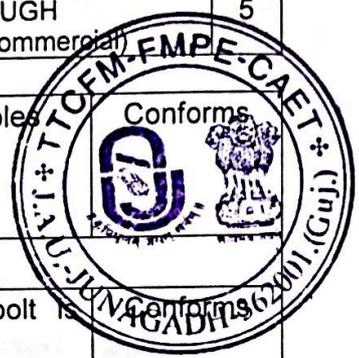


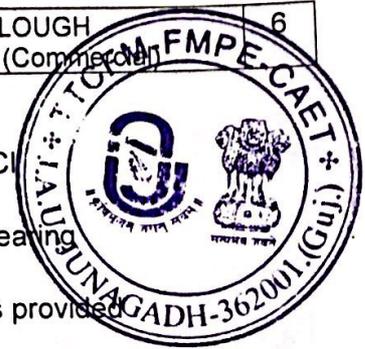
| Cl.  | Specification  | Dimensions as per IS: 4366-2001 (Part I) | As observed                        | Remark              |                     |
|--|--|--|------------------------------------|---------------------|---------------------|
| 3  | TYPES: Concave disc shall be of following types:<br>a) Plain, b) Notched and c) Flat centered  |  | Plain                              |                     |                     |
| 4  | MATERIALS: The steel used for the manufacture of disc shall conform to IS:9442-1980  |  | Ref. Cl. 5.2 of Ch.5               |                     |                     |
| 5  | <b>HARDNESS</b>  |  |                                    |                     |                     |
| 5.1  | The disc shall be either fully or partially hardened.  |  | Fully                              | Conforms            |                     |
| 5.2  | The fully hardened discs shall be properly and uniformly heat treated to have a hardness of 38-45 HRC, the equivalent Brinell and Vickers hardness numbers are 353-421 HB and 373-446 HV resp. |  | Ref. Cl. 5.1 of Ch.5               | --                  |                     |
| 6  | <b>DIMENSIONS AND TOLERANCES</b>   |  |                                    |                     |                     |
| 6.1  | The essential dimensions (mm) for all types of concave discs shall be as given in Table 1. Nominal size A: 250-810 mm, Thickness B: 2.50-8.00 mm, Concavity C: 12.5-155.0 mm                   |  | A: 662 mm<br>B: 5.0 mm<br>C: 97 mm | Conforms            |                     |
| <b>Table-1: Dimensions as per IS: 4366-2001 (Part I)</b> |  |  |                                    |                     |                     |
|  | Sr.  | Nominal size A (mm)                      | Thickness B, Min (mm)              | Concavity C (mm)    |                     |
|  | 1  | 250                                      | 2.50                               | 12.5                |                     |
|  | 2  | 280                                      | 2.50                               | 16.5                |                     |
|  | 3  | 315                                      | 3.15                               | 20.0                |                     |
|  | 4  | 355                                      | 3.15                               | 27.5                |                     |
|  | 5  | 405                                      | 3.15                               | 35.0                |                     |
|  | 6  | 455                                      | 3.55                               | 45.0                |                     |
|  | 7  | 510                                      | 3.55                               | 55.0                |                     |
|  | 8  | 560                                      | 4.00                               | 70.0                |                     |
|  | 9  | 610                                      | 4.00                               | 82.5                |                     |
|  | 10   | 660                                      | 5.00                               | 100.0               |                     |
|  | 11   | 710                                      | 6.00                               | 115.0               |                     |
|  | 12   | 760                                      | 8.00                               | 135.0               |                     |
|  | 13   | 810                                      | 8.00                               | 155.0               |                     |
| 6.2  | Other dimensions of notched concave disc shall be as given in Table 2. Disc size A: 250-810 mm, Equally spaced Notch No.:5-16, Notched width W: 70-95 mm, Notch depth H: 26-45                 |  | Not applicable                     | --                  |                     |
|  | Sr.  | Disc size, A (mm)                        | Equally spaced notches (no.)       | Notch width, W (mm) | Notch depth, H (mm) |
|  | 1  | 250                                      | 5                                  | 70                  | 26                  |
|  | 2  | 280                                      | 5                                  | 70                  | 26                  |
|  | 3  | 315                                      | 6                                  | 70                  | 26                  |
|  | 4  | 355                                      | 7                                  | 70                  | 26                  |
|  | 5  | 405                                      | 8                                  | 70                  | 26                  |
|  | 6  | 455                                      | 9                                  | 82                  | 32                  |
|  | 7  | 510                                      | 10                                 | 82                  | 32                  |
|  | 8  | 560                                      | 11                                 | 82                  | 32                  |
|  | 9  | 610                                      | 12                                 | 82                  | 32                  |
|  | 10   | 660                                      | 13                                 | 95                  | 45                  |
|  | 11   | 710                                      | 14                                 | 95                  | 45                  |
|  | 12   | 760                                      | 15                                 | 95                  | 45                  |
|  | 13   | 810                                      | 16                                 | 95                  | 45                  |

| Sr.               | Dimensions  | Tolerances (mm)   |   |             |
|-------------------|---|---|---|-------------|
| 6.3               | Other dimensions of flat centered concave discs shall be as given in Table 3. Disc size A: 250-810 mm, M: 50-160 mm, N: 100-210 mm, P: 22.5-180 mm  |   | Not applicable                                |             |
| 6.4               | The tolerances for different dimensions of the discs shall be as given in Table 4   |   |   |             |
| 1                 | Nominal size, A (mm)  |   |   |             |
|                   | Up to 405   | +2  |   |             |
|                   | 455-510   | +3  |   | -4          |
|                   | 560   | +4  |   | -5          |
|                   | 610-660   | +4  |   | -5          |
|                   | 710   | +5  |   | -6          |
|                   | 760   | +5  |   | -8          |
|                   | 810   | +10   |   | -12         |
| 2                 | Thickness, B  | Width +10, Length +10, Thickness +5%  |   | -0, -0, -0% |
| 3                 | Concavity, C for nominal size (mm)  |   |   |             |
|                   | Up to 455   |   | +2.5  |             |
|                   | 510-560   |   | +3.5  |             |
|                   | 610   |   | +5.0  |             |
|                   | 660   |   | +6.5  |             |
|                   | 710   |   | +8.0  |             |
|                   | 760   |   | +10.0   |             |
|                   | 810   |   | +12.5   |             |
| 4                 | Central hole (round /square)  | +1.5  |   | -0.0        |
| 5                 | Key way   | +1.0  |   | -0.0        |
| 6                 | Fixing hole   |   |   |             |
|                   | a) Square 12.5 mm   | +1.0  |   | -0.0        |
|                   | b) Round 10.5 mm  | +0.50   |   | -0.00       |
| 7                 | Pitch circle dia.   | +1.0  |   | -1.0        |
| 8                 | Fixing hole position  |   |   |             |
|                   | Below 610 mm  | +0.50   |   | -0.50       |
|                   | 610 mm and above  | +1.0  |   | -1.0        |
| 9                 | Bevel edge  |   |   |             |
|                   | a) Bevel angle  |   | +2° of declared angle                         |             |
|                   | b) Bevel length   |   | +2 mm of declared angle                       |             |
| 7                 | <b>HOLE TYPES:</b> The holes in concave discs shall be of the following types; a) Centre square hole, b) Centre circular hole with keyway and c) Several fixing holes with or without central circular hole |   | Several fixing holes with central square hole | Conforms    |
| 8                 | <b>HOLE SIZES</b>   |   |   |             |
| 8.1               | Centre square hole: The sizes of central square holes shall be 23, 26, 29, 31 and 33 mm. Up to 405 mm size discs, the hole size shall be not more than 26 mm.   |   | 30.0 mm                                       | Conforms    |
| 8.2, 8.2.1, 8.2.2 | Centre circular hole with keyway: The dia. of circular hole shall be 65 mm. The keyway size shall be 15.0x15.0 or 16.0x18.0 mm  |   | Not applicable                                | --          |
| 8.3               | Several fixing holes with or without central circular hole  |   |   |             |
| 8.3.1             | Central hole  | The diameter of central hole, if provided, shall be 28.5, 31, 51, 65 and 72 mm. | Not applicable                                | --          |
| 8.3.2             | Pitch circle diameter (PCD)   | The PCD of discs shall be 100, 210, 230, 290 and 350 mm.                        | 210 mm  | Conforms    |

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|         |  |   |  |                  |
|---------|--|---|--|------------------|
| 8.3.3   | Number of holes  | The no. of fixing holes shall be four holes for size up to 560 mm and five holes for size above 560 mm. | 5 holes  | Conforms         |
| 8.3.4   | Size of fixing holes   |   |  |                  |
| 8.3.4.1 | The square size of fixing holes for 12 mm countersunk bolt shall be 12.5 mm. As far as possible, the counter sunk bolt of M12 size shall be used.  |   | 12.5 bolt is used.   | Conforms         |
| 8.3.4.2 | The circular size of fixing holes for 10 mm rivet shall be 10.5 mm.  |   | Not applicable   | --               |
| 8.4     | Unless otherwise, agreed to between the purchaser and the supplier, the hole type and size for different sizes of disc shall be as given Table 5.  |   |  |                  |
| 9       | <b>OTHER REQUIREMENTS</b>  |   |  |                  |
| 9.4     | The thickness of the cutting edge shall be reasonably uniform. The edge thickness of the discs below 560 mm nominal size shall be between 0.2 to 1.0 mm and for discs of nominal size 560 mm and above shall be between 0.5 to 1.5 mm. |   | Reasonably uniform thickness of 1.0 mm and length of beveled edge 10 mm. | Conforms         |
| 9.5     | The cutting edge of the disc shall be beveled on one side or both sides as specified by the purchaser.   |   | One side   | Conforms         |
|         | Bevel angle i) For single angle  | 30° or 40°  | 40°  | Conforms         |
|         | ii) For stepped angle  | 50°/25°, 60°/30°, 65°/32°, 65°/45°  | Not applicable   | --               |
| 9.6     | The radius of concavity shall be a true radius.  |   | True radius  | Conforms         |
| 9.7     | Square hole shall be square and smooth. The corners of the square holes shall be rounded.  |   | Satisfactory   | Conforms         |
| 9.8     | The crown of the keyway shall be rounded.  |   | Not applicable   | --               |
| 9.9     | The fixing hole shall be equally spaced on pitch circle diameter.  |   | Satisfactory   | Conforms         |
| 10.1    | A disc shall be designated by its type, nominal size and thickness, e.g. Concave disc, plain edge, 560 mm nominal size and 4.0 mm thickness shall be designated as 'Plain Concave Disc 560/4.0/IS:4366 (Part I)'                       |   | Not marked   | Does not conform |
| 11.1    | Both the surfaces of disc shall be free from cracks and shall be reasonably free from flaws, such as seams, scales, pits, burrs and nicks.   |   | Smooth and well finished   | Conforms         |
| 11.2    | The discs shall be free from rust and shall have a protective coating which will prevent surface deterioration in transit and storage.   |   | Protective coated  | Conforms         |
| 12.1    | <b>Marking:</b> Each disc shall be legibly punched or stamped on the non-wearing portion of the disc with the following particulars.   |   |  |                  |
|         | a) Manufacturer's name or recognized trade-mark if any   | Not marked  |  | Does not conform |
|         | b) Batch / code no.  | Not marked  |  |                  |



**4.2.4 Disc flange:**

- a) Type and material : Circular, Forged CI  
 b) Number : 03  
 c) Nos. and type of bearing on each flange : 02, Taper roller bearing  
 d) Provision for lubrication : 1 grease nipple is provided  
 e) Nos. and dia. of holes on each flange : 5, 13.0 Ø mm

**4.2.5 Scraper assembly:**

- a) Type and material : Rectangular curved, MS flat  
 b) Number : 03 (1 on each disc)  
 c) Size of scrapper (mm) : 250(curved)x38x16  
 d) Location and method of fixing : Scraper are bolted to the disc flange.

**4.2.6 Furrow wheel:**

- a) Type and material : Circular, Steel (Boron as per applicant)  
 b) Number : 1  
 c) Size (mm) : 4x460 Ø  
 d) Location : On the rear end of frame  
 e) Method of fixing : Directly attached to the main frame with the help of bolts.  
 f) Axle shaft dimensions (mm) : 280x28 Ø  
 g) No. and type of bearing : 2, Ball bearing  
 h) No. and size of springs : 1, 135x65 Ø mm

**4.2.7 Reversing Mechanism:**

- a) Type : Mechanical/Self operated  
 b) Mode of operation : The reverse mechanism is operated by the turning of tractor on the reversible track (which has provision to adjust width of cut) with made of MS flat 1020 (curved) x40x8 mm, one end is clamped to pivot point (central axle hub) (through 2 nos. taper roller bearing No. 33012) and other is supported on reversible track. When the tractor is turned through centrifugal force, it changes the face of disc in reverse direction (approx. 80°-90°).

**4.2.7.1 Cam:**

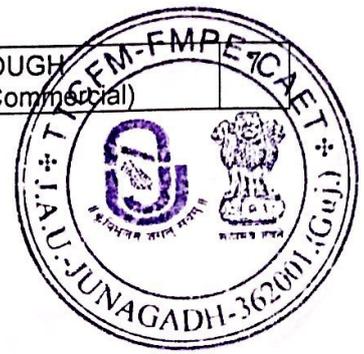
Not applicable

- a) Material : -  
 b) Dimensions (mm)  
 i -Total Length : -  
 ii -Effective length : -  
 iii -Width : -  
 iv -Thickness : -  
 v -Size of cam pin (mm) : -  
 vi -Size of lynch pin hole on cam pin : -

**4.2.7.2 Hydraulic Cylinder:**

Not applicable

- a) Type : -  
 b) Size of cylinder (mm) : -  
 c) Size of piston (mm) : -  
 d) Size of connecting arm (mm) : -  
 e) Stoke length (mm) : -



- 4.2.7.3 **Distributor:** : Not applicable
- a) Type : -
- b) Overall Size (mm) : -
- c) No. and size of hose pipes between tractor and distributor (mm) : -
- 4.2.7.4 **Reversing Mechanism Lock** : Self (weight) locking system is provided.
- 4.2.8 **Type of hitch and its details:**
- a) Type : Three point linkage, Pyramid
- b) Constructional details : The hitch pyramid is box type fabricated from MS flats (to form upper hitch point) and MS flats (to form lower hitch points).
- c) Size of upper hitch (mm) : Box type fabricated of 315x100x12 mm from MS flat having box thickness 80 mm.
- d) Size of cross bar : Round type fabricated of 1200x114  $\varnothing$  mm from MS pipe. (mm)

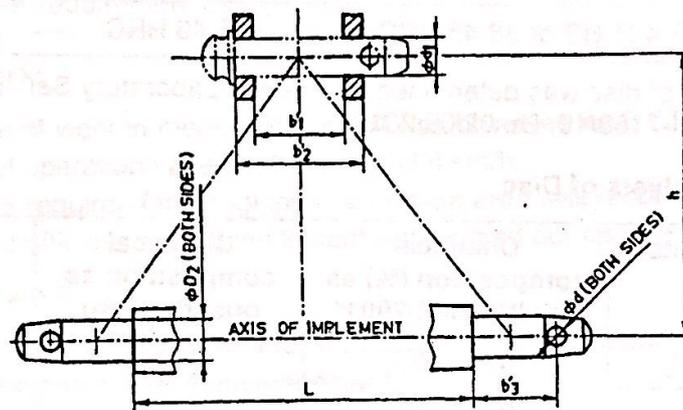
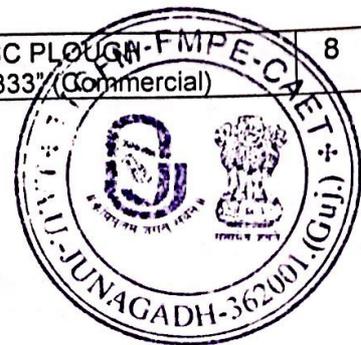


Fig. 3: Implement Hitch Attachment as per IS

Specification of Hitch Pyramid as per IS: 4468-2001 (Part-I)

| Sr.                            | Dimen. (Refer Fig. 3) | Description                              | Category-II  | As observed | Remarks          |
|--------------------------------|-----------------------|--|--------------|-------------|------------------|
| <b>Upper Hitch attachments</b> |                       |  |              |             |                  |
| 1                              | -                     | Dia. of hitch pin                        | 25.37-25.50  | -           | -                |
| 2                              | $d_1$                 | Dia. of hitch pin hole                   | 25.70-25.90  | 25.47       | Does not conform |
| 3                              | $b'_1$                | Width between inner faces of yoke        | 52.0 (Min)   | 52.14       | Conforms         |
| 4                              | $b'_2$                | Width between outer faces of yoke        | 86 (Max)     | 78.05       | Conforms         |
| <b>Lower hitch points</b>      |                       |  |              |             |                  |
| 5                              | -                     | Dia. of hitch pin                        | 27.80-28.00  | -           | -                |
| 6                              | $D_2$                 | Dia. of hitch pin hole                   | 28.70-29.00  | 25.55       | Does not conform |
| 7                              | $b'_3$                | Linch pin hole distance                  | 49 (Min)     | 80.00       | Conforms         |
| 8                              | $l$                   | Lower hitch point span                   | 823.5- 826.5 | 730.00      | Does not conform |
| <b>Other dimensions</b>        |                       |  |              |             |                  |
| 9                              | $d$                   | Dia. of linch pin hole (upper hitch pin) | 12 (Min)     | 12.00       | Conforms         |
| 10                             | $d$                   | Dia. of linch pin hole (lower hitch pin) | 12 (Min)     | 12.00       | Conforms         |
| 11                             | $h$                   | Mast height                              | 608.5- 611.5 | 630.00      | Does not conform |

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**4.3 Overall dimensions (mm) :**

- a) Length : 2300  
b) Width : 1430  
c) Height : 1160

**4.4 Total mass (kg) : 376.0**

**4.5 Color of implement : Saffron**

**5. LABORATORY TEST****5.1 Hardness of Disc:**

| Points | Hardness as per IS: 4366-2001 | Hardness as observed | Conformity to IS |
|--------|-------------------------------|----------------------|------------------|
| 1      | 353-421 HB or 38-45 HRC       | 45-46 HRC            | Conforms         |

The hardness of disc was determined from Alpha Laboratory Services, Rajkot, vide Test Report No. AH-7158/19, Dt. 02/06/2019.

**5.2 Chemical Analysis of Disc**

| Constituents    | Chemical composition (%) as per IS: 9442-2001* | Chemical composition as observed (%) | Conformity to IS |
|-----------------|--|--------------------------------------|------------------|
| Carbon (C)      | 0.70-0.80                                      | 0.280                                | Does not conform |
| Silicon (S)     | 0.10-0.40                                      | 0.213                                | Conforms         |
| Manganese (Mn)  | 0.60-1.00                                      | 1.190                                | Does not conform |
| Phosphorous (P) | 0.05 (max)                                     | 0.030                                | Conforms         |
| Sulphur (S)     | 0.05 (max)                                     | 0.010                                | Conforms         |

\* Any other alloy or carbon steel may be ordered subject to agreement between the purchaser and manufacturer. The material of disc (30MnB5 Steel) was got analyzed from Alpha Laboratory Services, Rajkot, vide Test report No. AS-52527/19, Dt. 02/06/2019.

**6. FIELD PERFORMANCE TESTS**

- 6.1 The plough was operated for 28.0 hours in medium black soil of Cattle Breeding Farm. The brief specifications of the tractor used in field testing is given in ANNEXURE-I. The results are given in ANNEXURE-II and are summarized in Table 1.

Table - 1

**SUMMARY OF FIELD PERFORMANCE TEST**

| Sr. | Parameters                | Range        |
|-----|---------------------------|--------------|
| 1   | Type of soil              | Medium black |
| 2   | Soil bulk density (g/cc)  | 1.59-1.60    |
| 3   | Average soil moisture (%) | 12.5-13.2    |

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|    |                                      |             |
|----|--------------------------------------|-------------|
| 4  | Average speed of operation (km/h)    | 3.0-3.4     |
| 5  | Average wheel slippage (%)           | 11.8-14.8   |
| 6  | Average depth of cut (cm)            | 24.0-26.4   |
| 7  | Average working width (cm)           | 106-111     |
| 8  | Area covered (ha/h)                  | 0.277-0.296 |
| 9  | Time required to cover 1 hectare (h) | 3.38-3.61   |
| 10 | Field efficiency (%)                 | 79.8-84.8   |
| 11 | Soil inversion (%)                   | 93.8-95.7   |
| 12 | Fuel consumption (l/h)               | 8.89-9.27   |
| 13 | Fuel consumption (l/ha)              | 30.61-32.09 |
| 14 | Av. implement draft (kgf)            | 1000-1055   |
| 15 | Power requirement (hp)               | 11.88-12.76 |

**6.1.1 Rate of work:**

- The rate of work in medium black soil was observed as 0.277-0.296 ha/h when the speed of operation varied between 3.0-3.4 km/h.
- The time required for ploughing one hectare area was recorded as 3.38-3.61 h.
- The field efficiency of the implement was worked out as 79.8-84.8 %.

**6.1.2 Quality of work:**

- The depth of operation and working width of implement were measured as 24.0-26.4 and 106-111 cm respectively.
- The percentage of soil inversion by weed count method was measured as 93.8-95.7 %.

**6.1.3 Draft requirement**

The implement draft was measured as 1000-1055 kgf.

**6.1.4 Labour requirement:**

One skilled operator is needed to operate the tractor and the implement simultaneously.

**6.1.5 Wear analysis of Disc (Mass basis):**

| Disc   | Mass of disc (g) |                               | Percentage of wear            |          |
|--------|------------------|-------------------------------|-------------------------------|----------|
|        | Before operation | After 28.0 hours of operation | After 28.0 hours of operation | Per hour |
| Disc-1 | 16000            | 15863                         | 0.86                          | 0.031    |
| Disc-2 | 16860            | 16725                         | 0.80                          | 0.029    |
| Disc-3 | 17435            | 17190                         | 1.41                          | 0.050    |

Remark: The percentage hourly wear on mass basis was observed as 0.029-0.050 %.

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**6.1.6 Ease of operation and adjustments:**

- The implement can be leveled by adjusting the top link easily from the operator seat.
- 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.
- All the components like disc, scraper, furrow wheel etc. can be easily detachable and replaceable.

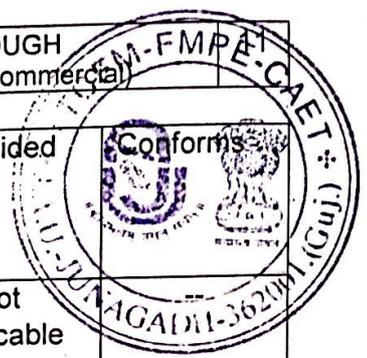
**7. DEFECTS, BREAK DOWNS AND REPAIRS**

No breakdown was occurred during 28.0 hour of operation of plough.

**8. CONFORMITY TO INDIAN STANDARDS****Specifications for Tractor-operated Disc Ploughs (IS: 10233-1982):**

| Cl. No.  | Requirements as per IS   | Observation                 | Conformity to IS                |  |                    |                         |
|----------|--|-----------------------------|---------------------------------|--|--------------------|-------------------------|
| 1        | 2  | 3                           | 4                               |  |                    |                         |
| <b>3</b> | <b>MATERIAL:</b>   |                             |                                 |  |                    |                         |
| 3.1      | The materials used for different components of the disc plough, except disc, shall be as given in col 3 of Table-1. The material may conform to the relevant Indian Standards given in col 4 of Table-1.             |                             |                                 |  |                    |                         |
|          | <b>Table 1: Materials for different components of disc plough</b>  |                             |                                 |  |                    |                         |
|          | <b>Sr.</b>   | <b>Name of part</b>         | <b>Material</b>                 | <b>Applicable standard</b>                       | <b>Observation</b> | <b>Conformity to IS</b> |
|          | <b>1</b>   | <b>2</b>                    | <b>3</b>                        | <b>4</b>   | <b>5</b>           | <b>6</b>                |
|          | 1  | Frame                       | Mild Steel                      | IS:226-1975                                      | Mild Steel         | Conforms                |
|          | 2  | Disc flange holder          | Carbon steel forging, Cast Iron | IS:2004-1978, IS:1030-1974                       | Cast Iron          | Conforms                |
|          | 3  | Scraper                     | Hot rolled steel                | IS:9442-1980                                     | Mild Steel         | --                      |
|          | 4  | Adjustment leavers          | Mild Steel                      | IS:226-1975                                      | Mild Steel         | Conforms                |
|          | 5  | Furrow wheel and land wheel | Cast Iron                       | IS:210-1978                                      | Mild Steel         | Conforms                |
|          | 6  | Loading platform            | Mild Steel                      | IS:226-1975                                      | Not provided       | --                      |
|          | 7  | Cross bar /hitch            | Mild Steel                      | IS:226-1975                                      | Mild Steel         | Conforms                |
|          | 8  | Loading mass                | Cast Iron                       | IS:210-1978                                      | Not provided       | --                      |
|          | 9  | Hitch pin                   | Carbon Steel                    | IS:1570-1979                                     | Carbon Steel       | Conforms                |
| 3.2      | The material for disc shall be in the accordance with IS: 4366 (Part I)-2001.  |                             |                                 | Ref. Ch. 5                                       | --                 |                         |
| <b>4</b> | <b>OTHER REQUIREMENTS:</b>   |                             |                                 |  |                    |                         |
| 4.1      | <b>Discs:</b> The disc used in disc ploughs shall conform to all the requirements, stipulated in IS: 4366 (Part I)-2001. Plain or notched discs of 610 or 810 mm nominal size shall be used.                         |                             |                                 | Ref. Cl. 4.2.3 of Ch. 4                          | --                 |                         |
| 4.2      | <b>Frame:</b> The frame shall be capable of sustaining a pull of 9.8 N per mm of nominal size of disc without permanent deflection or change in shape.   |                             |                                 | Satisfactory                                     | Conforms           |                         |
| 4.3      | <b>Scrapers:</b> Each disc shall be provided with the scraper. The scrapers shall be set in such a way that they should not touch the face of disc. Arrangement for adjusting the gap of the scrapers shall be made. |                             |                                 | Provided   | Conforms           |                         |
| 4.4      | <b>Bearings:</b> Tapered roller or ball bearings of suitable sizes shall be provided in disc holder, furrow wheel or land wheel. The bearings should be reasonable dust-proof and properly aligned.                  |                             |                                 | Tapered roller bearing for disc and furrow wheel | Conforms           |                         |

|                  |  |
|------------------|--|
| TTCFMJ/A/254/741 | THREE BOTTOM REVERSIBLE DISC PLOUGH<br>(TRACTOR MOUNTED) "SHREEJI-SAID-333" (Commercial) |
|------------------|--|



|     |   |                |          |
|-----|---|----------------|----------|
| 4.5 | <b>Lubrication arrangement:</b> The arrangement for lubrication of moving parts shall be made. Provision of grease nipples (see IS: 4009-1967) in plough bottom and wheels should be preferred. | Provided       | Conforms |
| 4.6 | <b>Transport wheels:</b> In trailed-type disc ploughs, transport wheels may be provided for transportation of disc plough from one place to other.  | Not applicable |          |
| 4.7 | <b>Hitching arrangement:</b>  |                |          |

|       |  |  |                  |
|-------|--|--|------------------|
| 4.7.1 | In trailed-type disc ploughs, the drawbar should be manufactured in such a manner that it conforms to the requirements of tractor drawbar as given in IS: 4931-1977. | Not applicable                                     | --               |
| 4.7.2 | In mounted-type disc ploughs, dimensions of hitch points should be such they conforms to the requirements of three-point linkages given in IS: 4468-2001.            | Ref. Cl. 4.2.8 of Ch. 4                            | --               |
| 4.8   | Angle adjustment: The disc angle of the plough shall be $42 \pm 3^\circ$ and tilt angle shall be in the range of $15^\circ$ to $25^\circ$ .                          | Disc angle: $45^\circ$ ,<br>Tilt angle: $22^\circ$ | Conforms         |
| 4.9   | Spring washer shall be provided with all the nut-bolt fastenings.  | Provided   | Conforms         |
| 4.10  | Cross bar with crank position for hitching point shall be provided.  | Provided   | Conforms         |
| 4.11  | Trailing type ploughs shall be provided with a suitable mechanism for depth adjustment.  | Not applicable                                     | --               |
| 4.12  | Operational and maintenance manuals and a set of tools including adjustable wrench and grease gun shall be provided.   | Not provided                                       | Does not conform |

|          |                               |  |  |
|----------|-------------------------------|--|--|
| <b>5</b> | <b>FINISH AND WORKMANSHIP</b> |  |  |
|----------|-------------------------------|--|--|

|     |   |                         |          |
|-----|---|-------------------------|----------|
| 5.1 | The disc shall be finished as specified in IS: 4366 (Part-I)-2001.  | Ref. Cl. 4.2.3 of Ch. 4 | --       |
| 5.2 | The welding of the various parts shall be satisfactory in all respects (see 7.1 of IS: 822-1970).   | Satisfactory            | Conforms |
| 5.3 | The components shall be free from pits, burrs and other visual defects.   | Satisfactory            | Conforms |
| 5.4 | The exposed metallic parts shall be free from rust and shall have a protective coating which will prevent surface deterioration in transit and storage. | Provided                | Conforms |

|          |                            |  |  |
|----------|----------------------------|--|--|
| <b>6</b> | <b>MARKING AND PACKING</b> |  |  |
|----------|----------------------------|--|--|

|     |  |                  |                  |
|-----|--|------------------|------------------|
| 6.1 | <b>Marking:</b> Each disc plough shall be marked with the following: |                  |                  |
|     | a) Manufacturer's name and recognized trade-mark, if any             | Marked (Shreeji) | Conforms         |
|     | b) Size of the disc; and   | Not marked       | Does not conform |
|     | c) Batch or Code Number  | Not marked       |                  |

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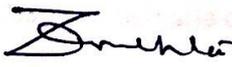
|       |  |
|-------|--|
| 6.1.1 | These particulars shall be stamped embossed or engraved on metallic plate and rigidly fitted on a non-wearing part of the disc plough. |
| 6.1.2 | Each disc plough may also be marked with the ISI certification Mark  |

### 9. SUMMARY OF OBSERVATIONS, COMMENTS AND RECOMMENDATIONS

1. All discs should be designated / marked as per IS.
2. Operator's-cum Service Manual and Parts catalogue should be provided in vernacular language and a set of tools including adjustable wrench and grease gun should be provided.
3. The marking/ labeling plate should be provided as per IS.
4. The specification of implement hitch does not fully conform to the IS: 4468 (Pt-I)-2001. This should be looked into. However looking to the present hitching system provided in the tractor, it is found suitable to attach the plough.
5. The hardness of disc conforms to IS and the chemical composition of the disc does not fully conforms to IS: 9442-2001. This should be looked into. But, considering the percentage hourly wear on mass basis as 0.029-0.050 %; the material is suitable for field operation.
6. The rate of work was recorded as 0.277-0.296 ha/h at corresponding forward speed of 3.0-3.4 km/h which is considered normal for three bottom disc plough.
7. The depth of operation was recorded as 24.0-26.4 cm in the soil having 12.5-13.2 % average moisture, which is considered normal.
8. The overall field performance of plough was found satisfactory.

Note: Test conducted by Er. H. R. Shekhda, Lab. Tech.

### TESTING AUTHORITY

|   |  |
|---|--|
| Prof. A. L. Vadher<br>Test Engineer & Assistant Professor |  |
| Dr. T. D. Mehta<br>Test Engineer & Associate Professor    |  |
| Dr. V. K. Tiwari<br>Testing Incharge and Professor & Head |  |

### 10. APPLICANT'S COMMENTS

1. All discs will be designated / marked as per IS.
2. Operator's-cum Service Manual and Parts catalogue will be provided in vernacular language and a set of tools including adjustable wrench and grease gun will be provided.
3. The marking/ labeling plate will be provided as per IS.

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## Annexure-I

## Brief specifications of the tractor used during field test

|     |   |  |
|-----|---|--|
| 1.  | Make, model and type  | L&T John Deere 5340<br>Version – 2<br>(As per CFMTTI, Budni (MP)<br>Test report No. T-511/993,<br>Nov-2004)<br>GJ-11M-6710 |
| 2.  | Number of cylinders   | 3  |
| 3.  | Maximum PTO power, kW   | 38.1   |
| 4.  | Power at standard power take-off speed (540 & 1000 rpm) kW        | 37.9   |
| 5.  | Engine speed corresponding to standard power take-off speed (rpm) | 2422   |
| 6.  | Rated engine speed, rpm   | 2400   |
| 7.  | No load engine speed during field test (rpm)                      | 800  |
| 8.  | Drawbar power, kW   | 32.3   |
| 9.  | Drawbar pull (kN) :   |  |
|     | Without ballast   | 18.2   |
|     | With ballast  | 23.1   |
| 10. | Type of wheel equipment   | Pneumatic  |
| 11. | Number & size of tyre :   |  |
|     | Front   | 6.50x20, 8 PR  |
|     | Rear  | 16.9x28, 12 PR   |
| 12. | Inflation pressure of tyres (kg/cm <sup>2</sup> )                 |  |
|     | For Field   | Front-1.6, Rear-0.8  |
|     | For Transport   | Front-2.8, Rear-1.4  |
| 13. | Standard track width (mm) :                                       |  |
|     | Front   | 1370   |
|     | Rear  | 1415   |
| 14. | Wheel base, mm  | 2050   |
| 15. | Total Operation Mass (kg) :                                       |  |
|     | Front   | 730  |
|     | Rear  | 1380   |
|     | Total   | 2110   |

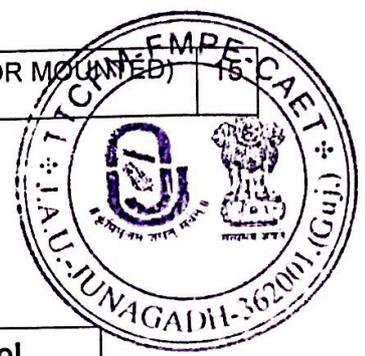
**Annexure-II**  
**Field Performance Results**



Place of Test: Cattle Breeding Farm

| Sr. | Parameters                  | TEST TRIALS  |            |            |            |
|-----|-----------------------------|--------------|------------|------------|------------|
|     |                             | I            | II         | III        | IV         |
| 1   | Date of Test                | 06/07/2019   | 08/07/2019 | 09/07/2019 | 10/07/2019 |
| 2   | Duration of Test (h)        | 6.50         | 7.00       | 7.00       | 7.50       |
| 3   | Gear used                   | B1           |            |            |            |
| 4   | Furrow length (m)           | 250          | 250        | 250        | 250        |
| 5   | Type of soil                | Medium black |            |            |            |
| 6   | Bulk density of soil (g/cc) | 1.60         | 1.59       | 1.59       | 1.59       |
| 7   | Soil moisture (% , d.b.)    | 13.2         | 12.8       | 13.1       | 12.5       |
| 8   | Av. forward speed (km/h)    | 3.0          | 3.3        | 3.2        | 3.4        |
| 9   | Av. wheel slippage (%)      | 11.8         | 13.4       | 14.8       | 11.3       |
| 10  | Av. depth of cut (cm)       | 25.9         | 26.4       | 24.3       | 24.0       |
| 11  | Av. width cut (cm)          | 107.5        | 111.0      | 106.0      | 108.8      |
| 12  | Area covered (ha/h)         | 0.277        | 0.295      | 0.289      | 0.296      |
| 13  | Time required for 1 ha(h)   | 3.61         | 3.39       | 3.46       | 3.38       |
| 14  | Field efficiency (%)        | 84.7         | 80.8       | 84.8       | 79.8       |
| 15  | Soil inversion (%)          | 95.7         | 93.8       | 94.5       | 94.0       |
| 16  | Fuel consumption (l/h)      | 8.89         | 9.03       | 9.27       | 9.08       |
| 17  | Fuel consumption (l/ha)     | 32.09        | 30.61      | 32.08      | 30.68      |
| 18  | Av. implement draft (kgf)   | 1055         | 1049       | 1021       | 1000       |
| 19  | Power requirement (hp)      | 11.88        | 12.76      | 12.15      | 12.63      |

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**Annexure-III**  
**Symbols and Abbreviations**

**A. Symbols assigned to basic SI units**

| Sr. | Physical Quantity | Name of SI Unit | Symbol |
|-----|-------------------|-----------------|--------|
| 1   | Length            | Meter           | m      |
|     |                   | Centimeter      | cm     |
|     |                   | Milimeter       | mm     |
| 2   | Mass              | Kilogram        | kg     |
|     |                   | Gram            | g      |
|     |                   | Tonne           | t      |
| 3   | Time              | Hour            | h      |
|     |                   | Minute          | min    |
|     |                   | second          | S      |

**B. Symbols assigned to some derived units**

| Sr. | Physical Quantity | Name of SI Unit              | Symbol            |
|-----|-------------------|------------------------------|-------------------|
| 1   | Area              | Square centimeter            | cm <sup>2</sup>   |
|     |                   | Square meter                 | m <sup>2</sup>    |
|     |                   | Hectare                      | ha                |
| 2   | Speed/Velocity    | Meter Per second             | m/s               |
|     |                   | Kilometer per hour           | km/h              |
| 3   | Pressure          | Newton per square millimeter | n/mm <sup>2</sup> |
| 4   | Time              | Minute                       | min               |
|     |                   | Hour                         | h                 |
| 5   | Volume            | Cubic centimeter             | cm <sup>3</sup>   |
|     |                   | Mililitre                    | ml                |
|     |                   | Litre                        | L                 |

**C. Abbreviations**

|      |   |                 |      |   |                       |
|------|---|-----------------|------|---|-----------------------|
| Cl   | : | Clause          | Fig. | : | Figure                |
| deg  | : | Degree          | kW   | : | Kilowatt              |
| IS   | : | Indian Standard | N.A. | : | Not applicable        |
| No.  | : | Number          | %    | : | Percent               |
| N.R. | : | Not Recorded    | rpm  | : | Revolution per minute |
| Ref. | : | reference       | km/h | : | Kilometer per hour    |