COMMERCIAL TEST REPORT

REPORT No: HAU/FMPE/17-18/Fer. Broad-02 **February, 2018**

SHAKTIMAN SQUARE FERTILIZER BROADCASTER "SSFB-400"

Department of Farm Machinery and Power Engineering
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(The College of Agricultural Engineering and Technology, CCSHAU, Hisar is a approved Testing Centre by Department of Agriculture & Cooperation, Ministry of Agriculture, GOI vide letter No.8-1/2004-My (I&P) dated September 14, 2010 and subsequent letters)

COMMERCIAL TEST REPORT

of

SHAKTIMAN SQUARE FERTILIZER BROADCASTER "SSFB-400"

Test requested by

M/s. Tirth Agro Technology Pvt. Ltd.,
Near Hotel Krishna Park, NH-27,
Gondal Road, Vavdi
Distt. Rajkot – 360004
Gujarat

Department of Farm Machinery and Power Engineering
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Hisar-125 004

TYPE OF TEST	**COMMERCIAL**
TEST REPORT NO.	**HAU/FMPE/17-18/Fer. Broad-02**
REPORT RELEASED IN	**February, 2018**
TYPE OF MACHINE	**Tractor Operated Fertilizer Broadcaster**
MANUFACTURED BY	**M/s. Tirth Agro Technology Pvt. Ltd.,** **"SHAKTIMAN", Survey No.108/1, Plot No.B, NH-27,** **Near Bharudi Toll Plaza,** **Bhunava (Village), Taluka: Gondal,** **Distt. Rajkot** **State: Gujarat, India PIN: 360311** **Phone:91 (2827) 661637 (30 lines), +91(2827) 270537** **FAX: +91(2827) 270457**
TEST REQUESTED BY	**M/s. Tirth Agro Technology Pvt. Ltd.,** **Near Hotel Krishna Park, NH-27,** **Gondal Road, Vavdi** **Distt. Rajkot – 360004** **Gujarat**
TEST CONDUCTED BY	**Department of Farm Machinery and Power Engineering** **College of Agricultural Engineering and Technology** **CCS Haryana Agricultural University, Hisar**

Type of test	: COMMERCIAL (ICT)
Test Code/procedure	: IS: 4468-1997 (Part-I), IS: 4931-1995, IS: 12337-1988
Period of test	: March to February, 2018
Test Report No.	: HAU/FMPE/17-18/Fer. Broad-02
Month & Year	: February, 2018
Test Report Referred	: IMP-722/1732/2015 May, 2015 (NRFMT&TI, Hisar)

Important Instructions

- The results reported in this report are observed values and no corrections have been applied for atmospheric and site conditions.
- The data given in this report pertains to the particular machine submitted by the applicant for test.
- The results presented in this report do not in any way attribute to durability of the machine.
- The report should not be reproduced in part or full without prior permission of Department of Farm Machinery and Power Engineering, CCSHAU, Hisar

SELECTED CONVERSIONS

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

3. Pressure

1 psi	=	6.895 kPa
1 kgf/sq. cm	=	98.067 kPa= 735.56 mm of Hg
1 bar	=	100 kPa = 10 N/ sq. cm.
1 mm of Hg	=	1.3333 m-bar

CONTENTS

1. SCOPE OF TEST

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

1.1 Specification of Fertilizer Broadcaster;

1.2 Field tests to evaluate the suitability of machine with regard to:-

- Quality of work
- Rate of work
- Labour requirement
- Power requirement
- Ease of operation and adjustment

2. TEST PROCEDURE

The following test codes were followed to test the machine as there is no specific BIS code for testing of fertilizer broadcaster

i. IS: 4468-1997 (Part-1) (Reaffirmed 2012); Agricultural wheeled tractors-Rear mounted three point linkage: Part 1 Categories 1, 2, 3, & 4

ii. IS: 4931-1995 (Reaffirmed 2009); Agricultural tractors-Rear mounted power take off types 1, 2 and 3

iii. IS:12337-1988 (Reaffirmed 2009); Specifications of manually operated fertilizer broadcaster

3. METHOD OF SELECTION

The machine was directly submitted for test by the applicant to the Institute. Thus, the method of selection is not known.

4. BRIEF DESCRIPTION OF EQUIPMENT

Machine is mounted by three point linkage on tractor and powered by tractor PTO shaft. Machine is designed to work at 540 PTO rpm. Propeller shaft of machine receives power from tractor PTO shaft. Power is transmitted to spreading disk and agitator through a gearbox. Five setting are provided to control fertilizer rate as well as to control spreading direction. The machine is designed to spread fertilizer in either LHS on RHS direction from the centre line of travel. The machine can also broadcast the fertilizer simultaneously in LHS & RHS direction. The machine requires the fallow land having width equal to tractor track width for operation in field.

5. SPECIFICATIONS

5.1. GENERAL

1.	Name & address of manufacture / applicant	:	M/s. Tirth Agro Technology Pvt. Ltd., "SHAKTIMAN", Survey No.108/1, Plot No.B, NH-27, Near Bharudi Toll Plaza, Bhunava (Village), Taluka: Gondal, Distt. Rajkot State: Gujarat, India PIN: 360311
2.	Name of Implement	:	Tractor Operated Fertilizer Broadcaster
3.	Type of test conducted	:	Field test using DAP
4.	Make	:	SHAKTIMAN
5.	Model	:	SSFB-400
6.	Serial No.	:	16J10007
7.	Weight	:	120 kg
8.	Suitability of machine	:	Fertilizer and seed broadcasting
9.	Capacity of hopper	:	400 kg (306.67 litres)

5.2. PRIME MOVER USED

1.	Tractor	:	New Holland - 4010
2.	Chassis No. / Engine No.	:	6189407/S-325D37105
4.	Max. PTO Power Kw	:	24.1
5.	Engine speed recommended for field test, rpm (apa)	:	1700

5.3. CHASSIS

1.	Type of frame	:	MS pipe (square)
2.	Size of pipe, mm	:	60 × 60

5.4. POWER TRANSMISSION SYSTEM

1.	Method of transmission	:	Power input shaft receives drive from tractor PTO shaft and transmits power to gearbox which in turn rotates the fertilizer distributing plate.

5.4.1. Three point linkage (Refer Fig.1)

S.No.	Component	Specifications		Remarks
		As per IS: 4468-1997 (part-1), mm	As measured , mm	
1.	**Upper hitch point (Cat-II)**			
a)	Diameter of hitch pin hole (d_1)	25.7 ± 0.2	25.80	Conforms
b)	Width between inner face of yoke (b'_1)	52.0 (min.)	58.0	Conforms
c)	Width between outer face of yoke (b'_2)	86.0 (max.)	79.1	Conforms
2.	**Lower hitch points (Cat-II)**			
a)	Diameter of hitch pin (D_2) Diameter of hole	28.0 – 0.2 28.70 to 29.00	27.90 28.70	Conforms Conforms
c)	Linch pin hole distance (b'_3)	49 (Min)	128.0	Conforms
3.	**Diameter of linch pin hole for Cat-I**			
a)	Upper hitch pin (d)	12 (min)	12	Conforms
b)	Lower hitch pin (d)	12 (min)	12	Conforms
4.	Mast height (h)	610 ± 1.5 or more in the range of 810 ± 1.5	580	**Does not Conform**
5.	Lower hitch point span (*l*)	825 ± 1.5 or lesser up to 683 mm	655	**Does not Conform**

* 2 out of 9 (22.2 %) dimensions are not conforming to BIS requirement.

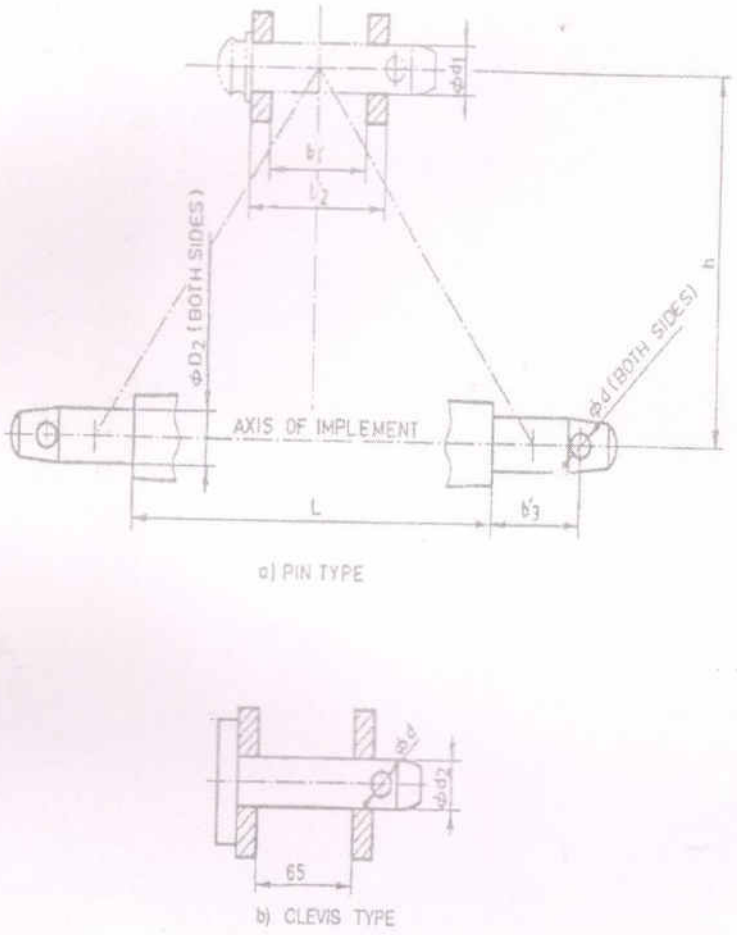


Fig.1: Dimensions of three point linkage as per IS 4468:1997 (Part-1)

5.4.2. Mast

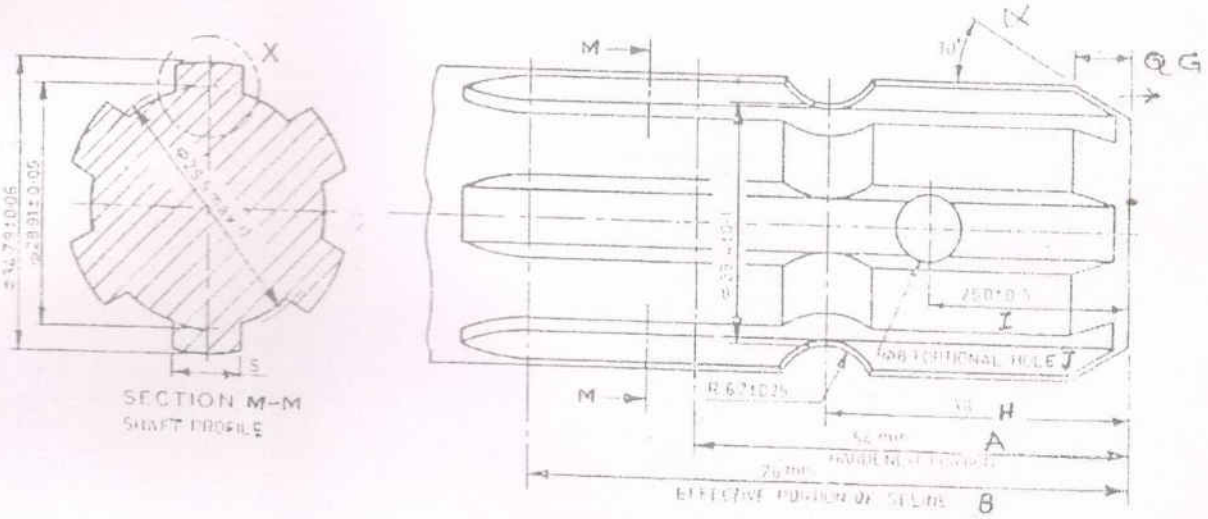
1.	Type	:	M. S. pipe fabrication
2.	Size of pipe, mm	:	60
3.	Method of mounting	:	The upper and lower hitch points are mounted on the MS pipe fabrication which acts as base frame.

5.4.3. Dimensions of power input shaft of fertilizer broadcaster (Ref. Fig.2)

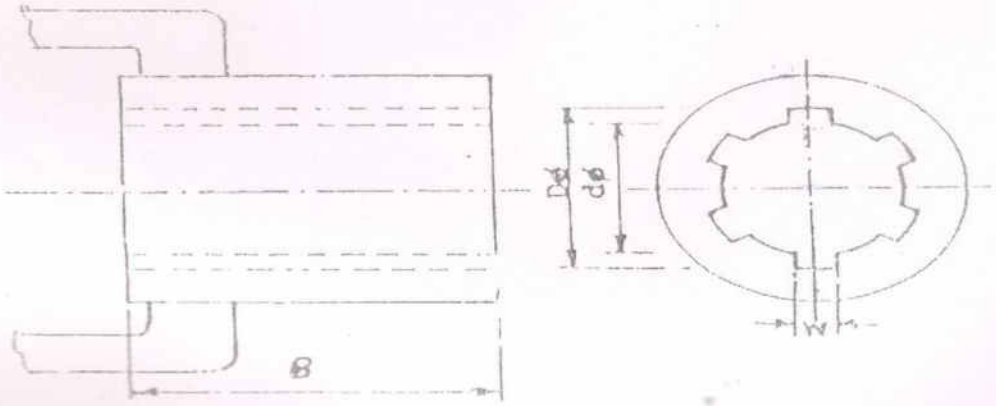
Notation	As per IS: 4931-1995, mm	As observed, mm	Remarks
A	54.0 (min)	64	Conforms
B	76.0 (min)	76.3	Conforms
D f	34.79 ± 0.06	34.84	Conforms
d f	28.91 ± 0.05	28.90	Conforms
G	7.0	8.0	Conforms
H	38.0	40.0	Conforms
I	25.0 ± 0.5	N.A	--
J	?8.3	N.A	--
R	6.7 ± 0.25	6.7	Conforms
S	8.69	8.69	Conforms
?	30 °	30 °	Conforms

5.4.4 Propeller shaft

1.	Type	:	Telescopic (in two segments with universal joint having 6 splined hub at both ends.)
2.	Length of shaft, mm		
	Minimum	:	855
	Maximum		1103
4.	Mass of shaft, kg	:	16.744
5.	Provision for locking	:	Provided



SPLINED END PINION SHAFT DIMENSIONS (mm)



PROPELLER SHAFT INSERT DIMENSIONS, (mm)

Fig.2: Dimensions of power input shaft & propeller shaft hub as per IS 4931:1995

5.4.4.1. **Propeller shaft hub dimensions (Ref. Fig; 2):**

Notation	As per IS:4931-1995, mm	As observed, mm	Remarks
Df	34.93 ± 0.03	34.90	Conforms
df	29.7 ± 0.1	29.60	Conforms
W	8.69 (min)	8.71	Conforms
B	54 (Min)	54	Conforms

5.4.5 Gear box Assembly

1. Type : Bevel pinion gear
2. No. of teeth on pinion : 17
3. No. of teeth on bevel gear : 17
4. Reduction ratio : 1:1
5. Grease capacity, g : 300
6. Grease change period, h (apa) : Every 100 working hours
7. Recommended grade of grease (apa) : Lithium Base Grease
8. No. of bearings : Two ball bearing (6205 2RS) on output shaft and Two ball bearing (6205 2Rs) on Input shaft

5.5. Hopper

1. Type : Square shaped fabricated by MS sheet
2. Size of MS sheet, mm : 2.0
3. Capacity : 400 kg (306.67 litres)
4. Size of hopper at top, mm : 1200 × 900
5. Size of hopper at bottom, mm : 180 × 180
6. Height of hopper, mm : 860
7. Loading height of hopper, mm : 1193
8. Metering mechanism and method of changing feed rate : Apertures are provided at the bottom of the hopper whose opening is adjusted by sliding shutters
9. Metering mechanism indexing lever : The sliding shutters of opertures are opened by a lever which is mounted on indexing plate. The indexing plate has eight holes. (Ref. Fig. 3)
10. Number of apertures : 3
11. Dimension of aperture (length × width), mm : 54×48×22

12.	Dia. of indexing plate rod	:	10 mm
13.	Length of indexing plate rod	:	160 mm

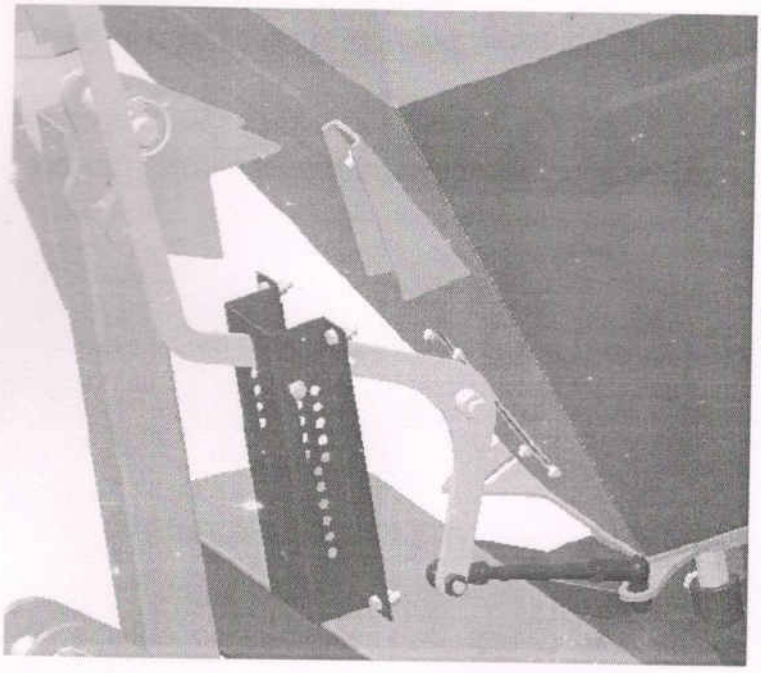


Fig. 3: A view of indexing plate

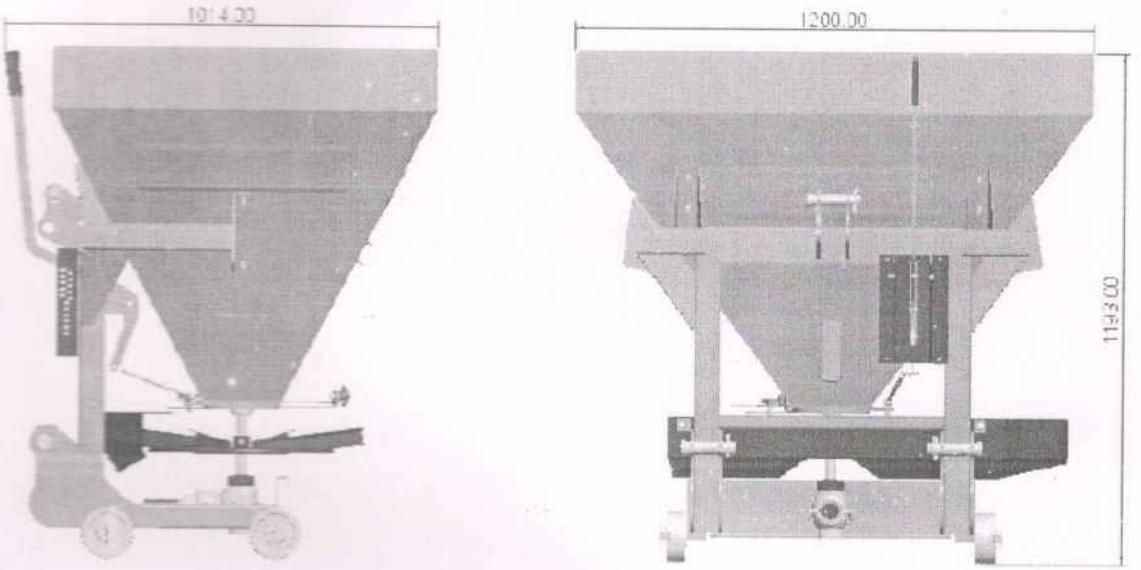
5.6. Fertilizer distributor

1.	Type of fertilizer distributor	:	Circular MS disc having four 'C' shaped vanes
2.	Number of discs	:	1
3.	Diameter of disc, mm	:	432.2
4.	Number of distributor vane	:	4
5.	Length of blade, m	:	190
6.	Height of blade, mm	:	30
7.	Angle of blades, degrees	:	0^0, 22^0, 33^0, 44^0
8.	Method of changing the angle of blades	:	By fixing nut and bolt on the holes provided for the purpose.

5.7 Overall Dimensions, mm

The overall dimensions are given in Fig.4.

1.	Length, mm	:	1020
2.	Width, mm	:	1200
3.	Height, mm	:	1195
4.	Weight, kg	:	120



L= 1020 mm W= 1200 mm H= 1195 mm

Fig. 4. Dimensions of Shaktiman Square Fertilizer Broadcaster "SSFB-400"

6. RUNNING -IN

The fertilizer broadcaster was run-in for one hour. Bolts and nuts were tightened and lubrication was done before the start of the actual test.

7. FIELD PERFORMANCE TEST

Field test of fertilizer broadcaster was conducted at RDS Farm, CCSHAU (Haryana) for 20.5 hours consisting of 5 trials. The implement was used for broadcasting DAP fertilizer. New Holland 4010 tractor was used. The detailed test results are given in Annexure-II and are summarized as under-:

Sl. No.	Parameters	Range
1.	Field condition	Levelled field
2.	Speed of field operation, km/h	3.03 to 3.12
3.	Total fertilizer spreading width, m	13.78 to 13.91
4.	Fertilizer application rate, kg/ha	109 to 120
5.	Uniformity Coefficient	54.6 to 59.2
6.	Actual field capacity, ha/h	3.16 to 3.46
7.	Field efficiency, %	77.34 to 81.97
8.	Fuel consumption, l/h	3.17 to 3.69
9.	Fuel consumption, l/ha	0.97 to 1.13
10.	PTO power requirement, hp	5.8 to 6.4

7.1 Quality of work

- The average forward speed was observed to be from 3.03 to 3.12 kmph.
- The uniformity coefficient which indicates the evenness of spreading of fertilizer was observed to be in the range of 54.6 to 59.2%

7.2 Rate of work and fuel consumption

The average width of spreading of fertilizer was observed as 13.78 to 13.91 m. The area covered was 3.16 to 3.46 ha/ h and fuel consumption varied from 3.17 to 3.69 l/h or 0.97 to 1.13 l/ha. The fertilizer application rate was in the range of 109 to 120 kg/ha.

7.3 Field efficiency and labour requirement

Field efficiency of machine was observed from 77.34 to 81.97 %. Only one person (Driver) is required to operate the tractor.

8. LUBRICATION & SERVICING

All lubrication points were lubricated/greased daily before starting the operation.

9. EASE OF OPERATION AND ADJUSTMENT

9.1 The drive shaft (universal coupling shaft) is provided with shear bolt for safety.

9.2 The propeller shaft has telescopic sections with universal joints, to adjust the length of drive shaft, which is adequate.

9.3 The operation and adjustment of fertilizer broadcaster was observed to be satisfactory.

9.4 Operator comfort: The equipment was easy for handling of operator.

9.5 Ease of loading: The loading height has been found to be satisfactory

9.6 Ease of setting delivery rates: The sliding shutter and lever arrangement is available on machine. The machine has to be calibrated before getting desired fertilizer rate.

9.7 Ease of cleaning machine and components: No complicated components are available in machine, hence the cleaning is easy.

10. SOUNDNESS OF CONSTRUCTION

No breakdown was observed during 20.5 hrs. of operation of fertilizer broadcaster

11. COMMENTS AND RECOMMENDATIONS

11.1 Some dimensions of three point linkage of the implement do not conform to IS: 4468-1997 (Part-1). This should be incorporated at production level.

11.2 The propeller shaft is provided with shearing bolt for safety of the machine.

11.3 Maneuverability of tractor with fertilizer broadcaster and quality of work were observed to be satisfactory.

11.4 Dimensions of input shaft of machine conforms to IS: 4931-1995.

11.5 The machine is provided with minimum cautionary notices for guidance as well as to ensure safety of operator.

11.6 The PTO power requirement of fertilizer broadcaster was observed from 5.8 to 6.4 hp.

11.7. The spreading chart of different types of seeds and fertilizer at different speed of tractor and gate settings of shutter alongwith application rate is given which is fixed on the machine for ready reference by the users.

12. LITERATURE

Instruction manual & spare parts list in English is provided with the machine. However, the manufacture should also develop these manuals in Hindi and other regional languages as per IS: 8132- 1999 for the guidance of users and technical personnel.

13. APPLICANTS COMMENTS

1. We will take necessary action for dimension of implement hitch as per IS: 4468 (Pt-I)-1997 (Reaffirmed in 2012).
2. We will take necessary action for provide product literature in other vernacular language as per IS 8132-1999

TESTING AUTHORITY

19.02.2018	19/2/18
(Er. MUKESH JAIN) Principal Investigator	**(Dr. VIJAYA RANI)** Co-Principal Investigator cum Head
Department of Farm Machinery and Power Engineering College of Agricultural Engineering and Technology CCS Haryana Agricultural University	

Test data collected and compiled by Er. Manoj

Annexure -I

BRIEF SPECIFICATIONS OF THE TRACTOR USED DURING FIELD TEST

1	Name of the tractor (Make)	NEW HOLLAND
2	Model	4010
3	Name of owner	CCSHAU, Hisar
4	Name of operator	Sh. Harish
5	Engine No./ Chassis No.	6189407/S-325D37105
6	Number of cylinders	3
7	Power at standard PTO speed, kW	24.1
8	Rated engine speed, rpm	2000
9	No load engine speed during field test (rpm)	1700
10	Drawbar power kW	21.3
11	Drawbar pull (kN): • Without ballast • With ballast	 13.4 20.2
12	Number & size of tyre: • Front • Rear	 Two, 6.00 - 16.0/8PR Two, 12.4 - 28.0/PR
13	Standard track width (mm): • Front • Rear	 1310 1340
14	Wheel base (mm)	1865
15	Ballast condition	Used in unballasted condition
16	Total Operational Mass (kg): • Front • Rear • Total	 740 1060 1800

Annexure-II

Field performance of Shaktiman Square fertilizer broadcaster (SSFB-400)

Place of Test : RDS Farm, CCSHAU, Hisar
Tractor used : New Holland - 4010
Gear used : L-2
Fertilizer used: DAP

Test	Date	Duration, h	Speed of tractor, km/h	PTO RPM	Operture shutter opening position*	Angle of blades of distributor plate**	Total fertilizer spreading width, m	Fertilizer application rate, kg/ha	Uniformity coefficient	Actual field capacity, ha/h	Field efficiency, %	Fuel consumption,	
												l/h	l/ha
1	17/03/2017	4.0	3.05	540	2	Medium	13.83	119	59.2	3.46	81.97	3.69	1.07
2	18/03/2017	4.0	3.03	540	2	Medium	13.80	114	58.5	3.21	78.20	3.64	1.13
3	20/03/2017	4.5	3.09	540	2	Medium	13.78	109	54.6	3.16	77.34	3.38	1.07
4	21/03/2017	8.0	3.12	540	2	Medium	13.91	120	58.4	3.28	78.52	3.17	0.97

*Operture shutter opening position: 15 holes are given on the Indexing lever. Hole No.1. hole opens the shutter to minimum and Hole No.15 opens the shutter to maximum.

** There are four angles of blades of distributor plate. The angles are 0^0 (min.), 22^0 (Medium), 33^0 (Maximum), 44^0 (Top)

Annexure-III

Laboratory test: Variation in fertilizer distribution

Travel speed	Hopper level	Setting No.	Weight of sample collected in 1 m² area at a equal distance from centerline (gram)																		Avg. weight (gram	Fertilizer rate (kg/ha)	Variation from mean (%)
			1 m		2 m		3 m		4 m		5 m		6 m		7 m		8 m		9 m		10 m				
			LH	RH	LH	RH	LH	RH	LH	RH	LH	RH	LH	RH	LH	RH	LH	RH	LH	RH	LH	RH			
05kmph	1/2	10	33.2	30.2	31.8	30.8	33.8	28.9	33.7	28.9	33.6	29.1	33.7	27.8	31.9	31.3	30.8	30.9	31.7	30.8	30.7	28.8	31.1	311.2	-11.94 to 7.93
		9	28.5	27.1	29.1	27.6	29.6	25.7	29.7	27.2	27.6	28.2	29.5	25.9	30.1	29.5	31.6	27.8	26.6	28.6	26.9	24.4	28.1	280.6	-15.00 to 11.20
		8	26.9	25.4	26.1	24.5	25.9	26.4	25.8	23.9	24.4	23.9	25.3	23.9	27.4	22.0	28.1	27.9	24.9	22.3	27.8	25.8	25.4	254.3	-15.59 to 9.50
		7	25.3	23.1	25.2	22.7	26.3	22.8	24.6	22.1	26.2	22.8	24.8	24.1	24.2	22.5	27.3	21.4	24.9	25.2	26.5	21.6	24.2	242.1	-13.13 to 11.32
		6	24.3	23.7	23.3	22.0	23.4	24.6	23.4	24.3	23.5	24.5	25.1	22.5	25.4	21.4	23.1	24.4	23.6	21.4	23.0	25.8	23.6	236.35	-10.44 to 8.39
		5	22.6	21.9	21.1	23.2	21.3	21.0	23.6	23.0	23.8	22.9	21.6	23.0	23.5	27.4	23.7	23.1	20.0	24.2	21.9	23.2	22.8	228	-14.00 to 16.79
		4	20.8	20.9	22.2	21.3	21.6	22.0	21.8	22.6	22.3	20.0	19.3	22.0	19.3	21.8	21.3	22.3	22.9	24.5	24.5	22.5	21.8	217.95	-12.93 to 11.04
		3	17.6	16.9	18.5	15.2	18.5	16.2	18.6	18.9	18.9	17.8	15.5	15.2	16.4	18.2	20.2	17.1	18.3	19.8	16.5	17.9	17.6	176.1	-15.86 to 12.82
		2	12.9	11.8	12.7	11.1	12.4	12.2	12.3	10.4	12.5	12.5	13.6	13.0	12.4	10.4	13.9	12.5	12.4	10.5	11.6	10.5	12.1	120.8	-16.15 to 13.09
		1	9.1	8.8	10.1	8.5	8.6	8.3	8.9	9.8	9.9	9.8	9.5	8.0	10.2	9.8	10.5	8.2	9.7	10.7	9.5	8.4	9.3	93.15	-16.44 to 12.94
	1/4	10	34.1	30.9	32.7	31.5	34.7	29.6	34.6	29.6	34.5	29.8	34.6	28.5	32.8	32.0	31.7	31.6	32.4	31.5	31.6	29.5	31.9	319.1	-11.96 to 8.04
		9	29.1	27.9	29.7	28.4	30.2	26.5	30.3	28.0	28.2	29.0	30.1	26.7	30.7	30.3	32.2	28.6	27.4	29.4	27.5	25.2	28.8	287.7	-14.17 to 10.65
		8	27.3	26.0	26.5	25.7	26.3	27.6	26.2	25.1	24.8	25.1	25.7	25.1	27.8	23.2	28.5	29.1	26.1	23.5	28.2	27.0	26.3	262.7	-13.23 to 9.73
		7	26.6	24.3	26.5	23.9	28.2	24.0	25.9	23.3	27.5	24.0	26.1	25.3	25.5	23.7	28.6	22.6	26.1	26.4	27.8	22.8	25.5	254.55	-12.63 to 11.00
		6	24	23.1	23.0	21.4	23.1	24.0	23.1	23.7	23.2	23.9	24.8	21.9	25.1	20.8	22.8	23.8	23.0	20.8	22.7	25.2	23.2	231.7	-11.39 to 8.06
		5	20.5	21.8	19.0	23.1	19.2	20.9	21.5	22.9	21.7	22.8	19.5	22.9	21.4	27.3	21.6	23.0	19.9	24.1	19.8	23.1	21.8	218	-14.74 to 20.15
		4	21.7	21.6	23.1	22.0	22.5	22.7	22.7	23.3	23.2	20.7	20.2	22.7	20.2	22.5	22.2	23.0	23.6	25.2	25.4	23.2	22.6	225.85	-11.81 to 11.08
		3	18.5	17.3	19.4	15.6	19.4	16.6	19.5	19.3	19.8	18.2	16.4	15.6	17.3	18.6	21.1	17.5	18.7	20.2	17.4	18.3	18.2	182.35	-16.89 to 13.58
		2	13.2	12.5	13.0	11.8	12.7	12.9	12.6	11.1	12.8	13.2	13.9	13.7	12.7	11.1	14.2	13.2	13.1	11.2	11.9	11.2	12.6	126	-13.51 to 11.27
		1	10.5	9.3	11.5	9.0	10.0	8.8	10.3	10.3	11.3	10.3	10.9	8.5	11.6	10.3	11.9	8.7	10.2	11.2	10.9	8.9	10.2	102.2	-20.24 to 14.12
	3/4	10	35.4	31.8	34.0	32.4	36.0	30.5	35.9	30.5	35.8	30.7	35.9	29.4	34.1	32.9	33.0	32.5	33.3	32.4	32.9	30.4	33.0	329.9	-12.21 to 8.36
		9	30.6	28.8	31.2	29.3	31.7	27.4	31.8	28.9	29.7	29.9	31.6	27.6	32.2	31.2	33.7	29.5	28.3	30.3	29.0	26.1	29.9	299.4	-14.71 to 11.16
		8	28.9	27.6	28.1	26.7	27.9	28.6	27.8	26.1	26.4	26.1	27.3	26.1	29.4	24.2	30.1	30.1	27.1	24.5	29.8	28.0	27.5	275.4	-13.80 to 8.50
		7	27.6	26.5	27.5	26.1	29.2	26.2	26.9	25.5	28.5	26.2	27.1	27.5	26.5	25.9	29.6	24.8	28.3	28.6	28.8	25.0	27.1	271.15	-9.33 to 8.40
		6	25.9	25.1	24.9	23.4	25.0	26.0	25.0	25.7	25.1	25.9	26.7	23.9	27.0	22.8	24.7	25.8	25.0	22.8	24.6	27.2	25.1	251.25	-10.20 to 7.63
		5	23.6	21.8	22.1	23.1	22.3	20.9	24.6	22.9	24.8	22.8	22.6	22.9	24.5	27.3	24.7	23.0	19.9	24.1	22.9	23.1	23.2	231.95	-16.56 to 15.04
		4	22.8	21.7	24.2	22.1	23.6	22.8	23.8	23.4	24.3	20.8	21.3	22.8	21.3	22.6	23.3	23.1	23.7	25.3	26.5	23.3	23.1	231.35	-11.23 to 12.70
		3	20.1	19.5	21.0	17.8	21.0	18.8	21.1	21.5	21.4	20.4	18.0	17.8	18.9	20.8	22.7	19.7	20.9	22.4	19.0	20.5	20.2	201.65	-13.29 to 11.17
		2	13.2	12.5	13.0	11.8	12.7	12.9	12.6	11.1	12.8	13.2	13.9	13.7	12.7	11.1	14.2	13.2	13.1	11.2	11.9	11.2	12.6	126	-13.51 to 11.27
		1	10.5	9.3	11.5	9.0	10.0	8.8	10.3	10.3	11.3	10.3	10.9	8.5	11.6	10.3	11.9	8.7	10.2	11.2	10.9	8.9	10.2	102.2	-20.24 to 14.12
	Full	10	38.2	32.8	36.8	33.4	38.8	31.5	38.7	31.5	38.6	31.7	38.7	30.4	36.9	33.9	35.8	33.5	34.3	33.4	35.7	31.4	34.8	348	-14.47 to 10.31
		9	36.6	29.7	37.2	30.2	37.7	28.3	37.8	29.8	35.7	30.8	37.6	28.5	38.2	32.1	39.7	30.4	29.2	31.2	35.0	27.0	33.1	331.35	-22.72 to 16.54
		8	32.8	28.7	32.0	27.8	31.8	29.7	31.7	27.2	30.3	27.2	31.2	27.2	33.3	25.3	34.0	31.2	28.2	25.6	33.7	29.1	29.9	299	-18.18 to 12.06
		7	28.5	26.5	28.4	26.1	30.1	26.2	27.8	25.5	29.4	26.2	28.0	27.5	27.4	25.9	30.5	24.8	28.3	28.6	29.7	25.0	27.5	275.2	-10.97 to 9.77
		6	27.1	28.8	26.1	27.1	26.2	29.7	26.2	29.4	26.3	29.6	27.9	27.6	28.2	26.5	25.9	29.5	28.7	26.5	25.8	30.9	27.7	277	-7.36 to 10.36
		5	25.3	28.6	23.8	29.9	24.0	27.7	26.3	29.7	26.5	29.6	24.3	29.7	26.2	34.1	26.4	29.8	26.7	30.9	24.6	29.9	27.7	277	-16.39 to 18.77
		4	24.1	27.5	25.5	27.9	24.9	28.6	25.1	29.2	25.6	26.6	22.6	28.6	22.6	28.4	24.6	28.9	29.5	31.1	27.8	29.1	26.9	269.1	-19.07 to 13.47
		3	22.4	23.8	23.3	22.1	23.3	23.1	23.4	25.8	23.7	24.7	20.3	22.1	21.2	25.1	25.0	24.0	25.2	26.7	21.3	24.8	23.6	235.65	-16.08 to 11.74
		2	15.7	17.8	15.5	17.1	15.2	18.2	15.1	16.4	15.3	18.5	16.4	19.0	15.2	16.4	16.7	18.5	18.4	16.5	14.4	16.5	16.6	166.4	-15.56 to 12.42
		1	12.6	11.4	13.6	11.1	12.1	10.9	12.4	12.4	13.4	12.4	13.0	10.6	13.7	12.4	14.0	10.8	12.3	13.3	13.0	11.0	12.3	123.2	-16.23 to 12.00

Annexure-IV

Effect of different settings of angle of blade of distributor plate on fertilizer spreading width

S.No.	Operture shutter opening position*	Angle of blade of fertilizer distributor plate	Engine RPM	PTO RPM	Spreading width, m
1	2	Min. (0^0)	1700	540	11.5
	2	Min. (0^0)	1500	470	09.5
	2	Min. (0^0)	1200	370	07.7
	2	Min. (0^0)	1000	306	06.6
2	2	Medium (22^0)	1700	540	13.1
	2	Medium (22^0)	1500	470	10.8
	2	Medium (22^0)	1200	370	09.3
	2	Medium (22^0)	1000	306	07.0
3	2	Maximum (33^0)	1700	540	16.7
	2	Maximum (33^0)	1500	470	13.8
	2	Maximum (33^0)	1200	370	12.1
	2	Maximum (33^0)	1000	306	11.7
4	2	Top (44^0)	1700	540	17.8
	2	Top (44^0)	1500	470	15.2
	2	Top (44^0)	1200	370	14.5
	2	Top (44^0)	1000	306	12.5

*Operture shutter opening position: 15 holes are given on the Indexing lever. Hole No.1. hole opens the shutter to minimum and Hole No.15 opens the shutter to maximum.

Annexure-V

Spreading chart for Fertilizer (As given on machine)

Seed norm ratio (kg./hectre) for different options and running
Speeds of the fertilizer machine with different disc

Tractor PTO : 540d/d
Disk height from floor : 70 cm
Tripple super phosphate width : 13.75 m
Urea : 13.25 m

	TRIPLE SUPER PHOSPHATE						UREA					
SPEED	6		7		8		6		7		8	
Calibration	A	B	A	B	A	B	A	B	A	B	A	B
2	3.8	5.8	3.2	4.9	2.8	4.3	6.5	7.7	5.3	6.6	4.6	5.8
3	14.8	21.5	12.7	18.4	11.1	16.1	18.9	25.5	16.2	21.9	14.2	19.2
4	30.4	43.1	26.1	36.9	22.8	32.3	34.6	46.3	29.7	39.7	26	34.7
5	48.6	58.8	41.7	50.4	36.5	44.1	49.4	60.1	42.3	51.5	37	45.1
6	61.9	65.2	53	55.9	46.4	48.9	63.9	70	54.8	60	47.9	52.5
7	65.7	70.9	56.3	60.8	49.3	53.2	70.3	72.9	60.3	62.5	52.7	54.7

A = Left Hand Side discharge opening

B = Right Hand Side discharge opening

Fig. 5: Fertilizer Broadcaster being used for broadcasting DAP