व्यावसायिक परीक्षण रिपोर्ट (प्रारंभिक)
COMMERCIAL TEST REPORT
(Initial)

संख्या/No.: LD/NERFMTTI, B. Chariali/ 2025-26/02/536
माह / Month: June 2025

THIS TEST REPORT IS VALID UPTO 30.06.2032

SWAN AGRO, NSML DT 200, ROTAVATOR

सत्यमेव जयते

भारत सरकार
GOVERNMENT OF INDIA
कृषि एवं किसान कल्याण मंत्रालय
MINISTRY OF AGRICULTURE AND FARMERS WELFARE
कृषि एवं किसान कल्याण विभाग
DEPARTMENT OF AGRICULTURE AND FARMERS WELFARE
उत्तर पूर्वी क्षेत्र कृषि यंत्र प्रशिक्षण एवं परीक्षण संस्थान
NORTH EASTERN REGION FARM MACHINERY TRAINING & TESTING INSTITUTE
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[AN ISO 9001:2015 CERTIFIED INSTITUTION]

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Type	:	Multi speed, Gear drive, Centrally mounted
Make	:	SWAN AGRO
Model	:	NSML DT 200
Year of manufacture	:	2025
Serial Number	:	1051217
Recommended power source, hp	:	Tractor- 40 hp and above
Type of blade	:	Hatchet (L-Shaped)
Size (cm) {Rotor Dia.× Working width}	:	45 x 201

`4.2 Prime Mover Used:

Tractor	:	SWARAJ 855 FE
Chassis No.	:	QUCL61618127164
Engine no.		47.1402/SML5041
Max. PTO Power (kW)	:	41.0

4.3 Constructional Details (Refer Fig.1) :

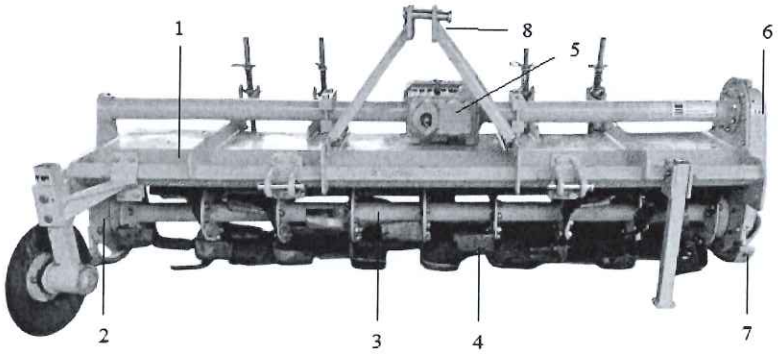

Fig.1 ROTARY TILLER (ROTAVATOR), Model: NSML DT 200

KEY WORDS:

1. Main frame
2. Side plate
3. Rotor shaft
4. Rotor blade
5. Primary reduction gear box
6. Secondary reduction gear box
7. Skid
8. Hitch pyramid

4.3.1 Main Frame:

Type	:	Fabricated from MS sheet, MS square pipe and M.S Plate.
Size of box section (mm)	:	2120 x 50 x 50.5
Size of supporting flat (mm) {R.H.S and L.H.S}	:	550 x 165 x 8.2 and 550 x 165 x 8.2
Type of mounting of box section	:	Two Nos. of MS flat were bolted with the help of 4 nos. of bolts & nuts at LHS and 6 nos. at RHS.

Summary of Field Performance Test

Sr. No.	Parameters/operations	Wet land operation (Puddling)	Dry land operation
1	2	3	4
1	Gear Used	L-2	L-2
2	Engine speed (rpm)		
	No load	1812 to 1815	1812 to 1818
	On load	1755 to 1758	1768 to 1776
3	Type of soil	Medium	
4	Depth of standing water (cm)/ soil moisture (%)	10.12	8.10 to 13.23
5	Bulk density of soil (g/cc)	--	1.45 to 1.56
6	Speed of operation (kmph)	2.14 to 2.24	2.86 to 2.93
7	Travel reduction (%)/ Wheel slip (%)	-1.02 to -2.27	-1.02 to -1.35
8	Depth of puddle (cm)/ Depth of cut (cm)	28.24 to 28.93	10.04 to 10.20
9	Working width (cm)	--	206 to 213
10	Area covered (ha/h)	0.47 to 0.48	0.52 to 0.55
11	Time required for one ha (h)	2.09 to 2.13	1.81 to 1.92
12	Puddling Index (%)/ Field efficiency (%)	89.6 to 90.2	85.22 to 91.01
13	Power requirement, kW	NR	25.68 to 28.20
14	Fuel consumption		
	l/h	3.30 to 3.35	4.95 to 5.18
	l/ha	6.90 to 7.14	8.96 to 9.97

7.1 Wet land operation :

The tractor was operated without cage wheel for puddling operation of rotary tiller (rotavator).

7.1.1 Quality of work :

a) The depth of puddle was recorded as 28.24 to 28.93 cm.

b) The puddling index was recorded as 89.6 to 90.2 %.

7.2 Dry land operation :

7.2.1 Rate of work :

(a) The rate of work was recorded as 0.52 to 0.55 ha/h and the speed of operation was recorded as 2.86 to 2.93 kmph.

(b) The time required to cover one hectare was recorded as 1.81 to 1.92 h.

7.2.2 Quality of work :

(a) The depth of cut was recorded as 10.04 to 10.20 cm.

(b) Working width was observed as 206 to 213 cm.

(c) Field efficiency was observed as 85.22 to 91.01%.

7.3 Effectiveness of sealing for wet land operation:

After completion of field test in wet land, the rotavator was dismantled for checking the effectiveness of sealing provided against ingress of mud and/or water in various sub-assemblies/components. The observations are given in ensuing Table:

Sr. No.	Location	Whether ingress of mud and/or water was observed (Yes/No)
1	Primary reduction gear box	No
2	Secondary reduction gear box	No
3	Rotor axle bearing cap	No

7.4 Labour requirement :

One skilled operator is needed to operate the tractor with the rotavator.

7.5 Adequacy of power of prime mover as used during test :

The power of the prime mover as used during test was found adequate.

7.6 Wear analysis of rotary blade:

7.6.1 On mass basis :

Wear analysis on mass basis was done after 36.02 hours (wet land and dry land operation) and the results are as shown below,

Wet land & dry land Operation				
Sr. No.	Initial Mass (g)	Final Mass (g)	Percentage of Wear	
			After 36.02 hours	Per Hour
1	1028	919	10.60	0.29
2	1051	976	7.14	0.20
3	1026	946	7.80	0.22
4	1036	940	9.27	0.26
5	1030	949	7.86	0.22
6	1022	925	9.49	0.26
7	1010	932	7.72	0.21
8	1025	941	8.20	0.23
9	1063	970	8.75	0.24

The hourly rate of wear of blade on mass basis after wet land & dry land operations was recorded as 0.20 to 0.29 %.

7.6.2 On dimensional basis (Refer Fig. 7):

Wear analysis of rotary blades on dimensional basis was done after 36.02 hours of wet land and dry land operation and the results are as shown below,

Sr. No.	Blade width at every 50 mm from outer end								Percentage wear							
	Initial				Final				After 36.22hour				Per hour			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
1	79.70	84.94	84.38	84.53	67.08	72.90	80.55	83.85	15.83	14.17	4.54	0.80	0.44	0.39	0.13	0.02
2	79.64	82.15	82.04	83.07	70.75	72.77	79.01	82.82	11.16	11.42	3.69	0.30	0.31	0.32	0.10	0.01
3	80.09	83.48	83.29	83.53	70.13	74.27	79.29	82.95	12.44	11.03	4.80	0.69	0.35	0.31	0.13	0.02
4	77.24	83.27	83.20	83.32	67.08	72.76	78.47	82.45	13.15	12.62	5.69	1.04	0.37	0.35	0.16	0.03
5	80.84	83.04	83.72	84.70	70.46	73.95	79.15	84.51	12.84	10.95	5.46	0.22	0.36	0.30	0.15	0.01
6	77.76	82.64	83.19	84.10	67.32	72.00	79.19	83.55	13.43	12.88	4.81	0.65	0.37	0.36	0.13	0.02
7	78.11	83.34	83.42	84.04	69.51	74.55	81.86	83.65	11.01	10.55	1.87	0.46	0.31	0.29	0.05	0.01
8	77.63	84.02	83.83	83.67	67.13	73.00	80.64	82.90	13.53	13.12	3.81	0.92	0.38	0.36	0.11	0.03
9	79.56	83.75	84.02	85.00	64.47	69.98	81.90	83.98	18.97	16.44	2.52	1.20	0.53	0.46	0.07	0.03
												Average	0.38	0.31	0.16	0.02

The hourly rate of wear of blade on dimensional basis after wet land & dry land operations was recorded as 0.02 to 0.38 %.

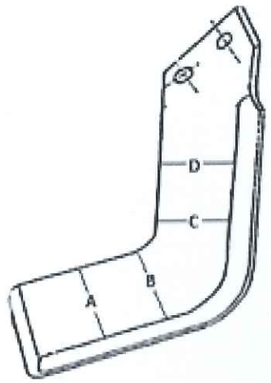

Fig. 7 DIMENSIONS OF BLADE FOR WEAR ANALYSIS

8. EASE OF OPERATION AND ADJUSTMENTS

The operator can easily adjust and control the rotavator from operator's seat in the field as the adjustments are within the easy reach of operator. However the operator has to get down from the tractor in order to raise/lower the depth adjusting skids.

9. DEFECTS, BREAKDOWNS AND REPAIRS

No breakdown was occurred during 36.02 hours of field performance test (wet land and dry land operation)

10. PARAMETERS APPLICABLE FOR QUALIFYING MINIMUM PERFORMANCE CRITERIA

Sr. No	Characteristics	Category Evaluative/ Non Evaluative	Requirement	Tolerance	As Observed	Whether meets the requirements (Yes/ No)
1	2	3	4	5	6	7
1	**Field Performance**					
i	Suitability for wet land operation	Evaluative	Should be suitable for wet land operation	--	Suitable	Yes
ii	Depth of cut in dry land operation (cm)	Evaluative	Minimum 10 cm	--	10.04 to 10.20 cm	Yes
iii	Depth of puddle in wet land operation(cm)	Evaluative	Minimum 12 cm	--	28.24 to 28.93 cm	Yes

1	2	3	4	5	6	7
iv	Field Efficiency (%)	Evaluative	Minimum 75 %	--	Average 88.12 %	Yes
v	Puddling Index (%)	Evaluative	Minimum 65 %	--	Average 89.90 %	Yes
2	**Safety Requirements**					
i	Safety considerations	Evaluative	Should meet the requirement of IS:10740 and IS:10318	--	Provided	Yes
ii	Safety Clutch/ device(shear bolt) in PTO drive shaft	Evaluative	Should be provided	--	Provided	Yes
iii	Rotavator Stand	Evaluative	Should be provided	--	Provided	Yes
iv	Rotavator shield to prevent flying of mud and stone	Evaluative	Should be provided	--	Provided	Yes
v	Guard over propeller shaft	Evaluative	Should be provided	--	Provided	Yes
3	**Effectiveness of sealing(presence of ingress of dust and water/ mud in various sub-assemblies)**					
i	Primary reduction gear/ box	Evaluative	No ingress of mud and water	--	No ingress of mud and water	Yes
ii	Secondary reduction gear/box	Evaluative	No ingress of mud and water	--	No ingress of mud and water	Yes
iii	Rotary axle bearing cap	Evaluative	No ingress of mud and water	--	No ingress of mud and water	Yes
4	**Material of construction**					
i	Hardness of blades	Evaluative	High carbon steel, boron steel	--	**Does not conform**	**No**
ii	Chemical composition of rotor blades	Evaluative	As per IS:6690	--	**Does not conform**	**No**
5	**Dimensional requirements**					
i	Dimension of three point linkage	Non-Evaluative	Should meet IS:4468 (part -I)	--	**Does not conform**	**No**
ii	Dimension of PIC of Implements	Non-Evaluative	Should meet IS:4931	--	**Does not conform**	**No**
iii	Dimensions of PIC yoke bore	Non-Evaluative	Should meet IS:4931	--	Conform	Yes
6	**Literature (Submission to test agency)**					
i	Operator cum service manual and part catalogue	Evaluative	Should be provided as per IS:8132	--	Provided.	Yes

1	2	3	4	5	6	7
7	**Labelling of Rotavator(provision of labelling plate) as mentioned below and should be welded on rotary tiller (Rotavator)**					
	Parameter					
i	Name and address of the manufacturer	Evaluative	Should be provided on rotary tiller (Rotavator)	--	Provided	Yes
ii	Make			--	Provided	Yes
iii	Model			--	Provided	Yes
iv	Size, (m) {Dia of Rotor X Width of Cut}			--	Provided	Yes
v	Country of origin			--	Provided	Yes
vi	Year of manufacture			--	Provided	Yes
vii	Chassis Serial Number			--	Provided	Yes
viii	Recommended PTO speed of Prime mover(rpm)			--	Provided	Yes
ix	Maximum PTO power requirement, kW			--	Provided	Yes
8	**Category of Breakdowns/ Defects**					
	Category of breakdowns	Category Evaluative/ Non Evaluative	Requirements	As Observed	Whether meets the requirements (Yes/ No)	
i	Critical breakdown	Evaluative	No critical breakdown	None	Yes	
ii	Major breakdown	Evaluative	Not more than one and neither of them should be repetitive in nature.	None	Yes	
iii	Minor breakdowns	Evaluative	Not more than three and frequency of each should not be more than two.	None	Yes	
iv	Total breakdowns	Evaluative	In no case, the total no of breakdown should exceed four, i.e. (1 major + 3 minor) or 4 minor breakdowns	None	Yes	

11. CRITICAL TECHNICAL SPECIFICATIONS

(Vide Ministry's letter No. 13-9/2019-(M&T) (I&P)-Part dated 26.04.2019)

Sr. No.	Parameters	Specifications	Observation	Remarks
1	2	3	4	5
1	Working width (mm)	1200 (Min.)	2010	Conforms
2	Type of blade	C/L/J shape as per demand	L	Conforms
3	Overlap, mm	15 (Min.)	15.4	Conforms
4	Thickness of blade (mm)	7-8 (Min.)	7.75	Conforms
5	No. of Blades	30 (Min.)	54	Conforms
6	Total number of flange	5 (Min.)	10	Conforms
7	Number of blades per flange	6 (Max.)	6	Conforms
8	Outer Diameter of rotor shaft, mm	75-90	73.5	**Does not conform**
9	Rotor diameter, including flange and blade mounted on flange, mm	425 (Min.)	460	Conforms
10	Side Drive	Gear drive	Gear drive	Conforms
11	Depth control mechanism	Arc shaped skid on both side of rotavator	Provided	Conforms
12	Material of blades	Boron (28MnCrB5) / High Carbon Steel EN42)	Boron (28MnCrB5)	Conforms
13	Hardness of Blade Material, HRC	38 (Min.)	44	Conforms
14	Safety clutch / device (Shear bolt) in PTO drive shaft	Must be provided	Provided	Conforms
15	Rotavator stand	Must be provided	Provided	Conforms
16	Guard over propeller shaft	Must be provided	Provided	Conforms
17	Sheet metal	AS36 / IS 2062	As per IS 2062	Conforms
18	Marking/labeling of machine	The labeling plate should be riveted on the body of machine having Name and address of manufacturer, Country of origin, Make, Model, Year of manufacturer, Serial number, Type, Size, required size of prime mover (kW)	Provided	Conforms

1	2	3	4	5
19	Literature	Operator manual, Service manual and Parts catalogue should be provided.	Provided	Conforms

12. COMMENTS AND RECOMMENDATIONS

12.1 Dimensions of Three point linkage of the rotavator does not conform to IS: 4468-1997 (Part-1) and it should be looked into for corrective action.

12.2 Dimensions of PIC of the rotavator does not conform to IS: 4931-1995 and it should be looked into for corrective action.

12.3 The hardness and chemical composition of rotary blades does not conform to the requirement of IS 6690:1981 (Reaffirmed 2022). This may be looked into for corrective action.

12.4 The outer diameter of rotor shaft does not conform to critical technical specifications vide Ministry's letter No. 13-9/2019-(M&T) (I&P)-Part dated 26.04.2019. This should be looked into for corrective action.

TESTING AUTHORITY

(M.R. PATIL)
SENIOR AGRICULTURAL ENGINEER

(P. KAMALABAI)
DIRECTOR

Draft test report compiled by **Shri Rahul, Senior Technical Assistant**

13. APPLICANT'S COMMENTS

Para No.	Our Reference	Applicants Comments
13.1	12.1	For further production we shall take appropriate action to improve the same as per IS: 4468-1997 in future.
13.2	12.2	For further production we shall take appropriate action to improve the same as per IS: 4931-1995 in future.
13.3	12.3	We will try to improve material & Hardness.
13.4	12.4	For further production we shall take appropriate action for Dia. of rotor shaft.

LD/NERFMTTI, B. Chariali/ 2025-26/02/536	SWAN AGRO, NSML DT 200 ROTAVATOR	COMMERCIAL (INITIAL)

ANNEXURE-I

FIELD PERFORMANCE RESULTS (WET LAND OPERATION)

Place of test: Village-Raina, Dist. -Ludhiana, Punjab

Tractor used: SWARAJ 855 FE

Sr. No.	Parameters	Test trails		Avg.
		I	II	--
1	Date of test	23.05.2025	23.05.2025	--
2	Net test duration (h)	5.05	5.17	--
3	Gear used	L-2		
4	Engine speed (rpm)			
	No load	1812	1815	1814
	On load	1758	1755	1757
5	Type of Soil	Medium		
6	Av. depth of standing water (cm)	10.12	10.12	10.12
7	Previous treatment	Nil		
8	Forward speed (kmph)	2.14	2.24	2.19
9	Av. travel reduction (%)	-2.27	-1.02	-1.65
10	Av. wheel sinkage (cm)	32.42	33.17	32.80
11	Av. depth of puddle (cm)	28.24	28.93	28.59
12	Water over puddle (cm)	4.18	4.24	4.21
13	Puddling index (%)	90.2	89.6	89.90
14	Fuel consumption (l/h)	3.35	3.30	3.33
15	Area covered(ha/h)	0.47	0.48	0.48
16	Time required for one ha (h)	2.13	2.09	2.11

ANNEXURE-II

FIELD PERFORMANCE RESULTS (DRYLAND OPERATION)

Place of test: Village- Kanech, Dist. Ludhiana, Punjab

Tractor used: SWARAJ 855 FE

Sr. No.	Parameters	I	II	III	IV	Avg.
1	Date of test	17.05.25	18.05.25	19.05.25	20.05.25	--
2	Net test duration (h)	7.20	7.60	7.75	3.25	--
3	Gear used	L-2				
4	Engine speed (rpm)					
	No load	1812	1815	1817	1818	1816
	On load	1768	1768	1776	1774	1772
5	Furrow length (m)	138	80	92	99.2	102.3
6	Type of soil	Medium				
7	Bulk density (g/cc)	1.56	1.56	1.47	1.45	1.51
8	Soil Moisture (%)	13.23	11.30	10.35	8.10	10.75
9	Previous treatment	Nil				
10	Forward speed, (kmph)	2.86	2.91	2.93	2.93	2.91
11	Wheel slippage (%)	-1.02	-1.11	-1.35	-1.32	-1.20
12	Av. Depth of cut (cm)	10.20	10.04	10.08	10.07	10.10
13	Av. Width of cut (cm)	213	206	207	206	208
14	Soil pulverization (cm)	1.05	1.10	1.32	1.25	1.18
15	Area covered (ha/h)	0.52	0.52	0.55	0.53	0.53
16	Power requirement (kW)	25.7	25.7	27.4	28.2	26.75
17	Time required for one ha (h)	2.05	2.07	2.21	2.09	2.11
18	Field efficiency (%)	85.22	87.27	91.01	88.99	88.12
19	Fuel consumption					
	l/h	5.18	5.00	4.95	5.05	5.05
	l/ha	9.97	9.60	8.96	9.39	9.48