



## ACE DI 450 NG TRACTOR



भारत सरकार

### GOVERNMENT OF INDIA

कृषि मंत्रालय (कृषि एवं सहकारिता विभाग, मशीनीकरण एवं प्रोद्योगिकी प्रभाग)

Ministry Of Agriculture (Deptt. of Agri. & Co-op, Mechanization & Technology Division)

केन्द्रीय कृषि मशीनरी प्रशिक्षण एवं परीक्षण संस्थान

### CENTRAL FARM MACHINERY TRAINING & TESTING INSTITUTE

(An ISO: 9001-2008 Certified Institute)

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<b>T-941/1459/2014</b>	<b>ACE DI 450 NG TRACTOR - Commercial (Initial)</b>
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Type of Test : **COMMERCIAL (Initial)**

Test code/Procedure : IS: 5994-1998 (Reaffirmed in 2009)  
IS: 9253-2001(Reaffirmed in 2012)  
and IS: 12207-2014.

Period of Test : October, 2013 to July, 2014

Test Report No. : **T-941/1459/2014**

Month/Year : **October, 2014**

- i) The results reported in this report are observed values and no corrections have been applied for atmospheric and site conditions.
- ii) The data given in this report pertain to the particular machine submitted by the applicant for test.
- iii) The results presented in this report do not in any way attribute to the durability of the machine.
- iv) This report should not be reproduced in part or full without prior permission of the Director, Central Farm Machinery Training and Testing Institute, Budni (M.P.)

#### SELECTED CONVERSIONS

<b>SELECTED CONVERSIONS</b>			<b>ABBREVIATIONS</b>	
S. No	Units	Conversion Factor		
1	<b>Force:</b>		As per applicant	apa
	1 kgf	9.80665 N	Top Dead Centre	TDC
		2.20462 lbf	Indian Standard	IS
2	<b>Power:</b>		Left Hand Side/ Right Hand Side	LHS/RHS
	1 hp	1.01387metric hp (Ps)	Mercury	Hg.
		745.7 W	Temperature	Temp.
	1 Ps	735.5 W	Not recorded	N.R.
	1 kW	1.35962 Ps	Revolutions per minute	rpm
3	<b>Pressure:</b>		Outer diameter/ Inner diameter	O.D/I.D
	1 psi	6.895 kPa	Not available/ Not applicable	N.A.
	1 kgf/cm <sup>2</sup>	98.067 kPa = 735.56 mm of Hg	Power take-off	PTO
	1 bar	100 kPa = 10 N/cm <sup>2</sup>	Relative Humidity	R.H.
	1 mm of Hg	1.3332 m-bar		

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## 16. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

**16.1** Evaluative (mandatory) / Non-evaluation (Non-mandatory) parameter applicable for qualifying Minimum Performance criteria as per Clause-4 (Table-1) of IS: 12207-2014 for acceptance of the tractor for the purpose of subsidies/NABARD financing are summarized as under:

S. No.	Characteristic	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207-2014	Values declared by the applicant (D)/ Requirement (R)	As observed	Whether meets the require- ments (Yes/No.)
1	2	3	4	5	6	7
<b>16.1.1</b>	<b>PTO Performance :</b>					
a)	Maximum power under 2 h test, (kW) (Natural ambient condition)	Evaluative	Declared value to be achieved with a tolerance of: -5 / +10% for PTO power >26 kW. - 7.5/+10% for PTO power ≤ 26 kW or -5 / +10% for Engine power >26 kW. -7.5/+10% for Engine power ≤ 26 kW	31.0 (D)	31.1	Yes
b)	Power at rated engine speed, (kW)	Non Evaluative	-do-	31.0 (D)	31.1	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Non Evaluative	± 5%	265 (D)	262	Yes
d)	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	± 8%	185 (D)	178.45	Yes
e)	Back-up torque, percent	Non Evaluative	10 percent, min.	17	20.2	Yes
f)	Maximum operating temperature, (°C)					
	1) Engine oil	Non Evaluative	The declared value should not exceed the max. value specified by the oil company and the observed value under high ambient condition should not exceed the declaration.	135 (D)	116	Yes
	2) Coolant (water)	Evaluative	The declared value should not exceed the boiling temperature of coolant under the pressurized or otherwise and the observed value under high ambient condition should not exceed the declaration.	110 (D)	90	Yes
g)	Engine oil consumption, (g/kWh)	Evaluative	Not exceeding 1% of SFC at max. power under High ambient conditions	2.64 (max.) (R)	0.19	Yes
h)	Smoke level	Evaluative	Maximum light absorption coefficient of 3.25 per metre or equivalent BOSCH No. 5.2 or 75 Hatridge value ( <b>As per CMVR</b> )	3.25 per meter (R)	0.10 per metre	Yes

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<b>16.1.2 Drawbar performance :</b>						
<b>a)</b>	Max. drawbar pull with ballast corresponding to 15 percent wheel slip, (kN)	Non Evaluative	Minimum 65% of static mass with ballast	18.00 (D)	24.04	Yes
				17.60 (R)		
<b>b)</b>	Max. drawbar pull without ballast corresponding to 15 percent wheel slip, (kN)	Evaluative	Minimum 65% of static mass of tractor without ballast	12.50 (D)	17.28	Yes
				12.36 (R)		
<b>c)</b>	Maximum drawbar power without ballast, (kW).	Evaluative	Minimum 80 % of PTO power as referred in SI No. i) a) of PTO performance in case of tractors having total static mass > 1500 kg Minimum 75 % of PTO power as referred in SI No. i) a) of PTO performance in case of light weight tractors having 1500 kg total static mass of tractor Minimum 75 % of the engine power as referred in SI No. i) a) of engine performance in case of tractors which do not have a PTO shaft.	24.8 (D)	27.5	Yes
				24.9 (R)		
<b>d)</b>	Max. transmission oil temperature (°C)	Non Evaluative	The declared value should not exceed the maximum value specified by oil company	135	78	Yes

<b>16.1.3 Power lift and hydraulic pump performance :</b>							
<b>a)</b>	Maximum lifting capacity throughout the range of lift, (kN):						
	1)	At hitch points	Non Evaluative	[Tolerance of minus 10%]	9.80 (D)	9.53	Yes
	2)	With the standard frame	Evaluative	The lift capacity should at least be 24 kg/PTO kW. and it should be 21.5 kg/engine kW where the tractor is not provided with a PTO shaft	7.50 (D)	8.68	Yes
				7.36 Minimum, (R)			
<b>b)</b>	Maximum drop in the height of the point of application of the force after each 5 minutes interval for a total duration of 30 Minutes, (mm)	Non Evaluative	Observed value should not exceed 50 mm.	50 (D)	40	Yes	

1	2	3	4	5	6	7	
<b>16.1.4</b>	<b>Brake performance at 25 kmph:</b>						
<b>a)</b>	Maximum stopping distance at a force, equal to or less than 600 N on brake pedal with road ballast, (m):						
	1)	Cold brake	Evaluative	10	10 (R)	8.31	Yes
	2)	Hot brake	Evaluative	10	10 (R)	8.37	Yes
<b>b)</b>	Maximum force exerted on the brake pedal to achieve a deceleration of 2.5 m/s <sup>2</sup> (N)	Evaluative	600	600 (R)	407 to 414	Yes	

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<b>c)</b>	Whether parking brake is effective at a force of 600 N at foot pedal(s) or 400 N at hand lever	Evaluative	Yes / No	Yes (R)	Yes	Yes
<b>16.1.5 Noise measurement :</b>						
<b>a)</b>	Maximum ambient noise emitted by the tractor, dB(A)	Evaluative	As per CMVR	88 (R)	85	Yes
<b>b)</b>	Maximum noise at operator's ear level dB(A)	Evaluative	As per CMVR	98 (R)	97	Yes
<b>16.1.6 Amplitude of mechanical vibrations at :</b>						
	1) Left foot rest	Non Evaluative	100 microns (max)	100 (R)	170	<b>No</b>
	2) Right foot rest			100 (R)	190	<b>No</b>
	3) Seat (with driver seated)			100 (R)	170	<b>No</b>
	4) Steering wheel			100 (R)	210	<b>No</b>
<b>16.1.7 Haulage requirements :</b>						
<b>a) Gross mass of the trailers, (tones):</b>						
	1) Two wheel	Non	--	5.0 (D)	5.0	Yes
	2) Four wheel	Evaluative	--	6.0 (D)	6.0	Yes
<b>b) Distance travelled / litre of fuel consumption, (km/l):</b>						
	1) Two wheel	Non	--	4.00 to 6.00 (D)	5.60 to 5.70	Yes
	2) Four wheel	Evaluative	--	3.50 to 5.50 (D)	4.56 to 4.66	Yes
<b>c) Fuel consumption (ml/km/tonne):</b>						
	1) Two wheel	Non	--	35.0 to 55.0 (D)	35.1 to 35.7	Yes
	2) Four wheel	Evaluative	--	30.0 to 50.0 (D)	35.8 to 36.5	Yes

1	2	3	4	5	6	7
<b>16.1.8 Wetland cultivation :</b>						
	Sealing for the following assemblies:	Evaluative	<b>The identified assemblies should essentially meet the requirement of IS: 11082. No water ingress in the identified assembly</b>	There should be no ingress of water	No ingress of water and/or mud was observed	Yes
	1) Clutch assembly	-do-				
	2) Brake housings	-do-				

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	3)	Front axle hubs	-do-	<b>given in column-2.</b> If tractor does not meet the requirements of wetland cultivation, it may be recommended for dry land operation only.	and mud (R)		
	4)	Engine oil	-do-				
	5)	Transmission oil	-do-				

**16.1.9 Safety features :**

<b>a)</b>	Guards against moving and hot parts	Evaluative	Belt drives, pulley, silencer, hydraulic pipes (As per IS 12239 (part 2))	At present no requirements	Provided	--
<b>b)</b>	Lighting arrangement (Tractor having more than 1150 mm rear track width)	Evaluative	As per CMVR	--	Provided	Yes
<b>c)</b>	Seating requirement (Tractors having more than 1150 mm rear track width)	Non-Evaluative	Should meet the requirements of IS 12343 (as amended from time to time)	--	Conforms	Yes
<b>d)</b>	Technical requirements for PTO shaft	Non-Evaluative	Should meet the requirements of IS 4931 (as amended from time to time)	--	Conforms	Yes
<b>e)</b>	Dimension of three point linkage	Non-Evaluative	Should meet the requirements of IS 4468 (part 1) (as amended from time to time)	--	<b>Does not meet the requirement</b>	<b>No</b>
<b>f)</b>	Specification of linkage and swinging drawbars	Non-Evaluative	Should meet the requirements of IS 12953 and IS 12362 (part 3) (as amended from time to time)	--	Conforms	Yes

**16.1.10 Labelling of tractors (Provision of labelling plate):**

	1)	Make	Evaluative	Should conform to the requirements of CMVR along-with declared value of PTO HP	--	ACE	Yes
	2)	Model	Evaluative		--	DI 450 NG	Yes
	3)	Year of manufacture	Evaluative		--	M AC (February ,2013)	Yes
	4)	Engine serial number	Evaluative		--	TMAC 0000002	Yes
	5)	Chassis number	Evaluative		--	MAC 450000002	Yes
	6)	Declaration of PTO power, (kW)	Evaluative		--	31	Yes

1	2	3	4	5	6	7
<b>16.1.11</b>	<b>Discard limit for:</b>					
<b>(a)</b>	Cylinder bore diameter, (mm)	Evaluative	To be specified by the manufacturer	105.30	105.05 to 105.06	Yes
<b>(b)</b>	Clearance between piston & cylinder liner at skirt, (mm)	Non Evaluative		0.45	0.145 to 0.158	Yes

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<b>(c)</b>	<b>Ring end gap (mm):</b>						
	-	Top comp. ring.	Evaluative	-do-	2.0	0.40 to 0.55	Yes
	-	2 <sup>nd</sup> comp. ring.		-do-	2.0	0.65 to 0.70	Yes
	-	Oil ring.		-do-	2.0	0.35 to 0.50	Yes
<b>(d)</b>	<b>Ring groove clearance (mm):</b>						
	-	Top comp. ring.	Evaluative	-do-	0.20	Taper rings	--
	-	2 <sup>nd</sup> comp. ring.		-do-	0.20	0.091 to 0.092	Yes
	-	Oil ring.		-do-	0.20	0.052 to 0.054	Yes
<b>(e)</b>	<b>Clearance of main bearings (mm):</b>						
	-	Diametrical clearance	Evaluative	To be specified by the manufacturer	0.40	0.086 to 0.127	Yes
	-	Crankshaft end float	Evaluative		0.60	0.18	Yes
<b>(f)</b>	<b>Clearance of big end bearings, (mm):</b>						
	-	Diametrical	Evaluative	-do-	0.60	0.095 to 0.118	Yes
	-	Axial	Evaluative	-do-	1.00	0.35	Yes
<b>(g)</b>	Clearance between king pin and bush, (mm)	Non Evaluative	-do-	1.00	0.068 to 0.101	Yes	
<b>(h)</b>	Clearance between centre pin and bush, (mm)	Non Evaluative	-do-	1.00	0.144 to 0.169	Yes	

<b>16.1.12 Literature (Submission to test agency)</b>						
<b>(a)</b>	Operator manual	Evaluative	Provided/Not Provided	As per relevant IS Code (IS 8132)	Provided	Yes
<b>(b)</b>	Parts Catalogue	Evaluative	Provided/Not Provided	As per relevant IS Code (IS 8132)	Provided	Yes
<b>(c)</b>	Workshop/Service manual	Evaluative	Provided/Not Provided	As per relevant IS Code (IS 8132)	Provided	Yes

<b>16.1.13 CATEGORY OF BREAKDOWNS / DEFECTS :</b>					
S. No.	Category of breakdowns	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207-2014	As observed	Whether meets the requirements (Yes/No.)
1.	Critical	Evaluative	No critical breakdown	None	Yes
2.	Major	Evaluative	Not more than two and neither of them should be repetitive in nature	None	Yes
3.	Minor	Evaluative	Not more than five and frequency of each should not be more than two.	<b>Mn- 5 (Two times)</b>	Yes
4.	Total breakdowns	Evaluative	In no case, the total number of breakdowns should exceed five, that is, (2 major + 3 minor) or 5 minor breakdowns.	<b>Two (Two Minor)</b>	Yes

<b>16.2 Optional requirements as per Clause-4 (Table-2) of IS:12207-2014:</b>				
S. No.	Characteristic	Requirements as per IS: 12207-2014	As observed	Whether meets the requirements (Yes/No.)
1.	Fitment of ROPS	With a provision for fitment of ROPS.	Not provided	Not applicable
		If ROPS fitted it should meet the requirement of IS: 11821-1992	Not provided	Not applicable
2.	Accessories	Trailer hitch, front tow hook, linkage	Provided	Yes

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	drawbar may be provided.		
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**16.3 Conformity with following IS:**

- i) Guidelines for declaration of power and specific fuel consumption and labeling of agricultural tractors (First revision) [IS 10273:1987 (Reaffirmed in March, 2009)] : Conforms
- ii) Agricultural tractors – Rear mounted power take-off - Types 1, 2 and 3 (third revision) [IS: 4931-1995 (Reaffirmed in March, 2009)] : Conforms
- iii) Agricultural wheeled tractors - Rear mounted three-point linkage: Part 1 Categories 1, 2, 3 & 4 (fourth revision) [IS 4468 (Part-I):1997 (Reaffirmed in February, 2012)] : **Does not conform**
- iv) Drawbar for agricultural tractors – Link type [IS 12953:1990 (Reaffirmed in February, 2012)] : Conforms
- v) Agricultural tractors - Operator’s seat technical requirement [IS 12343 –1998 (First revision) (Reaffirmed in March, 2009)] : Conforms
- vi) Guide for safety & comfort of operator of agricultural tractors: Part 1 General requirements (first revision) : [IS 12239 (Part-1)-1996 (Reaffirmed in February, 2012) / ISO 4254-1:1989] : **Does not conform**
- vii) Tractors and machinery for agriculture and forestry – Technical means for ensuring safety Part 2: Tractors (first revision) IS 12239 (Part-2)-1999 (Reaffirmed in March, 2009)] : **Does not conform**
- viii) Tractors and machinery for agriculture and forestry, powered lawn and garden equipment – Symbols for operator controls and other displays – Symbols for Agricultural Tractors and Machinery [IS: 6283 (Part-2) – 2007(Reaffirmed in March, 2009) / ISO 3767-2:1991)] : Conforms
- ix) Guidelines for location and operation of operator controls on agricultural tractors and machinery (first revision) (IS: 8133 – 1983) (Reaffirmed in March, 2009) / ISO 3789: 1982] : **Does not conform**
- x) Agricultural Tractor & Machinery Lighting device for travel on public roads [IS: 14683-1999 (Reaffirmed in March, 2009)] : Conforms

**16.4 Salient Observations:**

**16.4.1 Laboratory tests:**

**16.4.1.1 PTO Performance:**

- i) During PTO performance test (Part load test at standard PTO) under natural ambient condition, leakage of engine oil (about 200 ml) was observed from tappet cover gasket of cylinder No-3. The tappet cover rubber gasket was replaced with new one.



- ii) During PTO performance test (full load at varying speed test) under high ambient condition, leakage of engine oil was observed from tappet cover gasket of cylinder No-3. Thereafter, on close inspection it was found that contact surface of tappet cover was found uneven and rubber gasket was found teared off. The tappet cover rubber gasket was replaced with new one.

**This breakdown has been categorized as Mn-5(two times) as per IS: 12207-2008 and calls for stringent quality control measures at production level.**

- iii) The backup torque is 20.2 %.
- iv) The specific fuel consumption corresponding to maximum power was measured as 262 g/kWh against the declaration of 265 g/kWh, which meets the requirement of IS:12207-2008 with regard to tolerance.

#### 16.4.1.2 Drawbar performance test:

During 10 hour drawbar test, the creeping of LHS & RHS rear tyre over the rims was observed as 65 mm & 90 mm respectively, which was considered on higher side. This may be looked into for necessary corrective action.

#### 16.4.1.3 Mechanical Vibration:

The amplitude of mechanical vibration on various assemblies marked as (\*) in Chapter-9 of this test report are on higher side specially at the seat, steering control wheel, left and right foot rest. This calls for dampening down of vibrations to improve the operational comfort and service life of components.

#### 16.4.1.4 Three point linkage:

The lateral distance from lower hitch point to center line of tractor does not meet the requirements of IS: 4468(Part I)-1997. This should be looked into for necessary corrective action.

#### 16.4.1.5 Linkage drawbar:

Some of the parameters of the drawbar linkage conform to Cat.-I and some of them conform to Cat.-II. Keeping in view of the spirit of standardization, the necessary improvements may be incorporated.

#### 16.4.2 Field performance test:

##### 16.4.2.1 Wet land cultivation (Puddling operation):

No ingress of mud/or water was noticed during puddling operation of the tractor. Hence, It meets the requirements of IS: 11082-1984 (Technical requirements of agricultural tractors for wetland operation). The tractor is suitable for wetland operation (Puddling).

#### 16.4.3 Component/ assembly inspection

After completion of puddling test and water proof test, the tractor was partially dismantled it was observed that gearbox oil was presence in LHS of brake housing. It should be looked into for necessary improvement.

#### 16.5 Maintenance / Service Problems:

No noticeable maintenance/ service problem was observed during the test.

#### 16.6 Recommendation with regard to safety on tractor:

The following requirements, inter alia, may be considered for incorporation on the tractor:

- i) Provision for spark arresting device in exhaust system.
- ii) Provision of safety against accidental start of engine.
- iii) Provision of differential lock.
- iv) Provision of PTO shaft master shield.

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**16.7 Adequacy of Literature supplied with machine:**

- 16.7.1** The following literature was supplied with the tractor for reference during the test.
- i) Operator's manual (for ACE DI 550 \*, DI 854 NG ,DI 350 NG, DI 450 NG & DI 550 NG, tractors)
  - ii) Spare parts catalogue (for DI 854 NG ,DI 350 NG, DI 450 NG & DI 550 NG, tractors)
  - iii) Workshop manual (for DI-305 NG ,DI-854 NG, DI-350 NG, DI-450 NG & DI-550 NG, tractors)
- 16.7.2** The given literature supplied was found adequate. However, the following points needs to be incorporated in owners/operators manual.
- i) Details of all variants along with their features at a glance should be provided in the operator's manual.
- 16.7.3** The workshop manual has been supplied by the manufacturer before the release of this report.  
Therefore, it is recommended that operator's manual and workshop manual may be brought out as per IS: 8132-1999 (Reaffirmed in 2009) for the guidance of users and service personnel in national as well as regional languages by inclusion of the above information among the others.

**17. CITIZEN CHARTER**

Time frame for Testing & Evaluation as per Citizen Charter	Duration of Test	Whether the Test Report is released within the time frame given in Citizen Charter	Remarks
10 Months	10 Months (October, 2013 to July , 2014)	Yes	None

**TESTING AUTHORITY:**

**A.K. SINGH**  
SENIOR AGRICULTURAL ENGINEER

**C.R.LOHI**  
DIRECTOR

Test Report compiled by: **Pramod Yadav**, Assistant Agricultural Engineer.

**18. APPLICANT'S COMMENTS**

Para No.	Our Reference	Applicant's comments
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<b>18.1</b>	16.4.1.3, 16.4.1.4 & 16.4.1.5	We will take the necessary action during the production.
<b>18.2</b>	16.4.3	We will take the necessary action during the production.

**Annexure- I**

**BRIEF SPECIFICATION OF IMPLEMENTS USED DURING FIELD TEST**

S. No	Item	Disc Plough	Rotavator	Puddler
1.	Make	Field king	Shaktimaan	Not available
2.	Type	Mounted	Mounted	Mounted
3.	No. of Disc/blades	Two	36,in 7 flange	12 (6 in each gang)
4.	Type of Disc/blades	Plane concave	Hatchet	Notched
5.	Size of bottoms/blades, (mm)	650	225 x 50 x 10	460
6.	Spacing of bottoms/flanges, (mm)	560	250	164
7.	Lower hitch point span, (mm)	860	720	680
8.	Mast height, (mm)	615	480	680
9.	<b>Overall dimensions, (mm):</b>			
	- Length	1850	1750	1190
	- Width	855	1000	1810
	- Height	1200	980	1330
10.	Gross mass, (kg)	295	345	240

**Annexure- II**

**BRIEF SPECIFICATION OF CAGE WHEEL**

SI No.	Items	Specification
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1.	Type	Half cage wheel
2.	Outer dia, (mm)	1190
3.	Width, (mm)	340
4.	No. and types of lugs	14, Straight lugs made of M.S. angle section welded to angle iron frame
5.	Size of angle section, (mm)	50 x 50 x 5
6.	Length of lug, (mm)	340
7.	Spacing of lug, (mm)	270
8.	Weight of each cage wheels, (kg)	90

**Annexure – III**

**TRACTOR RUN HOURS DURING TEST**

<b>A.</b>	<b>LABORATORY AND TRACK TESTS:</b>	<b>HOURS</b>
1.	Running-in	--
2.	PTO performance test	13.6
3.	Power lift and hydraulic pump performance test	2.5
4.	Drawbar performance test	16.2
5.	Turning ability	0.3
6.	Location of centre of gravity	0.3
7.	Operator's field of vision	--
8.	Brake test	0.9
9.	Noise measurement	1.3
10.	Mechanical vibration test	1.0
11.	Nominal speed test	0.4
<b>B.</b>	<b>FIELD TEST:</b>	
1.	Disc Ploughing	10.4
2.	Rotavation	11.5
3.	Puddling (Including five hours water proof test)	15.8
<b>C.</b>	<b>HAULAGE TEST:</b>	11.3
<b>D.</b>	Miscellaneous test and other run hours including idle run, transportation, trials and preparation for test	6.8
	<b>TOTAL:</b>	<b>92.3</b>