



KUBOTA MU 4501 TRACTOR



सत्यमेव जयते

भारत सरकार

GOVERNMENT OF INDIA

कृषि एवं किसान कल्याण मंत्रालय

(कृषि, सहकारिता एवं किसान कल्याण विभाग, मशीनीकरण एवं प्रौद्योगिकी प्रभाग)

MINISTRY OF AGRICULTURE AND FARMERS WELFARE

(Deptt. of Agriculture, Co-operation & Farmers Welfare, 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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Manufacturer : M/s. KUBOTA Corporation,
700/867 Moo 3, Amata Nakorn Industrial Estate, Tambon Nonggakka, Amphur Panthong, Chonburi, 20160-Thailand

Test requested by applicant : i) M/s. KUBOTA Corporation, Chennai Liaison Office No.15, Medavakkam Road, Solinganallur, Chennai- 600 119, Tamil Nadu , INDIA

ii) M/s. Kubota Agricultural Machinery India Pvt. Ltd. No.15, Medavakkam Road, Solinganallur, Chennai- 600 119, Tamil Nadu, INDIA

Place of running-in : At Applicant's works

Duration of said running-in, (h):

- Engine : 30

- Transmission : 30

Method of Selection : The tractor was submitted directly by the applicant for test. Hence, method of selection is not known.

1. SPECIFICATIONS

- 1.1 Tractor:**
- Make : Kubota
- Model : MU4501
- Brand name : None
- Variant, if any : None
- Type : Four wheeled, Rear wheel driven (2WD), General purpose, Agricultural tractor.
- Year of manufacture : 2015
- Chassis number : KBTM30SAHHTKPA005
- Country of origin : Thailand
- 1.2 Engine:**
- Make : Kubota Engine (Thailand) co., Ltd.(apa)
- Model : V2403-M-DI (apa)
- Type : Four stroke, Liquid cooled, Direct injection, Naturally aspirated, Diesel engine.
- Serial number : BFC5140
- Year of manufacture : 2015
- Country of origin : Thailand
- Engine speed (Manufacturer's recommended production setting), (rpm):**
- Maximum speed at no load,(rpm) : 2700 to 2800
- Low idle speed,(rpm) : 875 to 1075
- Speed at maximum torque,(rpm) : 1300 to 1700
- Rated speed, (rpm):**
- For PTO use : 2500
- For drawbar use : 2500

12. FIELD TEST

12.1 The field tests comprising of disc ploughing, rotavation and puddling (including water proof test for five hours) were conducted for **9.3, 11.0** and **15.7** hours respectively.

All the field tests were conducted at the full accelerator settings, when the no load speed of the engine was **2746 -2783** rpm.

12.2 The brief specifications of the implements used during field tests are given in Annexure-I&II.

12.3 The summary of field test observation with disc plough, rotavator & puddling is given in **Table - 3**.

Table - 3

SUMMARY OF FIELD PERFORMANCE TEST

S. No.	Parameter/operation	Disc Ploughing	Rotavation	Puddling
1	2	3	4	
i)	Type of soil (refer IS: 7926-1975)	Medium	Heavy	Heavy
ii)	Av. soil moisture, (%) / Av. depth of standing water (cm)	14 to 18	8 to 14	11 to 13
iii)	Bulk density of soil, (g/cc)	1.60 to 1.80	1.52 to 1.73	--
iv)	Cone index, (kg/sq.cm) / Puddling index, (%)	5.8 to 8.2	6.8 to 8.2	75 to 81
v)	Gear used	L-1	L-1	L-2
vi)	Av. speed of operation, (kmph)	2.84 to 2.94	3.21 to 3.22	4.46 to 4.51
vii)	Av. wheel slip, (%) / Av. Travel reduction, (%)	9.0 to 10.0	-5.54 to -4.16	9.29 to 9.89
viii)	Av. depth of cut, (cm) / Av. Depth of puddles, (cm)	19 to 24	8.3 to 8.7	25 to 27
ix)	Av. working width, (cm)	78 to 79	147 to 166	--
x)	Area covered, (ha/h)	0.183 to 0.196	0.414 to 0.420	--
xi)	Fuel consumption:			
	- (l/h)	3.53 to 3.69	7.07 to 7.56	4.87 to 5.13
	- (l/ha)	18.01 to 20.16	16.83 to 18.26	--
xii)	Av. draft of implement, (kN)	5.5 to 6.10	--	--

Remarks: The average lub oil and coolant consumptions during the entire field tests was observed is Nil and Nil ml/h respectively.

12.4 Wet land cultivation (Puddling):

12.4.1 The tractor was fitted with full cage wheel for carrying out the puddling operation. The brief specification of full cage wheel used is given in **Annexure –II**.

12.4.2 After completion of puddling test and water proof test, the tractor was partially dismantled to check effectiveness of sealing provided against ingress of water and / or mud in various assemblies / components as per requirement of IS : 11082 – 1984 (Technical requirement of Agricultural tractor for wet land cultivation). The observations recorded were as under.

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Sl. No.	Location	Whether ingress of mud and/or water observed	Remarks
1.	King pin assemblies	No	None
2.	Stub axles	No	
3.	Centre pin assembly	No	
4.	Clutch housing	No	
5.	Brake housing	No	
6.	Lubricating oils of engine sump, transmission, hydraulic, differential, brakes & steering gearbox.	No	
7.	Starter motor	No	
8.	Alternator	No	

13. HAULAGE TEST

Type of trailer	:	Two wheel (Single axle)	Four wheel (Double axle)
Gross mass of trailer (tonne)	:	5.0	7.0
Height of trailer hitch above ground level, (mm)	:	540	570
Gear used during the test for negotiating slopes up to 8%	:	H-4	H-4
Average travel speed,(kmph)	:	29.97 to 31.10	28.50 to 28.66
Average fuel consumption:			
- (l/h)	:	5.45 to 5.47	5.92 to 6.11
- (ml/km/tonne)	:	35.0 to 36.5	28.5 to 28.7
Average distance traveled per litre of fuel consumption, (km)	:	5.48 to 5.70	4.90 to 5.00
General observations:			
Effectiveness of brakes	:	Effective	Effective
Maneuverability of tractor-trailer combination	:	Satisfactory	Satisfactory

14. COMPONENTS/ASSEMBLY INSPECTION

The engine and other assemblies were dismantled after **88.7 hours** of tractor operation at this Institute.

14.1 Engine:

14.1.1 Cylinder bore:

Cylinder No.	Cylinder bore dia, (mm)						Maximum permissible wear limit, (mm)
	Top position		Middle position		Bottom position		
	Thrust side	Non-thrust side	Thrust side	Non-thrust side	Thrust side	Non-thrust Side	
1.	87.04	87.01	87.03	87.00	87.03	87.00	87.15
2.	87.03	87.02	87.02	87.02	87.01	87.02	
3.	87.01	87.01	87.01	87.02	87.01	87.02	
4.	87.03	87.00	87.03	87.00	87.03	87.00	

14.1.2 Piston:

Piston No.	Piston dia, (mm)					Clearance between piston and cylinder liner at the skirt of the piston, (mm)	
	Top(above top compression ring)		At skirt			As observed	Maximum permissible limit
	Thrust side	Non-thrust side	Thrust side	Non-thrust side	Max. permissible wear limit,		
1.	86.618	86.577	86.954	**	86.699	0.086	0.40
2.	86.619	86.57	86.950	**		0.080	
3.	86.624	86.571	86.948	**		0.072	
4.	86.620	86.581	86.952	**		0.078	

** Not measurable due to piston design features.

14.1.3 Ring end gap:

Rings	Ring end gap, (mm)												Max. Permissible limit, (mm)
	Cylinder No.1			Cylinder No.2			Cylinder No. 3			Cylinder No. 4			
	Top	Mid-dle	Bot-tom	Top	Mid-dle	Bot-tom	Top	Mid-dle	Bot-tom	Top	Mid-dle	Bot-tom	
1 st comp ring	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	1.25
2 nd comp ring	0.55	0.55	0.55	0.55	0.55	0.55	0.50	0.50	0.50	0.55	0.55	0.55	1.25
Oil ring	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	1.25

14.1.4 Ring side clearance:

Rings	Ring side clearance, (mm)				Max. Permissible clearance Limit, (mm)
	Piston-I	Piston-II	Piston-III	Piston-IV	
1 st Compression ring	0.062	0.072	0.073	0.075	0.20
2 nd Compression ring	0.093	0.094	0.100	0.098	0.20
Oil ring	0.040	0.041	0.041	0.045	0.15

14.1.5 Main bearings:

Bearing No.	Diametrical Clearance, (mm)	Crankshaft end float, (mm)	Max. permissible clearance limit, (mm)	
			Diametrical clearance	Crankshaft end float
1.	0.069 to 0.089	0.16	0.40	0.50
2.	0.074 to 0.082			
3.	0.082 to 0.085			
4.	0.084 to 0.115			
5.	0.084 to 0.098			

14.1.6 Big end bearings:

Bearing No.	Clearance, (mm)		Max. permissible clearance limit, (mm)	
	Diametrical	Axial	Diametrical	Axial
1.	0.057 to 0.078	0.48	0.40	0.50
2.	0.066 to 0.099	0.48		
3.	0.059 to 0.080	0.48		
4.	0.067 to 0.078	0.48		

14.1.7 Valve, guides and timing gears:

Observation

Any marked sign of overheating of valves : **None**
 Pitting of seat/faces of valves : **None**
 Any visual damage to the teeth of timing gears : **None**

Spring Rate, (N/mm):

-Intake valve : 17.11 to 17.76
 -Exhaust valve : 16.67 to 17.76

Against the discard limit of 12.9 N/mm

Clearance between valve guide and valve stem, (mm):

Intake valve : 0.056 to 0.058
 Exhaust valve : 0.057 to 0.060

Against the discard limit of 0.10 mm

14.2 Clutch:

Any marked wear on clutch friction plates : None
 Condition of clutch release bearing : Normal
 Condition of release levers & springs : Normal
 Condition of pilot bearing : Normal
 Presence of oil in clutch housing : None
 Any marks on fly wheel/ pressure plate : None

Overall thickness of clutch plate, (mm):

-Transmission: : 10.96 to 10.99
 -PTO: : 7.66 to 7.68

Against the discard limit of 9.5 & 7.0 mm respectively

Height of lining over rivet head, (mm):

-Transmission: : 2.77 to 2.97
 -PTO: : 0.95 to 01.03

Against the discard limit of 0.3 mm above rivet head

14.3 Transmission gears:

Any visual damage, pitting & chipping of any transmission gear teeth : None
 Backlash between crown wheel and pinion, (mm) : 0.21

Against the discard limit of 0.40 mm

14.4 Brakes :

Description	Initial specified thickness of brake lining, (mm)	Measured overall thickness of brake lining after test, (mm)	Measured depth of oil groove, (mm)	Minimum permissible depth of oil groove of brake lining, (mm)
Left	0.6	0.53 to 3.481	0.48 to 0.66	0.40
Right	0.6	0.53 to 3.420	0.51 to 0.67	

14.5 Front axle:

Any marked wear of king pins	: None	
Any marked wear of king pin bushes	: None	
Clearance between king pin and bushes, (mm)	: 0.09 to 0.39	Against the discard limit of 0.35 mm
Condition of thrust bearings	: Normal	
Condition of bearings for stub axles	Normal	
Condition of seals for stub axles and king pins	: Normal	
Any visual damage, pitting & chipping of front axle	None	
Condition of centre pin & bushes	Normal	
Clearance between centre pin and bushes, (mm)	: 0.13 to 0.16	Against the discard limit of 0.35 mm

14.6 Steering system:

Visual condition of the components of complete steering assembly : Normal

14.7 Starter motor & Alternator:

Presence of soil/oil in housing : None
 Condition of bearings and other components : Normal

15. ADJUSTMENTS, DEFECTS, BREAKDOWNS AND REPAIRS

S. No	Adjustments/Defects/Breakdowns and repairs	Tractor run hours
	- None -	

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:

Sl. No.	Characteristic	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207:2014	Values declared by the applicant/ (D) Requirement (R)	As observed	Whet her meet s the requi re- ment s (Yes/ No.)
1	2	3	4	5	6	7
16.1.1 PTO Performance :						
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	30.7 (D)	30.5	Yes
b)	Power at rated engine speed, (kW)	Non Evaluative	-do-	30.7(D)	30.5	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Non Evaluative	± 5%	249 (D)	261	Yes
d)	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	± 8%	152.8 (D)	150	Yes
e)	Back-up torque, percent	Non Evaluative	10 percent, min.	30 % (D)	28.6	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.	130 (D)	105	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.	127(D)	106	Yes
g)	3) Engine oil consumption, (g/kWh)	Evaluative	Not exceeding 1% of SFC at max. power under High ambient conditions	0.87(D)/ 2.64(R)	0.31	Yes
h)	4) Smoke level	Evaluative	Maximum light absorption coefficient of 3.25 per metre or equivalent BOSCH No. 5.2 or 75 Hatridge value (As per CMVR)	3.25 per metre (R)	0.17	Yes

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1	2	3	4	5	6	7	
16.1.2	Drawbar performance :						
a)	Maximum drawbar pull with ballast corresponding to 15 percent wheel slip, (kN)	Non Evaluative	Minimum 65% of static mass with ballast	16.06 (R) Minimum	19.25	Yes	
				21.31 (D)			
b)	Max. drawbar pull without ballast corresponding to 15 percent wheel slip, (kN)	Evaluative	Minimum 65% of static mass of tractor without ballast or with standard ballast as the case may be.	11.89 (R) Minimum	16.48	Yes	
				16.85 (D)			
c)	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.	24.4 (R) Minimum	25.8	Yes	
				26.56 (D)			
d)	Maximum transmission oil temperature (°C)	Non Evaluative	The declared value should not exceed the maximum value specified by oil company	120 (D)	89	Yes	
16.1.3	Power lift and hydraulic pump performance :						
a)	Maximum lifting capacity throughout the range of lift, (kN):						
	1)	At hitch points	Non Evaluative	To be declared by manufacturer [Tolerance of minus 10%]	14.97 (D)	14.54	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 and it should be 16 kg/engine hp where the tractor is not provided with a PTO shaft	7.18 (R) Minimum	12.54	Yes
11.89 (D)							
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.	10 (D)	12	Yes	
16.1.4	Brake performance at 25 kmph:						
a)	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)	7.93	Yes
	2)	Hot brake	Evaluative	10	10 (R)	7.96	Yes

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1	2	3	4	5	6	7
b)	Maximum force exerted on the brake pedal to achieve a deceleration of 2.5 m/s ² (N)	Evaluative	600	600 (R) maximum	266 to 270	Yes
c)	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
16.1.5	Noise measurement :					
a)	Maximum ambient noise emitted by the tractor, dB(A)	Evaluative	As per CMVR	88 (R)	80	Yes
b)	Maximum noise at operator's ear level, dB(A)	Evaluative	As per CMVR	96 (R)	95	Yes
16.1.6	Amplitude of mechanical vibrations at :					
	1) Left foot rest	Non Evaluative	100 microns (max)	100 (R)	290	No
	2) Right foot rest				230	No
	3) Seat (with driver seated)				90	Yes
	4) Steering Wheel				140	No
16.1.7	Haulage requirements :					
a)	Gross mass of the trailers, (tones):					
	1) Two wheel	Non Evaluative	--	5.0 (D)	5.0	Yes
	2) Four wheel		--	7.0 (D)	7.0	Yes
	Distance travelled / litre of fuel consumption, (km/l):					
	1) Two wheel	Non Evaluative	--	5.2 ±1 (D)	5.48 to 5.70	Yes
	2) Four wheel	Non Evaluative	--	4.5 ±1(D)	4.90 to 5.00	Yes
c)	Fuel consumption (ml/km/tonne):					
	1) Two wheel	Non Evaluative	--	39.0 ± 5 (D)	35 to 36.5	Yes
	2) Four wheel	Non Evaluative	--	32.2 ± 5 (D)	28.5 to 28.7	Yes
16.1.8	Wetland cultivation :					
	Sealing for the following assemblies:	Evaluative	The identified assemblies should essentially meet the requirement of IS: 11082. No water ingress in the identified assembly given in column-2. If tractor does not meet the requirements of wetland cultivation, it may be recommended for dry land operation only.	There should be no ingress of water and/or mud	No ingress of mud and / or water was observed	Yes
	1) Clutch assembly	-do-				
	2) Brake housings	-do-				
	3) Front axle hubs	-do-				
	4) Engine oil	-do-				
	5) Transmission oil	-do-				

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1	2	3	4	5	6	7
16.1.9	Safety features :					
a)	Guards against moving and hot parts	Evaluative	Belt drives, pulley, silencer, hydraulic pipes (As per IS 12239 (part 2))	--	Meets the requirements	Yes
b)	Lighting arrangement (Tractor having more than 1150 mm rear track width)	Evaluative	As per CMVR	--	Meets the requirements	Yes
c)	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)	--	Does not meet the requirement	No
d)	Technical requirements for PTO shaft	Non-Evaluative	Should meet the requirements of IS 4931 (as amended from time to time)	--	Does not meet the requirement	No
e)	Dimension of three point linkage	Non-Evaluative	Should meet the requirements of IS 4468 (part 1) (as amended from time to time)	--	Meets the requirements	Yes
f)	Specification of linkage drawbar	Non-Evaluative	Should meet the requirements of IS 12953 and IS 12362 (part 3) (as amended from time to time)	--	Meets the requirements	Yes
	Specification of Swinging drawbars				Not Provided	NA
16.1.10	Labelling of tractors (Provision of labelling plate):					
	1) Make	Evaluative	Should conform to the requirements of CMVR	--	KUBOTA	Yes
	2) Model	Evaluative		--	MU4501	Yes
	3) Year of manufacture	Evaluative		--	KH (i.e. October, 2015)	Yes
	4) Engine number	Evaluative		--	BFC5140	Yes
	5) Chassis number	Evaluative		--	KBTM30SAHHTKPA 005	Yes
	6) Declaration of PTO power, (kW)	Evaluative		--	30.7 kW @2500rpm	Yes
16.1.11	Discard limit for:					
(a)	Cylinder bore diameter, (mm)	Evaluative	To be specified by the manufacturer	87.15	87.00 to 87.04	Yes
(b)	Clearance between piston & cylinder liner at skirt, (mm)	Non-Evaluative		0.40	0.072 to 0.086	Yes
(c)	Ring end gap (mm):					
	- Top comp. ring.	Evaluative	-do-	1.25	0.40	Yes
	- 2 nd comp. ring.		-do-	1.25	0.50 to 0.55	Yes
	- Oil ring.		-do-	1.25	0.40	Yes
(d)	Ring groove clearance (mm):					
	- Top comp. ring.	Evaluative	-do-	0.20	0.062 to 0.075	Yes
	- 2 nd comp. ring.		-do-	0.20	0.093 to 0.100	Yes
	- Oil ring.		-do-	0.15	0.040 to 0.045	Yes

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1	2	3	4	5	6	7
(e)	Clearance of main bearings (mm):					
	- Diametrical clearance	Evaluative	To be specified by the manufacturer	0.40	0.069 to 0.115	Yes
	- Crankshaft end float	Evaluative		0.50	0.16	Yes
(f)	Clearance of big end bearings, (mm):					
	- Diametrical	Evaluative	-do-	0.40	0.06 to 0.01	Yes
	- Axial	Evaluative	-do-	0.50	0.48	Yes
(g)	Clearance between king pin and bush, (mm)	Non Evaluative	-do-	0.35	0.09 to 0.39	No
(h)	Clearance between centre pin and bush, (mm)	Non Evaluative	-do-	0.35	0.13 to 0.16	Yes
16.1.12	Literature (Submission to test agency)					
(a)	Operator manual	Evaluative	Provided/Not Provided	Provided	Provided	Yes
(b)	Parts Catalogue	Evaluative	Provided/Not Provided	Provided	Provided	Yes
(c)	Workshop/Service manual	Evaluative	Provided/Not Provided	Provided	Provided	Yes

16.2 Optional requirements as per Clause-4 (Table-2) of IS:12207-2014:

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	No
		If ROPS fitted it should meet the requirement of IS: 11821-1992(As amended from time to time) or equivalent international standards.	ROPS not fitted	Not applicable
2.	Accessories	Trailer hitch, front tow hook, may be provided.	Front tow hook Not provided	No

16.3 CATEGORY OF BREAKDOWNS / DEFECTS :

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.	None	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.	None	Yes

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16.4 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)] : **Does not conform**
- 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 March, 2007)] : **Conform**
- iv) Drawbar for agricultural tractors – Link type [IS 12953:1990 (Reaffirmed in March, 2007)] : **Conforms**
- v) Agricultural tractors - Operator’s seat technical requirement (First revision) [IS 12343:1998 (first revision) (Reaffirmed in March, 2009)] : **Does not conform**
- vi) Guide for safety & comfort of operator of agricultural tractors: Part 1 General requirements (first revision) :[IS 12239 (PT-1)-1996 (Reaffirmed in Feb, 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 (PT-2)-1999 (Reaffirmed in March, 2009)] : **Conform**
- viii) Tractors and machinery for agriculture and forestry, powered lawn and garden equipment – Symbols for operator controls and other displays [IS: 6283 (Part-1)-2006 (Reaffirmed in March, 2009) and IS:6283 (Part-2)-2007 (Reaffirmed in March, 2009)] : **Conforms**
- ix) Guide lines for location and operation of operator controls on agricultural tractors and machinery (first revision) (IS: 8133 – 1983 (Reaffirmed in March, 2009)] : **Conforms**
- x) Agricultural Tractor & Machinery Lighting device for travel on public roads [(IS: 14683-1999 (Reaffirmed in March, 2009)] : **Does not conform**

16.5 Salient Observations:

16.5.1 Laboratory tests:

16.5.1.1 PTO Performance:

- i) The backup torque is **28.6 %**.
- ii) The specific fuel consumption corresponding to maximum power was measured as **249 g/kWh** against the declaration of **261 g/kWh**, which meets the requirement of IS: 12207-2014.

16.5.1.2 Hydraulic Performance:

The moment about rear axle with hitch points & standard frame was calculated as **13.67 kN-m** and **19.45 kN-m** respectively. Whereas, the moment about front axle was calculated as **11.84 kN-m**. The moment about rear axle is on higher side as compared to the moment about front axle. It is, therefore, recommended that the lifting capacity of the hydraulic system may be reduced suitably or additional ballast mass may be provided at front axle to avoid the front lifting of the tractor.

16.5.1.3 Mechanical Vibration:

The amplitude of mechanical vibration on various assemblies marked as (*) in Chapter-8 of this test report is on very higher side, especially at the steering control wheel and foot rests. This calls for dampening down of vibrations to improve the operational comfort and service life of components.

16.5.1.4 Operator's seat:

Vertical distance from Seat Index point to centre of brake & clutch pedal from seat index point to centre of steering control wheel does not meet the requirement of IS: 12343:1998 (re-affirmed in March, 2009). This should be looked into for necessary corrective action.

16.5.1.5 General:

- i) The tractor has no provision for track width adjustment of front wheel; this limits the use of tractor for intercultural operation.
- ii) Rear working light (plough light) is not provided on the tractor, for operation in the field during night. As per clause 4.1.7 of IS: 14683-1999, at least one lamp projection a general flood pattern of light should be provided at rear.

16.5.2 Field performance test:**16.5.2.1 Wet land cultivation (Puddling operation):**

No ingress of mud and / or water was noticed during puddling operation of the tractor and meet the requirements of IS: 11082-1984 (Technical requirements of agricultural tractors for wetland operation). Therefore, the tractor is found as suitable for wetland operation (Puddling).

16.5.3 Wear assessment / Component assembly inspection:

- i) During Component assembly inspection, the piston diameter at the skirt was measured as 86.948 to 86.954 mm. The initial setting of the piston diameter at the skirt is declared as 86.709 to 86.935 mm. which is lower than the specified limit. This should be looked into for necessary corrective action.
- ii) The clearance between king pin & bush on RHS measured as 0.091 to 0.398 mm against the declared value 0.35 mm, which is on higher side than the specified declared limit. This should be looked into for necessary corrective action.

The above said two parameter is non-evaluative as per IS:12207:2014

16.6 Maintenance / Service Problems:

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

16.7 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 master shield for PTO shaft.
- iii) Front tow hook should be provided.
- iv) Cautionary notice as per para 11.2 of IS:12239 (Part-2)-1999
- v) Vertical distance from seat index point to centre of clutch pedal & brake pedal from seat index point to centre of steering control wheel should be within the limit of easy handling of tractor.



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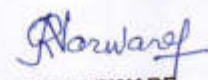
- 16.8 Adequacy of Literature supplied with machine:
The following literature has been supplied with the tractor
i) Operator's manual (For Kubota MU 4501 tractors).
ii) Illustration part's list (For Kubota MU 4501 tractors).
iii) Service manual (For Kubota MU 4501 tractors).

- 16.8.1 The literatures should also be brought out in national as well as other regional languages for the guidance of users and service personnel.

17. Citizen charter

Test duration under citizen charter	Duration of Test	Whether the report released within time frame given citizen charter	Remark, if any
10 Months	04 Months (April, 2016 to July, 2016)	Yes	None

TESTING AUTHORITY:

 C.S. RAGHUWANSHI AGRICULTURAL ENGINEER	 C.V. CHIMOTE TEST ENGINEER	 Y.K. RAO SENIOR AGRICULTURAL ENGINEER
 J.J.R. NARWARE DIRECTOR		

18. Applicant's Comment

Para No.	Our Reference	Applicant's Comment
18.1	16.5.3	We will confirm the issue of difference in declaration observed at second decimal place & we will transfer this matter to our quality department for improving.

Annexure- I**BRIEF SPECIFICATION OF IMPLEMENTS USED DURING FIELD TEST**

S.No	Item	Disc Plough	Rotavator
1.	Make	Field King	Kubota
2.	Type	Mounted	Mounted
3.	No. of Disc/blades	Two	36 in 07 flanges
4.	Type of Disc/blades	Plain Concave	L-shaped
5.	Size of Bottom/blades, (mm)	630	210 x 75 x 7
6.	Spacing between Bottoms/flanges, (mm)	550	240
7.	Lower hitch point span, (mm)	770	825
8.	Mast height, (mm)	635	515
9.	Overall dimensions (mm)		
	- Length	1890	895
	- Width	1030	1770
	- Height	1225	1075
10.	Gross mass, (kg)	375	440

Annexure- II**BRIEF SPECIFICATION OF CAGE WHEEL**

SI No.	Items	Specification
1.	Type	Full cage wheel
2.	Outer dia, (mm)	1330
3.	Width, (mm)	1000
4.	No. and types of lugs	28, Straight lugs made of M.S. angle section welded to angle iron frame
5.	Size of angle section, (mm)	49 x49 x 5
6.	Length of lug, (mm)	490
7.	Spacing of lug, (mm)	290
8.	Weight of each cage wheels, (kg)	160

Annexure – III**TRACTOR RUN HOURS DURING TEST**

A.	LABORATORY AND TRACK TESTS:	HOURS
1.	Running-in	--
2.	PTO performance test	19.3
3.	Power lift and hydraulic pump performance test	1.9
4.	Drawbar performance test	17.4
5.	Turning ability	0.20
6.	Location of centre of gravity	0.20
7.	Operator's field of vision	0.20
8.	Brake test	1.20
9.	Noise measurement	0.8
10.	Mechanical vibration test	0.8
11.	Nominal speed test	0.5
B.	FIELD TEST:	
1.	Ploughing	9.3
2.	Rotavation	11.0
3.	Wet land (puddling) operation (including water proof test)	15.7
C.	HAULAGE TEST:	6.30
D.	Miscellaneous test and other run hours including idle run, transportation, trials and preparation for test	3.9
TOTAL:		88.7