Agricultural Research Centre of Finland

AGRICULTURAL ENGINEERING RESEARCH
MTT/VAKOLA

TEST BULLETIN: O.E.C.D. No. 1688 RESTRICTED CODE

Report on Test in Accordance with O.E.C.D. Restricted Code
for the Official Testing of Agricultural Tractors



VALMET 8050-4 (4WD) 40 km/h Version

Manufactured by: Valtra Inc.
FIN-44200 Suolahti, Finland

Date of approval: 21st October 1997
Serial No. 1688 RESTRICTED CODE

MAATALOUDEN TUTKIMUSKESKUS
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This bulletin is based on engineering tests in accordance with the OECD Restricted Code for the Official Testing of Agricultural Tractors Performance. It does not contain an evaluation of the performance of the tractor on practical farm work.

This report has been approved by the OECD Co-ordinating Centre (CEMAGREF France) as being in accordance with the OECD Restricted Code for the Official Testing of Agricultural Tractors.

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Tractor manufacturer`s name and address	Valtra Inc. FIN-44200 Suolahti, Finland
Location of tractor assembly	Suolahti, Finland
Submitted for test by	The manufacturer
Selected for test by	The manufacturer
Place of running-in	Jyväskylä, Finland
Duration of running-in	100 h
Location of test	VAKOLA, Finland

I SPECIFICATIONS OF TRACTOR

TRACTOR

Make/Model/Type	Valmet/8050-4, 40 km/h version/Four wheel drive, unit construction
Number of driving wheels	4
Serial number	F32428
First serial number	E10114

ENGINE

Make/Model/Type	Valmet/620 DS/water cooled, direct injection diesel engine, turbocharged
Serial number	F8477

Cylinders

Number	6
Disposition	Vertical, in line
Bore/Stroke	108 mm/120 mm
Capacity	6600 cm^3
Compression ratio	16,5:1
Arrangement of valves	Overhead
Cylinder liners	Wet, with middle support

Supercharging

Make/Model	Schwitzer/S2B
Pressure	0,07 MPa

Fuel system

Fuel feed system	Membran type feed pump
Fuel filters	Paper filter 2pcs
Capacity of fuel tank	165 dm^3
Injection pump	Stanadyne DB2
Serial number of injection pump	8331714

Manufacturer's production setting of injection pump	61 mm^3/stroke at rated engine speed and full load x)
Flow rating at rated engine speed and full load	24,2 dm^3/h
Timing	20° before TDC
Injectors	Stanadyne NBS 0620, multihole
Injection pressure	23+2 Mpa

Governor

Make/Model/Type	Stanadyne/centrifugal
Governed range of engine speed	From 750 to 2400 rev/min
Rated engine speed	2200 rev/min

Air cleaner

Pre-cleaner	
Make/Model/Type	Valmet/cyclon type
Location of air intake	Above engine hood
Main cleaner	
Make/Model/Type	Valmet/dry cleaner with safety element
Location of air intake	Above engine hood
Maintenance indicator	Electrical

Lubrication system

Type of pump	Gear pump
Type of filters	One full flow oil filter with replaceable paper element
Number	1

Cooling system

Type of coolant	Anti-freeze
Type of pump	Centrifugal
Number of fan blades	8
Fan diameter	533 mm
Coolant capacity	34 dm^3
Type of temperature control	Thermostat
Superpressure system	50 kPa

Starting system

Make/Model/Type	Iskra/electrical solenoid starting motor
Starter motor power rating	3,6 kW
Cold starting aid	Thermostart

x) The given figure is based on fuel pump bench test according to ISO 4010, for actual fuel consumption see the test results, main power take-off test

Safety device	Only operable when clutch pedal is pressed
Electrical system	
Voltage	12 V
Generator	
Make/Model/Type	Iskra 12 V 95 A
Power	1280 W
Battery	
Number	1
Rating	184 Ah at 20 hours rating
Exhaust system	
Make/Model/Type	Valmet/Ebersprächer/muffler expansion chamber type
Location	Vertical on the right hand side debouch 2900 mm above ground
TRANSMISSION	
Clutch (travel alone)	
Make/Model/Type	Fichtel & Sachs 350 WGSZ/dry
Number of plates	1
Diameter of plates	350 mm
Method of operation	Mechanical,pedal operated
Gear box	
Make/Model/Type	Valmet/650/constant mesh fully synchronized with shuttle gear
Arrangement	Synchromesh gear box with 4 speeds, synchromesh group gear with 2 ranges (M and H), LL with dog clutch and 1 directional shift and 3-speed quick-shift gear
Number of gears	36 forward, 36 reverse
Available options	30 km/h transmission, 33 forward, 33 reverse
Rear axle and final drives	
Make/Model/Type	Valmet/crown wheel and pinion differential, planetary final drives
Differential lock	
Type	Multidisc
Method of engagement	Elecktrohydraulically by a press button
Method of disengagement	Elecktrohydraulically by a press button

Front axle and final drives

Make/Model/Type	Sige/CS 17 SD 01 crown wheel and pinion differential
Differential lock	
Type	Limit slip
Method of engagement	Automatic
Method of disengagement	Automatic

Total ratios and travelling speeds

Gear no	Group or range	Quick-shift	Number of engine revolutions for one revolution of the driving wheels		Nominal travelling speed (*) at rated engine speed of 2200 rev/min km/h	
			forward	reverse	forward	reverse
1	LL	I	1197	1168	0.57	0.58
1	LL	II	970	947	0.70	0.72
1	LL	III	779	760	0.87	0.89
2	LL	I	839	819	0.81	0.83
2	LL	II	681	664	1.00	1.02
2	LL	III	546	533	1.24	1.28
3	LL	I	597	583	1.14	1.17
3	LL	II	484	473	1.40	1.44
3	LL	III	389	379	1.76	1.79
4	LL	I	422	412	1.61	1.65
4	LL	II	343	334	1.98	2.03
4	LL	III	275	268	2.47	2.53
1	M	I	240	234	2.83	2.90
1	M	II	195	190	3.49	3.58
1	M	III	156	153	4.35	4.46
2	M	I	168	164	4.03	4.13
2	M	II	137	133	4.98	5.10
2	M	III	110	107	6.20	6.35
3	M	I	120	117	5.67	5.81
3	M	II	97.2	94.9	6.99	7.17
3	M	III	78.0	76.2	8.71	8.93
4	M	I	84.8	82.8	8.02	8.21
4	M	II	68.8	67.1	9.88	10.2
4	M	III	55.2	53.9	12.3	12.6
1	H	I	77.0	75.1	8.83	9.05
1	H	II	62.4	60.9	10.9	11.2
1	H	III	50.1	48.9	13.6	13.9
2	H	I	54.0	52.7	12.6	12.9
2	H	II	43.8	42.7	15.5	15.9
2	H	III	35.1	34.3	19.3	19.8
3	H	I	38.4	37.5	17.7	18.1
3	H	II	31.2	30.4	21.8	22.4
3	H	III	25.0	24.4	27.2	27.9
4	H	I	27.2	26.5	25.0	25.6
4	H	II	22.0	21.5	30.8	31.6
4	H	III	17.7	17.3	38.4	39.4

(*) Calculated with a tyre dynamic radius index of 820 mm (ISO 4251/1-1992)

Number of revolutions of front wheel for one revolution of rear wheels	1.310

POWER TAKE-OFF

Main power take-off

Type	Independent
Method of engagement	Hand lever operated electrohydraulical wet multiplate clutch together with a collar shifter
Number of shafts	1
Method of changing power take-off shaft ends	Changeable shaft and speed changing happens with a collar shifter

Power take-off proportional to engine speed

540 rev/min

Location	At the rear of the tractor
Diameter of power take-off shaft end	34,8 mm
Number of splines	6, in conformity with ISO 500:1991
Height above ground	780 mm
Distance from the median plane of the tractor	0 mm
Distance behind rear-wheel axis	428 mm
PTO speed at rated engine speed (2200 rev/min)	634 rev/min
Engine speed at standard PTO speed 540 rev/min	1874 rev/min
Ratio of rotation speeds (engine speed/PTO speed)	3,47
Power restriction and maximum torque	None, but advice to use 1000 r/min PTO for powers over 50 kW
Direction of rotation (viewed from behind tractor)	Clockwise

1000 rev/min

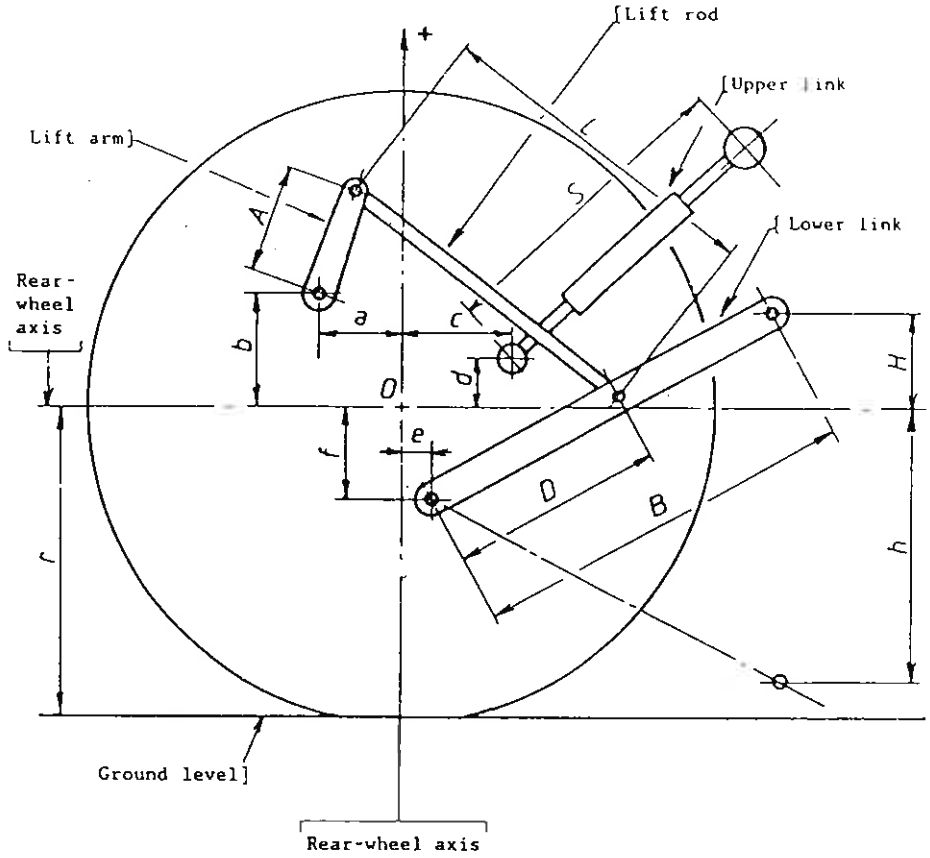
Location	At the rear of the tractor
Diameter of power take-off shaft end	34,8 mm
Number of splines	6, in conformity with ISO 500:1991, additional: 21, in conformity with ISO 500:1991
Height above ground	780 mm
Distance from the median plane of the tractor	0 mm
Distance behind rear-wheel axis	428 mm
PTO speed at rated engine speed (2200 rev/min)	1058 rev/min

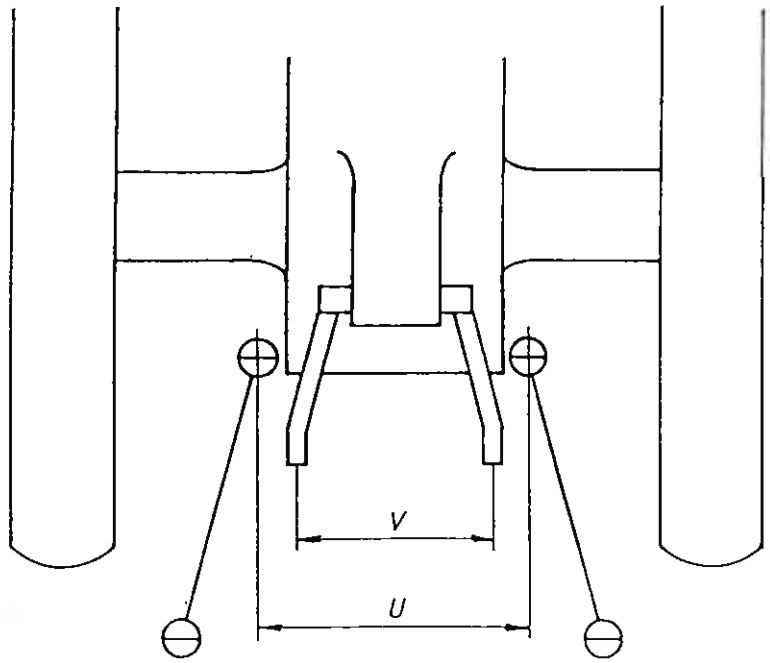
Engine speed at standard PTO speed 1000 rev/min	2080 rev/min
Ratio of rotation speeds (engine speed/PTO speed)	2,08
Direction of rotation	Clockwise
Power take-off proportional to ground speed	
PTO shaft	Optional together with 540/750, 540/1000 or 1000
Travelling distance for one revolution of power take-off shaft	131,6 mm x)
Number of power take-off shaft revolutions for one revolution of (rear) driving wheels	40,8 x)
Direction of rotation with forward gear engaged	Clockwise

POWER LIFT

Make/Model/Type	Valmet/60 kN
Type of hydraulic system	Open centre
Type and number of cylinders	Two single acting
Type of linkage lock for transport	Electric
Relief valve pressure setting	18 + 1 MPa
Opening pressure of cylinder safety valve	20 + 1 MPa
Lift pump type	Gear pump
Transmission between pump and engine	Gears
Type and number of filters	Suction strainer and pressure filter
Sitc of oil reservoir	In the gearbox
Type, number and location of tapping points	Push-pull, 4 at the rear of the tractor
Maximum volume of oil available to external cylinders	15 dm^3, 24 dm^3 with extra filling
Three point linkage	
Category	2, in conformity with ISO 730-1:1994
Category adapter	None

X) The proportional to ground speed power take off is not connected to pto speeds 540 or 1000, but is independent from those, lever in a third position


Lift rod
Upper link
Lift arm
Lower link
Rear-wheel axis
A
S
a
c
b
d
H
O
e
f
D
B
r
h
Ground level
Rear-wheel axis


V
U

		Dimension or range mm	Settings used in test mm
Length of lift arms	(A)	350	350
Length of lower links	(B)	900	900
Distance of lift arm pivot point from rear-wheel axis : horizontally	(a)	-108	-108
: vertically	(b)	285	285
Horizontal distance between the 2 lower link point	(u)	610	610
Horizontal distance between the 2 lift arm end points	(v)	600	600
Length of upper link	(S)	from 595 to 820	675
Distance of upper link pivot point from rear wheel axis : horizontally	(c)	419, 431, 443	431
: vertically	(d)	155, 230, 305	230
Distance of lower link pivot point from rear wheel axis : horizontally	(e)	198	198
: vertically	(f)	260	260
Distance of lower link pivot points to lift rod pivot points on lower links	(D)	330, 371, 427	427
Length of lift rods	(L)	from 560 to 770	660
Height of lower hitch points relative to the rear-wheel axis : in low position	(h)	from 390 to 750	620
: in high position	(H)	from -165 to 370	95
Height above ground of lower hitch points when locked in transport position (*)		200 - 1190	

(*) Assuming r = 820 mm tyre dynamic radius index of ISO 4251/1-1992.

Table 1.1 Dimensions of linkage geometry

TRAILER HITCH

Type	Hitch-hook
Hook diameter	47 mm
Height above ground	550 mm
Distance of hitch point from rear-wheel axis, horizontally	473 mm
Distance of hitch point from power take-off shaft end:	
- vertically	230 mm
- horizontally	45 mm
Maximum vertical permissible load	53 kN

STEERING

Make/Model/Type	Danfoss/Orbitrol OSPC125LS/hydrostatic
Method of operation	Hydraulic circuit with priority valve for steering

Cylinders	Single central cylinder acting on both steering arms
Working pressure	14 MPa

BRAKES

Service brake

Make/Model/Type	Valmet/oil immersed disc brakes (5+5 discs)
Method of operation	Two pedals hydraulically actuated independent or combined operation
Trailer braking take-off	Additional (mounted on tested tractor)

Parking brake

Type	Mechanical, coupled to both service brakes
Method of operation	Hand lever with ratchnet

WHEELS

Number	
- front	Two driving and steering wheels
- rear	Two driving wheels
Wheelbase	2558 mm
Track width adjustment:	

	Minimum mm	Maximum mm	Adjustment method
Front	1540	2035	Offset lug rims and reversing wheel centres
Rear	1610	2115	

PROTECTIVE STRUCTURE

Make/Model/Type	VALMET T 888/2A, Cab
Manufacturer's name and address	Valtra Inc. FIN-44200 Suolahti, Finland
Protective device	Protective cab, not tiltable
OECD approval number	Valmet 8050-4 (4 WD) CSS 0248/84 with seat GRAMMER DS 85 H/90 A
Date of approval	23rd May 1996

DRIVER'S SEAT

Make/Model/Type	Grammer DS 85 H/90 A
Type of suspension	Mechanical spiral spring
Type of damping	Hydraulic damper
Range of adjustment	
- longitudinal	175 mm
- vertical	60 mm

MISCELLANEOUS

Additional seat	
- location	To the left of the driver
- number of places	1

LIGHTNING

	Height above ground of centre mm	Size mm	Distance from outside edge of lights to median plane of tractor mm
Headlights	1170	100 x 160	260
Sidelights	1810	60 x 80	820
Rearlights	1760	60 x 80	783
Reflector	1560 785	40 x 180 ø 80	860 520

II. TEST CONDITIONS

Overall dimensions

	Length mm	Width		Height at top of	
		Minimum mm	Maximum mm	Protective structure mm	Exhaust silencer mm
Unballasted	4757	2155	2660	2750	2900

Ground clearance	475 mm
Clearance limiting part	Hitch-hook

Tractor mass
(with cab and tanks full)

	Unballasted	
	Without driver kg	With driver kg
Front	2090	2100
Rear	2650	2715
Total	4740	4815

Tyres and track width specifications

	Front	Rear
Tyres:		
- dimensions	14.9 R 28	18.4 R 38
- load index	128 A8	146 A8
- type	radial	radial
- maximum load (tyre manufacturer's)	18 kN	30 kN
- maximum load (tractor manufacturer's)	16.5 kN	40 kN
- inflation pressure (tyre manufacturer's)	160 kPa	160 kPa
- dynamic radius index	640 mm	820 mm
Chosen track width	1735 mm	1715 mm

Oils and lubrication (Capacity and change interval)

	Capacity dm^3	Oil change h	Filter change h
Engine	21	250	250
Gear box *)	34	1000	500
Front axle	8	1000	-
Final drive (front axle)	2 x 1.5	1000	-

*) Includes rear axle, final drive (rear), hydraulic system and steering

	Recommended	Used during test
Engine oil		Esso Diesellube
- Type		
- Viscosity	10W/30 +30...-20°C 5W/20 -10...-30°C	10 W/30
- Classification	API CD	API CD
Transmission oils		Esso Unifarm
- Type		
- Viscosity	10W/30, 5W/30 5W/20 -10..-30°C	15 W/40
- Classification	API - GL 4(STOU)	API GL 5
Front axle		Texaco Hypoid
- Type		
- Viscosity	80W/90, 10W/30	80 W/90
- Classification	API GL-5 (EP) or GL-4	EP

Grease	Universal grease
Number of lubrication points	29
Fuel	
Type	Dieseloil, in conformity with national standards
Density at 15 °C	PTO test 834 g/dm^3 Drawbar power test 835 g/dm^3
REPAIRS	None
REMARKS	None

III. TEST RESULTS

COMPULSORY TEST RESULTS

1. MAIN POWER TAKE-OFF

- Date and location of tests: 18.3.1997 VAKOLA
- Type of dynamometer: Schenk W 400

Power	Speed		Fuel consumption			Specific energy
	Engine	P.T.O.	Hourly		Specific	
kW	rev/min		kg/h	l/h	g/kWh	kWh/l
1.1 MAXIMUM POWER - TWO-HOUR TEST						
79.9	1788	860	18.3	21.9	229	3.64
1.2 POWER AT RATED ENGINE SPEED						
73.1	2200	1058	19.6	23.5	268	3.11
1.3 STANDARD POWER TAKE-OFF SPEED (1000 REV/MIN)						
77.7	2079	1000	19.5	23.4	251	3.32
1.4 PART LOADS 1.4.1 The torque corresponding to maximum power at rated engine speed						
73.1	2200	1058	19.6	23.5	268	3.11
1.4.2 85 % of torque obtained in 1.4.1						
63.3	2240	1077	18.1	21.7	286	2.92
1.4.3 75 % of torque defined in 1.4.2						
48.3	2279	1096	15.6	18.7	323	2.58
1.4.4 50 % of torque defined in 1.4.2						
32.8	2314	1113	12.7	15.2	388	2.15
1.4.5 25 % of torque defined in 1.4.2						
16.5	2343	1127	10.1	12.1	609	1.37
1.4.6 Unloaded						
0	2373	1141	7.3	8.8	-	-
1.5 PART LOADS AT STANDARD POWER TAKE-OFF SPEED (1000 REV/MIN) 1.5.1 The torque corresponding to maximum power						
77.7	2079	1000	19.5	23.4	251	3.32
1.5.2 85 % of torque obtained in 1.5.1						
67.7	2129	1024	17.9	21.5	265	3.14
1.5.3 75 % of torque defined in 1.5.2						
51.8	2175	1046	15.4	18.5	298	2.80
1.5.4 50 % of torque defined in 1.5.2						
35.2	2219	1067	12.4	14.9	352	2.36
1.5.5 25 % of torque defined in 1.5.2						
17.9	2254	1084	9.7	11.6	538	1.55
1.5.6 Unloaded						
0	2296	1104	6.6	7.9	-	-

- No load maximum engine speed	2373 rev/min
- Torque[1)] at rated engine speed	317 Nm
- Torque[1)] at maximum power	427 Nm
- Maximum torque[1)]	461 Nm
at engine speed	1310 rev/min
- Mean atmospheric conditions	
- Temperature	25 °C
- Pressure	100.9 kPa
- Relative humidity	40 %
- Maximum temperatures	
- Coolant	88 °C
- Engine oil	108 °C
- Fuel	43 °C
- Engine air intake	33 °C

[1)] Equivalent crankshaft torque

2. HYDRAULIC POWER AND LIFTING FORCE

2.1 Hydraulic power test

Date of tests	19.3 and 28.5.1997
Sustained pressure with relief valve open	18.5 MPa
Pump delivery rate at minimum pressure	71.0 l/min

	Flow rate l/min	Pressure MPa	Power kW
Flow rate corresponding to a hydraulic pressure equivalent to 90 % of the actual relief valve pressure setting and corresponding hydraulic power	65.5	16.7	18.2
Flow rate and hydraulic pressure corresponding to maximum hydraulic power	70.8	16.5	19.5

Tapping point used for test: External tapping

2.2 Power lift test

	At the hitch point	On the frame
Height of lower hitch points above ground in down position	200 mm	200 mm
Vertical movement	700 mm	700 mm
Maximum corrected force exerted through full range	57.2 kN	40.0 kN
Corresponding pressure of hydraulic fluid	16.7 MPa	16.7 MPa
Moment about rear-wheel axis	62.8 kNm	68.3 kNm
Maximum tilt angle of mast from vertical		13 degrees

Lifting heights relative to the horizontal plane including the lower link pivot points									
mm	-360	-300	-200	-100	0	100	200	300	340
Lifting forces (the values of force measured shall be corrected to correspond to a hydraulic pressure equivalent to 90 % of the actual relief valve pressure setting of the hydraulic lift system.)									
At the hitch points kN	58.4	58.5	58.0	57.2	58.0	58.7	57.9	57.5	58.4
Corresponding pressure: 16.7 MPa									
At the frame kN	56.1	54.0	52.0	50.7	48.0	47.2	44.5	41.5	40.0
Corresponding pressure: 16.7 MPa									

3. DRAWBAR POWER AND FUEL CONSUMPTION

Date of tests 21.5.1997

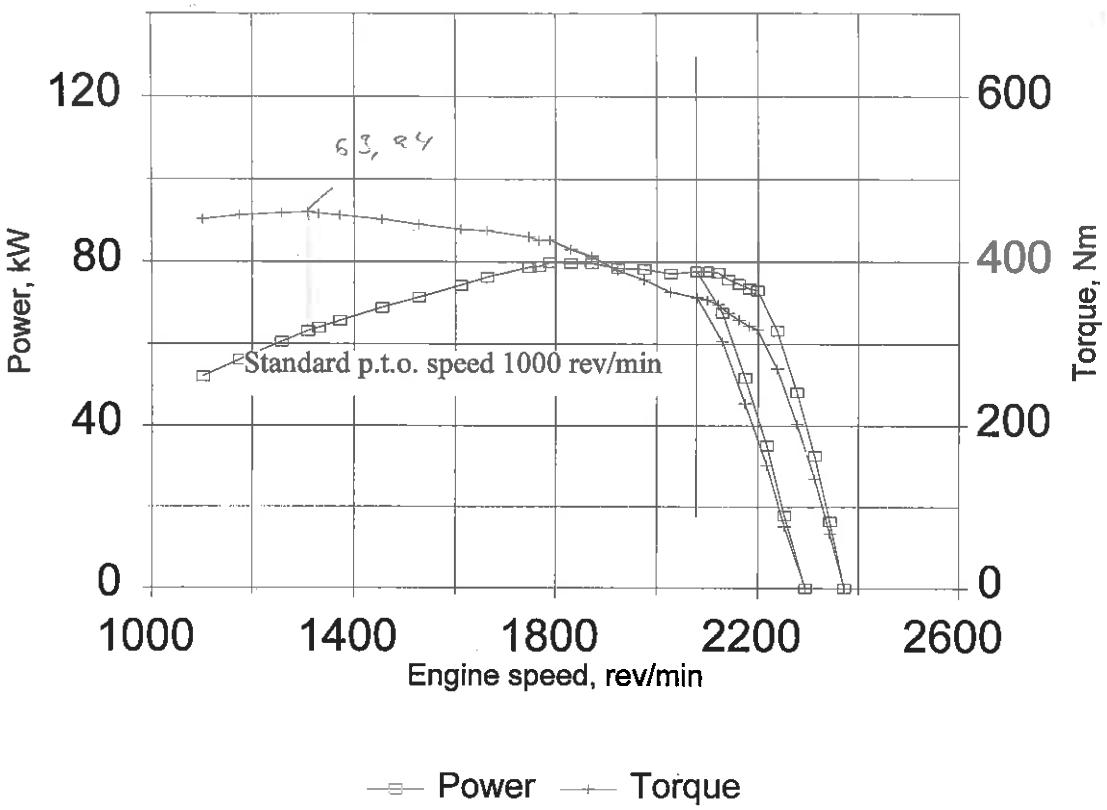
Type of track Tarmacadam

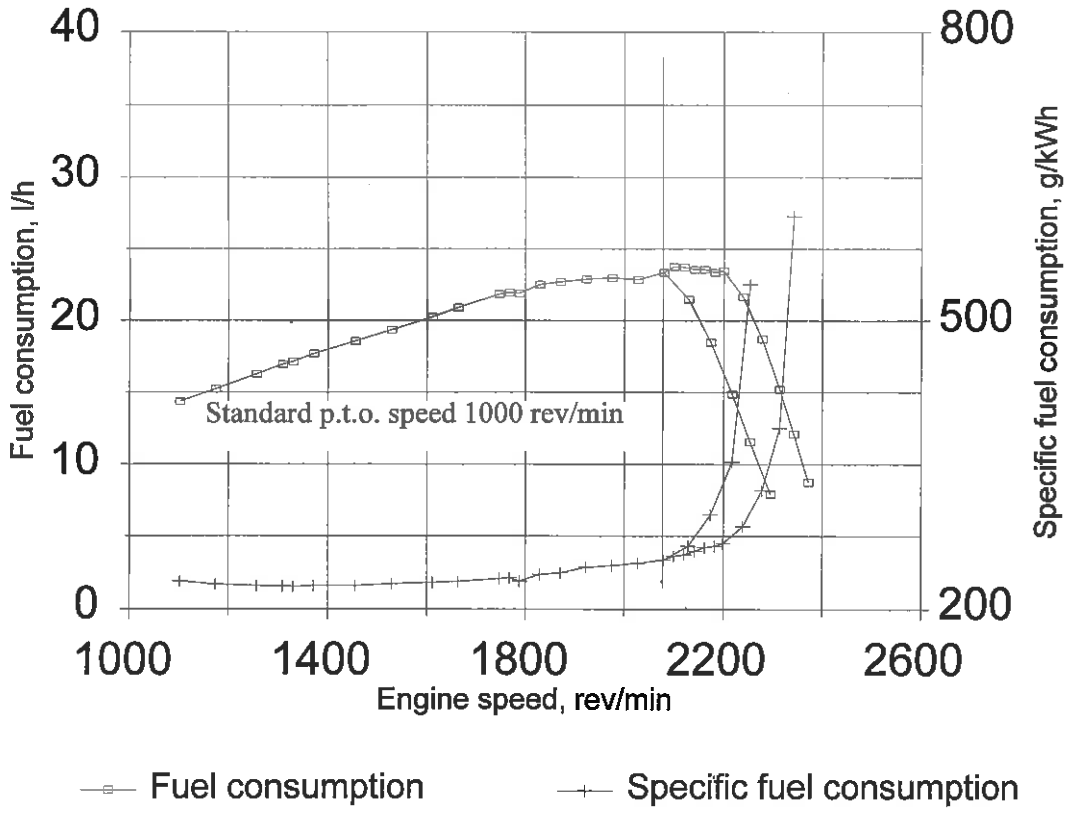
		Tyre inflation presssure	
	Height of drawbar above ground	Front	Rear
Unballasted	550 mm	130 kPa	130 kPa

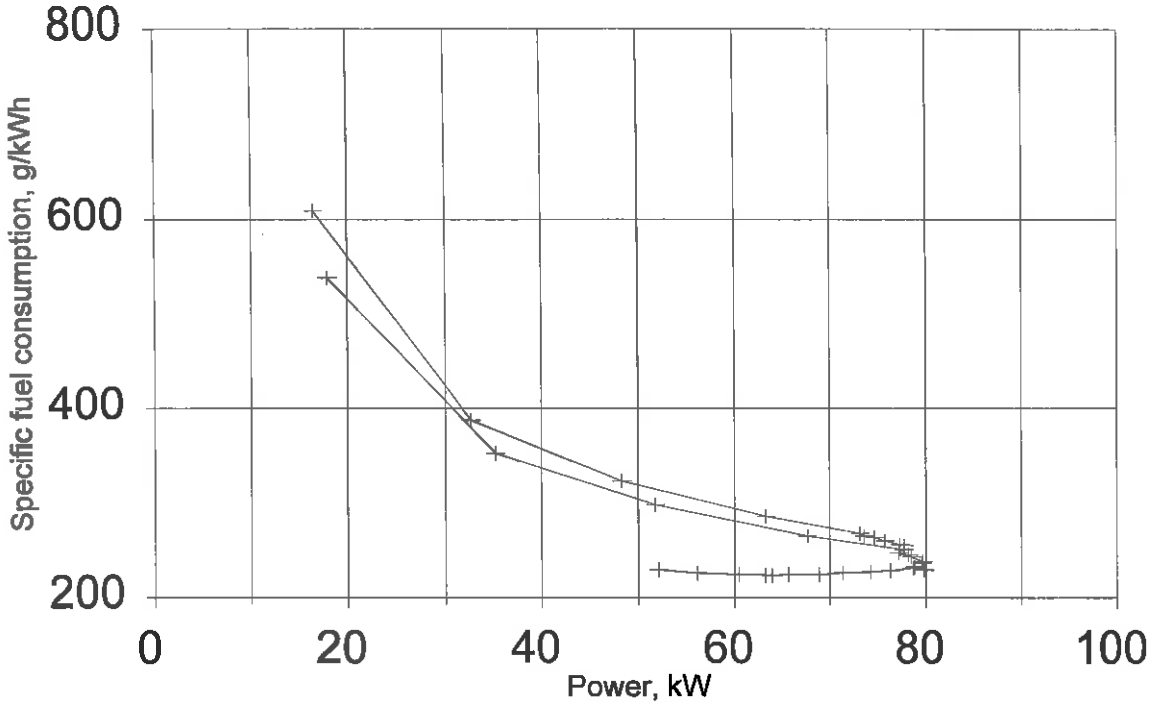
Gear and range	Power	Drawbar pull	Speed	Engine speed	Slip of wheels	Specific fuel consumption	Specific energy	Temperature			Atmospheric conditions		
								Fuel	Coolant	Engine oil	Temperature	Relative humidity	Pressure
	kW	kN	km/h	rev/min	%	g/kWh	kWh/l	°C	°C	°C	°C	%	kPa
3.1 MAXIMUM POWER IN TESTED GEARS (unballasted tractor)													
2 M I	40.6	39.8	3.67	2303	14.8	405	2.07	23	84	88	8	36	101
1 M III	42.6	39.4	3.90	2270	14.8	397	2.11	23	84	90	7	36	101
2 M II	49.2	39.9	4.44	2256	14.7	363	2.31	23	85	92	8	36	101
3 M I	57.1	41.0	5.02	2241	14.8	346	2.42	24	85	93	8	36	101
2 M III	59.0	39.7	5.35	2180	14.5	335	2.50	24	85	94	8	36	101
3 M II	61.8	39.8	5.59	2020	14.6	313	2.67	25	85	95	9	36	101
4 M I	63.9	39.4	5.84	1850	14.9	298	2.80	26	84	95	9	36	101
3 M III	65.0	37.0	6.32	1784	12.2	287	2.91	26	84	96	6	36	101
1 H I	65.9	36.8	6.45	1799	12.4	286	2.93	26	84	96	7	36	101
4 M II	66.4	32.4	7.38	1778	9.3	281	2.98	27	84	97	6	36	101
1 H II	68.0	29.7	8.24	1774	7.9	271	3.09	27	85	97	7	36	101
4 M III	67.4	25.5	9.52	1778	6.1	273	3.06	28	84	97	8	36	101
2 H I	69.3	25.6	9.74	1780	6.2	269	3.10	28	85	97	7	36	101
1 H III	68.3	23.2	10.60	1784	5.4	269	3.10	28	85	97	7	36	101
2 H II	68.8	20.0	12.38	1802	4.5	271	3.08	29	85	97	8	36	101
3 H I	68.1	17.5	14.01	1783	4.1	274	3.05	29	85	97	8	36	101
2 H III	66.3	15.4	15.51	1796	3.6	277	3.01	29	85	97	7	36	101

3.2 FUEL CONSUMPTION

Gear and range	Power	Drawbar pull	Speed	Engine speed	Slip of wheels	Specific fuel consumption	Specific energy	Temperature			Atmospheric conditions		
								Fuel	Coolant	Engine oil	Temperature	Relative humidity	Pressure
	kW	kN	km/h	rev/min	%	g/kWh	kWh/l	°C	°C	°C	°C	%	kPa
3.2.1 In selected gear at maximum power													
2 H I	69.3	25.6	9.74	1780	6.2	269	3.10	28	85	97	7	36	101
3.2.1.1 75 % of pull at maximum power at rated speed													
2 H I	65.1	19.2	12.20	2190	4.5	311	2.69	28	83	93	7	36	101
3.2.1.2 50 % of pull at maximum power at rated speed													
2 H I	44.8	12.8	12.60	2284	5.4	377	2.22	28	85	92	7	36	101
3.2.1.3 Next higher gear at reduced engine speed, same pull and travelling speeds as in 3.2.1.1													
1 H III	64.1	19.1	12.08	2006	4.2	285	2.94	30	86	98	7	36	101
3.2.1.4 Next higher gear at reduced engine speed, same pull and travelling speeds as in 3.2.1.2													
1 H III	45.2	13.0	12.52	2088	4.6	352	2.38	30	84	98	8	36	101


120
80
40
0
600
400
200
0
Power, kW
Torque, Nm
63, 84
Standard p.t.o. speed 1000 rev/min
1000
1400
1800
2200
2600
Engine speed, rev/min
Power
Torque


40
30
20
10
0
800
500
200
Fuel consumption, l/h
Specific fuel consumption, g/kWh
Standard p.t.o. speed 1000 rev/min
1000
1400
1800
2200
2600
Engine speed, rev/min
Fuel consumption
Specific fuel consumption


800
600
400
200
Specific fuel consumption, g/kWh
0
20
40
60
80
100
Power, kW

Vihdin Painorasteri