FINNISH RESEARCH INSTITUTE OF ENGINEERING IN AGRICULTURE AND FORESTRY
(VAKOLA)

Testing, research and development of the machines used in agriculture, gardening, forestry, dairy, household work and home industries

Address: Rukkila, 00001 Helsinki 100, Finland

TEST BULLETIN: O.E.C.D. No. 357

Report on test in accordance with O.E.C.D. Standard Code for the Official Testing of Agricultural Tractors



VALMET 1100 DIESEL TRACTOR

Manufactured by: Valmet Oy, Tourulan Tehdas, Jyväskylä, Finland

This report has been approved by the O.E.C.D. Coordinating Centre (C.N.E.E.M.A. France) as being in accordance with the O.E.C.D. Standard Code for the Official Testing of Agricultural Tractors

Date of approval: 9th June 1971 Serial No. 357

This bulletin is based on engineering tests in accordance with the O.E.C.D. Standard Code for the Official Testing of Agricultural Tractors. It does not contain an evaluation of the performance of the tractor on practical farm work.

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Tractor manufacturer:	Valmet Oy, Tourulan Tehdas, Jyväskylä, Finland
Submitted for the test by:	The manufacturer
Selected by:	The manufacturer with the agreement of the institute
Place of running-in:	Helsinki and district
Duration of running-in:	173 hours

SPECIFICATION OF TRACTOR

Tractor

Make:	Valmet Oy, Tourulan Tehdas
Model:	1100
Type:	Four wheel, rear wheel driven
Serial No.:	2471

Engine

Make:	Valmet Oy, Linnavuoren Tehdas
Model:	411 AS
Type:	4- stroke, turbocharged direct injection diesel, water cooled
Serial No.:	6319
Cylinders:	4 cylinders, vertical, in line, 108 mm bore, 114 mm stroke, capacity 4180 cm^3, compression ratio 17:1, overhead valves, dry replaceable cylinder liners
Turbocharger:	Holset 3LD14 1.25
Fuel system:	A.C. diaphragm type fuel feed pump, C.A.V. type FAS 5836180 paperfilter with watertrap, capacity of fuel tank 95 l, Simms type P 5074 injection pump, serial No. P 5074, manufacturer's production setting: 17,9 kg/h at 2300 rev/min rated engine speed and at specific gravity 0,830 at 15°C, Simms type NL 139 B injector nozzles, injector setting 200 kp/cm^2, injection timing 18° before T.D.C.
Gorvernor:	Simms type 1000 S 740, mechanical governed range of engine speed 650...2450 rev/min, rated engine speed 2300 rev/min
Air cleaner:	Main filter Mann, dry paperfilter 45 225 65 104
Lubrication system:	Forced feed from gear type pump, full flow replaceable paper filter type Fram CH-801 PL, total oil capacity 10 l, recommended oil change period 150 h
Cooling system:	Water cooled, pressurized at 0,4 kp/cm^2, impeller assisted with 410 mm dia, belt driven 4 blade fan, thermostat and radiator curtain for temperature control, cooling water capacity 16 l
Starting system:	Electrical, Bosch type 4 PS 1359010 solenoid engaged starter motor, operable only when main gear selector is in neutral position, thermostart system C.A.V. 1854050 12 V for cold starting
Electrical system:	Voltage: 12, negative earth Generator: Bosch type 0101 206 138 Battery: Salama type 2 x 6 E 155 lead acid, capacity 155 Ah

Transmission

Clutch: Fichtel&Sachs, dry double plate, 310 mm dia, operated with two separate pedals, when needed the two pedals can be locked together so that they work as one

Gearbox: Own make, four forward synchromesh, one reverse and dual range synchromesh reduction gears, 8 forward speeds and 2 reverse

Rear axle and final drive: Own make, crown wheel and pinion with bevel gear type differential and spur gear final drives, pedal operated differential lock

Oil capacities: Transmission 32 l, final drives 9,5 l each, recommended oil change period 750 h

Gear	Number of engine revolutions for 1 revolution of driving wheel	Nominal travelling speed at 2300 rev/min rated speed of engine km/h
forward		
1 (L1)	211,49	3,2
2 (H1)	127,75	5,3
3 (L2)	94,12	7,2
4 (H2)	56,85	11,9
5 (L3)	45,03	15,2
6 (L4)	35,30	19,3
7 (H3)	27,20	25,0
8 (H4)	21,32	32,0
reverse		
1 (LR)	131,27	5,1
2 (HR)	79,29	8,5

Power take-off

Main: Live p.t.o. operated by foot pedal, at rear of the tractor in vertical centre plane, 6 splines, 1 3/4 (44,35 mm) dia, height above ground 771 mm, proportional engine speed giving 711 or 1012 rev/min at 2300 rev/min rated engine speed, standard p.t.o. speed 540 rev/min at 1747 engine speed and standard p.t.o. speed 1000 rev/min at 2273 engine speed, direction of rotation clockwise viewed from tractor rear

Ground speed: Proportional ground speed giving distance travelled for 1 revolution of p.t.o. 0,15 m, number of p.t.o. revolutions for one revolution of driving wheel 33,1, direction of rotation clockwise viewed from tractor rear in all forward speeds and anticlockwise in the reverse speeds

Auxiliary: In front of engine

Belt pulley: Attacheable to rear of tractor in two alternative horizontal positions, p.t.o. driven, manually engaged, 270 mm dia x 165 mm face width, 1067 or 1518 rev/min giving 907 or 1286 m/min linear speed at 2300 rated engine speed, direction of rotation: optional

Power lift: Own make, live hydraulic with gear type pump directly driven from engine supplying oil to ram cylinder and external tapping, category 2 three point linkage with lower link sensing, draught, position and pressure controls, adjustable draught response and speed to drop implement, vertical lift movement above ground: 95...690 mm or 535...985 mm depending on lift rod position

Drawbar	Fixed on hydraulic hitch-hook, height above ground 495 mm, distance from rear axle 753 mm, 304 mm under p.t.o. and 382 mm behind it, lateral adjustment 485 mm
Trailer hitch	At rear of the tractor, hydraulic hitch-hook, height above ground 545 mm, distance from rear axle 319 mm to rear, 226 mm under p.t.o. and 50 mm in front of it
Towing hitch	At front of tractor, height above ground 710 mm
Steering	Own make, hydrostatic steeringsystem gets pressure oil from the same pump as power lift. Oilflow is 19 l/min and max. pressure 70 kp/cm^2, steering valve is Orbitrol type OSP 160
Brakes	Own make, hydraulically operated double disc dry type on differential half shafts, hydraulic brake force egualizer, independent or combined pedal operated, hand lever ratched operating both brakes for parking
Wheels	
Steering wheels:	Two at front, Nokia 13-16 tyres, 10 ply ratings, maximum permissible weight on each tyre 3000 kp at 5,0 kp/cm^2 pressure, track 1570 - 1670 - 1770 - 1870 mm by extending front axle and reversing wheels
Driving wheels:	Two at rear, Pirelli 18,4-34 tyres, 8 ply ratings, mounted on W 14 L - 34 rims, maximum permissible weight on each tyre 3850 kp at 2,1 kp/cm^2 pressure, track 1615 - 1735 - 1835 - 1935 mm changed by reversing wheel centres and offset lugs on rims
Wheelbase:	2310 mm

Tractor and ballast weights

(without driver but tanks full)

Weight without ballast:	Front:	1285 kg
	Rear:	2430 "
	Total:	3715 "
Ballast:	Front:	10 frame weights and frame, total 470 kg
	Rear:	8 weights per wheel, total 1273 kg, liquid 628 kg
Weight with full ballast:	Front:	1873 kg
	Rear:	4213 "
	Total:	6086 "

Seat	Bostrom Argus XL upholstered cushion and backrest, torsionspring with hydraulic damper, adjustable for driver's weight from 50 to 110 kp, range of adjustment 105 mm fore and aft
Number of grease points	
Whole tractor:	14

Overall dimensions

Overall length:	3,80 m without ballast weights 4,27 m with front weights fitted
Overall width:	Without ballast weights 2,09 m at 1615 mm rear wheel track With ballast weights 2,60 m at 1820 mm rear wheel track
Overall height:	2,46 m to roof of safety cab
Minimum ground clearance:	470 mm to underside of trailer hitch

Lighting

	Height above ground of centre cm	Diameter cm	Distance from outside edge of tractor at 1615 mm wheel track to centre cm
Head lights	96,5	12	85,5
Side lights	179	4 x 10,5	16
Rear lights	179	4 x 10,5	16
Reflectors	148	7,5	20

Unrestricted beam angle of headlight in plan view 106°

FUELS AND LUBRICANTS USED IN TESTS

Fuel:	Shell diesel oil, specific gravity 0,830 at 15°C, cetane number 58
Engine oil:	Esso Extra, SAE 30
Transmission oil:	Esso Gear Oil, SAE 80

COMPULSORY TESTS

1. MAIN POWER TAKE-OFF PERFORMANCE

Date and location of tests: 28th and 29th September 1970
Helsinki, Finland

Type of dynamometer: Water brake, Schenck U1-30

Horsepower	Speeds rev/min		Fuel consumption		
metric hp	Engine	P.t.o.	l/h	g/metric hph	metric hph/l
Maximum power - 2 hour test					
106,6	2300	1012	21,65	169	4,92
Standard p.t.o. speed (1000 rev/min)					
105,0	2273	1000	21,42	170	4,90
Speed recommended by the manufacturer for drawbar work					
106,6	2300	1012	21,65	169	4,92
Part loads					
93,8	2380	1043	20,03	177	4,68
0	2450	1075	4,75	-	-
47,2	2390	1050	11,65	205	4,04
106,6	2300	1012	21,65	169	4,92
23,9	2430	1065	7,83	272	3,05
70,3	2380	1045	15,75	186	4,47

No load maximum engine speed:		2450	rev/min
Equivalent crankshaft torque at maximum power:		33,3	kpm
Maximum equivalent crankshaft torque: at 1605 rev/min engine speed		35,7	kpm
Mean atmospheric conditions:	temperature	17	°C
	pressure	766	mm Hg
	relative humidity	45	%
Maximum temperatures:	coolant	95	°C
	engine oil	128	°C
	fuel	67	°C

2. DRAWBAR PERFORMANCE

Date of tests: 1st - 7th October 1970, 24th - 25th May 1971
Type of track: tarmacadam
Height of drawbar above ground: 545 mm

Gear	Horse-power	Drawbar-pull	Speed	Engine speed	Wheel slip	Spec. fuel consumption		Temperature °C			Atmospheric conditions		
	metric hp	kp	km/h	rev/min	%	g/metric drawbar hph	metric drawbar hph/l	Coolant	Fuel	Engine oil	Temperature °C	Relative humidity %	Pressure mm Hg
(i) Maximum power (ballasted)													
1 (L1)	49,5	4550	2,90	2360	12,0	222	3,74	85	18	78	7	80	758
2 (H1)	84,8	4800	4,77	2330	11,4	196	4,23	85	18	78	7	80	758
3 (L2)	92,5	3650	6,84	2320	6,7	201	4,13	85	18	78	7	80	758
4 (H2)	90,0	2130	11,40	2260	3,8	201	4,13	75	11	79	7	80	758
5 (L3)	89,0	1650	14,50	2220	2,3	203	4,08	75	10	77	7	74	758
6 (L4)	83,8	1210	18,65	2230	3,0	222	3,74	75	10	77	7	74	758
(ii) Five hour test at 75 % of pull at maximum power in 4th gear													
4 (H2)	71,2	1600	12,00	2370	2,4	207	4,02	85	17	80	7	65	765
(iii) Five hour test at pull corresponding to 12,3 % wheelslip in test (i)													
1 (L1)	-	4600	2,81	-	-	-	-	85	17	85	8	70	769
(iv) Maximum power (unballasted)													
1 (L1)	30,1	2800	2,91	2300	9,3	276	3,01	75	11	70	6	62	757
2 (H1)	45,0	2700	4,50	2310	14,8	255	3,26	75	12	60	6	62	757
3 (L2)	71,0	2830	6,78	2360	8,9	233	3,56	75	11	70	6	62	757
4 (H2)	90,8	2160	11,30	2290	4,0	206	4,03	75	12	60	8	63	757
5 (L3)	90,5	1680	14,56	2310	2,5	211	3,94	75	12	69	8	63	757
6 (L4)	89,2	1280	18,80	2320	2,2	201	4,12	75	12	69	8	63	757

Total oil consumption during ten hours duration of tests (ii) and (iii): 123 g/h

3. TURNING SPACE AND TURNING CIRCLE

Details of wheel equipment: As in specification without ballast

Track of wheels: Front: 1570 mm
Rear: 1615 mm

	With brakes		Without brakes	
	right-hand m	left-hand m	right-hand m	left-hand m
Radius of turning space	3,81	3,93	4,20	4,28
Radius of turning circle	3,56	3,69	3,95	4,04

4. LOCATION OF CENTRE OF GRAVITY

	mm
Height above ground	903
Distance forward from the vertical plane containing the axis of the rear wheels	795
Distance from the median plane of the tractor	0

5. BRAKE TESTS

Date of tests: 23rd October and 2nd November 1970

Type of track: tarmacadam

Type of decelerometer: Moto Meter

Weight of ballasted tractor with driver: 6161 kg

Cold brakes

		Ballasted	Without ballast
Travelling speed of tractor	km/h	25,0	25,0
Maximum deceleration	m/s^2	4,4	4,3
Stopping distance	m	8,4	7,7
Force exerted on the brake pedal	kp	47	48
Force exerted on the brake pedal to achieve a deceleration of 2,5 m/s^2	kp	38	20

Brake fade characteristics (hot tests)

Maximum deceleration hot/cold	98 %
Stopping distance cold/hot	100 %
Force on pedal cold/hot	88 %

Parking brake

Efficiency of handbrake:	
facing up slope	good
facing down slope	good
Pull on handbrake:	40 kp

6. MEASUREMENT OF AMBIENT NOISE EMITTED BY THE TRACTOR

Date of tests:	12th January 1971	
Type of sound level meter:	Brüel & Kjaer, 2203	
Type of track:	tarmacadam	
Results of tests:	gear:	8th
	travelling speed before acceleration	23,2 km/h
	sound level:	89 dB A

7. NOISE MEASUREMENT AT THE DRIVER'S EAR LEVEL IN THE SAFETY CAB

Date of tests:	12th January 1971
Type of sound level meter:	Brüel & Kjaer, 2203
Type of octave filter:	Brüel & Kjaer, 2112 + 2305
Type of track:	tarmacadam
Results of tests:	

Gear	Travelling speed [1] km/h	Sones
3 (L2)	7,0	119
4 (H2)	11,6	141
8 (H4)	31,0	136
Top (with light load)	34,0	119

1) The first gear tested corresponding to the travelling speed nearest to 7,25 km/h

8. POWER LIFT AND HYDRAULIC PUMP PERFORMANCE

Date and location of tests: 19th and 24th November 1970, Helsinki, Finland

Hydraulic fluid: Shell, Tellus 29

Type of linkage lock for transport: hydraulic

Opening pressure of the cylinder over pressure relief valve: 180 kp/cm^2

	Height above ground in down position mm		Vertical movement mm	Maximum force exerted through full range kp	Pressure kp/cm^2	Lifting force when front of tractor lifts kp
	hitch point	frame				
Linkage giving maximum mechanical advantage						
At hitch points	510	-	370	2450	178	-
On the frame	-	525	355	1700	176	-
Linkage giving minimum mechanical advantage						
At hitch points	120	-	505	1925	178	-
On the frame	-	160	435	1810	177	1810

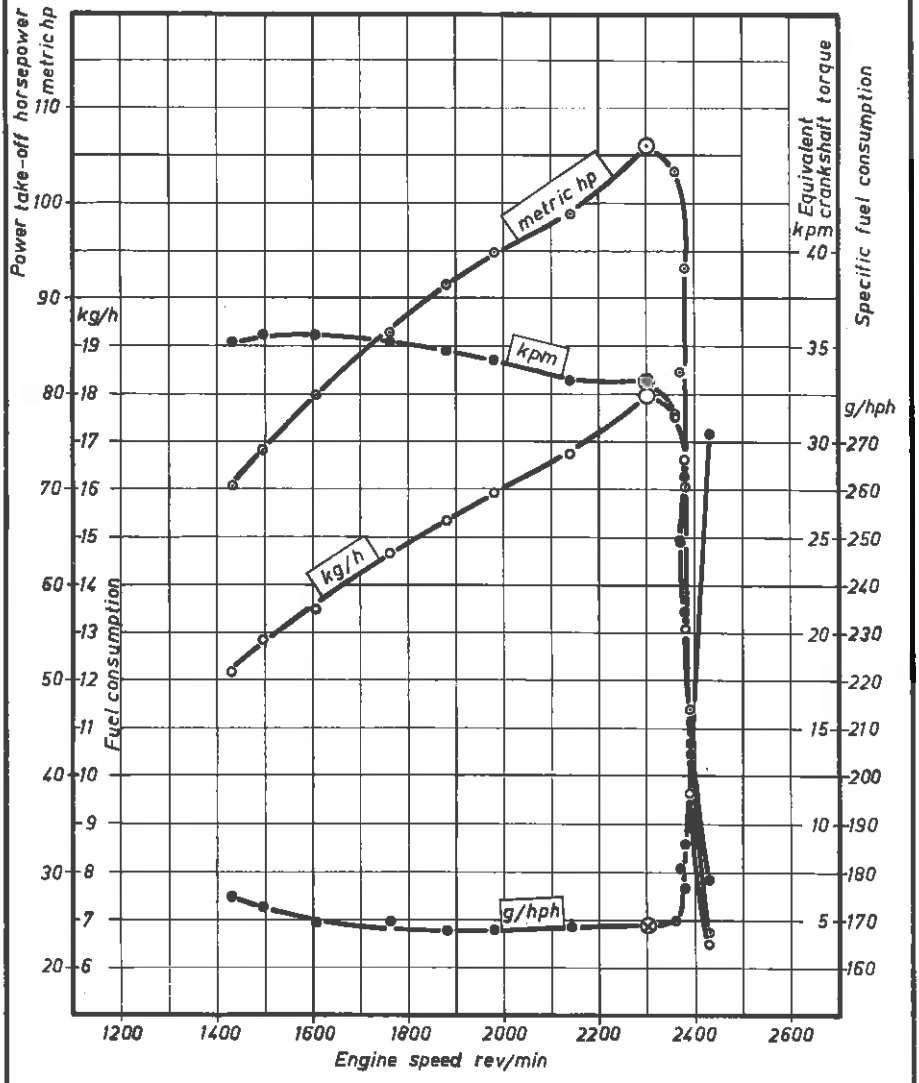
Pump characteristics:

Opening pressure of the relief valve:	165	kp/cm^2
Sustained pressure by the open relief valve:	180	"
Pump delivery rate at external tapping at minimum pressure and rated engine speed:	45,2	l/min
at maximum hydraulic power:	40,3	"
delivery pressure:	160	kp/cm^2
power:	14,3	metric hp

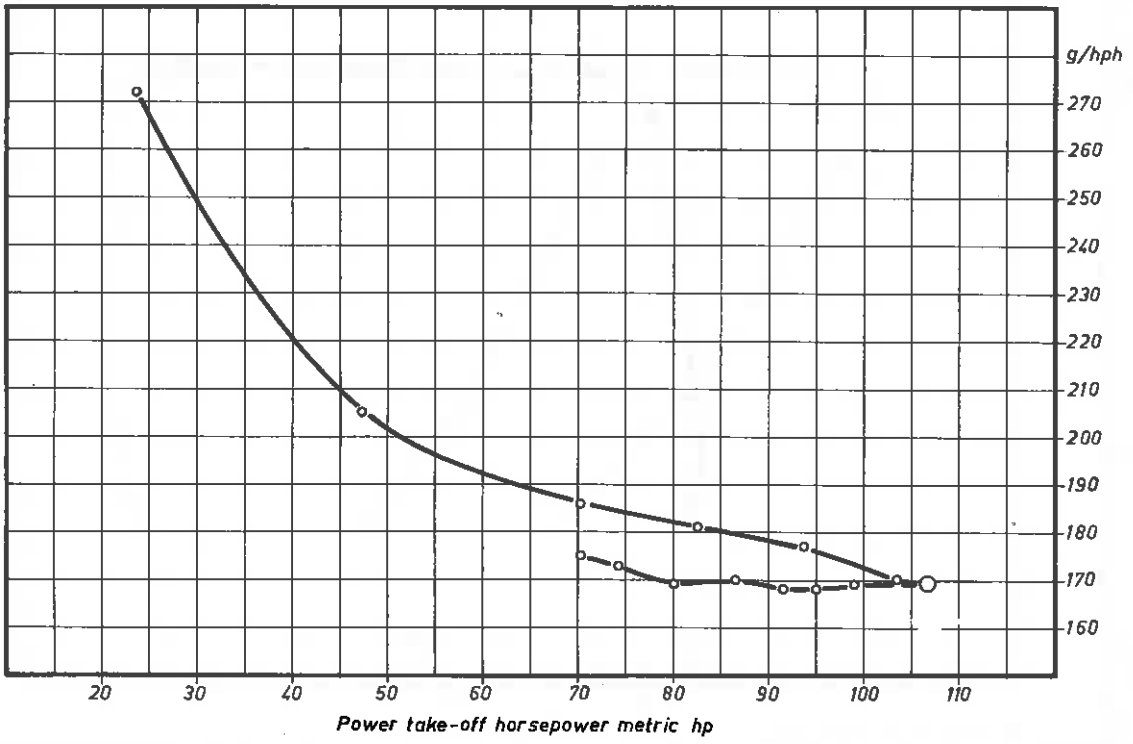
Helsinki, 15th April 1971

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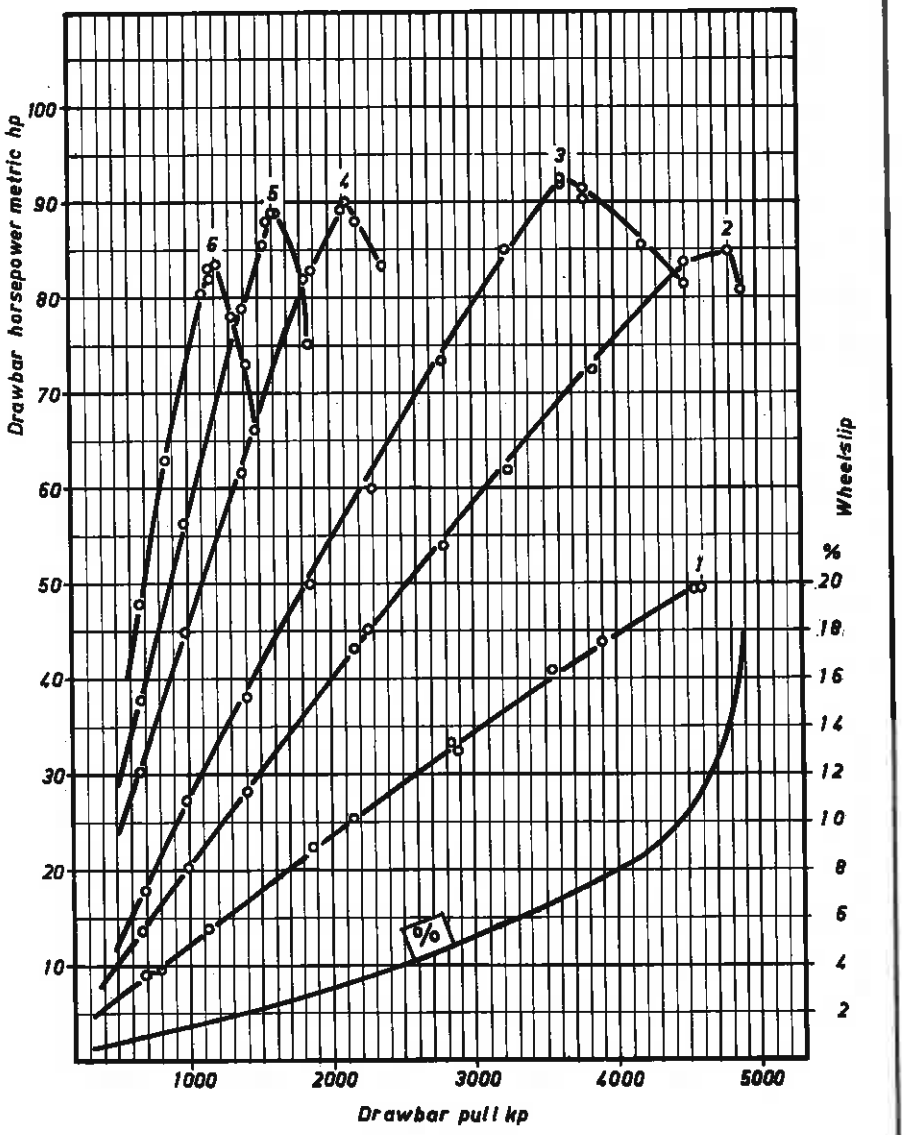
Finnish Research Institute of Engineering in Agriculture and Forestry	Power take-off test	Valmet 1100 diesel tractor



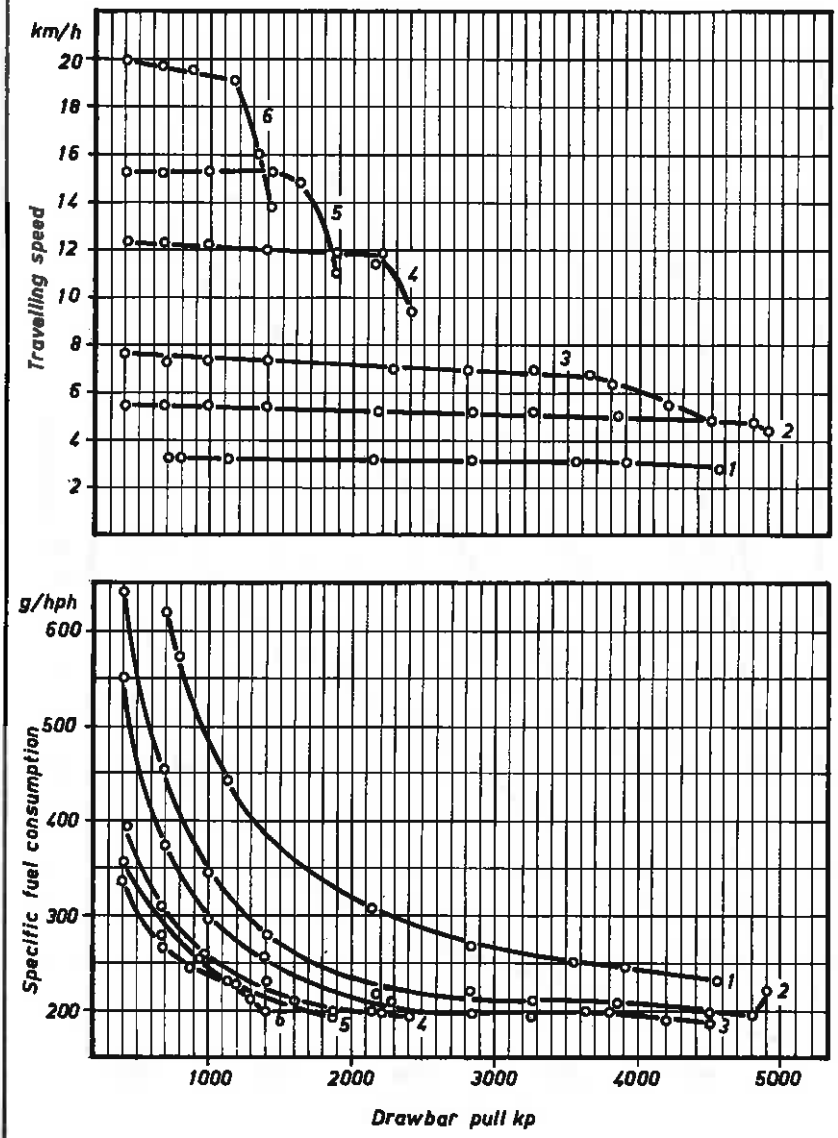
Finnish Research Institute of Engineering in Agriculture and Forestry	**Power take-off test**	*Valmet 1100 diesel tractor*



Finnish Research Institute of Engineering in Agriculture and Forestry	Drawbar test with ballast	Valmet 1100 diesel tractor



Finnish Research Institute of Engineering in Agriculture and Forestry	Drawbar test with ballast	Valmet 1100 diesel tractor



Finnish Research Institute of Engineering in Agriculture and Forestry	Drawbar test without ballast	Valmet 1100 diesel tractor

