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, Helsinki 10, Finland

TEST BULLETIN: O.E.C.D. No. 265

Report on test in accordance with O.E.C.D.
Test Code for Agricultural Tractors



VALMET 500 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. Tractor Test Code.

Date of approval: 21st April 1969 **Serial No. 265**

This Bulletin is based on engineering tests in accordance with the O.E.C.D. Tractor Code. It does not contain an evalution 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:	Jyväskylä and district
Duration of running-in:	290 hours

SPECIFICATION OF TRACTOR

Tractor

Make:	Valmet Oy, Tourulan Tehdas
Model:	500
Type:	Four wheel, rear wheel driven
Serial No.:	36780

Engine

Make:	Valmet Oy, Linnavuoren Tehdas
Model:	310 B
Type:	4- stroke, direct injection diesel, water cooled
Serial No.:	25860
Cylinders:	3 cylinders, vertical, in line, 100 mm bore, 114 mm stroke, capacity 2685 cm^3, compression ratio 17:1, overhead valves, wet replaceable cylinder liners
Fuel system:	A.C. diaphragm type V.P. fuel feed pump, C.A.V. type FAS 5836180 filters, prefilter A.C. 7950001, capacity of fuel tank 40 l, Simms type P 4624/4 injection pump, serial No. 12551, manufacturer's production setting: 9,580 kg/h at 2300 rev/min rated engine speed, Simms type N 1317 injector nozzles, injector setting 200 kp/cm^2, injection timing 20° before T.D.C.
Governor:	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 & Hummel, 3103474041 oil bath cleaner, oil capacity 0,7 l Pre-cleaner Mann & Hummel, 4802477120 centrifugal type
Lubrication system:	Forced feed from gear type pump with metal strainer in sump, full flow replaceable paper filter, total oil capacity 6,4 l, recommended oil change period 150 h
Cooling system:	Water cooled, pressurized at 0,4 kp/cm^2, impeller assisted with 365 mm dia, belt driven 4 blade fan, thermostat and radiator curtain for temperature control cooling water capacity 10 l
Starting system:	Electrical, Bosch type JD (R) 12 V 4 PS solenoid engaged starter motor
Electrical system:	Voltage: 12, positive earth Generator: Lucas type C 40 T Battery: Salama 2 x 6 V type 6 F 140 A lead acid, capacity 140 Ah

Transmission

Clutch:	Borg & Beck, dry single plate, 280 mm dia, pedal operated
Gearbox:	Own make, one sliding, two synchromesh, reverse and dual range synchromesh reduction gears, 6 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 12,5 l, final drives 5,5 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)	163,5	3,5
2 (L2)	100,5	5,6
3 (H1)	64,0	8,8
4 (L3)	48,0	11,8
5 (H2)	39,3	14,4
6 (H3)	18,8	30,0
reverse		
L	114,5	4,9
H	44,8	12,6

Power take-off	At rear of the tractor in vertical centre plane, 6 splines, 1 3/8 in (34,9 mm), height above ground 652 mm, proportional engine speed 722 rev/min at 2300 rev/min rated engine speed, standard p.t.o. speed 540 rev/min at 1720 rev/min engine speed, direction of rotation clockwise viewed from tractor rear
Belt pulley	Attacheable to rear of tractor in two alternative horizontal positions, p.t.o. driven, manually engaged, 225 mm dia x 165 mm face width, 1443 rev/min giving 1020 m/min linear speed at 2300 rated engine speed, direction of rotation: optional
Power lift	Own make, live hydraulic with gear type pump driven from the camshaft gear via splined stub and sliding collar supplying oil to ram cylinder and external tapping, category 2 three point linkage with draught and position controls, adjustable draught response and speed to drop implement, vertical lift movement above ground: 40...740 mm or 565...1010 mm depending on lift rod position
Trailer hitch	At rear of the tractor, hook type, height above ground 452 mm, distance from rear axle 197 mm to rear, 200 mm under p.t.o. and 8 mm in front of it
Steering	Own make, worm and nut type with double drag links
Brakes	Own make, double disc dry type on differential half shafts, independent or combined pedal operated, hand lever ratched operating both brakes for parking

Wheels

Steering wheels:	Two at front, Nokia 7.50-16 tyres, 6 ply ratings, maximum permissible weight on each tyre 710 kp at 2,5 kp/cm^2 pressure, track width 1390 mm by 100 mm steps to 1690 mm changed by extending front axle
Driving wheels:	Two at rear, Pirelli 14.9-28 tyres, 6 ply ratings, mounted on W 11 rims, maximum permissible weight on each tyre 1535 kp at 1,3 kp/cm^2 pressure, track width 1395 mm by 120 and 140 mm steps to 1915 mm changed by reversing wheel centres and offset lug type rims
Wheelbase:	1910 mm

Tractor and ballast weights
(without driver but tanks full)

Weight without ballast:	Front:	764 kg
	Rear:	1313 "
	Total:	2077 "
Ballast:	Front:	-
	Rear:	8 weights per wheel, total 1185 kg
Weight with full ballast:	Front:	764 kg
	Rear:	2498 "
	Total:	3262 "

Seat — Own make, upholstered cushion and backrest, parallelogram linkage with rubber springs, adjustable for driver's weight from 50 to 120 kp, range of adjustment 34 mm fore and aft

Number of grease points

Whole tractor: 20

Overall dimensions

Overall length:	3,18 m
Overall width:	Without ballast weights 1,87 m at 1515 mm rear wheel track With ballast weights 2,85 m at 1515 mm rear wheel track
Overall height:	2,28 m to top of exhaust pipe
Minimum ground clearance:	415 mm to underside of trailer hitch

Lighting

	Height above ground of centre cm	Diameter cm	Distance from outside edge of tractor at 1515 mm wheel track to centre cm
Head lights	108,5	12	59,5
Side lights	153	5	19,5
Rear lights	153	5	19,5
Reflectors	138	7,5	21

Unrestricted beam angle of headlight in plan view 108°

FUELS AND LUBRICANTS USED IN TESTS

Fuel:	Shell diesel oil, specific gravity 0,834 at 15°C, cetane number 56
Engine oil:	Esso Motor Oil, SAE 10 W
Transmission oil:	Esso Gear Oil GX, SAE 90

COMPULSORY TESTS

1. MAIN POWER TAKE-OFF PERFORMANCE

Date and location of tests: 30th and 31th September 1968 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					
47,6	2300	722	11,20	196	4,24
Standard p.t.o. speed (540 rev/min)					
40,3	1720	540	9,03	187	4,47
Speed recommended by the manufacturer for drawbar work					
47,6	2300	722	11,20	196	4,24
Part loads					
41,5	2370	745	9,65	194	4,30
0	2450	768	3,00	-	-
21,0	2410	757	6,04	240	3,48
47,6	2300	722	11,20	196	4,24
10,6	2430	763	5,32	418	1,99
31,4	2390	751	7,68	204	4,08

No load maximum engine speed:		2450 rev/min
Equivalent crankshaft torque at maximum power:		14,8 kpm
Maximum equivalent crankshaft torque:		17,1 kpm at 1275 rev/min engine speed
Mean atmospheric conditions:	temperature	18 °C
	pressure	760 mm Hg
	relative humidity	49 %
Maximum temperatures:	coolant	87 °C
	engine oil	78 °C
	fuel	23 °C

2. DRAWBAR PERFORMANCE

Date of tests: 9th September - 7th October 1968

Type of track: tarmacadam

Height of drawbar above ground: 452 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)	31,8	2582	3,3	2370	5,7	237	3,52	82	19	70	-3	45	758
2 (L2)	41,6	2180	5,2	2250	4,6	226	3,69	82	19	73	-4	45	758
3 (H1)	41,0	1364	8,1	2215	6,1	231	3,58	83	21	73	-4	50	760
4 (L3)	40,2	1010	10,7	2180	2,1	231	3,61	85	22	74	-5	50	760
5 (H2)	39,2	772	13,7	2270	1,6	247	3,40	85	24	74	-5	50	760
(ii) Five hour test at 75 % of pull at maximum power in 3rd gear													
3 (H1)	33,5	1025	9,1	2370	4,9	243	3,35	81	18	74	10	55	758
(iii) Five hour test at pull corresponding to 5,7 % wheelslip in test (i)													
1 (L1)	-	2580	3,3	-	-	-	-	80	20	76	4	53	762
(iv) Maximum power (unballasted)													
1 (L1)	17,8	1500	3,2	2405	10,3	288	2,89	84	23	78	8	48	757
2 (L2)	30,0	1510	5,4	2390	6,2	241	3,46	83	22	76	7	48	757
3 (H1)	39,2	1235	8,5	2340	6,5	235	3,56	80	24	75	7	50	756
4 (L3)	42,1	1022	11,1	2290	3,1	216	3,86	83	24	76	6	51	756
5 (H2)	38,9	782	13,4	2265	2,5	241	3,46	83	26	76	6	51	756

Total oil consumption during ten hours duration of tests (ii) and (iii): 19 g/h

3. TURNING SPACE AND TURNING CIRCLE

Details of wheel equipment: As in specification without ballast

Track of wheels: Front: 1390 mm

Rear: 1515 mm

	With brakes		Without brakes	
	right-hand m	left-hand m	right-hand m	left-hand m
Radius of turning space	3,11	3,12	3,41	3,43
Radius of turning circle	2,99	3,00	3,29	3,31

4. LOCATION OF CENTRE OF GRAVITY

	mm
Height above ground	715
Distance forward from the vertical plane containing the axis of the rear wheels	705
Distance from the median plane of the tractor	0

5. BRAKE TESTS

Date of tests: 18th October and 3rd December 1968

Type of track: tarmacadam

Type of decelerometer: Moto Meter

Weight of ballasted tractor with driver: 3337 kg

Cold brakes

	Ballasted	Without ballast
Travelling speed of tractor km/h	25,0	25,0
Maximum deceleration m/s^2	5,3	4,2
Stopping distance m	4,8	6,2
Force exerted on the brake pedal kp	30	25

Brake fade characteristics (hot tests)

Maximum deceleration hot/cold	96 %
Stopping distance cold/hot	104 %
Force on pedal cold/hot	100 %

Parking brake

Efficiency of handbrake:	good cold and hot
Force on handbrake cold and hot:	55 kp

6. MEASUREMENT OF AMBIENT NOISE EMITTED BY THE TRACTOR

Date of tests:	8th April 1969	
Type of sound level meter:	Brüel & Kjaer, 2203	
Type of track:	tarmacadam	
Results of tests:	gear:	6th
	travelling speed before acceleration	22,5 km/h
	sound level:	89 dB A

7. NOISE MEASUREMENT AT THE DRIVER'S EAR LEVEL

Date of tests:	18th March 1969
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 (H1)	8,8	141
6 (H3)	30,0	168

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

7. POWER LIFT AND HYDRAULIC PUMP PERFORMANCE

Date and location of tests: 10th and 13th January 1969, Helsinki, Finland

Hydraulic fluid: Esso hydraulic oil AK 50

Type of linkage lock for transport: hydraulic

Opening pressure of the cylinder over pressure relief valve: 175 kp/cm^2

	Height above ground in down position mm		Vertical movement	Maximum force exerted through full range	Pressure	Lifting force when front of tractor lifts
	hitch point	frame	mm	kp	kp/cm^2	kp
Linkage giving maximum mechanical advantage						
At hitch points	585	-	320	1995	165	1775
On the frame	-	580	345	1320	165	1010
Linkage giving minimum mechanical advantage						
At hitch points	40	-	580	1475	170	-
On the frame	-	125	525	1180	165	1020

Pump characteristics:

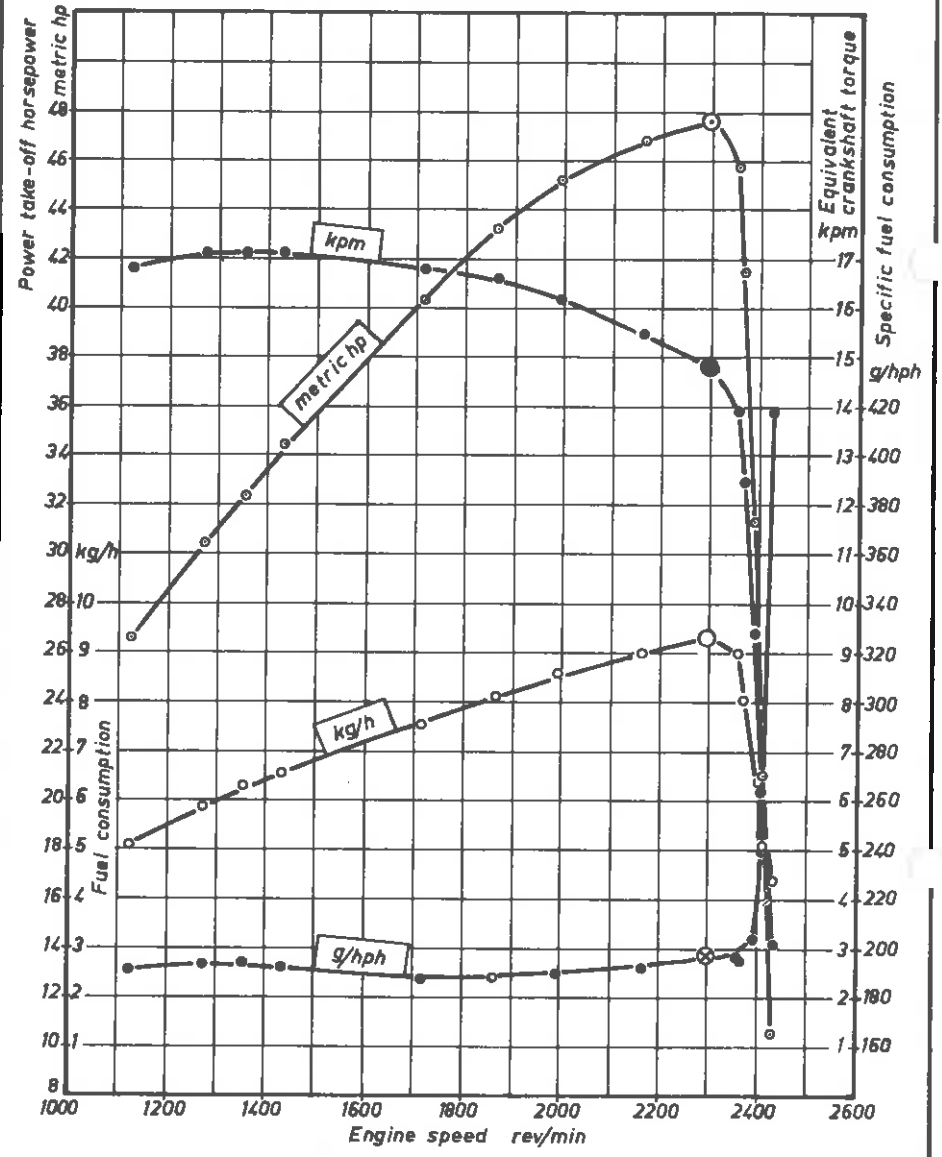
Opening pressure of the relief valve:	155	kp/cm^2
Sustained pressure by the open relief valve:	175	"
Pump delivery rate at external tapping at minimum pressure and rated engine speed:	24,1	l/min
at maximum hydraulic power:	17,4	"
delivery pressure:	157	kp/cm^2
power:	6,05	metric hp

REPAIRS, ADJUSTMENTS AND REMARKS DURING THE TESTS: None

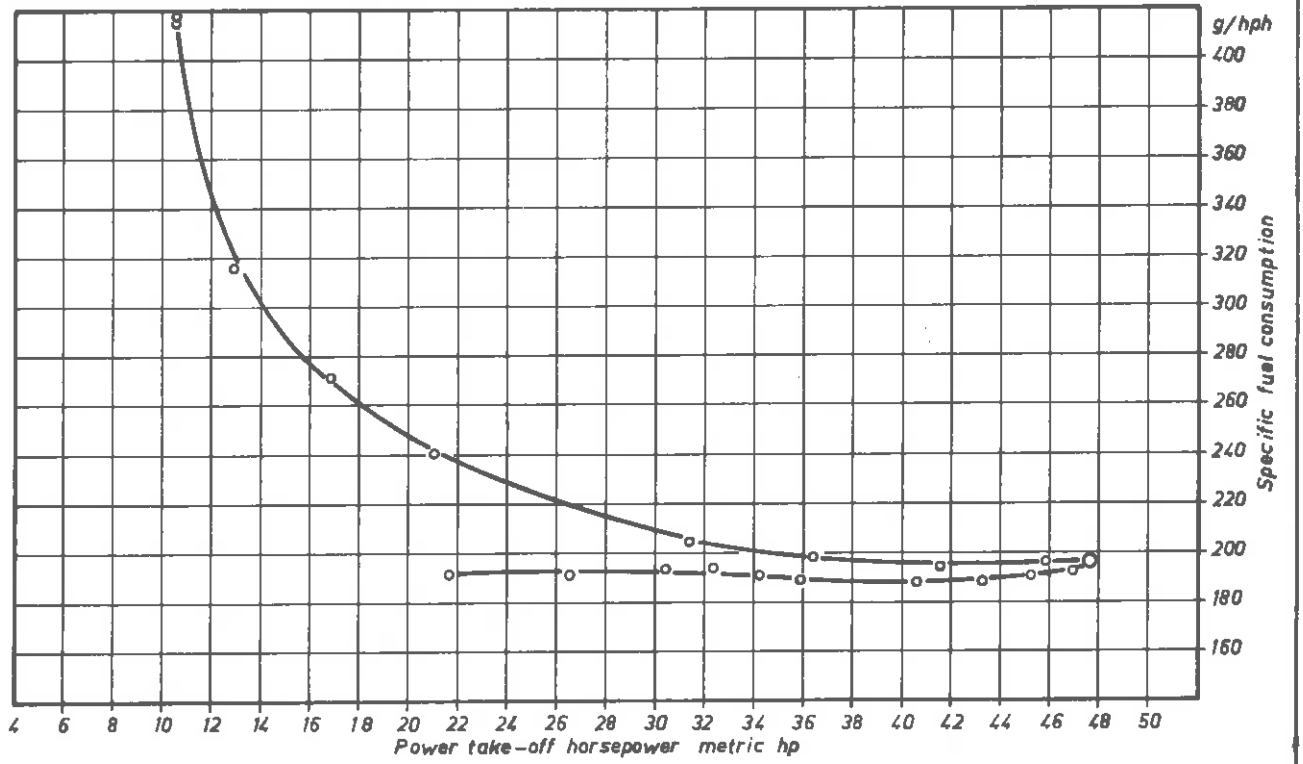
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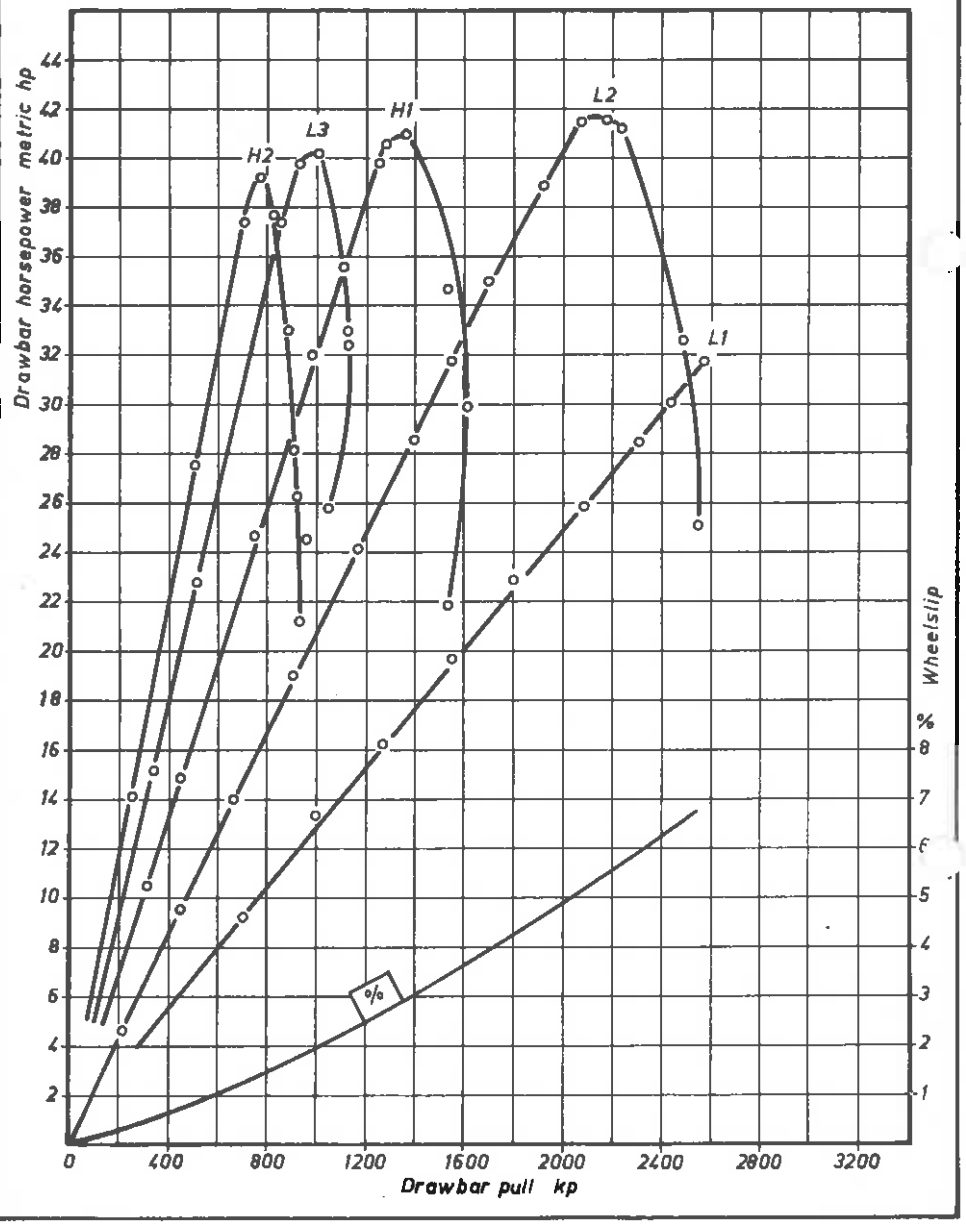
Finnish Research Institute of Agricultural Engineering	Power take-off test	Valmet 500 diesel tractor



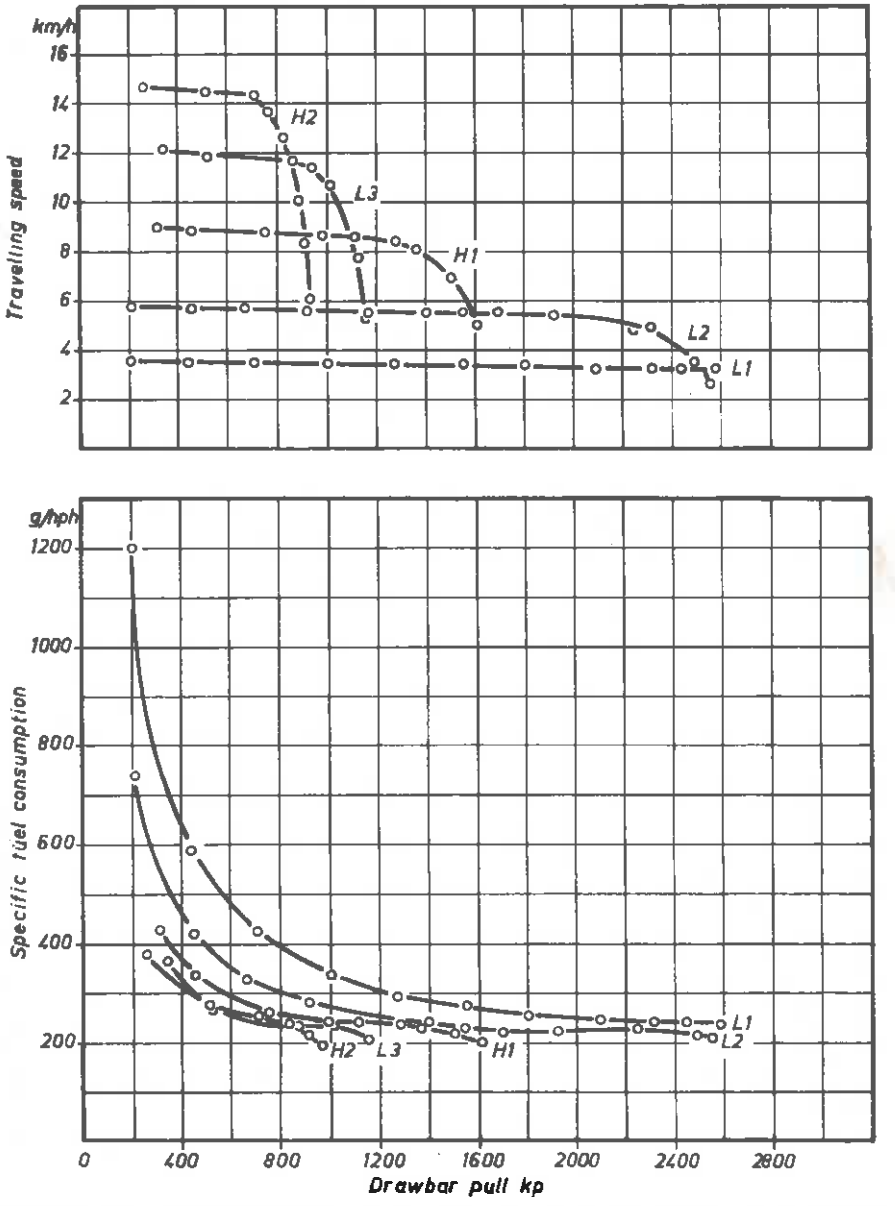
Finnish Research Institute of Agricultural Engineering	Power take-off test	Valmet 500 diesel tractor



Finnish Research Institute of Agricultural Engineering	**Drawbar test** with ballast	**Valmet 500 diesel tractor**



Finnish Research Institute of Agricultural Engineering	**Drawbar test** with ballast	**Valmet 500 diesel tractor**



Finnish Research Institute of Agricultural Engineering	Drawbar test without ballast	Valmet 500 diesel tractor

