NATIONAL SWEDISH TESTING INSTITUTE
FOR AGRICULTURAL MACHINERY

Head office: Ultuna, UPPSALA 7, Sweden

Testing Stations for Agricultural, Forestry and Garden Machines:

(South Sweden)	(Middle Sweden)	(North Sweden)
ALNARP	Ultuna, UPPSALA 7	Röbäcksdalen, TEG

Testing Station for Dairy Machines: ALNARP

TEST BULLETIN : OECD No. 017

Date of Approval: 5th January 1962

TEST IN ACCORDANCE WITH OECD TEST CODE FOR AGRICULTURAL TRACTORS

Tractor Bolinder-Munktell BM 320 Buster/Volvo 320 Buster

Test requested by:

AB Bolinder-Munktell of the Volvo-group, Eskilstuna, Sweden

Manufactured by:

AB Bolinder-Munktell of the Volvo-group, Eskilstuna, Sweden

Date of test: August 1961

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This Bulletin is based on engineering tests in accordance with the OECD Tractor Code. It does not contain an evaluation of the performance of the tractor on practical farm work.

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Section 1

Specification of tractor

Tractor:

Make: AB Bolinder-Munktell of the Volvo-group

Model: BOLINDER-MUNKTELL BM 320 BUSTER/VOLVO 320 BUSTER

Type: Diesel

No: 1538

Engine:

Make: Perkins Engines Ltd. Model 913, turbulence chamber system, No. 1201753

Rated output: 37 hp_{metric} at 2000 r/m (engine fully equipped)

Cylinders: 3 cylinders, vertical, in-line, 91,44 mm bore × 127 mm stroke, compression ratio 17,4: 1; replaceable dry cylinder liners, overhead valves

Rated speeds: For belt work and p.t.o. work 1500 r/m, for drawbar work 2000 r/m

Minimum speed: (For full load work) Not specified

Fuel system: Fuel: Diesel oil
Injection pump: CAV DPA 3232378
Injection nozzles: CAV BDL 110 S 6133
Injection timing 18° before T.D.C.; injector opening pressure 120—125 kp/cm²
Capacity of fuel tank: 35 litres

Governor: CAV, centrifugal type
Governed range of engine speed 500 to 2000 r/m

Air cleaner: AC-7955863, oil bath, oil capacity 0,7 litre

Oiling system: Forced feed from gear type pump. Recommended oil SAE 20-20 W heavy duty oil, below 0°C SAE 10-10 W. Filter AC-Delco E/OF 8232, full flow. Recommended oil change period, 125 hours. Oil capacity 6 litres

Cooling system: Pressurised, (0,23—0,30 kp/cm²) impeller assisted with 4-blade belt driven fan, thermostat and radiator shutter for temperature control. Cooling water capacity 8 litres

Transmission:

Clutch: Tractor equipped with transmission driven p.t.o. Borg and Beck, 11 in. diameter, single plate, dry, foot-pedal operated
Tractor equipped with continuous running p.t.o. Laycock, transmission clutch 11 in. diameter, p.t.o. clutch 9 in. diameter. Each of them single plate, dry, foot-pedal operated

Gearbox: Own make, gear 1, 2 and 3 sliding gear type, gear 4 and 5 constant mesh, 5 forward speeds and 1 reverse

Differential: Crown wheel and pinion, differential and spur gear final drive. Differential lock fitted. Total transmission oil capacity 18 litres. With continuous running p.t.o. 20 litres

Gear No.	Number of engine revolutions for one revolution of driving wheel	Theoretical travelling speed for rated speed of engine km/h	
		1500 r/m	2000 r/m
1	111,31	2,9	3,9
2	61,41	5,3	7,1
3	42,40	7,7	10,3
4	25,34[1]	12,9[1]	17,2[1]
5	17,59	18,6	24,8
Reverse	51,18	6,4	8,5
[1] For tractors with numbers between 1000 and 1730	26,55	12,3	16,4

Steering device: Worm and dual fixed stud type with single drop arm and fixed length drag link

Brakes: Hand brake—none fitted
Foot brakes—shoe and drum type on rear wheels; independent or combined foot-pedal operated
Latch on foot-pedals for parking

Wheels:

Steering wheels: Two at front. Tyres, 5.50—16, 4-ply rating pneumatic, track 1228 mm and 1390 mm changed by reversing wheels

Driving wheels: Two at rear. Tyres 11—28, 6-ply rating pneumatic, track 1353 by 100 mm steps to 1954 mm
Maximum possible weight on each tyre 1225 kg at 1,6 kp/cm²

Belt pulley:

Location: Rear-mounted and p.t.o.-driven

Diameter/width: 225 mm/160 mm

Speed: 1096 r/m at 1500 r/m and 1462 r/m at 2000 r/m engine speed

Belt linear speed: 12,9 m/s at 1500 r/m and 17,2 m/s at 2000 r/m engine speed

Direction of rotation: Optional

Power take-off:

Main: 6-spline, 34,9 mm (1 3/8 in.) diameter, in centre-line at rear of tractor

Height above ground: 609 mm

Speed: 533 r/m at 1500 r/m engine speed
711 r/m at 2000 r/m engine speed

Direction of rotation: Clockwise viewed from tractor rear

Power lift: Own make, single acting. Draught and position control. Independent, declutchable, pump drive, working pressure 120 kp/cm². Oil flow 25,2 l/min at 2000 r/m engine speed. Oil capacity 8—18 litres, force at end of lower links 940 kp or 1050 kp, depending on position of lift links. Diameter of hitch pin hole 22,9 mm (0,902 in.) Diameter of upper hitch pin hole 19,4 mm (0,764 in.)

Drawbar:

Standard: Fixed drawbar, height above ground 414 mm
Distance from rear axle 313 mm

Optional: Swinging drawbar. Heights above ground minimum 245 mm, maximum 460 mm
Lateral adjustment, total 560 mm. Vertical adjustment by stretching screws and horizontal adjustment on drawbar frame

Hitch: None fitted

Electrical equipment:

Voltage: 12 V
Generator: Bosch LJ/GG 130/12/2000 AR 19
Battery: 152 amp-hours
Starting device: Bosch BNG 4/12 C R 242

Overall dimensions:

Overall length: 2,96 m (3,10 m to the lower links in their highest position)
Overall width: 1,72 m (to outside of tyres)
Overall height: 2,10 m (to top of exhaust pipe)
Minimum ground clearance: 0,42 m (to rear axle, without drawbar)

Weights:

	Without additional weight, kg	With maximum additional weight, kg
On front wheels	620	680
On rear wheels	950	1800
Total	1570	2480

Section 2
Laboratory tests

I Compulsory tests: Power take-off test

Date and location of tests: August 17, 1961, Ultuna, Uppsala 7
Type of dynamometer: Hydraulic
Position of governor control: Index for p.t.o. work and fully open
Fuel: Diesel oil, density 0,827 at 20°C
Cetane No. 48
Oil: Heavy Duty, SAE 20-20 W

1. Sustained power tests

Duration of test h	Power hp_{metric}	Engine speed r/m	Torque kpm	Spec. fuel consumption g/hph	Fuel temp. °C	Oil temp. °C	Coolant temp. °C	Air temp. °C	Atmos. press. mm Hg	Remarks
2	37,2	2000	13,3	201	21	100	77	18	752	Max. power
1	21,5	1019	15,1	194	21	85	79	16	752	Speed less than at max. torque

2. Varying speed tests

Power hp_{metric}	Engine speed r/m	Fuel consumption kg/h	hph/kg	g/hph	Temperature Fuel °C	Oil °C	Coolant °C	Atmospheric conditions Temp. °C	Press. mm Hg	Remarks
30,6	1490	5,91	5,19	193	20,5	87	78	15	752	Rated speed for p.t.o. work
0,2	1741	1,66	—	—	20,5	80,5	66	14	752	Lowest recorded
37,2	2000	7,48	4,97	201	21	100	77	18	752	Rated speed for drawbar work
0,3	2208	2,41	—	—	21,5	91,5	60,5	14	752	Lowest recorded

II Supplementary tests: Belt test

Date and location of tests: August 16, 1961, Ultuna, Uppsala 7
Type of dynamometer: Electrical swinging frame
Position of governor control: Index for p.t.o. work and fully open
Fuel: Diesel oil, density 0,827 at 20°C
Cetane No. 48
Oil: Heavy Duty, SAE 20-20 W

1. Sustained power tests

Duration of test h	Power hp_{metric}	Engine speed r/m	Torque kpm	Spec. fuel consumption g/hph	Fuel temp. °C	Oil temp. °C	Coolant temp. °C	Air temp. °C	Atmos. press. mm Hg	Remarks
2	34,7	2002	12,4	215	25	102	77	20	752,5	Max. power
1	20,3	1021	14,2	204	22	86,5	79	18	752,5	Speed less than at max. torque

2. Varying speed tests

Power hp_{metric}	Engine speed r/m	Fuel consumption			Temperature			Atmospheric conditions		Remarks
		kg/h	hph/kg	g/hph	Fuel °C	Oil °C	Coolant °C	Temp. °C	Press. mm Hg	
28,5	1495	5,86	4,86	206	24,5	92	79,5	19	752,5	Rated speed for p.t.o. work
1,0	1752	1,85	—	—	23,5	83	66	19	752,5	Lowest recorded
34,7	2002	7,47	4,65	215	25	102	77	20	752,5	Rated speed for drawbar work
1,7	2200	2,65	—	—	23	92	62	20	752,5	Lowest recorded

Section 3
Drawbar tests on drum dynamometer

Date of tests: August 21—23, 1961
Type of surface: Concrete
Position of governor control: Fully open
Type of tyre: Rear, 11—28, 6-ply rating
Front, 5.50—16, 4-ply rating
Fuel: Diesel oil, density 0,827 at 20°C
Cetane No. 48
Oil: Heavy Duty, SAE 20-20 W

A. Test with maximum additional weight

Weight of tractor
without ballast: Front 620 kg, rear 950 kg
with ballast: Front 680 kg, rear 1800 kg
with ballast: Total 2480 kg

Weight of ballast
front: 60 kg (1 weight per wheel)
rear: 850 kg (6 weights per wheel, 560 kg, water 145 kg per wheel)

Tyre pressure, rear: 1,0 kp/cm²

Height of drawbar above ground: 390 mm

1. Maximum powers and pulls

Gear No.	Maximum powers								Maximum pulls	
	Power hp_{metric}	Corresponding pull kp	Wheel slip %	Engine speed r/m	Travelling speed km/h	Engine temp. °C	Air temp. °C	Atmos. press. mm Hg	Pull kp	Reason for stall
1	27,4	2207	15,8	2030	3,36	70	17	746	2208	Wheel-spin
2	32,7	1300	6,2	1998	6,80	78	20,5	746	1500	Engine stall
3	32,9	885	4,2	1995	10,03	78	21	746	1020	» »
4	31,6	520	2,7	2000	16,40	77,5	18,5	746	605	» »
5	31,4	340	1,5	2000	24,9	78	21	746	400	» »

2. Fuel consumption

Gear No.	Optimum fuel consumption			Range of pull over which specific fuel consumption does not exceed the optimum consumption by more than 10 % kp
	g/hph	hph/kg	Corresponding pull kp	
1	247	4,05	1700	1180—2180
2	219	4,56	1430	850—1500
3	218	4,59	1000	640—1020
4	222	4,50	600	415— 605
5	222	4,50	400	310— 400

B. Test without ballast

Weight of tractor
front: 620 kg
rear: 950 kg
total: 1570 kg

Tyre pressure, rear: 1,0 kp/cm²

Height of drawbar:
above ground: 390 mm

1. Maximum powers and pulls

Gear No.	Maximum powers								Maximum pulls	
	Power	Corresponding pull	Wheel slip	Engine speed	Travelling speed	Engine temp.	Air temp.	Atmos. press.	Pull	Reason for stall
	hp_{metric}	kp	%	r/m	km/h	°C	°C	mm Hg	kp	
1	18,7	1370	14,5	2140	3,68	67	18	751	1395	Wheelspin
2	31,6	1345	12,8	2015	6,34	76	19	751	1400	»
3	33,0	900	6,5	1996	9,90	78	19	745	1030	Engine stall
4	33,0	550	3,7	2010	16,20	78	19	745	630	» »
5	32,7	357	2,5	1996	24,75	78	18,5	751	415	» »

2. Fuel consumption

Gear No.	Optimum fuel consumption			Range of pull over wich specific fuel consumption does not exceed the optimum consumption by more than 10 %
	g/hph	hph/kg	Corresponding pull kp	kp
1	283	3,53	1330	920—1395
2	234	4,27	1050	720—1400
3	220	4,54	980	590—1030
4	216	4,63	615	380— 630
5	215	4,65	400	285— 415

Section 4

I Location of centre of gravity:

Tractor with tanks filled, with driver, without water in tyres and ballast weight—735 mm forward of rear wheel centre

Tractor with tanks filled, with driver, fully ballasted—519 mm forward of rear wheel centre

II Turning space and turning radius:

Type of wheels: Front 5.50—16, rear 11—28

Tread: Front 1228 mm, rear 1353 mm

Results	With brakes		Without brakes	
	Right hand	Left hand	Right hand	Left hand
Radius of turning space.....	3,1 m	3,0 m	3,5 m	3,4 m
Turning radius.....	3,0 m	2,9 m	3,4 m	3,3 m

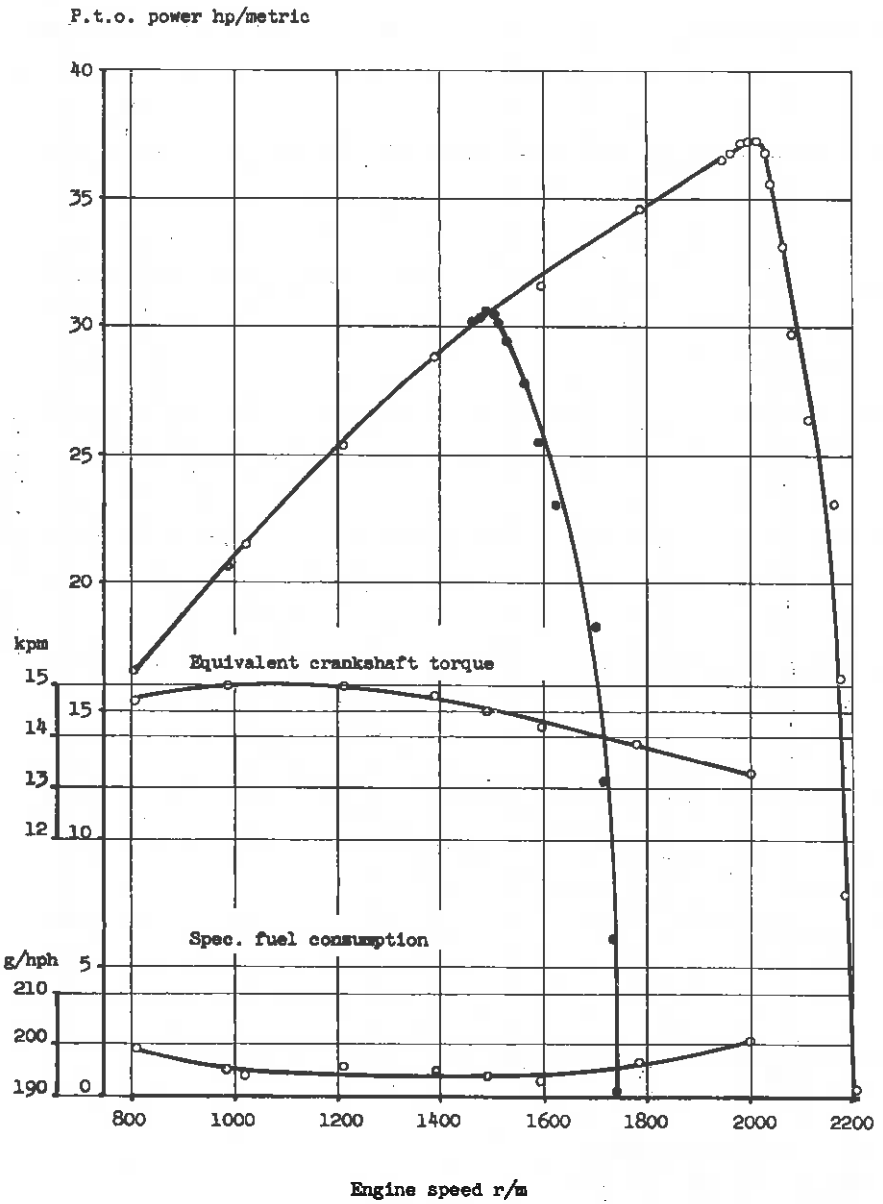
Section 5

1. Repairs and adjustments during test: None
2. Remarks: None

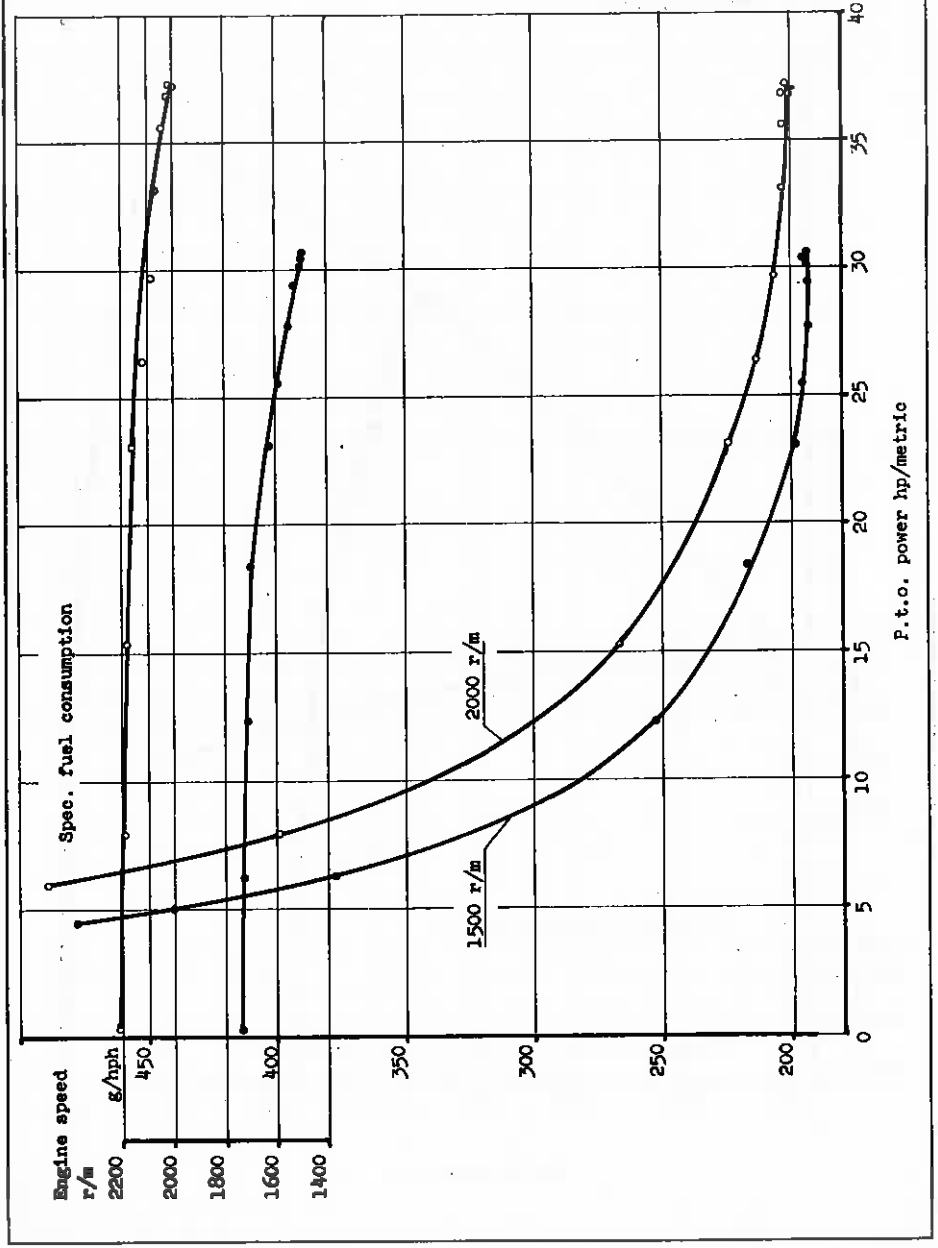
Ultuna, Uppsala 7, 15th October, 1961

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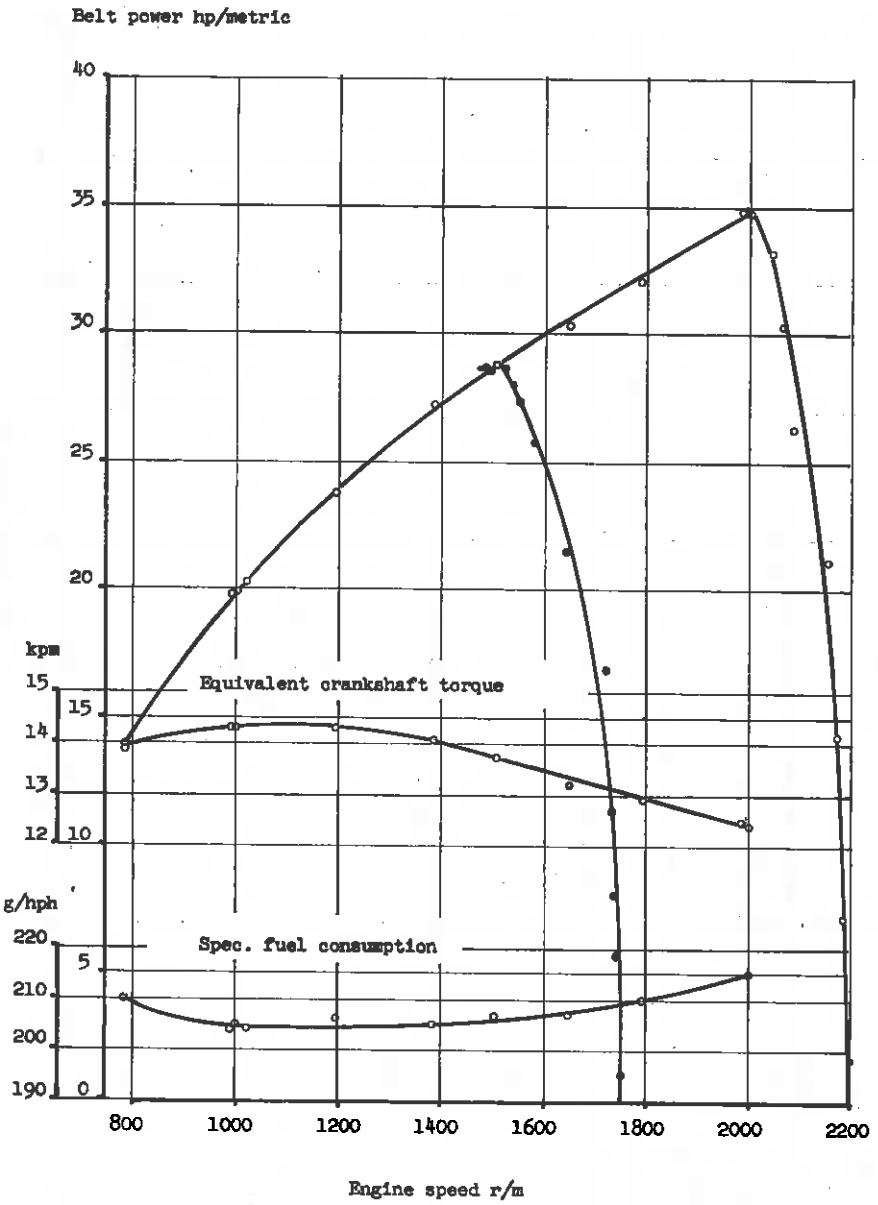
National Swedish Testing Institute for Agricultural Machinery	Power take off test BM/Volvo 320	Figure 1. 17-8-61



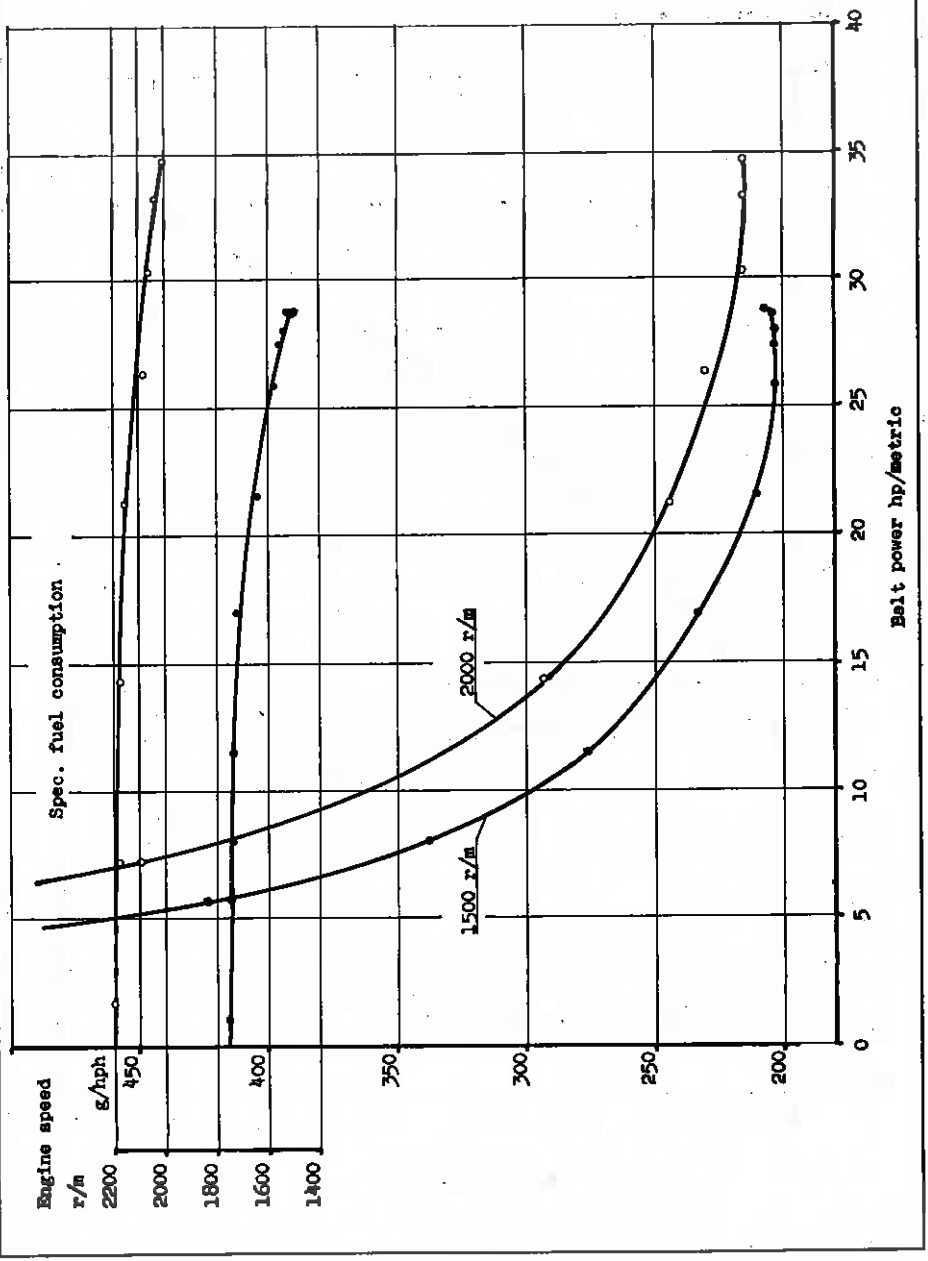
National Swedish Testing Institute for Agricultural Machinery	Power take off test BM/Volvo 320	Figure 2. 17-8-61



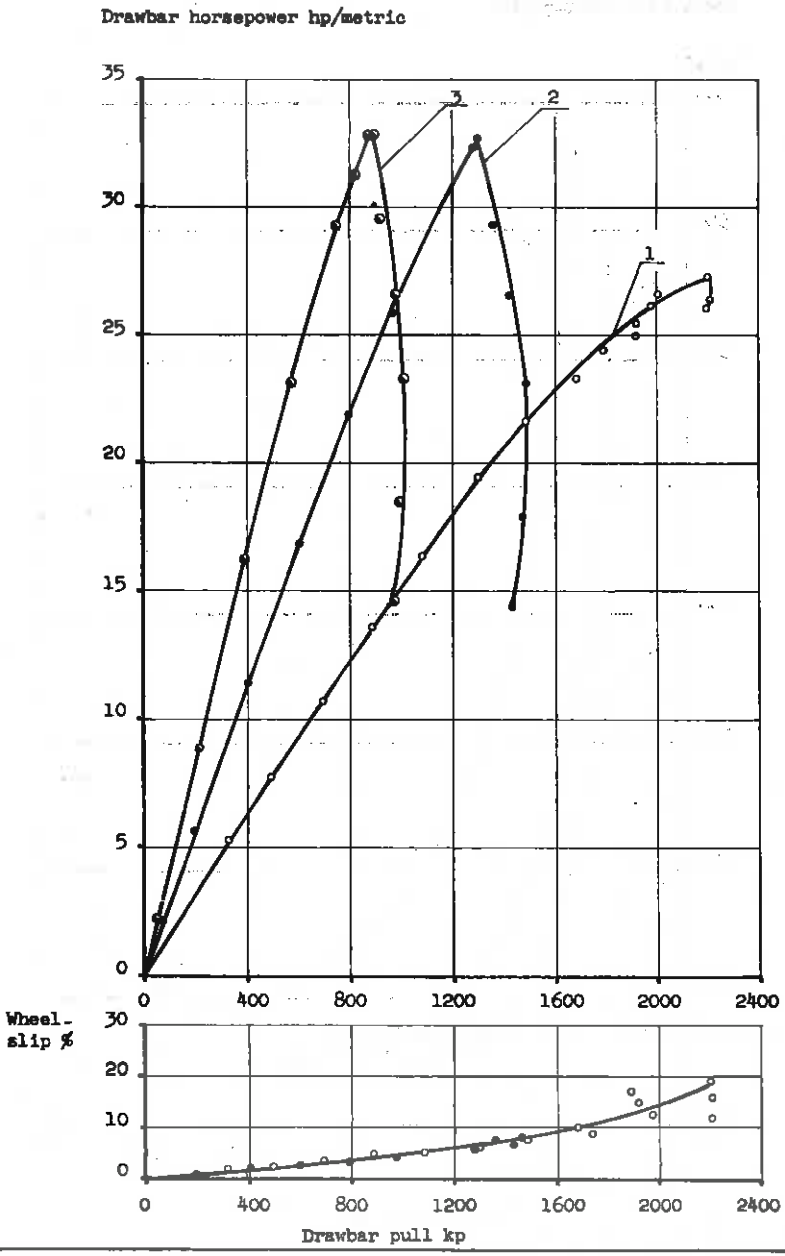
National Swedish Testing Institute for Agricultural Machinery	Belt test BM/Volvo 320	Figure 3. 16-8-61



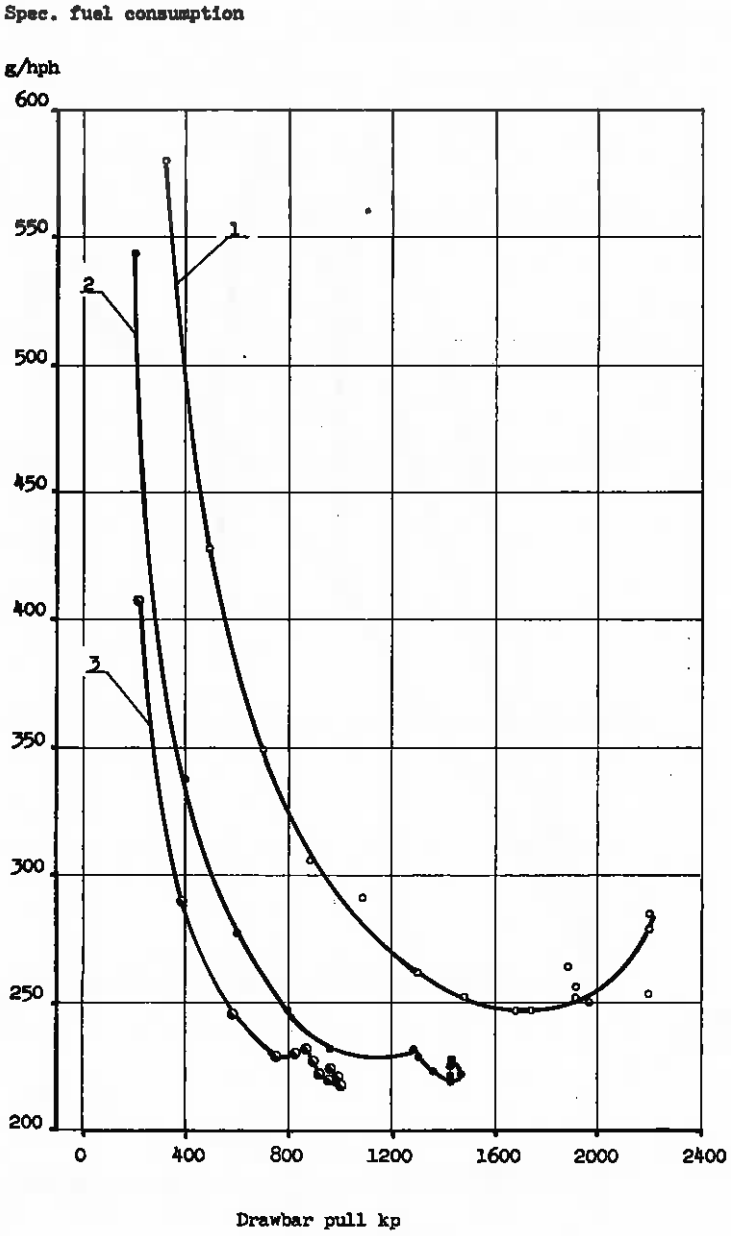
National Swedish Testing Institute for Agricultural Machinery	Belt test BM/Volvo 320	Figure 4. 16-8-61



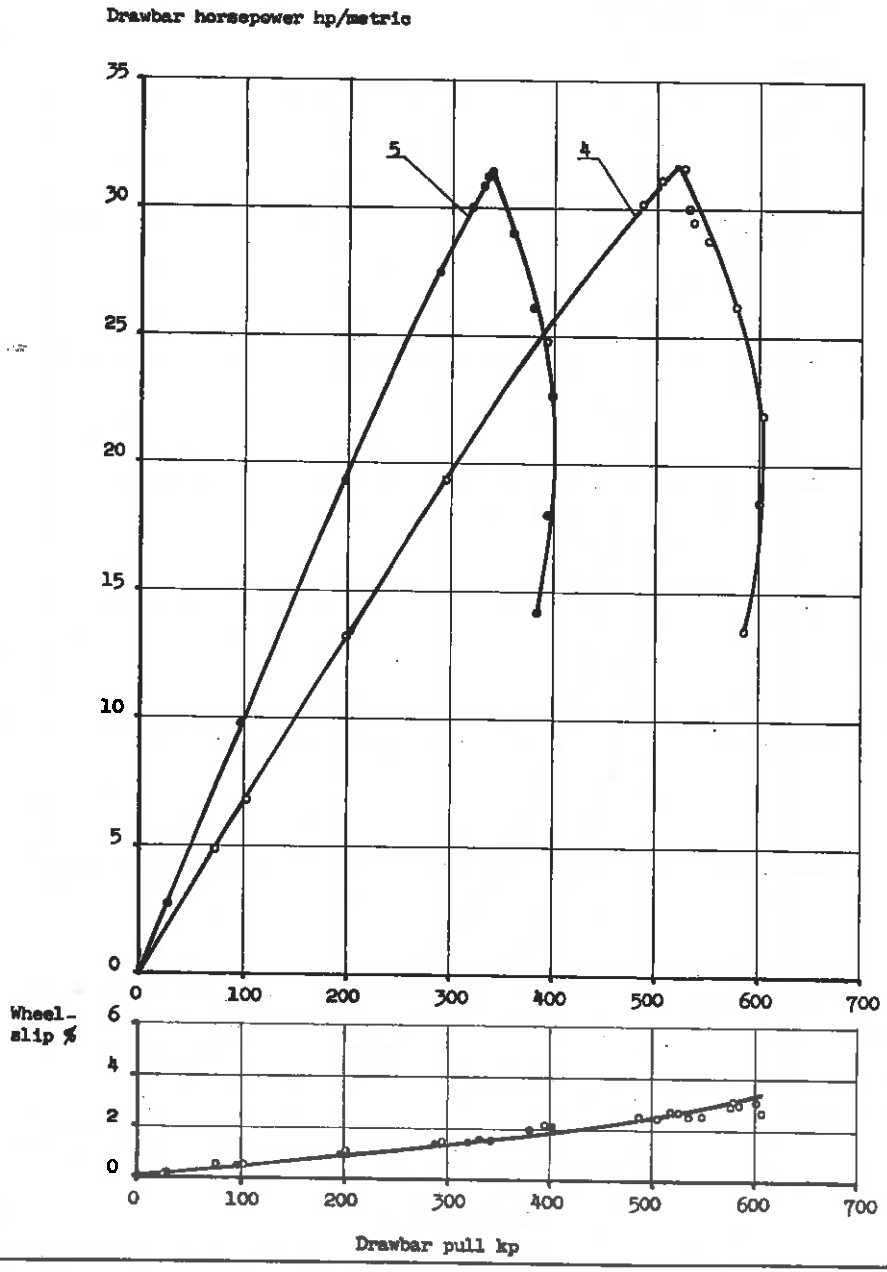
National Swedish Testing Institute for Agricultural Machinery	Drawbar test on drumdynamometer BM/Volvo 320 with ballast Gear 1, 2 and 3	Figure 5. 21-8-61



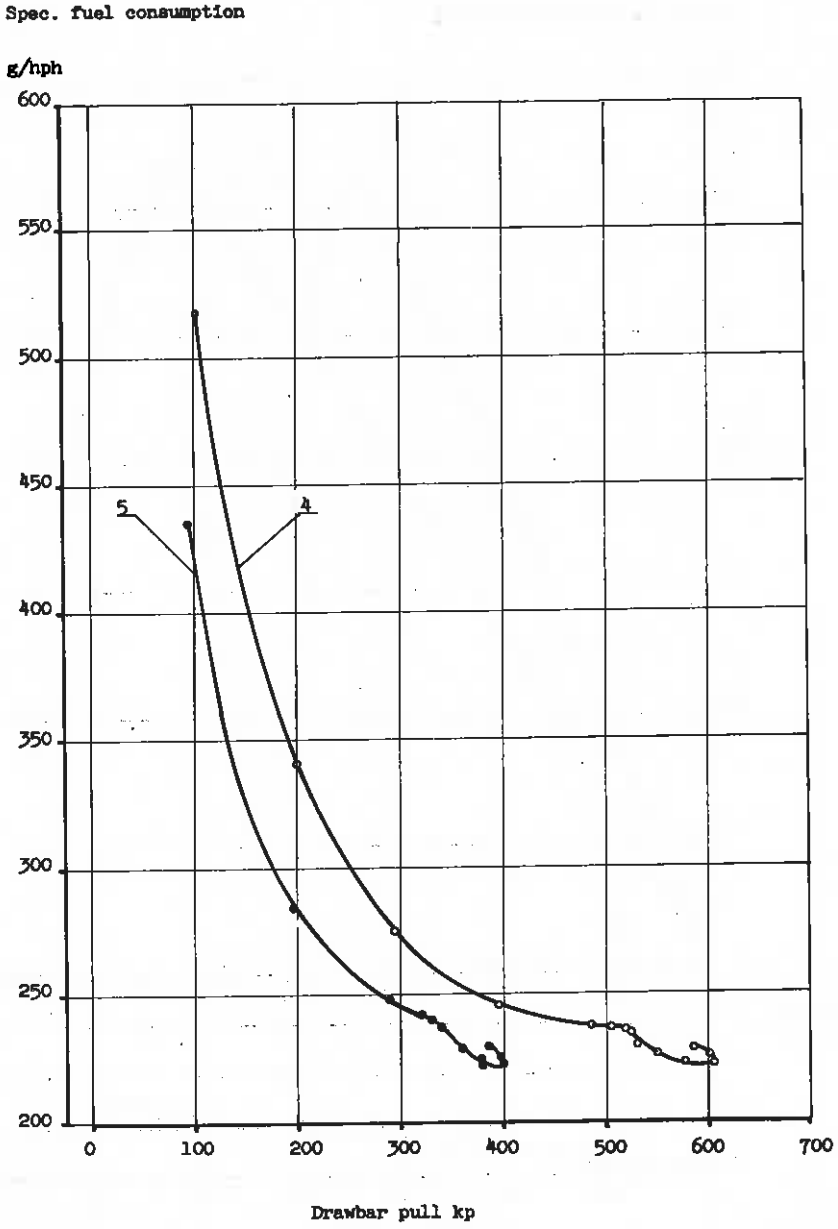
National Swedish Testing Institute for Agricultural Machinery	Drawbar test on drumdynamometer BM/Volvo 320 with ballast Gear 1, 2 and 3	Figure 6. 21-8-61



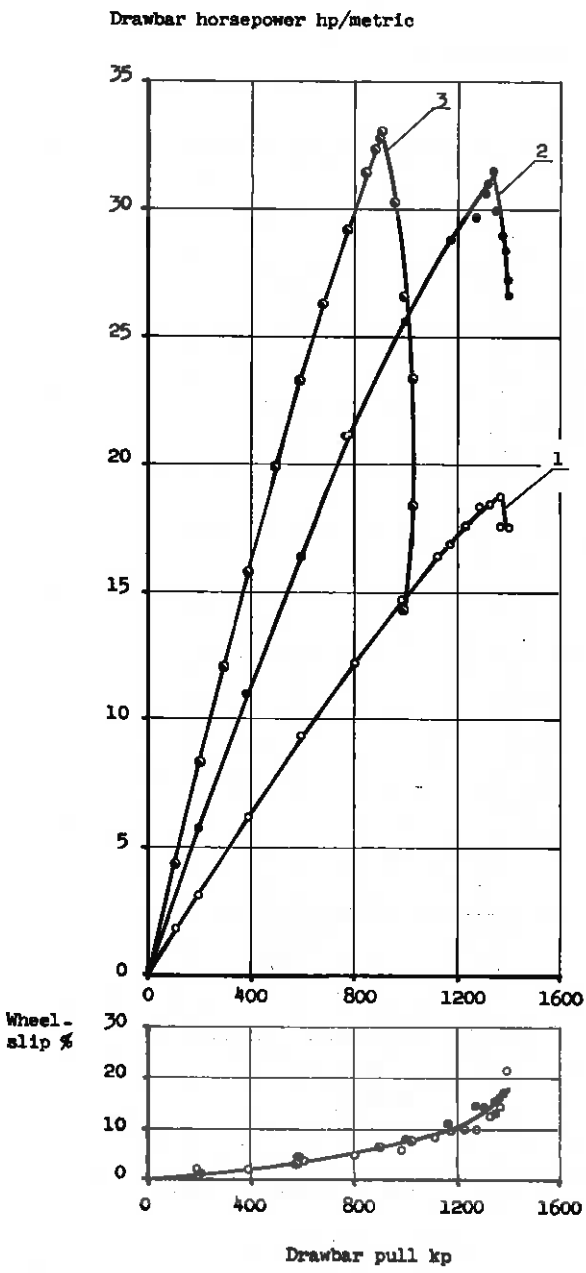
National Swedish Testing Institute for Agricultural Machinery	Drawbar test on drumdynamometer BM/Volvo 320 with ballast Gear 4 and 5	Figure 7. 21-8-61



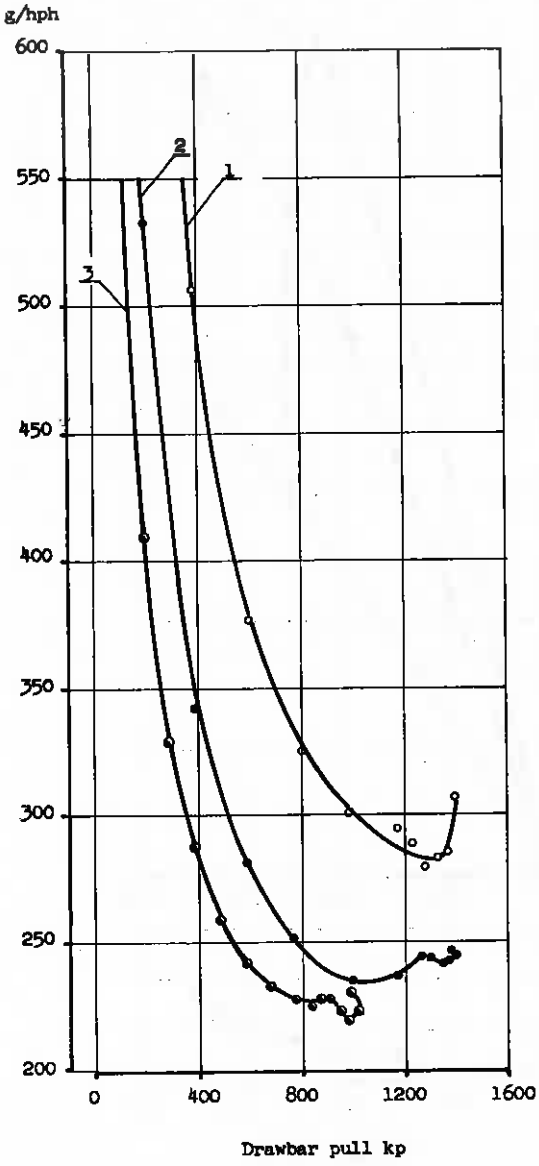
National Swedish Testing Institute for Agricultural Machinery	Drawbar test on drumdynamometer BM/Volvo 320 with ballast Gear 4 and 5	Figure 8. 21-8-61



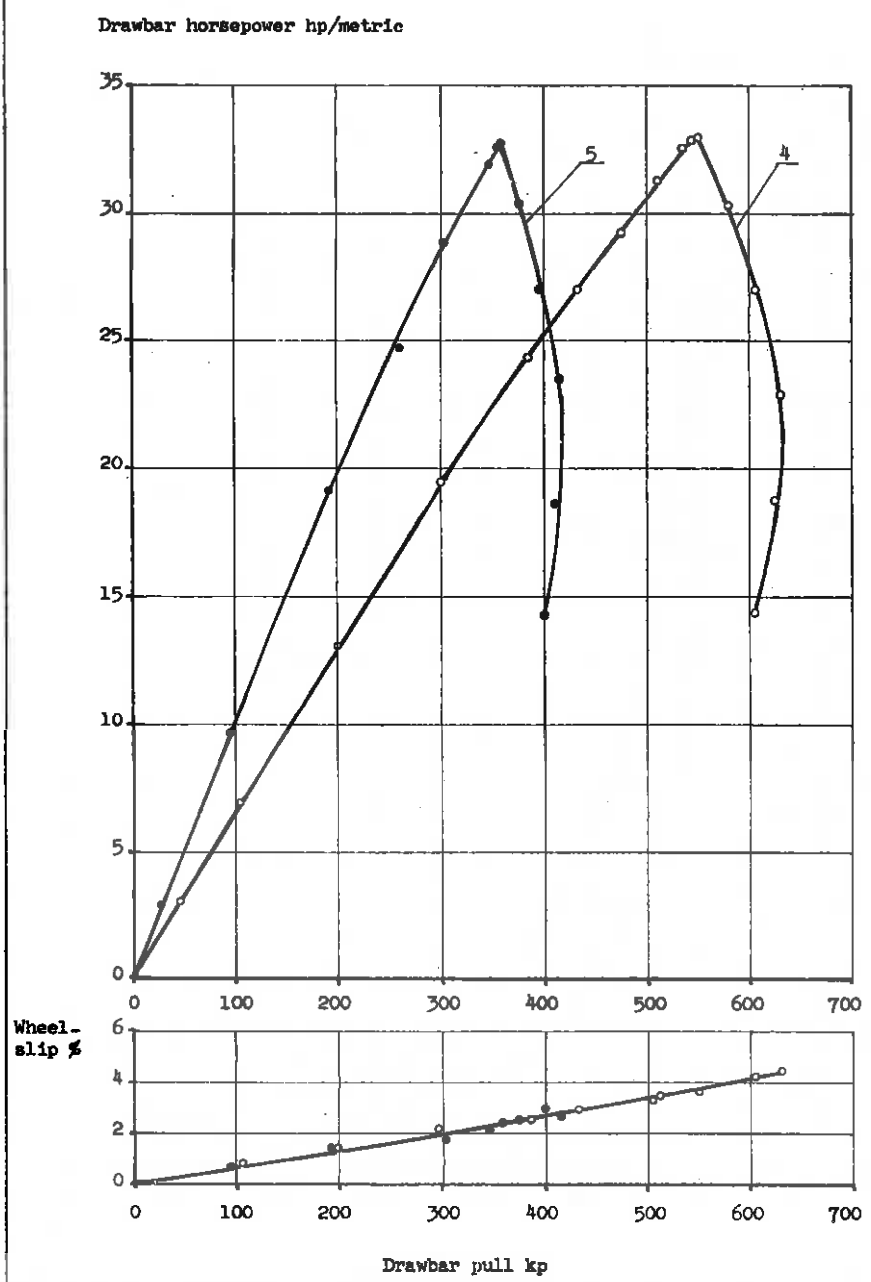
National Swedish Testing Institute for Agricultural Machinery	Drawbar test on drumdynamometer BM/Volvo 320 without ballast Gear 1, 2 and 3	Figure 9. 22/23-8-61



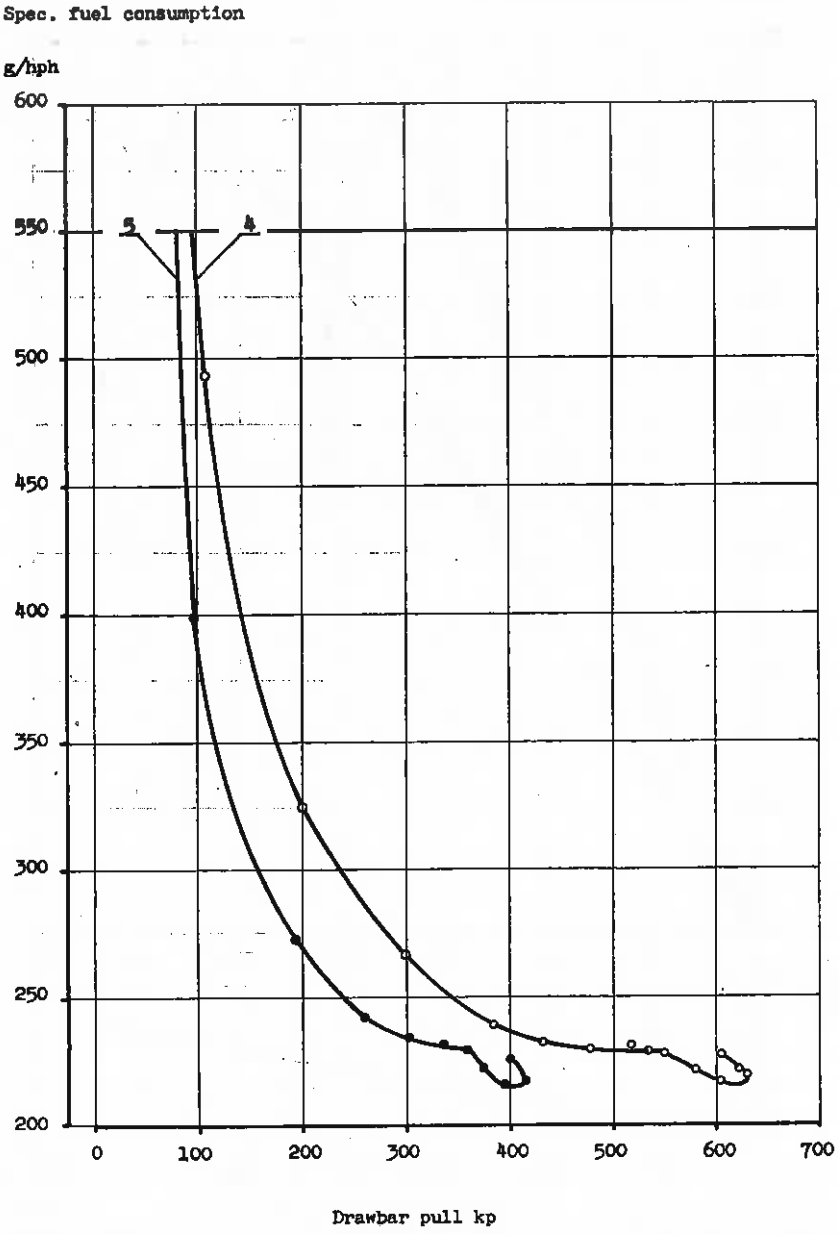
National Swedish Testing Institute for Agricultural Machinery	Drawbar test on drumdynamometer BM/Volvo 320 without ballast Gear 1, 2 and 3	Figure 10. 22/23-8-61



National Swedish Testing Institute for Agricultural Machinery	Drawbar test on drumdynamometer BM/Volvo 320 without ballast Gear 4 and 5	Figure 11. 22/23-8-61



National Swedish Testing Institute for Agricultural Machinery	Drawbar test on drumdynamometer BM/Volvo 320 without ballast Gear 4 and 5	Figure 12. 22/23-8-61



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