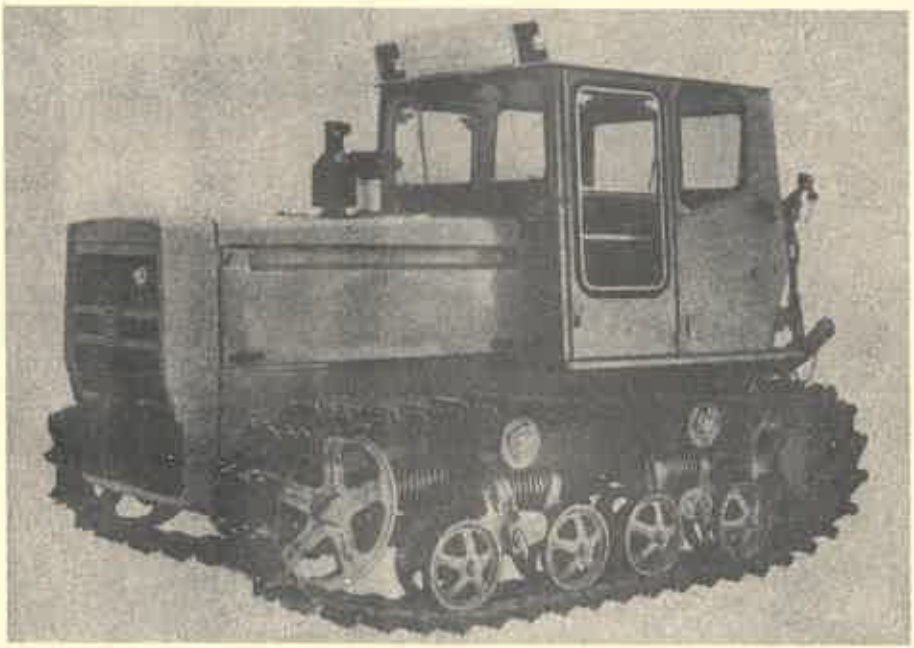
O.E.C.D. Report No. 382
Printed: Septembar 1972

Report on test in accordance with O.E.C.D. STANDARD-CODE for the Official Testing of Agricultural Tractors



TRACTOR DIESEL BNT - 70

Manufactured by: BRATSTVO - NOVI TRAVNIK
YUGOSLAVIA

Date of Tests: April - June 1971.

INSTITUT "KIRILO SAVIĆ" - BEOGRAD
INSTITUT ZA MEHANIZACIJU POLJOPRIVREDE - ZEMUN

This Bulletin is based on engineering tests accordance with the O.E.C.D. STANDARD-CODE for Official Testing of Agricultural Tractors.

It does not contain an evaluation of the performance of the Tractor on practical work.

This Report has been approved by the O.E.C.D. Co-Ordinating Centre (C.N.E.E.M.A. France) as being in accordance with the O.E.C.D. STANDARD-CODE.

Date of Approval : 21. May 1972.

Serial No.: 382

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Tractor manufacturer's name and address:	BRATSTVO - Novi Travnik, Yugoslavia
Submitted for test by:	Manufacturer
Selected by:	The representatives of the Institute for Agricultural Mechanization
Place of running in:	Institute for Agricultural Mechanization, Beograd - Zemun, Yugoslavia
Duration of running-in:	60 h

SPECIFICATION OF TRACTOR

TRACTOR

Make:	BRATSTVO - Novi Travnik, Yugoslavia
Model:	BNT -70
Type:	Crawler
Serial N°:	0098

ENGINE

Make:	FAMOS - Sarajevo, Yugoslavia
Model:	ET - 70
Type:	Water cooled 4 - stroke Diesel engine with direct injection
Serial N°:	51885

Cylinders

Number:	4
Disposition:	Vertical in line
Bore/Stroke:	112/140 mm (4,41/5,51 in)
Capacity:	5520 cm^3 (336,86 in^3)
Compression ratio:	18,0 : 1
Arrangement of valves:	Overhead valves
Cylinder liners:	Replaceable, wet liners

Fuel and injection system

Type of fuel feed:	Mechanical type feeding pump
Make, type and model of fuel filter(s):	Double filter "Tehnotrans" - Rogatica, type PG 01.000
Capacity of fuel tank:	250 lit (55,0 UK gal)
Make, type and model of injection pump:	Friedman Maier, mechanical type, with piston elements
Serial N° of injection pump:	P 24 G 9 - 3a 75 B II OVR

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Manufacturer's production setting:	Quantity of injected fuel: 78 ± 1 mm^3 ($0,00476 \pm 0,000061$ in^3) for each element at 500 rpm of injection pump Injection timing: 24 ± 2^0 before T.D.C.
Make, type and model of injectors:	Needle's type of injector's nozzles "Bosch"
Manufacturer's production setting.:	Injection pressure: 190 ± 10 kg/cm^2 (2702 ± 142 lb/in^2)
Governor	
Make:	Friedman Maier
Type:	Mechanical, centrifugal, all-range
Range of speed:	400 - 1900 rev/min
Rated speed:	1800 rev/min
Air cleaner	
Main:	
Make:	Donaldson
Type:	Dry
Oil capacity:	-
Pre-cleaner:	
Make:	Donaldson
Type:	GAH OO - 0471
Lubrication system	
Type:	Under pressure, with oil pump
Type and number of filters:	Fine filter "Ikarus" IK 730 Rough filter "Pobjeda" Tešanj
Oil capacity:	15 lit (3,30 UK gal)
Changing period:	240 hours
Cooling system	
Type:	Water cooled, with compulsory circulation
Details of pump and fan:	8 - blade belt driven fan Ø 540 mm (Ø 21,26 in)
Coolant capacity:	30 lit (6,60 UK gal)
Means of temperature control:	Thermostat

Pressure details:	Open system
Starting system	
Make:	Iskra - Kranj, Yugoslavia
Type:	Electrical starter SL3 - 24/11 TI - D, alternatively SL 3/N - 24/4/11 TI - D
Aids for cold starting:	Automatical heater
Electrical system	
Voltage:	24 V
Generator:	Direct current generator
Make:	Iskra - Kranj, Yugoslavia
Type:	DGD - 24/300/1300 M/2 TI - D or DGD - 24/300/1300 I/2 TI - D
Battery:	
Make:	Munja - Zagreb, Yugoslavia
Type:	12 - 84 N 6, with leaden plates
Capacity and rating:	2 batteries a 12 V, serial connected, capacity of one battery 84 Ah
TRANSMISSION	
Clutch	
Make:	Famos - Sarajevo, Yugoslavia, according to the construction of factory Bratstvo
Type and diameter of discs:	Dry single clutch with 2 discs Ø 355 mm (Ø 13,98 in)
Method of operation:	Operated mechanically, by single foot pedal
Gearbox	
Make:	Bratstvo - Novi Travnik, Yugoslavia
Type:	Mechanical
Number of gears:	5 forward and 1 reverse
Rear axle and final drive	
Make:	Bratstvo - Novi Travnik, Yugoslavia
Type:	One pair of bevel gears and one pair of spur gears
Differential lock:	None
Type:	-

Method of operating lock: -

Details of transmission if other than above: -

Oil capacity

Gear box and middle part of rear axle: 9 lit (1,98 UK gal)

Final drive(s): 2 x 1,7 lit (2,x 0,374 UK gal)

Changing period: 480 - 500 hours

Gear No.	Number of engine revolutions for one revolution of driving sprocket	Nominal travelling speed for 1800 rev/min rated speed of engine km/h	(mile/h)
Forward			
1	62,88	3,48	(2,16)
2	48,61	4,51	(2,80)
3	41,60	5,26	(3,27)
4	35,93	6,10	(3,79)
5	28,58	7,66	(4,76)
Reverse			
1	94,32	2,32	(1,44)

Power take off

Main

Location: At rear of tractor, on the distance of 97,5 mm (3,84 in) to the left of the longitudinal axis of tractor.

Dimensions: Ø 34,9 mm (13,80 in)

Type of drive: Direct proportional to the engine speed.

No. of splines: 6

Whether these are ISO standard: Yes

Height above ground: 765 mm (30,12 in)

Proportional engine speed: 523 rpm of p.t.o. shaft at 1800 rpm of engine

Engine speed: 1858 rpm of engine at standard p.t.o. speed of 540 rpm.

Direction of rotation: Clockwise viewed facing driving end.

Ground speed None

Details of other power take-off, if any:	Drive of p.t.o. shaft of 540 rpm through the connection shaft and reduction gearbox fitted at the end of the con - nection shaft. Ratio between the engine rpm and connection shaft rpm: 2,375 (758 rpm of connection shaft at 1800 rpm of engine). As a possible option a multiplying gearbox fitted at the end of the connection shaft in order to obtain 1000 rpm p.t.o. is available.

POWER LIFT

Make:	Bratstvo - Novi Travnik
Type:	Hydraulic, with 3-point and 2-point linkage system
Oil capacity:	25 lit (5,50 UK gal)
Category:	III
Description of controls:	Position control
External tappings:	None
Pump:	
- Type:	Gear type
- Working pressure:	100 atm (1422 lb/in^2)
- Type of drive:	Direct from the engine
Cylinder(s) of the Power Lift system:	
- Number of cylinders:	One
- Type:	Double acting

DRAWBAR

Type:	Stiff
Height above ground:	395 mm, 425 mm, 510 mm and 540 mm (15,55 in), (16,73 in), (20,08 in) and (21,26 in)
Distance from rear axle:	Horizontal 550 mm (21,65 in)
Lateral adjustment:	In steps to the left and to the right for distance of 90 mm and 180 mm (3,54 in) and (7,09 in).

HITCH

Two hitches welded on the front side of the frame on the mutual distance of 860 mm (33,86 in). Hight above ground of hitches 420 mm (16,54 in).

STEERING

Make:	Bratstvo - Novi Travnik, Yugoslavia
Type:	Lateral clutches in combination with band brakes on separate drums
Method of operation:	By acting the lever (handle) the late - ral clutch will be detached, respecti- vely running of the corresponding track of tractor will be eliminated. By acting the foot pedal, the brake of the cor - responding halfshaft will be put into the action.

BRAKES

Make:	Bratstvo - Novi Travnik
Type:	Band type
Method of operation:	Mechanical
Type of parking brake:	Parking latch

TRACKS

Type:	Open type, with seven joints
Number of track plates:	43
Width of track plates:	390 mm (15,35 in) and 525 mm (20,67 in) during the tests: 390 mm (15,35 in)
Grouser height:	45 mm (1,77 in)
Track pitch:	170 mm (6,69 in)
Size of pins:	Ø 22 mm x 425 mm (Ø 0,87 in x 16,73 in)
Track gauge:	1435 mm (56,50 in)
Length of track in ground contact:	1770 mm (69,68 in)
Nominal ground pressure:	0,40 kg/cm^2 (5,69 lb/in^2)
Driving sprocket:	
Pitch circle diameter:	664 mm (26,14 in)
Number of teeth:	12
Face width:	45 mm (1,77 in)
Suspension:	

Type:	Elastic type of suspension: each track has two balancing units with 4 rollers of 350 mm (13,78 in) dia. The spiral balancing spring is situated horizontally.
Details of idler wheels:	With double rim of 600 mm (23,62 in) dia: tightening by menas of two spiral springs:
Details of top and bottom rollers:	Two top rollers of 210 mm (8,27 in) dia on each track. Four bottom rollers on each balancing unit.
Lubrication:	Grease points on the bearings of balancing units, of top and bottom rollers and of idle wheels.

WEIGHTS

Tractor (without driver but with tanks full):	6445 kg (14209 lb)

SEAT

Make:	Vaso Miskin Crni – Sarajevo, Yugoslavia
Type of suspension:	Stiff
Type of damping:	Sponge and springs
Range of adjustments:	In 2 steps – horizontally 40 mm (1,57 in) – vertically 30 mm (1,18 in)

NUMBER OF GREASE POINTS

(whole tractor)	32

OVERALL DIMENSIONS

Overall length:	
– with linkage of hydraulic system	4245 mm (167,13 in)
– without linkage of hydraulic system (with drawbar)	3725 mm (146,65 in)
Overall width:	1880 mm (74,02 in)
Overall height (measured on the driver's cab):	2570 mm (101,18 in)
Special remarks:	–

LIGHTING

	Height above ground of centre-		Diameter		Distance from outside edge of tractor to centre	
	cm	(in)	cm	(in)	cm	(in)
Headlights	231,5	(91,14)	13,0	(5,12)	44,5	(17,52)
Rear lights	225,0	(88,58)	13,0	(5,12)	54,0	(21,26)

Unrestricted beam angle of headlight in plan view: 35^{o}

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FUELS AND LUBRICANTS USED IN TESTS

LABORATORY AND TRACK TESTS

Fuel:

Type:	Commercial Diesel oil D_2
Specific gravity at 15 °C (59 °F):	0,828 gr/cm^3 (0,03 lb/in^3)
Cetane number:	57

Engine oil:

Type:	SAE 30 Super HD S 3
Viscosity:	According to SAE Standard

Transmission oil:

Type:	Hypenol SAE 140
Viscosity:	According to SAE Standard

Hydraulic fluid:

Type:	SAE 30 Super HD S 3
Viscosity:	According to SAE Standard

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COMPULSORY TESTS

(1) ENGINES PERFORMANCE AT THE MAIN P.T.O.: SHAFT

Date and location of tests: 13th April 1971 Institute for Agricultural Mechanization, Beograd-Zemun, Yugoslavia

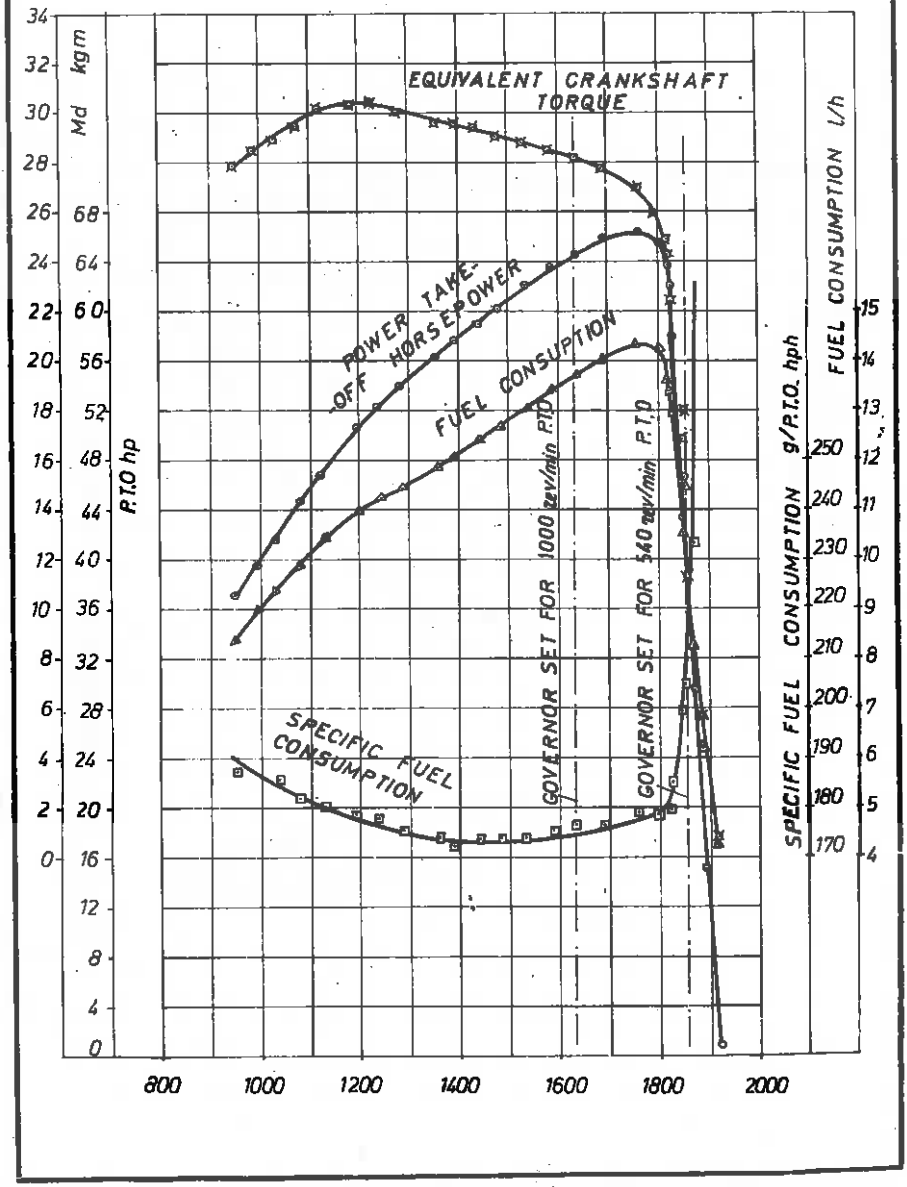
Type of dynamometer: Hydraulic brake "Schenk" U 1- 30

Horsepower	Speed		Fuel consumption		
	Engine	P.T.O.	Per hour	Specific	Hp hour/unit of volume
metric hp (UK HP)	rpm	rpm	l/h (UK gal/h)	g/met hph (lb/HPh)	metric hph/lit (HPh/UK gal)
MAXIMUM POWER - 2 hour test					
66,20 (65,25)	1762	513	14,32 (3,16)	179,0 (0,401)	4,62 (20,62)
STANDARD P.T.O. SPEED (540 rev/min)					
46,60 (45,90)	1585	540	11,50 (2,53)	204,0 (0,457)	4,05 (18,14)
STANDARD P.T.O. SPEED (1000 rev/min)					
64,20 (63,30)	1636	476	13,72 (3,02)	177,0 (0,397)	4,68 (21,02)
SPEED RECOMMENDED BY MANUFACTURER FOR DRAWBAR WORK					
66,20 (65,25)	1762	513	14,32 (3,16)	179,0 (0,401)	4,62 (20,62)
PART LOADS					
(i) 85 % of torque at maximum power					
58,00 (57,20)	1830	532	12,97 (2,86)	185,5 (0,415)	4,46 (19,99)
(ii) unloaded					
0,97 (0,96)	1920	558	4,28 (0,94)	3660,0 (8,200)	0,23 (1,02)
(iii) 50 % of the load defined in (i)					
29,50 (29,10)	1870	544	8,34 (1,84)	234,5 (0,525)	3,54 (15,80)
(iv) maximum power					
66,20 (65,25)	1762	513	14,32 (3,16)	179,0 (0,401)	4,62 (20,62)
(v) 25 % of the load defined in (i)					
14,95 (14,75)	1890	549	6,21 (1,37)	343,5 (0,769)	2,41 (10,77)
(vi) 75 % of the load defined in (i)					
43,60 (43,00)	1847	536	10,54 (2,32)	200,0 (0,448)	4,14 (18,54)

No load, maximum engine speed:	1920 rev/min
Equivalent crankshaft torque at maximum power:	26,85 kgm (193,87 lbft)
Maximum equivalent torque:	30,46 kgm (220,32 lbft) at 1238 rev/min engine speed
Mean atmospheric conditions:	
Temperature:	26 °C (24 - 28 °C) 79 °F (75 - 82 °F)
Pressure:	760,2 mm Hg (29,93 in Hg)
Relative humidity:	52 %
Maximum temperature:	
Coolant:	90 °C (194 °F)
Engine oil:	88 °C ((190 °F)
Fuel:	22 °C (72 °F)

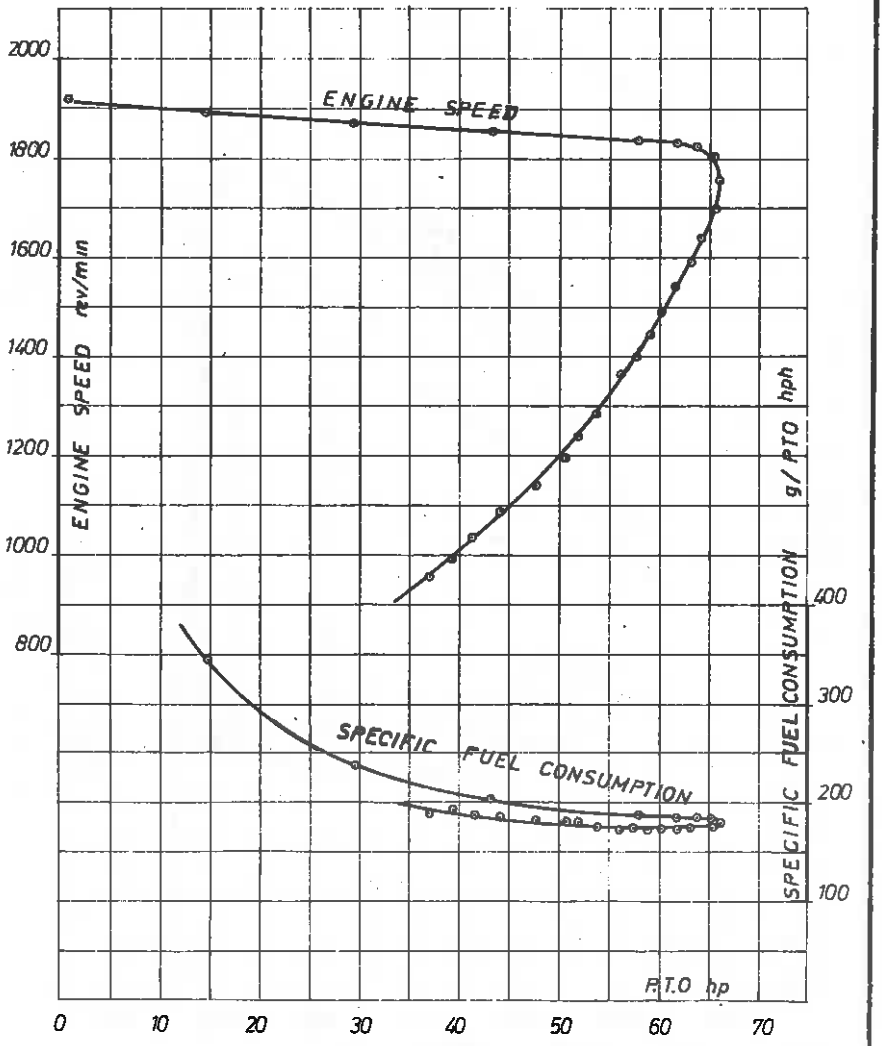
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(2) DRAWBAR PERFORMANCE

Date of tests: 10th May 1971
Type of track: Grassland
Height of drawbar above ground: 395 mm (15,55 in)

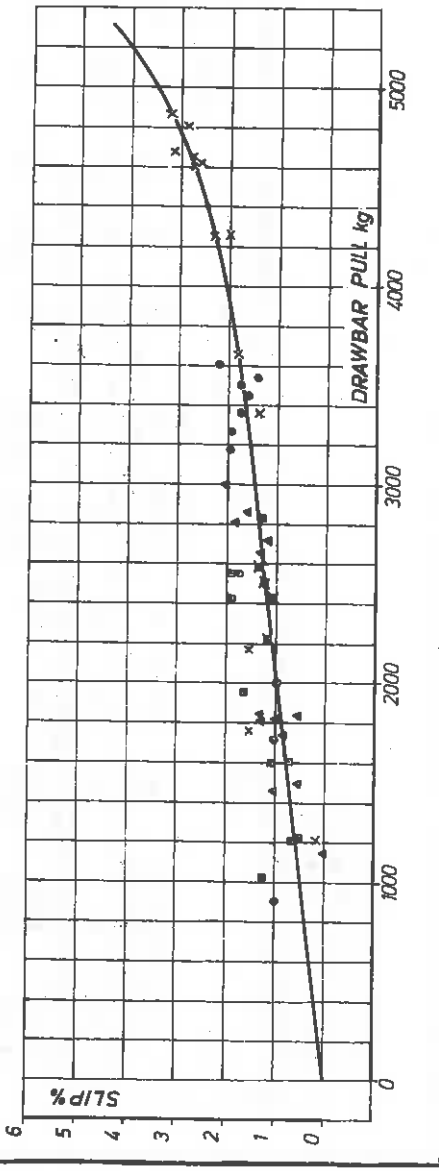
Gear	Speed	Horsepower	Drawbar pull	Engine speed	Track-slip	Specific work	Specific fuel consumption	Temperature			Atmospheric conditions		
								Coolant	Fuel	Engine oil	Tempe-rature	Rela-tive humi-dity	Pres-sure
	km/h (mile/h)	metric hp (UK HP)	kg (lb)	rev/min	%	hph/lit (drawbar HPh/UK gal)	g/hph (lb/ draw HPh)	°C (°F)	°C (°F)	°C (°F)	°C (°F)	%	mm Hg (in Hg)
(1)	(2)	(3) =	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(i)	MAXIMUM POWER (Tractor unballasted - the ballast is not foreseen by the construction)												
1.	3,45 (2,14)	54,30 (53,49)	4250 (9367)	1740	2,31	3,67 (16,45)	225 (0,504)	33 (91)	88 (190)	82 (180)	26 (79)	46,0	762,8 (30,03)
2.	4,50 (2,80)	52,50 (51,71)	3160 (6965)	1755	1,50	3,54 (15,86)	234 (0,524)	32 (90)	88 (190)	81 (178)	26 (79)	46,0	762,8 (30,03)
3.	5,18 (3,22)	50.63 (49,87)	2640 (5819)	1765	1,38	3,41 (15,28)	240 (0,538)	32 (90)	87 (189)	82 (180)	25 (77)	45,0	762,8 (30,03)
4.	5,66 (3,52)	49,00 (48,27)	2340 (5157)	1770	1,12	3,29 (14,74)	252 (0,564)	31 (88)	87 (189)	82 (180)	25 (77)	45,0	762,8 (30,03)
5.	7,15 (4,44)	42,35 (41,71)	1600 (3526)	1780	0,79	2,84 (12,73)	278 (0,623)	31 (88)	88 (190)	83 (181)	26 (79)	45,0	762,8 (30,03)
(ii)	TEN HOUR TEST at 75 % of pull at maximum power												
3.	5,50 (3,42)	4 ,75 (41,12)	2050 (4518)		1,05	2,98 (13,35)	278 (0,623)	31 (88)	82 (180)	74 (165)	26 (79)	45,0	760,0 (29,92)

Total oil consumption during ten hours duration of test (ii): . . . . . 36,8 gr/h (0,081 lb/h)
Maximum drawbar pull 4870 kg (10737 lb) at trackslip of 3,2 %

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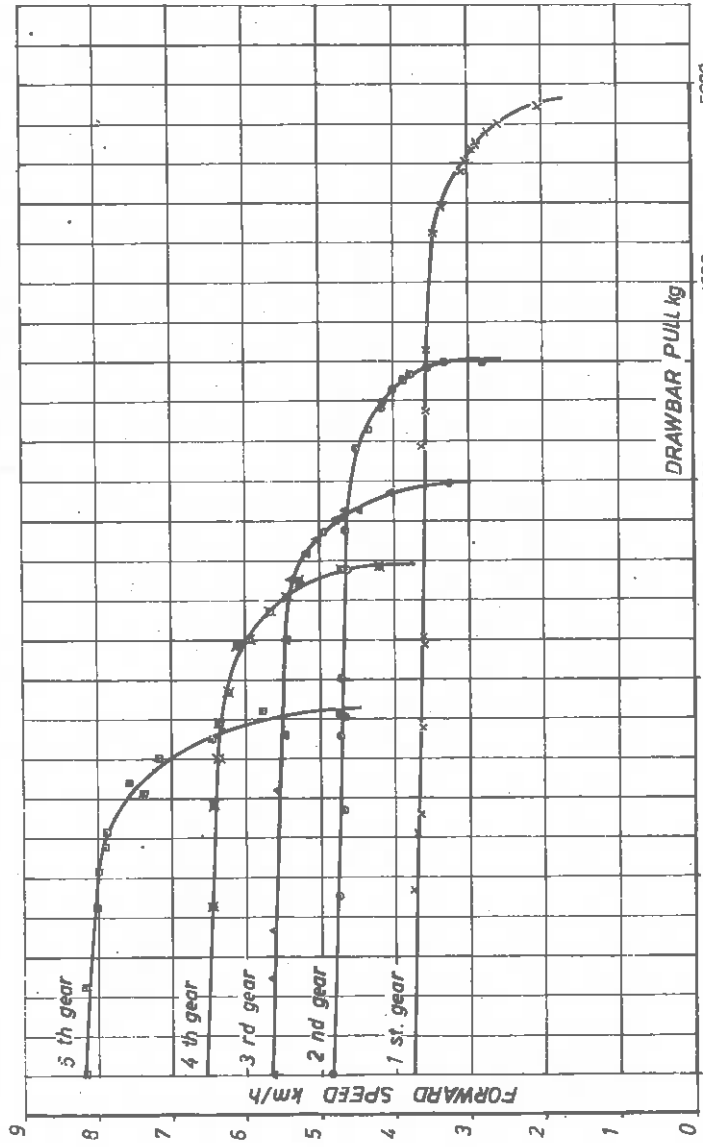
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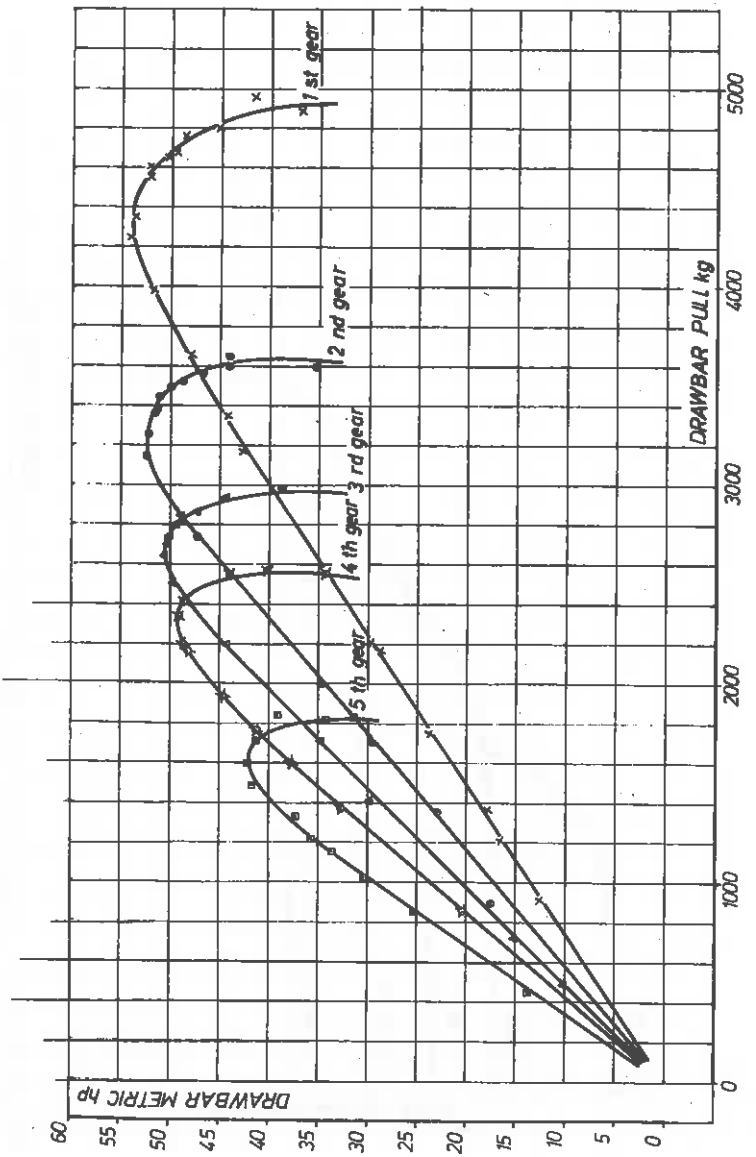
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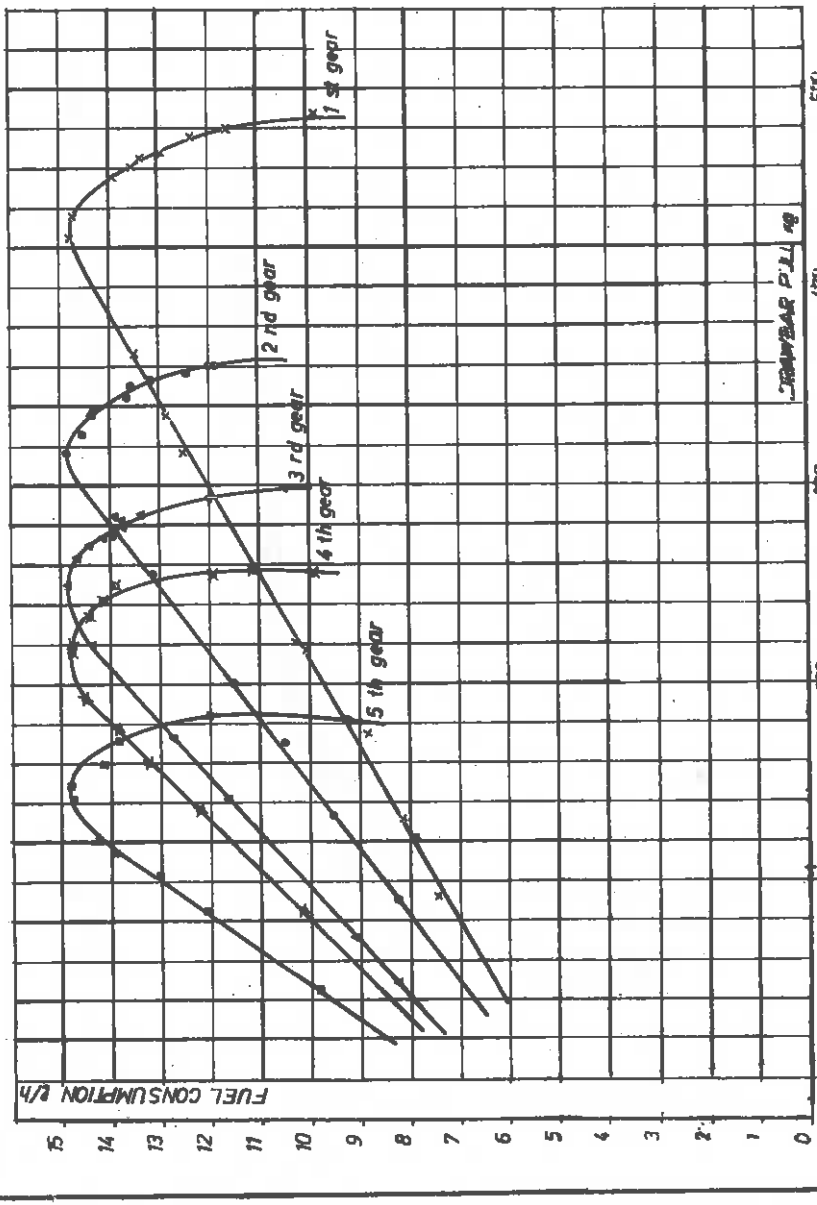
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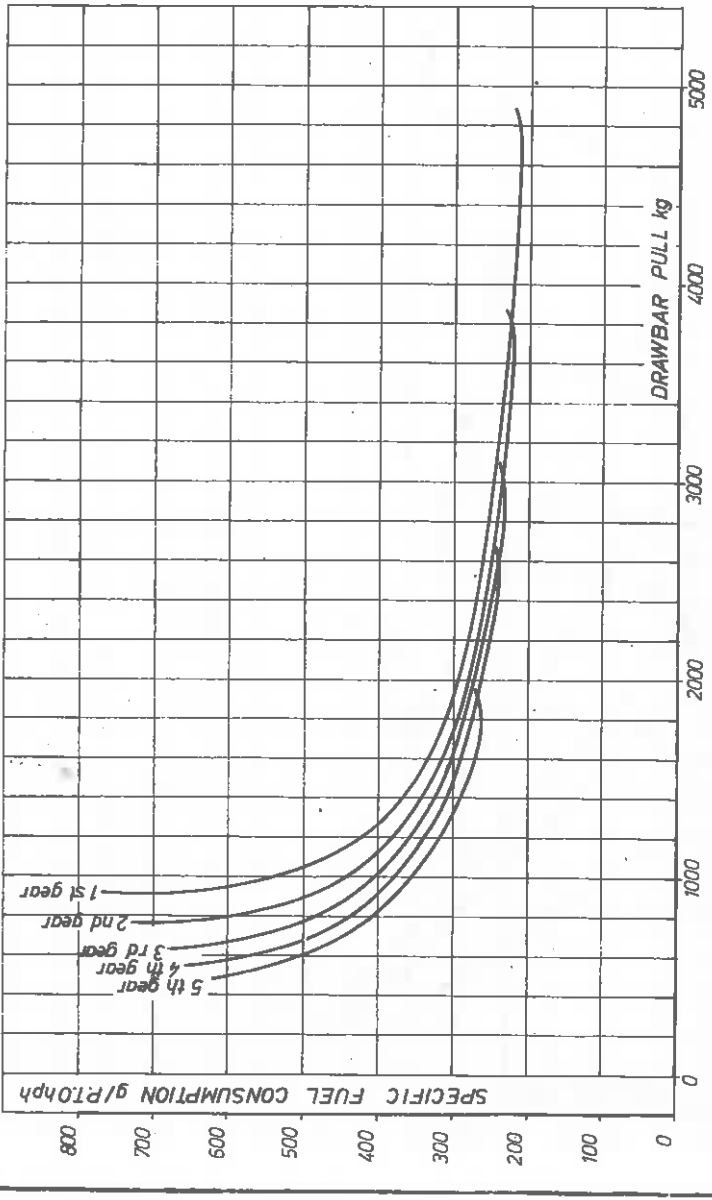
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(3) TURNING SPACE AND TURNING CIRCLE
Width of tracks 1435 mm (56,50 in)

	With brakes	
	Right hand	Left hand
Radius of turning circle	2120 mm (6,98 ft)	2120 mm (6,98 ft)
Radius of turning space	2680 mm (8,80 ft)	2680 mm (8,80 ft)

(4) LOCATION OF CENTRE OF GRAVITY

Height above ground:	705 mm (27,76 in)
Distance forward from the vertical plane containing the axis of the driving sprocket:	1265 mm (49,81 in)
Distance from the median plane:	10,5 mm (0,41 in) to the left

(5) NOISE MEASUREMENT AT THE DRIVER'S EAR LEVEL

Date of tests:	20th May 1971
Type of sound level meter and octave filter:	Precision Sound Level Meter Type 2203 + Octave Filter Set Type 1613, both of the firm Bruel & Kjaer
Type of track:	Grassland
Type of frequency analyser:	Octave filter according to I E C
Results of test (tractor with the cab):	Gear: 5 th Travelling speed: 7,2 km/h (4,46 mile/h) Sones: 107,1 Remark: In no gear was recorded the noise over 1 dB higher from the noise recorded in the 5-th gear.

(6) POWER LIFT AND HYDRAULIC PUMP PERFORMANCE

Date and location of tests:	16th May 1971, Institute for Agricultural Mechanization, Beograd-Zemun, Yugoslavia
Hydraulic fluid: Make and type:	Hydraoil, respectively SAE
Viscosity:	Winter period: Hydraoil 50, respectively SAE 20 Super HD S 3 Summer period: Hydraoil 90, respectively SAE 30 Super HD S 3

(Further data after "Results of Tests")

R E S U L T S O F T E S T S

HEIGHT ABOVE GROUND IN DOWN POSITION AT HITCH POINTS		VERTICAL MOVEMENT		MAXIMUM FORCE EXERTED THROUGH FULL RANGE		PRESSURE		LIFTING FORCE WHEN FRONT OF TRACTOR LIFTS	
mm	(in)	mm	(in)	kg	(lb)	kg/cm^2	(lb/in^2)	kg	(lb)
i)) TWO-POINT LINKAGE									
Linkage giving maximum mechanical advantage									
310	(12,20)	1025	(40,35)	3380	(7452)	140	(1991)	1990	(4387)
Linkage giving minimum mechanical advantage									
205	(8,07)	1120	(44,09)	3350	(7385)	142	(2020)	1990	(4387)
ii) THREE-POINT LINKAGE									
Linkage giving maximum mechanical advantage									
320	(12,60)	1110	(43,70)	3250	(7165)	142	(2020)	1940	(4277)
Linkage giving minimum mechanical advantage									
215	(8,46)	1180	(46,46)	3220	(7099)	142	(2020)	1940	(4277)

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Viscosity index:	According to the Standard	
Type of linkage lock for transport:	Chains	

Pump characteristics

i) Opening pressure of the relief valve:	152 kg/cm^2	(2162 lb/in^2)
Sustained pressure by the open relief valve:	146 kg/cm^2	(2077 lb/in^2)
ii) Pump delivery rate at minimum pressure and rated engine speed:	81,2 lit/min	(17,90 UK gal/min)
iii) Pump delivery rate:	68,7 lit/min	(15,10 UK gal/min)
Delivery pressure:	133 kg/cm^2	(1892 lb/in^2)
Power:	20,4 metric hp	(20,1 HP)

Test Engineer: Dr. M. STEGENŠEK, and
S. ČANADI

Officer in charge: N. MILOVANOVIĆ

Director: V. VIDAKOVIĆ

Date 30th December 1971.