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

MITSUBISHI FARM TRACTOR D 2500

Manufactured by: Mitsubishi Heavy Industries Ltd.
Sagamihara Machinery Works,
Kanagawa, Japan



Test No.: 49004/O.E.C.D.
Date of test: October 1974

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: 15th April, 1975 Serial No.: 475

, INSTITUTE OF AGRICULTURAL MACHINERY

OMIYA SAITAMA JAPAN

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Tractor manufacturer:	Mitsubishi Heavy Industries Ltd. Sagamihara Machinery Works Kanagawa, Japan
Submitted for test by:	The manufacturer
Selected by:	The manufacturer with the agreement of the I. A. M.
Place of running-in:	Mitsubishi Limited
Duration of running-in:	63 hours

SPECIFICATION OF TRACTOR

Tractor

Make:	Mitsubishi Heavy Industries Ltd.
Model:	Mitsubishi farm tractor D 2500
Type:	Four wheel, rear wheel driven
Serial No.:	M63-81007

Engine

Make:	Mitsubishi Heavy Industries Ltd.
Model:	MITSUBISHI 2DR7
Type:	Water cooled, 4 stroke, indirect injection diesel
Serial No.:	31011
Cylinders:	2 cylinders, vertical in line, 94 mm bore x 98 mm stroke, capacity 1360 cm^3, compression ratio 20 : 1, overhead valves, monoblock construction
Fuel system:	Gravity feed, TOKYO ROKI replaceable paper filter, fuel tank capacity 30 l, NIPPON DENSO PES 2A injection pump, serial No. IMO138, manufacturer's production setting for injection pump; 0.042 cm^3/stroke at 2500 rev/min engine speed, NIPPON DENSO ND-DN4SD24 injector nozzles, injection pressure 120 kg/cm^2
Governor:	NIPPON DENSO centrifugal variable speed governor, governed range of engine speed 900-2750 rev/min, rated engine speed 2500 rev/min
Air cleaner:	TOKYO ROKI dry type with replaceable paper element, pre-cleaner none
Lubrication system:	Forced feed from gear-type pump with metal strainer in sump, replaceable cartridge-type paper element full flow filter, oil capacity 5 l, recommended oil change period 100 hours, cartridge change period 100 hours, recommended oil viscosity HD SAE 10W/30
Cooling system:	Water cooled, impeller assisted with 325 mm dia 6-blade belt driven fan, cooling water capacity 5.0 l, pressurized at 0.7 kg/cm^2
Starting system:	Electrical, 12V MITSUBISHI ELECTRIC MOO5T 20071 solenoid engaged starter moter, electrical glow plug and excess fuel injection for cold starting
Electrical system:	Voltage: 12, negative earth Generator: MITSUBISHI ELECTRIC AH 2015S Battery: JAPAN STORAGE BATTERY N70,

capacity 70 Ah at 20hour rating

Transmission

Clutch : DAIKIN single dry clutch, 210 mm dia plate, operated by single foot pedal

Gearbox : Own make, mechanical type with sliding gear, 2-stage group gear giving 10 forward speed and 2 reverse

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

Oil capacity : Gearbox 18 l, final reduction units 0. 8 l each, recommended oil change period 600 hours, recommended oil viscosity ;
winter SAE 80
summer SAE 90

Gear ratios and speeds

Gear	Number of engine revolution for one revolution of driving wheel	*Nominal travelling speed for 2500 rev/min rated speed of engine, km/h
Forward		
1	591. 67	0. 95
2	374. 16	1. 32
3	277. 16	1. 78
4	207. 87	2. 38
5	146. 73	3. 37
6	128. 86	3. 84
7	92. 78	5. 33
8	68. 72	7. 20
9	51. 54	9. 60
10	36. 38	13. 59
Reverse		
1	241. 40	2. 05
2	59. 86	8. 26

* Calculated with a tyre rolling radius of 525 mm

Power take-off

Atrear of tractor, 35 mm dia, 6-spline acc. to JIS standard, height above ground 570 mm, in tractor's median plane, proportional engine speed giving 630, 883, 1235 and 1600 rev/min at 2500 rev/min rated engine speed, 540 rev/min at

2140 rev/min engine speed, direction of rotation clockwise viewed from driving end

Belt pully — Optional, not fitted on tractor tested

Power lift — Own make, Hydraulic, gear type pump directly from engine, supplies oil to a single acting ram and 1 external tapping, maximum oil pressure 150 ± 5 kg/cm², JIS 1 implement linkage with nudging system, oil capacity and oil changing period in common with transmisson box (see page 2)

Drawbar

Linkage drawbar: Optional, drawbar fixed on lower links with central hole and 3 holes 80 mm apart either side of centre line, vertical adjustment from 130 mm to 798 mm changed by adjustable stay links, distance behind rear axle with lower links horizontal 850 mm, position reletive to p. t. o. 553 mm to rear

Swinging drawbar: Optional, not fitted on tractor tested

Hitch — Optional, clevis type, at rear of tractor, height above ground 396 mm, distance from rear axle 320 mm, position relative to p. t. o. 23 mm to rear

Steering — Ball and nut type with single drag link

Brakes — Mechanically acting as internal shoe type, acting on brake drums on differential half shafts, operated by foot pedals, operated independently or together by pedals, fixed by ratchet both pedals of the foot brake for parking

Wheels

Steering wheels: Two at front, OHTSU FO-1 5.00-15 tyres, 4 ply rating, maximum permissible weight on each tyre 350 kg at 2.60 kg/cm² pressure, track width 1070-1470 mm by 5 steps changed by extending front axle

Driving wheels: Two at rear, OHTSU AT-5 11.2-24 tyres, 4 ply rating, maximum permissible weight on each tyre 880 kg at 1.2 kg/cm² psessure, track width 1030-1540 mm by 8 steps changed by reversing wheel and offset lugs on rims

Wheel base: 1650 mm

Lighting

	Height above ground of centre cm	Size cm	Distance from outside edge of tractor to centre cm
Headlights	105	11 dia	55
Reflectors	124	5 dia	23

Number of grease points: (whole tractor) 9

CONDITIONS DURING TEST

Weight

Tractor (Without driver but with tanks full)

	Front kg	Rear kg	Total kg
Without ballast	443	674	1117
With ballast	512	762	1274

Ballast

	No. of weight	Total weight kg	Water kg
Additional	3	60	Front flame weights
Rear Wheels	4	97	—

Track setting — Front wheels track width 1070 mm
Rear wheels track width 1030 mm

Overall dimension

	Length	Width m		Height m	
		Max.	Min.	With exhaust	Without exhaust
With ballast	2. 98	1. 92	1. 41	1. 97	—
Without ballast	2. 87	1. 85	1. 34	1. 97	—

Remarks: Length with three point linkage

Seat — TAIYO SEISAKUSHO, seat with rubber damper, pan seat with cution, range of adjustment 60 mm fore and aft

FUELS AND LUBRICANTS USED IN TESTS

Fuel : Diesel oil, specific gravity 0.8306 at 15°C, viscosity at 30°C 3.382 cSt, Cetane No. 57, to No. 2 JIS

Engine oil : MITSUBISHI 30 DIAMOND HD, viscosity at 37.8°C 112 cSt

Transmission oil : 80 FUSO EP, viscosity at 37.8°C 102 cSt

COMPULSORY TESTS

(1) MAIN POWER TAKE-OFF PERFORMANCE

Date and location of tests : 11th October, 1974; I. A. M., Omiya, JAPAN

Type of dynamometer : DC Elcetrical, MEIDENSHA EB-DH

Horsepower (metric) hp	Speed		Fuel consumption		
	Engine rev/min	p. t. o. rev/min	l/h	g/metric hph	metric hph/l
MAXIMUM POWER-2 hour test					
23.9	2500	630	6.51	224	3.67
STANDARD p. t. o. SPEED (540 rev/min)					
21.8	2143	540	5.68	215	3.84
PART LOADS					
(Ⅰ)20.9	2571	648	5.84	230	3.58
(Ⅱ) 0	2710	683	2.05	—	—
(Ⅲ)10.7	2623	661	3.84	296	2.79
(Ⅳ)23.9	2500	630	6.51	224	3.67
(Ⅴ) 5.4	2662	671	2.90	443	1.86
(Ⅵ)15.9	2603	656	4.82	250	3.30

No load maximum engine speed:	2710 rev/min	
Equivalent crankshaft torque at maximum power:	6.85 kgm	
Maximum torque:	7.36 kgm at 1800 rev/min of the engine	
Means atmospheric conditions:	temperature;	23°C
	pressure;	769 mmHg
	relative humidity;	55%
	coolant;	104°C
	engine oil;	112°C
	fuel;	23°C

(*) The recommended speed for drawbar work was not expressly specify by the manufacturer.

(2) DRAWBAR PERFORMANCE

Date of tests: 17th to 21st October, 1974
Type of track: Concrete
Height of drawbar above ground: 360 mm

Gear No.	Speed km/h	Horse-power (metric) hp	Drawbar pull kg	Engnie speed rev/min	Slip of wheels %	Fuel Consumption		Temperature			Atmospheric Conditions		
						Metric drawbar hph/l	g/metric drawbar hph	Fuel °C	Coolant °C	Engine oil °C	Temper-ature °C	Relative humidity %	Pressure mmHg
(Ⅰ)	MAXIMUM POWER (ballasted)												
1	0.86	1.86	580	2704	15.8	0.64	1275	31	79	78	20	59	772
2	1.22	2.63	580	2694	15.0	0.96	852	33	78	76	21	55	772
3	1.62	3.48	580	2688	15.1	1.22	668	34	78	77	21	55	772
4	2.16	4.64	580	2680	14.9	1.47	563	35	78	78	21	56	772
5	3.06	6.57	580	2660	14.9	1.88	434	36	79	78	21	60	772
6	3.46	7.42	580	2660	15.3	2.01	406	36	79	78	21	60	772
7	4.75	10.21	580	2636	14.8	2.32	351	36	81	78	21	60	772
8	6.34	13.61	580	2616	15.0	2.59	314	38	81	81	20	66	772
9	8.32	*17.86	580	2580	15.1	2.67	305	38	82	79	20	66	772
10	12.06	20.1	450	2505	10.2	2.91	275	39	81	80	18	66	772
(Ⅱ)	FIVE HOUR TEST at 75 % of pull at maximum power												
8	6.44	14.32	600	2625	13.1	2.70	302	33	80	79	18	82	771
(Ⅲ)	+FIVE HOUR TEST at pull corresponding to 15% wheelslip in test (Ⅰ)												
9	8.86	—	580	—	—	—	—	38	81	80	21	76	761
(Ⅳ)	MAXIMUM POWER (unballasted)												
1	0.86	1.70	530	2714	15.0	0.69	1181	35	78	75	22	58	769
2	1.22	2.40	530	2700	15.0	0.92	891	34	78	75	22	58	769
3	1.66	3.37	550	2710	14.9	1.18	692	31	78	76	22	58	769
4	2.20	4.47	550	2704	15.3	1.47	558	32	78	77	22	58	769
5	3.06	6.23	550	2672	15.0	1.83	446	32	78	75	22	61	769
6	3.49	7.11	550	2660	14.9	1.98	414	32	79	75	22	61	769
7	4.79	9.75	550	2640	15.3	2.27	360	33	79	76	22	61	769
8	6.44	13.13	550	2620	14.8	2.63	310	36	79	78	20	66	769
9	8.46	*17.23	550	2592	15.2	2.78	293	36	80	78	19	65	769
10	12.06	20.1	450	2520	12.1	2.96	276	36	81	77	19		769

Total oil consumption during ten hours duration of tests (Ⅱ) and (Ⅲ): 7g/h

*Maximum power available at 15% wheelslip.

Test (Ⅲ) was carried out with additional ballast and the results for power, slip and fuel consumption have no practical significance.

(3) TURNING SPACE AND TURNING CIRCLE

Details of wheel equipment: As in specification, without ballast
Track of wheels: front 1070 mm, rear 1030 mm

Results	With brakes		Without brakes	
	right-hand m	left-hand m	right-hand m	left-hand m
Radius of turning space	2.74	2.71	3.09	3.05
Radius of turning circle	2.64	2.61	2.99	2.95

(4) LOCATION OF CENTRE OF GRAVITY

mm

Height above ground	681
Distance forward from the vertical plane containing the axis of the rear wheels	620
Distance from the median plane	0

(5) BRAKING

Date of tests: 24th Octoder, 1974
Type of track: Concrete
Type of decelerometer: YOSHIDA SEIKI Co., Ltd., Type 106-2C
Weight of ballasted tractor: 1311 kg

COLD BRAKES

		Ballasted	Without ballast
Travelling speed of the tractor	km/h	14.1	14.1
(1) Deceleration	m/s^2	3.6	3.8
(2) Stopping distance	m	2.4	2.3
(3) Force exerted on the brake pedal	kg	30.0	30.0
(4) Force exerted on the brake pedal to achive a deceleration of $2.5 m/s^2$	kg	14.0	14.0

BRAKE FADE CHARACTERISTICS (hot tests)

		Ballasted
Deceleration hot/deceleration cold x 100	%	100
Stopping distance cold/stopping distance hot x 100	%	103
Force on pedal cold/force on pedal hot x 100	%	100

PARKING BRAKE

Efficiency of parking latch: Satisfactory facing up and down slope

(6) MEASUREMENT OF AMBIENT NOISE

Date of tests: 23rd October, 1974

Type of sound level meter: Bruel & Kjaer Type 2203

Type of track: Concrete

Results of tests: Gear 10th

Travelling speed before acceleration 10.6 km/h

Sound level 78 dB(A)

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

Date of tests : 23rd October, 1974

Type of sound level meter : Bruel & Kjaer Type 2203

Type of track : Concrete

Results of tests

Gear	Travelling speed km/h	dB(A)
8th	5. 74	91
9th	8. 37	91
10th	12. 63	93

(8) POWER LIFT AND HYDRAULIC PUMP PERFORMANCE

Date and location of tests : 14th–15th October, 1974 ;
I. A. M., Omiya. JAPAN

Hydraulic fluid

make and type ; 80 FUSO EP

viscosity : 112 cSt (37. 8°C)

viscosity index : 102

Type of linkage lock for transport : Hydraulic

Pump characteristics

i) Opening pressure of the relief valve (manufacturer's figures) : 150 kg/cm²

Sustained pressure of the relief valve : 155 kg/cm²

ii) Pump delivery rate at minimum pressure and rated engine speed : 13. 7 l/min

iii) Pump delivery rete : 13. 9 l/min

Delivery pressure : 125 kg/cm²

Power : 3. 85 metric hp

Linkage geometry when connected to the standard frame

	Maximum mechanical advantage	Minimum mechanical advantage
Projected length in side view		
lower links, mm	800	800
lift arm, mm	270	270
lift rods, mm	420	590
top link, mm	635	600
Distance of lift rod connection point from pivot point of lower link, mm	655	565
The following dimension are giving relative to the rear wheel centre line, situated 520 mm above the ground level		
Lower link pivot point	50 mm behind, 59 mm below	50 mm behind, 59 mm below
Top link pivot point	258 mm behind, 240 mm above	258 mm behind, 240 mm above
Lift arm pivot point	98 mm forward, 395 mm above	98 mm forward, 395 mm above
Maximum and minimum height of lower link hitch points	407 mm above, 71 mm above	169 mm above, 390 mm below
Height of lower link hitch points when locked in transport position	407 mm above, —	— —

Lifting heights in relation to a horizontal line through the lower link pivoting point, cm

		−32.2	−30	−25	−20	−15	−10	−5	0	+5	+10	+12.8	+15	+20	+23.4	+25	+30	+35	+40	+45	+46.5
Lifting force at the hitch point kg (Values for the pressure at maximum hydraulic horsepower, calculated from measurements made at maximum pressure)	max. mech. advantage	—	—	—	—	—	—	—	—	—	—	2880	2410	1870	—	1630	1455	1350	1275	1215	965
	min. mech. advantage	1145	1145	1145	1145	1135	1105	1090	1055	1035	1000	—	970	955	905	—	—	—	—	—	—
	Maximum force exerted throughout whole range 965 kg Force at which front of tractor is calculated to lift with maximum allowable front ballast 995 kg																				
	Pressure 155 kg/cm²																				

		−39.3	−35	−30	−25	−20	−15	−10	−5	0	+5	+10	+14.6	+15	+20	+25	+30	+35	+37.1	+40	+45	+50	+55	+60	+61.4
Lifting force at the frame kg (Values for the pressure at maximum hydraulic horsepower, calculated from measurements made at maximum pressure)	max. mech. advantage	—	—	—	—	—	—	—	—	—	—	—	1885	1830	1430	1270	1140	1030	—	925	845	795	725	670	565
	min. mech. advantage	915	915	910	900	880	855	835	805	765	730	705	—	660	600	565	550	535	515	—	—	—	—	—	—
	Maximum force exerted throughout whole range 565 kg Force at which front of tractor is calculated to lift with maximum allowable front ballast 580 kg																								
	pressure 155 kg/cm²																								

REPAIRS AND ADJUSTMENTS DURING TEST	:	None
REMARKS	:	None
Officer in charge	:	S. ARAI
Head of Testing Division	:	M. ARIYOSHI
Date	:	19th February, 1975

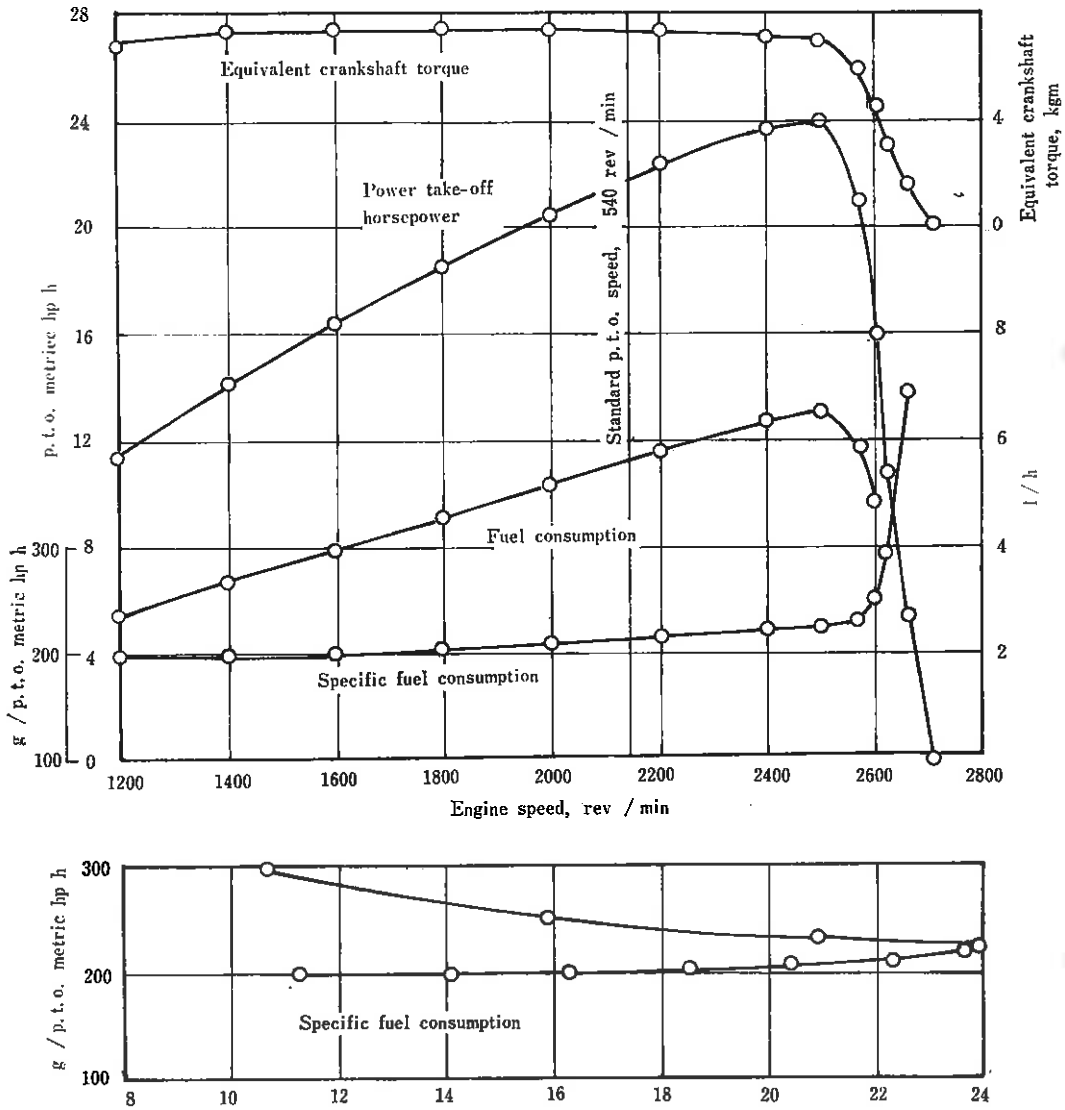


Fig. 1 Power take-off test

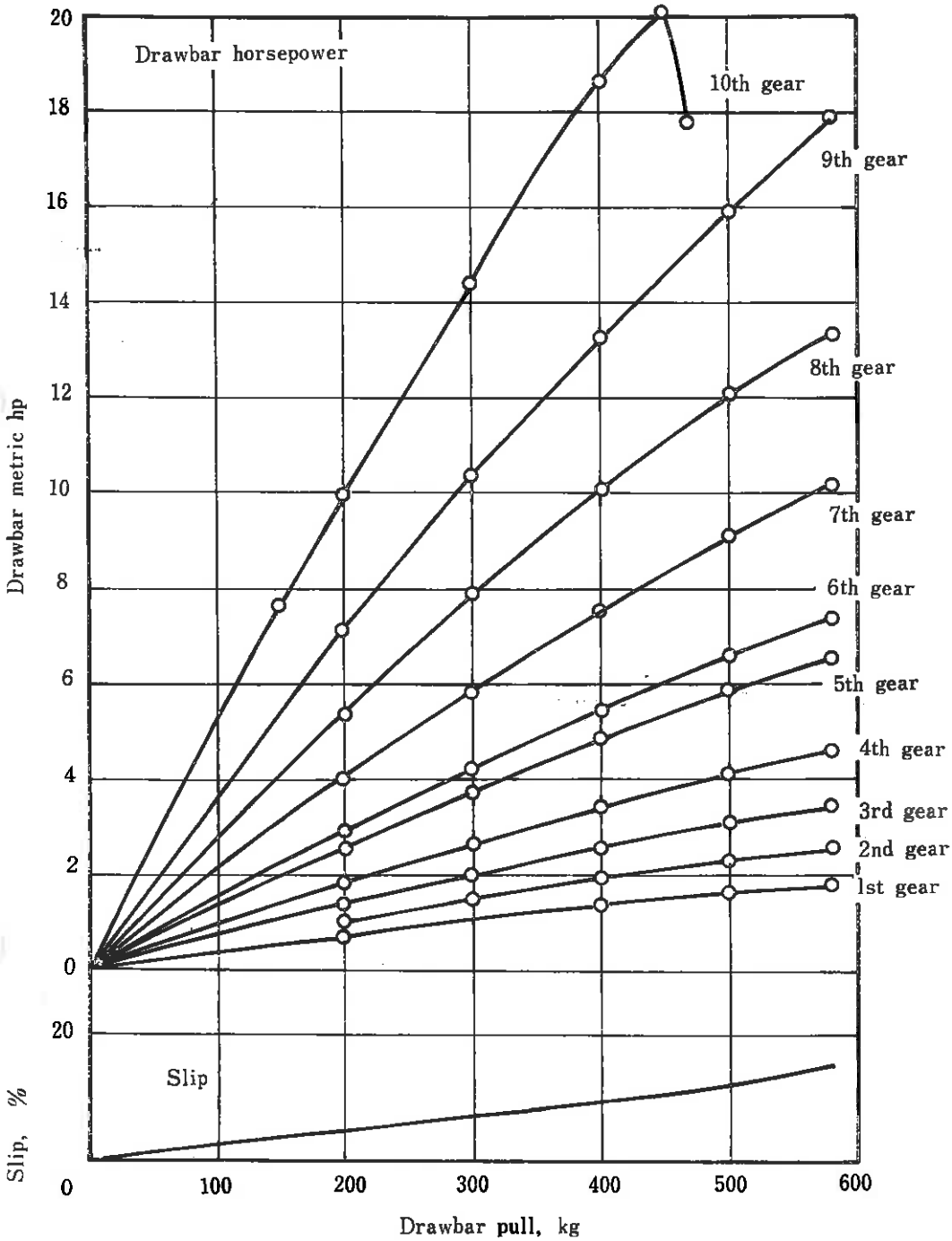


Fig. 2 Drawbar-test on concrete, with ballast

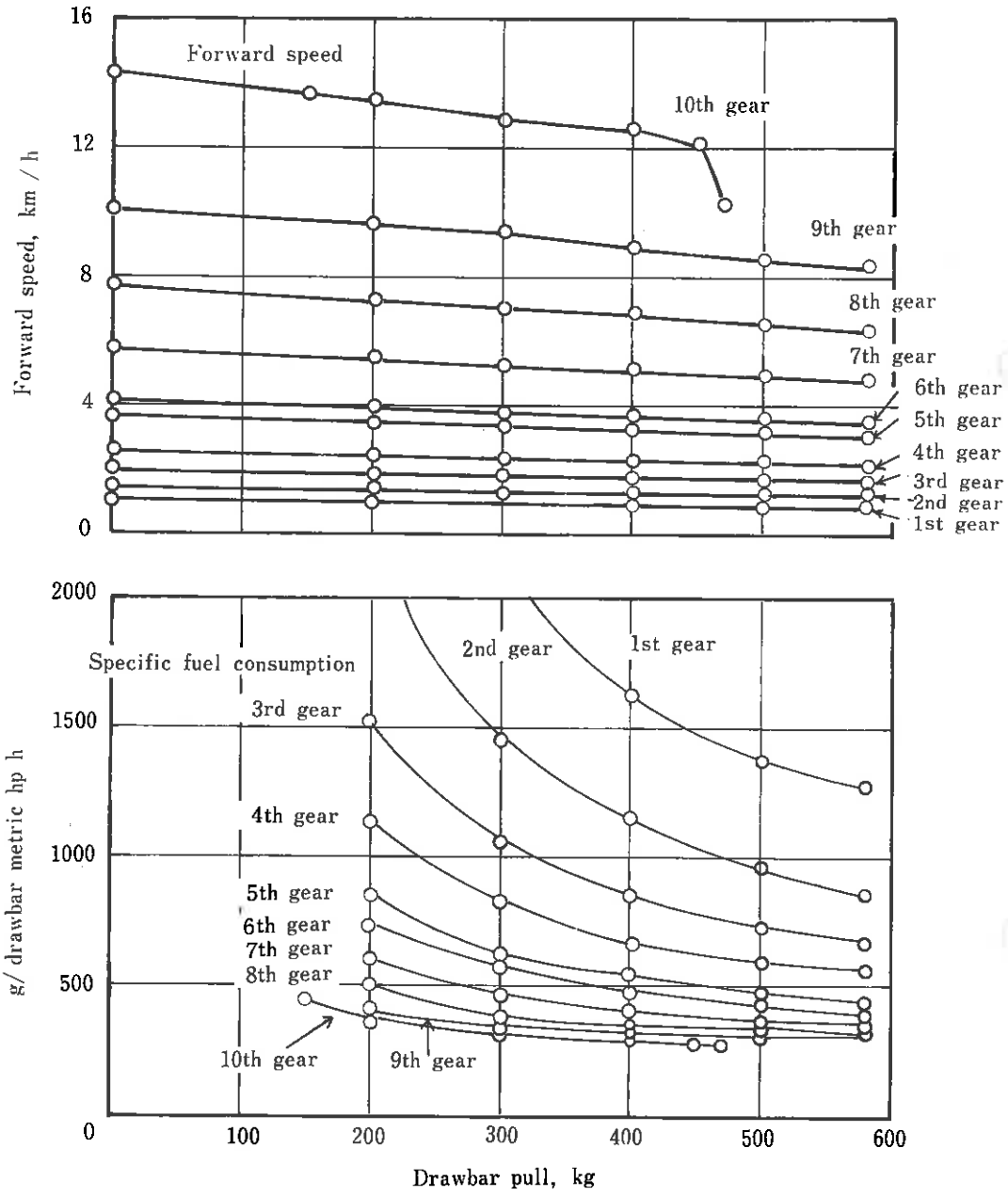


Fig. 3 Drawbar-test on concrete, with ballast

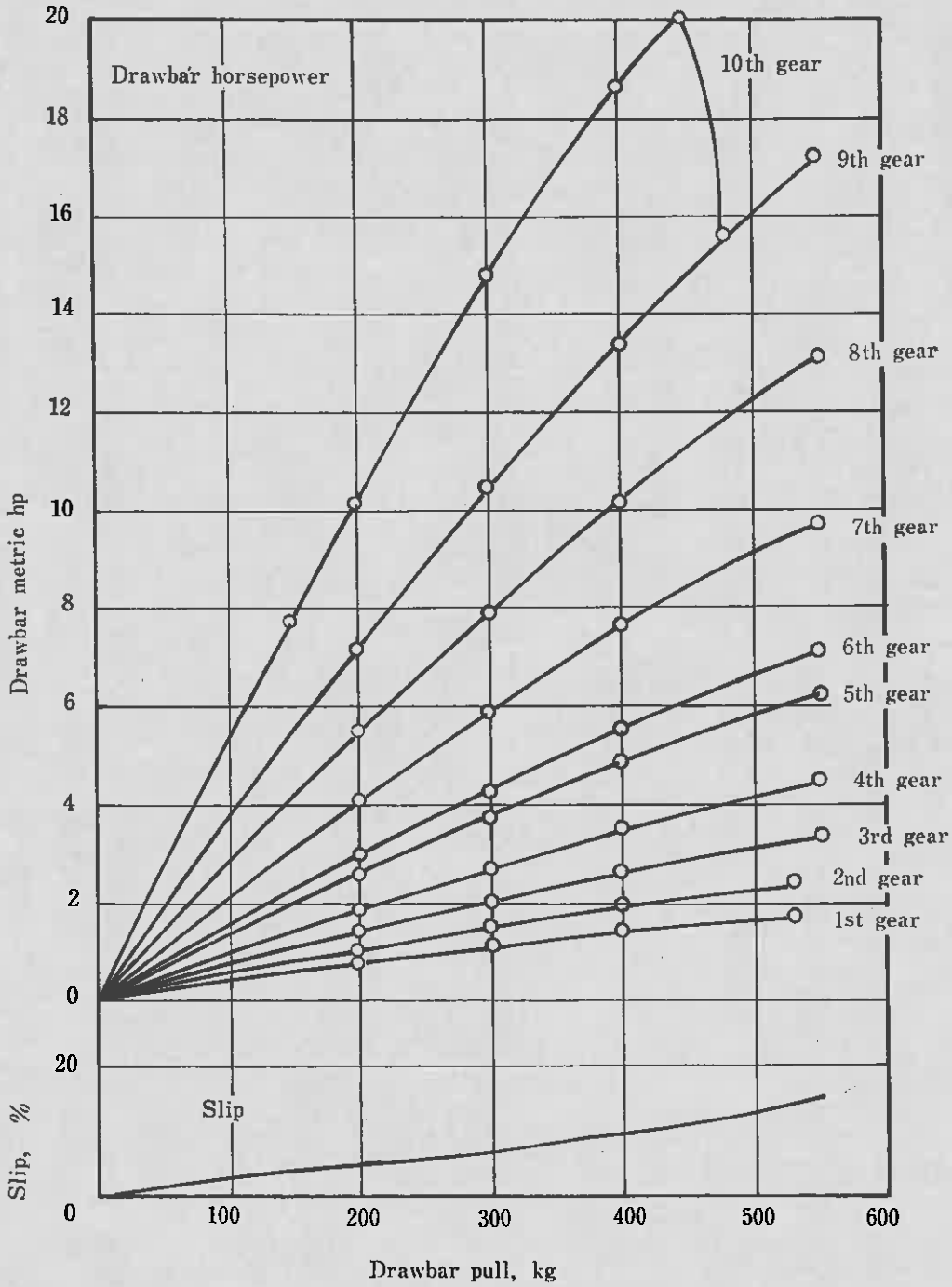


Fig. 4 Drawbar-test on concrete, without ballast