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Test 970: International Farmall 856 (Diesel)

Nebraska Tractor Test Lab

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Nebraska Tractor Test Lab, "Test 970: International Farmall 856 (Diesel)" (1968). *Nebraska Tractor Tests*. 1331.

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NEBRASKA TRACTOR TEST 970 – INTERNATIONAL FARMALL 856 DIESEL

POWER TAKE-OFF PERFORMANCE

Hp	Crank- shaft speed rpm	Fuel Consumption		Temperature Degrees F				
		Gal per hr	Lb per hp-hr	Hp-hr per gal	Cooling medium	Air wet bulb	Air dry bulb	Barometer inches of Mercury
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours								
100.49	2400	6.632	0.460	15.15	181	62	75	28.990
Standard Power Take-off Speed (1000 rpm)—One Hour								
94.29	2072	6.047	0.447	15.59	184	62	75	28.960
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS								
88.57	2485	5.953	0.468	14.88	176	63	75	.....
0.00	2652	2.148	.....	.....	170	61	72	.....
46.00	2582	4.003	0.607	11.49	172	62	73	.....
100.96	2400	6.598	0.456	15.30	180	63	75	.....
23.17	2618	3.060	0.921	7.57	171	62	74	.....
67.67	2537	4.890	0.504	13.84	174	63	75	.....
Av	54.40	2546	4.442	0.569	12.25	174	62	74 28.945

DRAWBAR PERFORMANCE

Hp	Draw- bar pull lbs	Speed miles per hr	Crank- shaft speed rpm	Fuel Consumption			Temp Degrees F				Barom- eter inches of Mercury
				Slip of drivers %	Gal per hr	Lb per hp-hr	Hp-hr per gal	Cool- ing med	Air wet bulb	Air dry bulb	
VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST											
Maximum Available Power—Two Hours—8th Gear (1st Hi-TA)											
87.17	7127	4.59	2399	8.68	6.641	0.531	13.13	162	44	53	28.843
75% of Pull at Maximum Power—Ten Hours—8th Gear (1st Hi-TA)											
70.60	5398	4.90	2502	6.35	5.525	0.545	12.78	161	56	60	28.630
50% of Pull at Maximum Power—Two Hours—8th Gear (1st Hi-TA)											
49.68	3649	5.11	2540	4.24	4.583	0.643	10.84	158	37	43	28.760
MAXIMUM POWER WITH BALLAST											
72.71	9417	2.90	2464	14.98	5th Gear (3rd Lo-TA)			164	54	65	28.700
84.84	8315	3.83	2400	10.15	6th Gear (3rd Lo-DD)			164	45	56	28.850
86.05	8074	4.00	2405	9.88	7th Gear (4th Lo-TA)			162	45	56	28.850
88.70	7213	4.61	2403	8.43	8th Gear (1st Hi-TA)			165	45	56	28.860
87.77	6250	5.27	2400	7.23	9th Gear (4th Lo-DD)			160	46	56	28.870
89.95	5589	6.03	2403	6.51	10th Gear (1st Hi-DD)			160	46	56	28.870
90.09	5391	6.27	2399	6.07	11th Gear (2nd Hi-TA)			162	45	55	28.880
88.88	4077	8.18	2400	4.35	12th Gear (2nd Hi-DD)			160	45	55	28.880
88.85	2982	11.17	2401	3.66	13th Gear (3rd Hi-TA)			160	45	55	28.880
82.94	2154	14.50	2397	2.72	14th Gear (3rd Hi-DD)			160	45	55	28.880
MAXIMUM PULL WITHOUT BALLAST											
66.02	8448	2.93	2481	14.93	5th Gear (3rd Lo-TA)			158	54	69	28.905
VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—8th Gear (1st Hi-TA)											
Pounds pull				7213	8001	8453	8811	9027	9144		8951
Horsepower				88.70	85.97	80.61	72.46	63.22	52.73		41.47
Crankshaft speed rpm				2403	2131	1911	1667	1430	1181		945
Miles per hour				4.61	4.03	3.58	3.08	2.63	2.16		1.74
Slip of drivers %				8.43	9.88	10.68	11.60	12.25	12.51		12.12

TIRES, BALLAST and WEIGHT

		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 18.4-38; 8; 16	Two 18.4-38; 8; 16
Ballast	—Liquid	850 lb each	None
	—Cast iron	None	None
Front tire	—No, size, ply & psi	Two 7.50-16; 8; 40	Two 7.50-16; 8; 40
Ballast	—Liquid	None	None
	—Cast iron	None	None
Height of drawbar		18 inches	18½ inches
Static weight with operator—Rear		9120 lb	7420 lb
Front		2915 lb	2870 lb
Total		12035 lb	10290 lb

Department of Agricultural Engineering

Dates of Test: April 15 to April 30, 1968

Manufacturer: INTERNATIONAL HARVESTER COMPANY, CHICAGO, ILLINOIS

FUEL, OIL and TIME Fuel No 2 Diesel Cetane 52.4 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.8371 Weight per gallon 6.970 lb Oil SAE 30 API service classification MS, DG, DM, DS To motor 2.092 gal Drained from motor 1.413 gal Transmission and final-drive lubricant IH Hy-Tran Fluid Total time engine was operated 45 hours.

ENGINE Make International Diesel Type 6 cylinder vertical Serial No 2U006284 Crankshaft mounted lengthwise Rated rpm 2400 Bore and stroke 4.321" x 4.625" Compression ratio 16 to 1 Displacement 406.9 cu in Cranking system 12 volt electric (two 6-volt batteries) Lubrication pressure Air cleaner two stage dry type with automatic dust unloader using replaceable pleated paper element Oil filter full ow screw-on replaceable cartridge Oil cooler engine coolant heat exchanger for engine oil, radiator for transmission and hydraulic oil Fuel filter one primary and one final fuel filter using replaceable screw-on cartridges Muffler was used Cooling medium temperature control thermostat.

CHASSIS Type standard Serial No 10970 S-Y Tread width rear 56" to 94 front 50" to 74" Wheel base 104.8" Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from centerline of rear wheels 28.6" Vertical distance above roadway 37.7" Horizontal distance from center of rear wheel tread 0" to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio with partial range operator controlled power shifting Advertised speeds mph first 1¼ second 1¾ third 1¾ fourth 2¼ fifth 3¼ sixth 4 seventh 4¼ eighth 4¾ ninth 5½ tenth 6 eleventh 6¼ twelfth 8¼ thirteenth 11 fourteenth 14 fifteenth 14¾ sixteenth 18¾ reverse first 2¼ second 3 third 3 fourth 4 fifth 5½ sixth 7 seventh 7¼ eighth 9¼ Clutch single plate dry disc operated by foot pedal Brakes dry disc hydraulically power actuated by two foot pedals Steering hydraulic with power assist Turning radius (on concrete surface with brake applied) right 114" left 114" (on concrete surface without brake) right 123" left 123" Turning space diameter (on concrete surface with brake applied) right 241" left 241" (on concrete surface without brake) right 260" left 260" Belt pulley 1101 rpm at 2400 engine rpm diam 11" face 7.5" Belt speed 3170 fpm Power take-off 539 or 1014 rpm at 2100 engine rpm.

REPAIRS and ADJUSTMENTS No repairs or adjustments.

REMARKS All test results were determined from observed data obtained in accordance with the SAE and ASAE test code.

First, second, third and fourth gears were not ran as it was necessary to limit the pull in fifth gear to avoid excessive wheel slippage. Fifteenth and sixteenth gears were not run as they exceeded 15 mph.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 970.

L. F. LARSEN

Engineer in Charge

G. W. STEINBRUEGGE, Chairman

J. J. SULEK

D. E. LANE

Board of Tractor Test Engineers

The University of Nebraska Agricultural Experiment Station
E. F. Frolik, Dean; H. W. Ottoson, Director; Lincoln, Nebraska

EXPLANATION OF TEST REPORT

GENERAL CONDITIONS

Each tractor is a production model equipped for common usage. Power consuming accessories can be disconnected only when it is convenient for the operator to do so in practice. Additional weight can be added as ballast if the manufacturer regularly supplies it for sale. The static tire loads and the inflation pressures must conform to recommendations in the Tire Standards published by the Society of Automotive Engineers.

PREPARATION FOR PERFORMANCE RUNS

The engine crankcase is drained and refilled with a measured amount of new oil conforming to specifications in the operators manual. The fuel used and the maintenance operations must also conform to the published information delivered with the tractor. The tractor is then limbered-up for 12 hours on drawbar work in accordance with the manufacturer's published recommendations. The manufacturer's representative is present to make appropriate decisions regarding mechanical adjustments.

The tractor is equipped with approximately the amount of added ballast that is used during maximum drawbar tests. The tire tread-bar height must be at least 65% of new tread height prior to the maximum power run.

BELT OR POWER TAKE-OFF PERFORMANCE

Maximum Power and Fuel Consumption. The manufacturer's representative makes carburetor, fuel pump, ignition and governor control settings which remain unchanged throughout all subsequent runs. The governor and the manually operated governor control lever is set to provide the high-idle speed specified by the manufacturer for maximum power. Maximum power is measured by connecting the belt pulley or the power take-off to a dynamometer. The dynamometer load is then gradually increased until the engine is operating at the rated speed specified by the manufacturer for maximum power. The corresponding fuel consumption is measured.

Varying Power and Fuel Consumption. Six different horsepower levels are used to show corresponding fuel consumption rates and how the governor causes the engine to react to the following changes in dynamometer load: 85% of the dynamometer torque at maximum power; minimum dynamometer torque, $\frac{1}{2}$ of the 85% torque; maximum power, $\frac{1}{4}$ and $\frac{3}{4}$ of the 85% torque. Since a tractor is generally subjected to varying loads the average of the results in this test serve well for predicting the fuel consumption of a tractor in general usage.

DRAWBAR PERFORMANCE

All engine adjustments are the same as those used in the belt or power take-off tests. If the manufacturer specifies a different rated crankshaft speed for drawbar operations, then the position of the manually operated governor control is changed to provide the high-idle speed specified by the manufacturer in the operating instructions.

Varying Power and Fuel Consumption With Ballast. The varying power runs are made to show the effect of

speed-control devices (engine, governor, automatic transmission, etc.) on horsepower, speed and fuel consumption. These runs are made around the entire test course which has two 180 degree turns with a minimum radius of 50 feet. The drawbar pull is set at 3 different levels as follows: (1) as near to the pull at maximum power as possible and still have the tractor maintain the travel speed at maximum horsepower on the straight sections of the test course; (2) 75% of the pull at maximum power; and (3) 50% of the pull at maximum power. Prior to 1958, fuel consumption data (10 hour test) were shown only for the pull obtained at maximum power for tractors having torque converters and at 75% of the pull obtained at maximum power for gear-type tractors.

Maximum Power with Ballast. Maximum power is measured on straight level sections of the test course. Data are shown for not more than 12 different gears or travel speeds. Some gears or travel speeds may be omitted because of high slippage of the traction members or because the travel speed may exceed the safe-limit for the test course. The maximum safe speed for the Nebraska Test Course has been set at 15 miles per hour. The slippage limits have been set at 15% and 7% for pneumatic tires and steel tracks or lugs, respectively. Higher slippage gives widely varying results.

Maximum Pull without Ballast. All added ballast is removed from the tractor. The drawbar pull is determined at slip limits of 15% for pneumatic tires or 7% for steel tracks or lugs. The tractor is operated at the fastest possible travel speed.

Varying Power and Travel Speed with Ballast. Travel speeds corresponding to drawbar pulls beyond the maximum power range are obtained to show the "lugging ability" of the tractor. The run starts with the pull at maximum power; then additional drawbar pull is applied to cause decreasing speeds. The run is ended by one of three conditions: (1) maximum pull is obtained, (2) the maximum slippage limit is reached, or (3) some other operating limit is reached.

For additional information about the Nebraska Tractor Tests write to the Department of Agricultural Engineering, University of Nebraska, Lincoln, Nebraska.



INTERNATIONAL FARMALL 856 DIESEL