

University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

Nebraska Tractor Tests

Tractor Test and Power Museum, The Lester F. Larsen

1-1-1963

Test 856: Farmall 706 (Diesel)

Nebraska Tractor Test Lab

University of Nebraska-Lincoln, tractortestlab@unl.edu

Follow this and additional works at: <https://digitalcommons.unl.edu/tractormuseumlit>



Part of the [Energy Systems Commons](#), [History of Science, Technology, and Medicine Commons](#), [Other Mechanical Engineering Commons](#), [Physical Sciences and Mathematics Commons](#), [Science and Mathematics Education Commons](#), and the [United States History Commons](#)

Nebraska Tractor Test Lab, "Test 856: Farmall 706 (Diesel)" (1963). *Nebraska Tractor Tests*. 1246.
<https://digitalcommons.unl.edu/tractormuseumlit/1246>

This Article is brought to you for free and open access by the Tractor Test and Power Museum, The Lester F. Larsen at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Nebraska Tractor Tests by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

NEBRASKA TRACTOR TEST 856 - FARMALL 706 DIESEL

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

POWER TAKE-OFF PERFORMANCE

Hp	Crank- shaft speed rpm	Fuel Consumption		Hp-hr per gal	Temperature Degrees F			Barometer inches of Mercury	
		Gal per hr	Lb per hp-hr		Cooling medium	Air wet bulb	Air dry bulb		
MAXIMUM POWER AND FUEL CONSUMPTION									
Rated Engine Speed—Two Hours									
72.42	2300	5.506	0.525	13.15	201	56	75	29.023	
Standard Power Take-off Speed (1000 rpm)—One Hour									
67.26	2072	5.101	0.524	13.19	203	56	75	29.000	
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS									
64.79	2420	4.813	0.513	13.46	188	56	75	.....
0.00	2544	1.829	.....	.....	163	56	75	.....
33.43	2495	3.132	0.647	10.67	170	56	75	.....
74.09	2301	5.500	0.513	13.47	201	57	76	.....
16.89	2524	2.476	1.012	6.82	165	56	75	.....
49.38	2459	3.910	0.547	12.63	178	55	74	.....
Av	39.76	2457	3.610	0.627	11.01	178	56	75	28.975

DRAWBAR PERFORMANCE

Hp	Draw- bar pull lbs	Speed miles per hr	Crank- shaft speed rpm	Slip of drivers %	Fuel Consumption			Temp Degrees F			Barometer inches of Mercury
					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—10th Gear (2nd Hi-TA)											
65.12	4701	5.19	2295	5.88	5.439	0.577	11.97	199	47	61	28.865
75% of Pull at Maximum Power—Ten Hours—10th Gear (2nd Hi-TA)											
54.46	3668	5.57	2416	4.28	4.536	0.575	12.01	182	50	55	28.627
50% of Pull at Maximum Power—Two Hours—10th Gear (2nd Hi-TA)											
37.87	2468	5.75	2466	3.00	3.673	0.670	10.31	178	36	37	28.655
MAXIMUM POWER WITH BALLAST											
52.90	8026	2.47	2415	14.57	5th Gear (3rd Lo-TA)			179	38	48	29.060
64.06	7363	3.26	2305	11.28	6th Gear (4th Hi-TA)			178	39	50	29.060
64.13	6560	3.67	2303	9.33	7th Gear (3rd Lo-DD)			183	39	50	29.040
66.48	6584	3.79	2302	9.20	8th Gear (1st Hi-TA)			188	41	53	29.010
65.95	4932	5.01	2294	6.62	9th Gear (4th Lo-DD)			189	41	53	29.010
67.55	4870	5.20	2307	6.42	10th Gear (2nd Hi-TA)			192	44	57	28.960
66.55	4318	5.78	2304	5.61	11th Gear (1st Hi-DD)			191	44	57	28.960
66.80	3216	7.79	2302	4.03	12th Gear (2nd Hi-DD)			188	44	57	28.960
67.64	2732	9.28	2302	3.39	13th Gear (3rd Hi-TA)			190	46	51	28.950
64.59	1944	12.46	2299	2.53	14th Gear (4th Hi-TA)			186	46	51	28.940
64.40	1747	13.82	2298	2.02	15th Gear (3rd Hi-DD)			184	46	51	28.930
MAXIMUM POWER WITHOUT BALLAST											
63.30	4686	5.07	2297	7.35	10th Gear (2nd Hi-TA)			189	51	59	28.610
VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST											
10th Gear (2nd Hi-TA)											
Pounds pull			4870		5076	5243	5234	5193	5067		
Horsepower			67.55		62.68	57.48	50.26	42.60	34.69		
Crankshaft speed rpm			2307		2060	1830	1607	1371	1143		
Miles per hour			5.20		4.63	4.11	3.60	3.08	2.57		
Slip of drivers %			6.42		6.55	6.68	6.95	6.95	6.82		

TIRES, BALLAST and WEIGHT

		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 15.5-38; 8; 20	Two 15.5-38; 8; 14
	—Liquid	708 lb each	None
	Cast iron	None	None
Front tires	—No, size, ply & psi	Two 6.50-16; 6; 36	Two 6.50-16; 6; 32
	—Liquid	None	None
	Cast iron	None	None
Height of drawbar		22 inches	22 inches
Static weight	—Rear	7516 lb	6100 lb
	—Front	2320 lb	2255 lb
Total weight with operator		10011 lb	8530 lb

Department of Agricultural Engineering

Dates of Test: October 21 to November 8, 1963

Manufacturer: INTERNATIONAL HARVESTER COMPANY, CHICAGO, ILLINOIS

Manufacturer's Power Rating: Not rated

FUEL, OIL and TIME Fuel No 2 Diesel Cetane No 57.2 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.8294 Weight per gallon 6.906 lb Oil SAE 30 API service classification MS, DS To motor 3.095 gal Drained from motor 1.920 gal Transmission and final drive lubricant IH Hy-Tran fluid Total time engine was operated 62½ hours.

ENGINE Make International Diesel Type 6 cylinder vertical Serial No D28248097 Crankshaft mounted lengthwise Rated rpm 2300 Bore and stroke 3¹¹/₁₆" x 4²⁵/₁₆" Compression ratio 18.2 to 1 Displacement 282 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 flow replaceable treated paper element Oil cooler engine coolant heat exchanger for crankcase oil and radiator for transmission and hydraulic oil Fuel filter one primary and one final fuel filter using replaceable treated paper elements Muffler was used Cooling medium temperature control thermostat.

CHASSIS Type Tricycle Serial No 1387 Tread width rear 56" to 94" front 8" or 16" Wheel base 97.5" Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 27.5" Vertical distance above roadway 35.4" 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 1.17 second 1.55 third 1.71 fourth 2.28 fifth 2.70 sixth 3.60 seventh 3.95 eighth 4.08 ninth 5.27 tenth 5.43 eleventh 5.98 twelfth 7.96 thirteenth 9.42 fourteenth 12.57 fifteenth 13.81 sixteenth 18.43 Reverse first 2.01 second 2.67 third 2.94 fourth 3.91 fifth 4.63 sixth 6.18 seventh 6.79 eighth 9.06 Clutch single plate dry disc operated by foot pedal Brakes dry disc hydraulically power actuated operated by two foot pedals Steering hydraulic with power assist Turning radius (on concrete surface with brake applied) right 111" left 111" (on concrete surface without brake) right 116" left 117" Turning space diameter (on concrete surface with brake applied) right 236" left 237" (on concrete surface without brake) right 248" left 250" Belt pulley 1067 rpm at 2100 engine rpm diam 11" face 7.5" Belt speed 3073 fpm Power take-off 539 or 1014 rpm at 2100 engine rpm.

REPAIRS and ADJUSTMENTS The three point hitch vertical stabilizer lockout bracket failed during the limber-up run. This was replaced and test continued.

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 run as it was necessary to limit the pull in fifth gear to avoid excessive wheel slippage. Sixteenth gear was not run as it exceeded 15 mph.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 856.

L. F. LARSEN

Engineer-in-Charge

L. W. HURLBUT, Chairman

G. W. STEINBRUEGGE

J. J. SULEK

Board of Tractor Test Engineers

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, $\frac{1}{2}$ 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 trans-

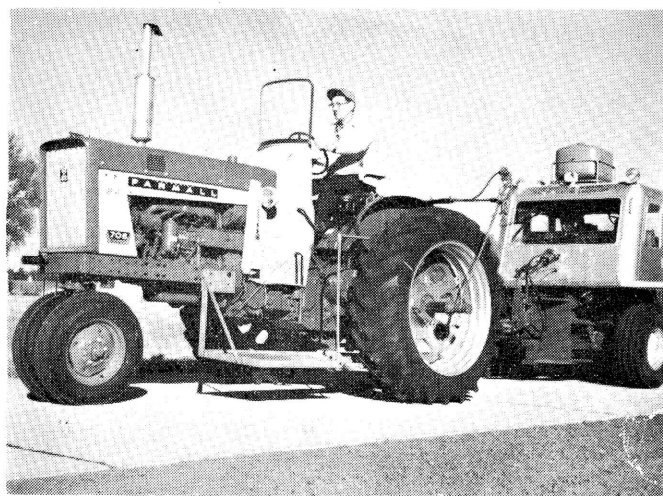
mission, etc.) on horsepower, speed and fuel consumption. These runs are made around the entire test course which has two 180 degree turns with a minimum radius of 50 feet. The drawbar pull is set at 3 different levels as follows: (1) as near to the pull at maximum power as possible and still have the 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 Power Without Ballast. All added ballast is removed from the tractor. The maximum drawbar power of the tractor is determined by the same procedure used for getting maximum power with ballast. The gear (or travel speed) is the same as that used in the 10-hour test.

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.



Farmall 706 Diesel