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Test 493: John Deere 70

Nebraska Tractor Test Lab
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The Experiment Station
University of Nebraska College of Agriculture
W. V. Lambert, Director, Lincoln, Nebraska

Department of Agricultural Engineering
Dates of test: May 15 to May 20, 1953.
Manufacturer: JOHN DEERE WATERLOO TRACTOR WORKS OF DEERE MANUFACTURING COMPANY, WATERLOO, IOWA
Manufacturer's rating: Not Rated.

NEBRASKA TRACTOR TEST NO. 493

JOHN DEERE 70

BELT HORSEPOWER TESTS

Hp	Crank shaft speed rpm	Fuel Consumption: Gal per hour	Fuel Consumption: Hp-hr per gal	Fuel Consumption: Lb per hp-hour	Water used gal per hour	Temp Deg F: Cooling med	Temp Deg F: Air	Barometer inches of mercury
TEST B—100% MAXIMUM LOAD—TWO HOURS								
48.29	975	4.498	10.74	0.567	0.00	169	63	28.780
TEST C—OPERATING MAXIMUM LOAD—ONE HOUR								
45.88	976	3.850	11.92	0.511	0.00	167	59	28.758
TEST D—RATED LOAD—ONE HOUR								
43.00	975	3.675	11.70	0.520	0.00	165	63	28.755
TEST E—VARYING LOAD—TWO HOURS (20 minute runs; last line average)								
42.99	975	3.670	11.71	0.520	...	165	62	.....
1.75	1088	1.365	1.28	4.749	...	162	62	.....
23.34	1051	2.478	9.42	0.647	...	170	62	.....
44.34	914	3.734	11.87	0.513	...	168	64	.....
11.90	1068	1.813	6.56	0.928	...	167	62	.....
33.86	1021	3.064	11.05	0.551	...	170	63	.....
26.36	1019	2.687	9.81	0.621	0.00	167	63	28.750

TORQUE (at dynamometer)

RPM	1005	950	904	854	805	748	707	648	594	527
Lb.-ft.	270.4	279.5	283.7	284.9	287.9	287.9	283.0	274.2	266.4	241.3

DRAWBAR HORSEPOWER TESTS

Hp	Draw bar pull lb	Speed miles per hr	Crank shaft speed rpm	Slip of drive wheels %	Fuel Consumption: Gal per hour	Fuel Consumption: Hp-hr per gal	Fuel Consumption: Lb per hp-hr	Water used gal per hour	Temp Deg F: Cooling med	Temp Deg F: Air	Barometer inches of mercury
TEST F—100% MAXIMUM LOAD—THIRD GEAR											
42.24	3539	4.48	974	6.72	..... Not Recorded				170	66	28.750
TEST G—OPERATING MAXIMUM LOAD											
31.71	5453	2.18	973	15.71	..... Not Recorded				172	71	28.750
39.84	4467	3.34	975	9.11	..... Not Recorded				170	72	28.750
39.84	3318	4.50	975	6.37	..... Not Recorded				170	67	28.750
40.35	2318	6.53	976	4.41	..... Not Recorded				171	67	28.750
37.75	1576	8.98	975	2.74	..... Not Recorded				171	70	28.750
35.42	1031	12.88	978	1.76	..... Not Recorded				170	72	28.750
TEST H—RATED LOAD—TEN HOURS—3rd Gear											
33.61	2771	4.55	975	5.35	3.255	10.33	0.590	0.03	171	64	28.816
TEST J—OPERATING MAXIMUM LOAD—3rd Gear											
38.30	3331	4.31	975	10.50	..... Not Recorded				172	74	28.690
TEST K—OPERATING MAXIMUM LOAD—3rd Gear											
37.47	3418	4.11	973	12.02	..... Not Recorded				173	75	28.660

TIRES, WHEELS, and WEIGHT

	Tests F, G, & H	Test J	Test K
Rear wheels			
Type	Cast iron	Cast iron	Cast iron
Liquid ballast	610 lb each	None	None
Added cast iron	420 lb each	None	None
Rear tires			
No. and size	Two 13-38	Two 13-38	Two 12-38
Ply	6	6	6
Air pressure	14 lb	12 lb	12 lb
Front wheels			
Type	Pressed steel	Pressed steel	Pressed steel
Liquid ballast	None	None	None
Added cast iron	None	None	None
Front tires			
No. and size	Two 6.00-16	Two 6.00-16	Two 6.00-16
Ply	4	4	4
Air pressure	28 lb	28 lb	28 lb
Height of drawbar	18 inches	18½ inches	18 inches
Static weight			
Rear end	6620 lb	4560 lb	4488 lb
Front end	1882 lb	1882 lb	1875 lb
Total weight as tested with operator	8677 lb	6617 lb	6538 lb

FUEL, OIL and TIME Gasoline octane No ASTM 76 Research 82 (rating taken from oil company's typical inspection data); weight per gallon 6.090 lb **Oil** SAE 20; to motor 2.455 gal; drained from motor 1.821 gal **Total time motor was operated** 44 hours.

CHASSIS TYPE Tricycle **Serial No** 7000003 **Tread width** rear 60" to 88" front 8 5/16" and 12 1/16" **Wheel Base** 91" **Hydraulic control system** direct engine drive with throw out lever **Advertised speeds mph** first 2.5 second 3.5 third 4.5 fourth 6.5 fifth 8.75 sixth 12.5 reverse 3.25 **Belt pulley** diam 12⅞" face 7⅜" rpm 975 **Belt speed** 3285 fpm **Clutch** dry multiple disc operated by hand lever **Seat** upholstered seat with back rest **Brakes** internal expanding shoe operated by two foot pedals **Equalized** no **Power take-off** direct engine drive with independent clutch.

ENGINE Make John Deere **Type** 2 cylinder horizontal **Serial No** 7000003 **Crankshaft mounted** crosswise **Head I Lubrication** pressure **Bore and Stroke** 5⅞" x 7" **Rated rpm** 975 **Compression ratio** 6.15 to 1 **Displacement** 379.5 cu in **Port Diameter Valves** Inlet 1 15/16" Exhaust 1¾" **Governor** variable speed centrifugal **Carburetor Size** 1½" double barrel **Ignition System** battery **Starting System** two 6 volt batteries **Air Cleaner** Oil washed wire mesh **Muffler** was used **Oil Filter** replaceable impregnated paper element **Cooling medium temperature control** thermostat.

REPAIRS AND ADJUSTMENTS No repairs or adjustments.

REMARKS All test results were determined from observed data and without allowances, additions or deductions. Tests B and F were made with carburetor set for 100% maximum belt horsepower and data from these tests were used in determining the horsepower to be developed in tests D and H, respectively. Tests C, D, E, G, H, J & K were made with an operating setting of the carburetor (selected by the manufacturer) of 94.7% of maximum belt horsepower.

HORSEPOWER SUMMARY

	Drawbar	Belt
1. Sea level (calculated) maximum horsepower (based on 60° F. and 29.92" HG)	44.21	50.35
2. Observed maximum horsepower (tests F & B)	42.24	48.29
3. Seventy-five per cent of calculated maximum drawbar horsepower and eighty-five per cent of calculated maximum belt horsepower (formerly ASAE and SAE ratings)	33.16	42.80

We, the undersigned, certify that this is a true and correct report of official tractor test No. 493.

L. F. LARSEN
Engineer in Charge

C. W. SMITH
L. W. HURLBUT
F. D. YUNG
Board of Tractor Test Engineers

EXPLANATION OF TEST REPORT

TEST A: The manufacturer's representative operates the tractor for a minimum of 12 hours using light to heavy drawbar loads in each gear.

This serves as a period for limber up, general observation and adjustments. Adjustments that are permissible include valve tappet clearance, breaker point gap, spark plug gaps, clutch and others of a similar nature. No new parts or accessories can be installed without having mention made of it in the report.

No data are recorded during this preliminary run except the time that the engine is operated.

BELT HORSEPOWER TESTS

TEST B: The throttle valve is held wide open and the belt load on the dynamometer is adjusted so that the engine is at the rated speed recommended by the manufacturer. Carburetor, ignition timing and manifold adjustments are all set for maximum engine power.

This test is designed to determine maximum belt horsepower of the tractor at rated speed and to measure fuel consumption at the maximum power on the belt.

TEST C: For tractors with carburetors the best fuel economy does not always occur when the engine develops maximum power at rated speed. Test C is intended to allow the manufacturer's representative to select a more economical fuel setting even though there is a slight loss of power. *This more practical carburetor setting is used in all later tests except test F.* The throttle valve is held wide open and load adjusted to give rated rpm. Tests B and C are the same for diesel tractors, which have an altogether different fuel system.

TEST D: The throttle control lever is set so that the governor will maintain rated engine speed when rated load is applied. Rated load is 85% of 100% maximum, as obtained in test B, corrected to standard conditions.

This rating is somewhat less than the maximum belt horsepower in order that the operator may have a certain amount of reserve.

TEST E:

Varying load serves to show the range of engine speeds when the engine is controlled by the governor during the following varied loads of 20 minutes each: rated load, no load, ½ rated load, maximum load at wide open throttle valve, ¼ and ¾ rated load.

The average result of this test shows the average power and fuel consumption. Since the average tractor is subjected to varying loads, these data serve well in predicting fuel consumption and efficiency of a tractor in general use.

Torque, lb-ft at dynamometer, is obtained with wide open throttle and sufficient load is applied to give several readings.

DRAWBAR HORSEPOWER TESTS

In all drawbar tests the pull exerted by the tractor is transmitted by a hydraulic pressure cylinder to a recording instrument in the test car. All tests are made on the same dirt test course which is maintained by grading, sprinkling and rolling so that it remains very nearly the same throughout the season. The same tires, wheels and weights are used for all tests except J and K.

TEST F: A drawbar test, the results of which are used to determine the rated drawbar horsepower in test H. The carburetor is set to develop maximum power as in test B. The rated gear recommended by manufacturer as plow gear is used in this test. The drawbar load is adjusted to give rated engine speed.

TEST G: Maximum drawbar horsepower is determined in each gear when the carburetor is set for fuel economy as in test C. The throttle valve is held wide open and the load is applied so that the engine runs at rated engine speed.

When operating in low gear it is not uncommon for the tractor to develop less drawbar horsepower than in rated gear because of excessive wheel slippage. When excessive wheel slippage occurs the load is reduced until slippage approaches 16%. When the load is reduced it is necessary to operate the tractor engine at part throttle and control engine speed by governor action.

TEST H: Intended to test the ability of the tractor to run continuously for 10 hours at rated drawbar horsepower and to determine the fuel consumption during that time. Rated drawbar horsepower is 75% of 100% maximum drawbar horsepower (Test F), corrected to standard conditions.

When operating at rated load the throttle control lever is set to maintain rated engine speed. This rating is less than maximum drawbar horsepower in order that the operator may have a certain amount of reserve.

TEST J: The tractor is operated in rated gear with all added weight removed. This test shows the effect of the removal of added weight on the performance of the tractor when compared with test G.

Removal of wheel weights generally increases wheel slippage and decreases drawbar horsepower.

TEST K: Similar to test J except that the smallest tires and lightest wheels offered by the manufacturer are used.