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## Test 1011: John Deere 3020 Syncro Range

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# NEBRASKA TRACTOR TEST 1011-JOHN DEERE 3020 SYNCRO RANGE GASOLINE

## POWER TAKE-OFF PERFORMANCE

Hp	Crankshaft 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
<b>MAXIMUM POWER AND FUEL CONSUMPTION</b>								
Rated Engine Speed—Two Hours								
71.37	2500	6.544	0.556	10.91	194	69	75	29.017
Standard Power Take-off Speed (1000 rpm)—One Hour								
66.11	2071	5.855	0.537	11.29	196	70	76	28.980
<b>VARYING POWER AND FUEL CONSUMPTION—TWO HOURS</b>								
62.13	2561	6.067	0.592	10.24	188	71	76	.....
0.00	2682	2.734	.....	.....	178	69	74	.....
31.91	2629	4.500	0.856	7.09	183	69	74	.....
70.91	2500	6.517	0.558	10.88	194	70	75	.....
16.22	2673	3.674	1.374	4.41	180	70	75	.....
47.45	2608	5.335	0.682	8.89	184	69	74	.....
Av 38.10	2609	4.805	0.765	7.93	185	70	75	28.960

## DRAWBAR PERFORMANCE

Hp	Drawbar pull lbs	Speed miles per hr	Crankshaft 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	Cooling med	Air wet bulb	Air dry bulb	
<b>VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST</b>											
Maximum Available Power—Two Hours—4th Gear											
61.26	4642	4.95	2503	6.28	6.516	0.645	9.40	186	69	77	28.900
75% of Pull at Maximum Power—Ten Hours—4th Gear											
45.03	3213	5.26	2596	3.88	5.669	0.764	7.94	187	65	77	29.003
50% of Pull at Maximum Power—Two Hours—4th Gear											
33.73	2341	5.40	2641	3.03	4.960	0.892	6.80	179	67	71	28.885
<b>MAXIMUM POWER WITH BALLAST</b>											
56.33	7804	2.71	2533	14.97	2nd Gear	.....	199	75	95	28.870	
61.43	6156	3.74	2498	8.72	3rd Gear	.....	188	71	81	28.850	
63.47	4807	4.95	2502	6.21	4th Gear	.....	190	71	81	28.850	
62.23	3805	6.13	2500	4.80	5th Gear	.....	190	71	81	28.850	
62.58	2813	8.34	2498	3.42	6th Gear	.....	189	72	82	28.850	
61.36	2189	10.51	2501	2.57	7th Gear	.....	189	72	83	28.850	
<b>MAXIMUM PULL WITHOUT BALLAST</b>											
47.39	6468	2.75	2588	14.72	2nd Gear	.....	172	64	73	28.820	

## VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—4th Gear

Pounds Pull	4807	5110	5426	5687	5798	5672
Horsepower	63.47	60.39	56.43	51.79	44.89	36.59
Crankshaft speed rpm	2502	2251	1993	1749	1496	1241
Miles per hour	4.95	4.43	3.90	3.41	2.90	2.42
Slip of drivers, %	6.21	6.54	7.32	7.45	7.96	7.58

## TIRES, BALLAST and WEIGHT

		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 15.5-38; 8; 22	Two 15.5-38; 8; 14
Ballast	—Liquid	575 lb each	None
	—Cast iron	435 lb each	None
Front tires	—No, size, ply & psi	Two 6.00-16; 6; 40	Two 6.00-16; 6; 40
Ballast	—Liquid	None	None
	—Cast iron	10 lb each	None
Height of drawbar		18½ inches	18 inches
Static weight with operator—Rear		8050 lb	6030 lb
	Front	2170 lb	2150 lb
	Total	10220 lb	8180 lb

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

Department of Agricultural Engineering

Date of Test: May 13 to June 2, 1969

Manufacturer: JOHN DEERE WATERLOO TRACTOR WORKS, WATERLOO, IOWA

**FUEL, OIL and TIME** Fuel gasoline Octane No Motor 85.0 Research 93.0 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.7288 Weight per gallon 6.067 lb Oil SAE 30 API service classification MS-DM To motor 1.702 gal Drained from motor 1.410 gal Transmission and final-drive lubricant John Deere Special 303 oil Total time engine was operated 50 hours.

**ENGINE** Make John Deere gasoline Type 4 cylinder vertical Serial No M11RO127689R Crankshaft mounted lengthwise Rated rpm 2500 Bore and stroke 4¼" x 4¼" Compression ratio 7.5 to 1 Displacement 241 cu in Carburetor size 1½/16" Ignition system battery Cranking system 12 volt electric Lubrication pressure Air cleaner dry type with replaceable treated paper element Oil filter full flow replaceable paper element Oil cooler engine coolant heat exchanger for crankcase oil and radiator for transmission and hydraulic system Fuel filter sediment bowl and screen Muffler was used Cooling medium temperature control thermostat.

**CHASSIS** Type standard Serial No T111-R125705R Tread width rear 60" to 91" front 48½" to 82¼" Wheel base 92.75" 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 24.0" Vertical distance above roadway 35.6" Horizontal distance from center of rear wheel tread 0.125" to the left Hydraulic control system direct engine drive Transmission selective gear fixed ratio with partial range Syncro-mesh Advertised speeds mph first 2.0 second 3.1 third 4.1 fourth 5.2 fifth 6.4 sixth 8.6 seventh 10.7 eighth 17.6 reverse 3.3 and 5.2 Clutch single plate dry disc operated by foot pedal Brakes wet disc hydraulically power actuated operated by two foot pedals which can be locked together Steering hydrostatic power Turning radius (on concrete surface with brake applied) right 116½" left 116½" (on concrete surface without brake) right 139" left 139" Turning space diameter (on concrete surface with brake applied) right 243½" left 243½" (on concrete surface without brake) right 287" left 287" Belt pulley 978 rpm at 2100 engine rpm diam 12" face 8.5" Belt speed 3074 fpm Power take-off 1014 rpm at 2100 engine rpm.

**REPAIRS and ADJUSTMENTS:** Following PTO runs it was necessary to make a correction on foot throttle to maintain high idle.

**REMARKS:** All test results were determined from observed data obtained in accordance with the SAE and ASAE test code. First gear was not run as it was necessary to limit the pull in second gear to avoid excessive wheel slippage. Eighth gear was not run because it exceeded 15 mph.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 1011.

L. F. LARSEN  
Engineer-In-Charge

G. W. STEINBRUEGGE, Chairman  
W. E. SPLINTER  
D. E. LANE  
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,  $\frac{1}{2}$  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.



JOHN DEERE 3020 SYNCRO RANGE GASOLINE