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## Test 1460: John Deere 4650 PowerShift Diesel 15-Speed

Nebraska Tractor Test Lab

University of Nebraska-Lincoln, [tractortestlab@unl.edu](mailto:tractortestlab@unl.edu)

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NEBRASKA TRACTOR TEST 1460  
JOHN DEERE 4650 POWERSHIFT DIESEL  
15 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption			Temperature °F (°C)				Barometer inch Hg (kPa)
		gal/hr (l/h)	lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Cooling medium	Air wet bulb	Air dry bulb		
MAXIMUM POWER AND FUEL CONSUMPTION									
Rated Engine Speed—Two Hours (PTO Speed—998 rpm)									
165.52 (123.43)	2200	9.761 (36.949)	0.411 (0.250)	16.96 (3.341)	184 (84.6)	61 (15.9)	75 (23.8)	28.990 (97.895)	
VARYING POWER AND FUEL CONSUMPTION—Two Hours									
143.77 (107.21)	2249	8.819 (33.384)	0.428 (0.260)	16.30 (3.211)	181 (82.8)	62 (16.4)	76 (24.2)	..... .....	
0.00 (0.00)	2338	2.601 (9.846)	..... .....	..... .....	167 (75.0)	60 (15.8)	74 (23.6)	..... .....	
73.44 (54.76)	2297	5.676 (21.486)	0.539 (0.328)	12.94 (2.549)	176 (80.3)	60 (15.6)	74 (23.3)	..... .....	
165.38 (123.32)	2200	9.799 (37.093)	0.413 (0.252)	16.88 (3.325)	186 (85.3)	62 (16.4)	76 (24.4)	..... .....	
37.04 (27.62)	2316	4.132 (15.641)	0.778 (0.474)	8.96 (1.766)	170 (76.7)	62 (16.4)	76 (24.2)	..... .....	
108.94 (81.24)	2271	7.340 (27.785)	0.470 (0.286)	14.84 (2.924)	180 (81.9)	60 (15.8)	74 (23.6)	..... .....	
Av Av	88.10 (65.70)	2279 (24.208)	6.395 (0.308)	0.506 (0.308)	13.78 (2.714)	177 (80.3)	61 (16.1)	75 (23.9)	28.983 (97.872)

DRAWBAR PERFORMANCE WITH BIAS PLY TIRES

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption			Temp. °F (°C)		Barom. inch Hg (kPa)	
					gal/hr (l/h)	lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Cool- ing med	Air wet bulb		Air dry bulb
Maximum Available Power—Two Hours 10th Gear											
137.31 (102.39)	8250 (36.70)	6.24 (10.05)	2200	4.12	9.639 (36.487)	0.490 (0.298)	14.25 (2.806)	187 (85.8)	65 (18.3)	74 (23.3)	28.760 (97.118)
75% of Pull at Maximum Power—Ten Hours 10th Gear											
109.42 (81.60)	6345 (28.22)	6.47 (10.41)	2266	3.49	8.324 (31.509)	0.531 (0.323)	13.15 (2.590)	178 (80.8)	41 (5.1)	42 (5.4)	28.834 (97.368)
50% of Pull at Maximum Power—Two Hours 10th Gear											
74.57 (55.61)	4231 (18.82)	6.61 (10.64)	2290	2.43	6.593 (24.958)	0.617 (0.375)	11.31 (2.228)	175 (79.4)	33 (0.6)	36 (1.9)	29.210 (98.638)
50% of Pull at Reduced Engine Speed—Two Hours 13th Gear											
74.79 (55.77)	4231 (18.82)	6.63 (10.67)	1437	2.43	5.214 (19.735)	0.486 (0.296)	14.35 (2.826)	175 (79.2)	36 (2.2)	41 (5.0)	29.235 (98.722)

MAXIMUM POWER IN SELECTED GEARS

127.27 (94.91)	16746 (74.49)	2.85 (4.59)	2222	14.78	5th Gear			181 (82.5)	39 (3.9)	45 (7.2)	29.230 (98.705)
136.66 (101.91)	15138 (67.34)	3.39 (5.45)	2200	10.05	6th Gear			184 (84.4)	62 (16.7)	70 (21.1)	28.770 (97.152)
141.03 (105.16)	13171 (58.59)	4.02 (6.46)	2199	7.41	7th Gear			185 (85.0)	61 (16.1)	68 (20.0)	28.780 (97.186)
138.12 (103.00)	11040 (49.11)	4.69 (7.55)	2201	5.72	8th Gear			185 (85.0)	60 (15.6)	66 (18.9)	28.780 (97.186)
137.98 (102.89)	9472 (42.13)	5.46 (8.79)	2202	4.85	9th Gear			184 (84.4)	58 (14.4)	64 (17.8)	28.780 (97.186)
140.62 (104.86)	8460 (37.63)	6.23 (10.03)	2200	4.04	10th Gear			182 (83.3)	55 (12.8)	60 (15.6)	28.790 (97.220)
139.47 (104.00)	7220 (32.12)	7.24 (11.66)	2198	3.47	11th Gear			185 (85.0)	63 (17.2)	71 (21.7)	28.770 (97.152)
143.33 (106.88)	6621 (29.45)	8.12 (13.06)	2200	3.22	12th Gear			185 (84.7)	64 (17.8)	73 (22.8)	28.770 (97.152)

LUGGING ABILITY IN 10th GEAR

Crankshaft Speed rpm		2200	1986	1765	1543	1312	1096
Pull—lbs (kN)		8460 (37.63)	9532 (42.40)	10375 (46.15)	11066 (49.22)	10792 (48.01)	9081 (40.39)
Increase in Pull %		0	13	23	31	28	7
Power—Hp (kW)		140.62 (104.86)	141.88 (105.80)	136.62 (101.88)	126.93 (94.65)	105.31 (78.53)	74.86 (55.82)
Speed—Mph (km/h)		6.23 (10.03)	5.58 (8.98)	4.94 (7.95)	4.30 (6.92)	3.66 (5.89)	3.09 (4.98)
Slip %		4.04	4.85	5.32	5.64	5.64	4.53

TRACTOR SOUND LEVEL WITH CAB	Radial Ply		Bias Ply	
	2000 RPM	2200 RPM	2000 RPM	2200 RPM
Maximum Available Power—Two Hours	75.5	76.5	76.5	
75% of Pull at Maximum Power—Ten Hours			76.0	
50% of Pull at Maximum Power—Two Hours			77.0	
50% of Pull at Reduced Engine Speed—Two Hours			73.5	
Bystander in 15th gear			88.0	

Department of Agricultural Engineering

Dates of Test: October 9-28, 1982

Manufacturer: JOHN DEERE TRACTOR  
WORKS, P.O. Box 270, Waterloo, Iowa 50702

FUEL, OIL AND TIME: Fuel No. 2 Diesel  
Cetane No. 46.6 (rating taken from oil company's inspection data) Specific gravity converted to 60°/60° (15°/15°) 0.8379 Fuel weight 6.977 lbs/gal (0.836 kg/l) Oil SAE 15W-40 API service classification CD, CC, SD To motor 4.601 gal (17.415 l) Drained from motor 4.253 gal (16.099 l) Transmission and final drive lubricant John Deere Hy-Gard transmission and hydraulic fluid Total time engine was operated 60.5 hours.

ENGINE: Make John Deere Diesel Type six cylinder vertical with turbocharger and intercooler Serial No. \*RG6466A231034\* Crankshaft lengthwise Rated rpm 2000 to 2200 Bore and stroke 4.57" × 4.75" (116.0 mm × 120.6 mm) Compression ratio 15.8 to 1 Displacement 466 cu in (7636 ml) Starting system 12 volt Lubrication pressure Air cleaner two paper elements Oil filter one full flow paper cartridge Oil cooler engine coolant heat exchanger for crankcase oil, radiator for hydraulic and transmission oil Fuel filter two paper elements with prestrainer Muffler vertical Cooling medium temperature control three thermostats and variable speed fan.

CHASSIS: Type standard with duals Serial No. \*RW4650P001183\* Tread width rear 63" (1600 mm) to 130" (3300 mm) front 60.2" (1530 mm) to 86.3" (2192 mm) Wheel base 118.5" (3010 mm) 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 31.5" (800 mm) Vertical distance above roadway 45.3" (1151 mm) Horizontal distance from center of rear wheel tread 0.3" (8 mm) to the right Hydraulic control system direct engine drive Transmission selective gear fixed ratio with full range operator controlled powershift Advertised speeds mph (km/h) first 1.3 (2.1) second 1.9 (3.1) third 2.3 (3.7) fourth 2.9 (4.7) fifth 3.3 (5.3) sixth 3.8 (6.1) seventh 4.3 (7.0) eighth 5.0 (8.0) ninth 5.7 (9.2) tenth 6.5 (10.5) eleventh 7.5 (12.0) twelfth 8.4 (13.5) thirteenth 10.4 (16.7) fourteenth 14.5 (23.4) fifteenth 18.0 (29.0) reverse 1.8 (2.9), 2.6 (4.2), 4.0 (6.4), 6.0 (9.7) Clutch wet multiple disc hydraulically power actuated and operated by foot pedal Brakes wet disc hydraulically power actuated and operated by two foot pedals which can be locked together Steering hydrostatic Turning radius (on concrete surface with brake applied) right 165" (4.2 m) left 165" (4.2 m) (on concrete surface without brake) right 181" (4.6 m) left 181" (4.6 m) Turning space diameter (on concrete surface with brake applied) right 346" (8.79 m) left 346" (8.79 m) (on concrete surface without brake) right 380" (9.65 m) left 380" (9.65 m) Power take-off 998 rpm at 2200 engine rpm.

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

SUPPLEMENTAL TESTS  
DRAWBAR PERFORMANCE WITH RADIAL PLY TIRES

POWER AND FUEL CONSUMPTION AT 2200 RPM											
Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption			Temp. °F (°C)			
					gal/hr (l/h)	lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Cool- ing med	Air wet bulb	Air dry bulb	Barom. inch Hg (kPa)
Maximum Available Power—Two Hours 10th Gear											
140.48 (104.76)	8052 (35.82)	6.54 (10.53)	2201	1.90	9.728 (36.826)	0.483 (0.294)	14.44 (2.845)	182 (83.3)	49 (9.4)	59 (14.7)	29.115 (98.317)

MAXIMUM POWER IN SELECTED GEARS										
127.06 (94.75)	18794 (83.60)	2.54 (4.08)	2221	14.64	4th Gear	179 (81.4)	43 (6.1)	50 (10.0)	29.050 (98.097)	
142.05 (105.93)	16586 (73.78)	3.21 (5.17)	2199	5.30	5th Gear	183 (83.9)	56 (13.3)	70 (21.1)	29.060 (98.131)	
145.80 (108.73)	14787 (65.77)	3.70 (5.95)	2202	4.15	6th Gear	185 (85.0)	57 (13.9)	70 (21.1)	29.060 (98.131)	
145.69 (108.64)	12723 (56.59)	4.29 (6.91)	2200	3.14	7th Gear	186 (85.6)	57 (13.9)	70 (21.1)	29.060 (98.131)	
141.88 (105.80)	10698 (47.58)	4.97 (8.00)	2201	2.46	8th Gear	186 (85.3)	57 (13.9)	70 (21.1)	29.070 (98.165)	
141.47 (105.49)	9232 (41.06)	5.75 (9.25)	2199	2.03	9th Gear	185 (85.0)	57 (13.9)	69 (20.6)	29.080 (98.199)	
143.07 (106.68)	8205 (36.50)	6.54 (10.52)	2199	1.86	10th Gear	184 (84.4)	54 (12.2)	65 (18.3)	29.110 (98.300)	
140.74 (104.95)	6980 (31.05)	7.56 (12.17)	2200	1.51	11th Gear	185 (85.0)	56 (13.3)	70 (21.1)	29.060 (98.131)	
146.06 (108.92)	6465 (28.76)	8.47 (13.64)	2200	1.42	12th Gear	185 (84.7)	56 (13.3)	70 (21.1)	29.060 (98.131)	

LUGGING ABILITY IN 10th GEAR						
Crankshaft Speed rpm		2199	1981	1762	1535	1323
Pull—lbs (kN)		8205 (36.50)	9252 (41.15)	10072 (44.80)	10604 (47.17)	10227 (45.49)
Increase in Pull %		0	13	23	29	25
Power—Hp (kW)		143.07 (106.68)	144.90 (108.05)	140.04 (104.43)	128.20 (95.60)	106.61 (79.50)
Speed—Mph (km/h)		6.54 (10.52)	5.87 (9.45)	5.21 (8.39)	4.53 (7.30)	3.91 (6.29)
Slip %		1.86	2.12	2.29	2.46	2.46

POWER AND FUEL CONSUMPTION AT 2000 RPM  
POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption		Temperature °F (°C)			Barometer inch Hg (kPa)	
		gal/hr (l/h)	lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Cooling medium	Air wet bulb		Air dry bulb
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—One Hour (PTO Speed—907 rpm)								
168.59 (125.72)	2000	9.420 (35.659)	0.390 (0.237)	17.90 (3.526)	183 (83.7)	61 (15.9)	75 (23.8)	28.985 (97.878)

DRAWBAR PERFORMANCE WITH RADIAL PLY TIRES

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption			Temp. °F (°C)			Barom. inch Hg (kPa)
					gal/hr (l/h)	lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Cool- ing med	Air wet bulb	Air dry bulb	
Maximum Available Power—Two Hours 10th Gear											
144.10 (107.46)	9121 (40.57)	5.93 (9.54)	2001	2.25	9.531 (36.080)	0.461 (0.281)	15.12 (2.978)	182 (83.1)	47 (8.1)	54 (12.2)	29.020 (97.996)
MAXIMUM POWER IN SELECTED GEARS											
147.50 (109.99)	14250 (63.39)	3.88 (6.25)	2000	3.57	7th Gear			186 (85.6)	57 (13.9)	70 (21.1)	29.060 (98.131)
145.22 (108.29)	9183 (40.85)	5.93 (9.54)	1999	1.94	10th Gear			186 (85.3)	56 (13.3)	68 (20.0)	29.080 (98.199)
148.86 (111.00)	7265 (32.32)	7.68 (12.37)	2000	1.60	12th Gear			184 (84.4)	56 (13.3)	70 (21.1)	29.060 (98.131)

TIRES, BALLAST AND WEIGHT		Bias Ply Tires		Radial Ply Tires	
		With Ballast	Without Ballast	With Ballast	Without Ballast
Rear Tires Ballast	—No., size, ply & psi (kPa)	Four 20.8-38; 10; 14 (95)	Four 20.8-38; 10; 14 (95)	Four 20.8R38; 10; 12 (85)	Four 20.8R38; 10; 12 (85)
	—Liquid (each inner)	500 lb (227 kg)	None	310 lb (141 kg)	None
	—Cast Iron (each)	None	None	None	None
Front Tires Ballast	—No., size, ply & psi (kPa)	Two 14L-16.1; 10; 44 (305)	Two 14L-16.1; 10; 44 (305)	Two 14L-16.1; 10; 44 (305)	Two 14L-16.1; 10; 44 (305)
	—Liquid (each)	None	None	None	None
	—Test Equip. (each)	38 lb (17 kg)	None	38 lb (17 kg)	None
Height of Drawbar		24.5 in (620 mm)	24.5 in (620 mm)	24.5 in (620 mm)	24.5 in (620 mm)
Static Weight with Operator—Rear		14650 lb (6645 kg)	13650 lb (6192 kg)	14710 lb (6672 kg)	14090 lb (6391 kg)
Front		5010 lb (2273 kg)	4935 lb (2239 kg)	5030 lb (2282 kg)	4955 lb (2248 kg)
Total		19660 lb (8918 kg)	18585 lb (8430 kg)	19740 lb (8954 kg)	19045 lb (8639 kg)

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump return was maintained at 120°F (48.6°C). Eight gears were chosen between 15% slip and 10 mph (16.1 km/h).

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 1460.

LOUIS I. LEVITICUS  
Engineer-in-Charge

K. VON BARGEN  
W. E. SPLINTER  
L. L. BASHFORD  
Board of Tractor Test Engineers



John Deere 4650 Powershift Diesel