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Louis J. Meyer

Jay L. Treat

Fred W. Boren

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Soil Tillage Effects on Soil Moisture and Grain Sorghum Yield

Louis J. Meyer, Agronomist
Jay L. Treat, Area Extension Economist
Fred W. Boren, Station Superintendent

We compared yields, soil moistures, and costs associated with plowing, chiseling, and disking on a Parsons silt loam site. The preceding crop was corn.

Primary tillage was May 14; planting, May 17. The soil was wet and compacted from more spring rains than usual. More than 2 inches of rain, May 23-25, caused heavy crusting and spotty emergence. Plots were replanted June 9 using a Buffalo till-planter (10-inch sweep) to destroy the existing row and to plant simultaneously.

We broadcast 125 pounds N and 60 pounds K_2O per acre May 14, banded 100 pounds of 18-46-0 at planting and applied 3 pounds (active ingredient) per acre of Miloguard immediately after planting for residual weed control on all plots. No-till plots received additionally 1 pound (active ingredient per acre) of Paraquat and X-77 spreader-sticker (8 oz./10 gallons of

AGRICULTURAL EXPERIMENT STATION
Kansas State University, Manhattan
Floyd W. Smith, Director

Table 1—Effect of tillage treatment on grain sorghum yields and soil-moisture percentages, Parsons, 1973.

Treatment	Yield @ 12.5% moisture (bu/a)	Grain test (lbs/bu)	Soil moisture, % *					
			May 17			Aug. 20		
			0-4	4-8	8-12	0-4	4-8	8-12
				(in)			(in)	
Plow ¹	54.4	41.0	17.0	21.8	23.0	5.2	7.6	13.5
Chisel ²	55.8	41.1	18.0	19.4	22.3	5.8	7.6	13.3
Disk ³	51.8	40.7	18.0	20.0	21.7	6.3	6.9	11.9
No-till ⁴	46.8	41.5	22.2	20.6	21.0	6.3	7.2	12.3
LSD .05	ns	ns	ns	ns	ns	ns	ns	ns
LSD .10	5.0	ns	3.1	ns	ns	ns	ns	ns

* The proportion of moisture to soil by weight determines soil-moisture percentage.

1. Plow, disk, disk, springtooth, plant, spray, cultivate.

2. Chisel, disk, disk, springtooth, plant, spray, cultivate.

3. Heavy disk, disk, springtooth, plant, spray, cultivate.

4. Till-plant, spray, cultivate.

Tillage: May 14

Cultivated: July 20

Plot size: 40' wide, 40' long.

Planted: May 17

Row width: 30 inches

Harvested: October 4, 1973

Replanted: June 9

Variety: Northrup King 222G

Area harvested: 200 sq. ft.

Table 2—Costs and returns based on 1973 grain sorghum tillage experiment, Parsons.

	Primary Seedbed Preparation			
	Plow	Chisel	Heavy disk	No-till (till-plant)
Grain sorghum yield and value				
a) Yield, bu/acre ¹	54.4	55.8	51.8	46.8
b) Crop value/acre @ \$1.50/bu	\$81.60	\$83.70	\$77.70	\$70.20
Costs per acre², \$				
Plow (moldboard)	\$ 5.20			
Chisel		\$ 4.10		
Heavy disk			\$ 3.20	
Tandem disk ³	4.40	4.40	2.20	
Springtooth	1.60	1.60	1.60	
Plant (no-till planter*)	2.85	2.85	2.85	\$ 4.50*
Cultivate (once)	1.90	1.90	1.90	1.90
Fertilizer application (b'cast)	1.05	1.05	1.05	1.05
Herbicide application (b'cast)	1.55	1.55	1.55	1.55
Harvest, combine	6.25	6.25	6.25	6.25
Haul to bin or elevator @ 6¢/bu	3.26	3.35	3.11	2.81
Seed ¹	1.50	1.50	1.50	1.50
Fertilizer ^{1,4}	20.98	20.98	20.98	20.98
Herbicide ¹	6.00	6.00	6.00	13.55
Lime, pro-rated	1.25	1.25	1.25	1.25
Land tax	3.00	3.00	3.00	3.00
Mgt. & misc., @ 10% of gross	8.16	8.37	7.77	7.02
c) Total costs ⁵	68.95	68.15	64.21	65.36
• Return to land (b-c)	12.65	15.55	13.49	4.84

1. Data from the experiment; other data estimated.

2. Costs computed using custom rates.

3. Plowed and chiseled plots were tandem disked twice.

4. N @ 10¢/lb, P₂O₅ @ 8¢/lb, K₂O @ 5¢/lb.

5. Other than land interest.

spray) tank mixed with the Miloguard. Spray volume was 50 gallons per acre using 60 pounds pressure.

Composite soil samples were taken 0-4, 4-8, 8-12 inches deep May 17 and August 20 for gravimetric soil moisture determinations. All plots were cultivated July 20, and volunteer corn was removed by hand. Plots were harvested October 4. Effects of yields and soil moisture are shown in Table 1. Costs are compared in Table 2.

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Fred Boren, Superintendent