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Managing Irrigated Crop Residue[1]

by Paul E. Penas[2]

To study how yearly removing crop residue by burning or baling affected the soil, I started two long-term crop residue management studies at the branch station's Irrigation Project northwest of Holcomb, Kansas. The soil is a silted Richfield silty clay loam, a soil developed from wind-blown material and deposits of silt and clay from irrigation water taken from the Arkansas river.

The two studies are on wheat residue, initiated the summer of 1969, and on grain sorghum residue, started in the fall of 1970. Each year shortly after harvest, four residue management treatments were applied to different plots. Two nitrogen rates were applied preplant for grain sorghum and topdressed for wheat in the spring. All other cultural practices were those recommended for irrigated grain sorghum and wheat production.

Table 1 gives grain sorghum yields for the seven years (1971-77) and Table 2, for wheat yields for the eight years (1970-77) for the four residue management treatments and the two nitrogen fertilization rates. No significant long-term differences in yield due to residue management or nitrogen rates occurred. However, signi-

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ficant differences in yield due to residue management treatments and/or nitrogen rates occurred four of the seven years of the grain sorghum study and four of the eight years of the wheat study. The data indicate a slight yield advantage to burning of grain sorghum residue and removing or burning wheat residue.

The soil test data in Tables 3 and 4 show no significant differences due to residue management. The higher rate of nitrogen fertilization did not leave substantially more nitrogen after harvest of grain sorghum. Fall sampling of wheat plots showed nearly equal nitrogen (soil test values) for both rates of nitrogen applied.

It was anticipated that soil physical properties would not change greatly, but they will be measured after each study has been conducted ten years. Visual observation during the first tillage after burning indicates a much more friable and easily tilled soil than in plots where the crop residue was retained.

Yields and soil test data after seven years of grain sorghum and eight years of wheat indicate that removing or burning crop residue annually has little effect on grain yield or soil fertility. Continuation of the studies should substantiate these conclusions.

Table 1.—Yield of irrigated grain sorghum as influenced by residue management and nitrogen fertilization. Garden City, Kansas. 1971-77.

Residue management treatment	Yield (bu/acre)[1]		
	80 lb/a of N*	160 lb/a of N*	Avg
Worked in	124.9	126.3	125.6
Removed	120.8	124.9	122.8
2x residue	126.7	127.1	126.9
Burned	127.9	129.1	128.5
Avg	125.1	126.8	
LSD (.05) for means:			
Residue treatments		NS	
N rates		NS	

1. Yields are reported at 12.5% moisture.
*N rates were 100 lb/a and 200 lb/a before 1976.

Table 2.—Yield of irrigated wheat as influenced by residue management and nitrogen fertilization. Garden City, Kansas. 1970-77.

Residue management treatment	Yield (bu/acre)[1]		
	50 lb/a of N	100 lb/a of N	Avg
Worked in	62.6	64.2	63.4
Removed	64.1	65.0	64.6
2x residue	62.4	63.5	62.0
Burned	62.3	66.1	64.2
Avg	62.8	64.7	
LSD (.05) for means:			
Residue treatment		NS	
N rates		NS	

1. Yields are reported at 12.5% moisture.

Table 3.—Soil test values as influenced by irrigated grain sorghum residue management and nitrogen fertilization. Garden City, Kansas. 1971-77.

Residue management treatment	N rate lb/a[2]	Soil test values[1]				
		pH	O.M. %	Avail. N ppm	Avail. P lb/a	DTPA Zn ppm
Worked in	80	7.9	2.0	19	33	1.0
	160	7.8	2.1	38	26	1.1
Removed	80	7.9	2.0	17	26	1.0
	160	7.9	2.0	38	27	1.0
2x residue	80	7.9	2.0	16	33	1.1
	160	7.9	2.1	30	31	1.1
Burned	80	7.9	2.1	18	32	1.1
	160	7.9	2.0	40	28	1.0

1. Sampled November 1976 to 6 inches deep.
2. N rates were 100 lb/a and 200 lb/a before 1976.

Table 4.—Soil test values as influenced by irrigated wheat residue management and nitrogen fertilization. Garden City, Kansas. 1970-77.

Residue management treatment	N rate lb/a	Soil test values[1]				
		pH	O.M. %	Avail. N ppm	Avail. P lb/a	DTPA Zn ppm
Worked in	50	7.8	1.8	22	24	1.2
	100	7.8	1.8	26	25	1.3
Removed	50	7.8	1.7	27	23	1.1
	100	7.8	1.8	24	22	1.2
2x residue	50	7.8	1.9	22	24	1.2
	100	7.8	1.9	23	23	1.3
Burned	50	7.8	1.8	28	23	1.2
	100	7.8	1.8	26	24	1.2

1. Sampled November 1977 to 6 inches deep.

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