Influence of Tillage Methods on Wheat Production Following Different Crops

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INTRODUCTION

Wheat acreage has fluctuated widely with price outlook at planting time over the past 10 years. New adapted varieties with Hessian fly and disease resistance have made wheat a cheaper and more dependable crop to grow. Wheat in the southeast has often been a crop to fill in between main summer crops such as soybean or corn. However, with new varieties and management techniques, wheat can be a major cash crop. Much of the southern wheat is grown in double cropping systems with soybean or other summer annual crops. Therefore, there is often little time to prepare a good seedbed for the wheat crop if cotton, corn, soybean or even a hay crop are being harvested late in the fall. Reginelli et *al.* (1991) reported that wheat could be grown with reduced tillage in Mississippi. Touchton et al. (1989) reported that summer crops have different tillage requirements when winter crops are compacted by livestock. The objective of this study was to evaluate tillage treatments on wheat when planted behind soybean or perennial grass crops.

METHODS

This research was conducted for three years at the NFREC, Quincy, on a Norfolk loamy fine sand soil (Fine-loamy, siliceous, thermic Typic Kandiudult). Main plots consisted of previous crops: soybean, bermudagrass, and bahiagrass. Split plots were tillage treatments: turning plow, chisel plow, harrow, and no-till. Fertilizer was applied at the rate of 500 lbs/A of 5-10-15 after tillage. Wheat was planted at the rate of 100 lbs/A with a Tye Pasture Pleaser across all tillage treatments between 19 November and 3 December in each of the three years. Nitrogen was applied as a topdress application either the last week of January or the first week of February in each year with a Gandy applicator at the rate of 100 lbs N/A. Penetrometer readings were measured in each of the three years in all plots with a recording penetrometer to determine soil resistance. Wheat was harvested each year with a modified Gleaner E combine and yield, test weight, kernel weight, and moisture determined on each sample. The Duncan's Multiple Range test was used to determine differences among treatments at the 5% level of probability.

RESULTS

Overall grain yields were highest where the land was prepared by using the turning plow (Table 1) in the first year of the study. No-till yields were the lowest planted behind any of the three crops and especially low after bahiagrass. Penetrometer measurements indicated that soil resistance was the highest following bahiagrass than other crops and that no-tillage planting resulted in the highest soil-resistance. However, many farmers prefer to grow summer crops after bahiagrass pastures because of the excellent tilth and low numbers of nematodes and diseases and high yields experienced. Even though there is not very much documented evidence, most researchers who have worked on interseeding crops into bahiagrass have reported a reduction in growth which has been speculated to be allelopathic. Although growth of overseeded crops into bermudagrass may be slower than for prepared seedbeds, it is not usually as slow as in bahiagrass sods (R.L. Stanley, 1992, personal communication). Yields were highest (not statistically different) for no-till wheat in the second year of the study following soybean

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Table 1. Wheat yield as influenced by tillage treatments from three previous crops, year 1.

Tillage Treatment	Previous Crop			Avg. Across crops
	Soybeans	Bahiagrass	Bermudagrass	
turning plow	60.8 a[1]	42.5 a	47.8 a	50.3 a
chisel plow	53.4 a	36.8 a	50.1 a	46.8 a
harrow	48.5 ab	41.4 a	52.0 a	41.3 a
no-till	36.3 b	20.6 b	47.1 a	34.1 b
avg. across tillage trt.	49.8	35.3	49.2	

[1] Means in a column followed by different letters are statistically different at the 5% level of probability according to Duncan's Multiple Range Test.

Table 2. Influence of tillage on soil resistance six weeks after planting wheat into a bahiagrass field, year 1.

Soil depth	Tillage method at planting			
	Bottom plow	Harrow	Chisel plow	No-Till
--in.--	soil resistance (lbs/sq in)			
2	4	42	61	192
4	104	133	154	246
6	204	325	238	354
8	250	483	350	479
12	292	483	446	454

(Table 3). Penetrometer data (Table 4) for the year might explain this since no definite tillage pan was noted down to 12 inches during this year while a definite tillage pan was detected in years one and three. Wheat yields were lower with no-till in bahia and bermudagrass. Year three had similar results to year 1 in that no-tillage wheat resulted in lowest yields (Table 5). The three year average (Table 6) showed that no-tillage wheat behind a row crop such as soybean could result in yields 86% as high as using tillage treatment. Where large acreages had to be planted in a timely fashion or risk yield loss with later plantings, no-till could be a favorable alternative. Yields of no-till wheat into bahiagrass were only 61% of the tilled plots averaged over three years. Plantings made into bermudagrass sods more closely resembled those made into soybean stubble and if both sods were available for winter no-till plantings of wheat, bermudagrass would be preferred. Heavier no-till drills could result in better stands. The living mulch (bermuda and bahiagrass), although dormant at planting, gave the wheat some competition for nutrients and moisture during the grain fill period.

SUMMARY

Deep tillage may result in better wheat grain yields in some years. Fields that do not have traffic pans may obtain wheat yields from no-till plantings similar to till plantings. Plantings made after soybean generally did better than plantings made after or into sods. Bermudagrass was a superior sod crop for planting into over bahiagrass. Bahiagrass had a thicker root mass near the surface and perhaps allelopathic effects that reduced wheat yields. Where timeliness is essential, no-tillage plantings may result in near 85% of the yield of tilled plantings following either soybean or bermudagrass.

LITERATURE CITED

1. **Reginelli, D.B., N.W. Buehring, R.L. Ivey, T.E. Foster and J.D. Summers.** 1991. Wheat response to tillage systems and planting dates. 1991 Proceedings Southern Conservation Tillage Conference. Spec. Report 148 pp. 68-71.

2. **Touchton, J.T., D.W. Reeves, and D.P. Delaney.** 1989. Tillage systems for summer crops following winter grazing. 1989 Proceedings Southern Conservation Tillage Conference Special Bulletin 89-1:72-75.

Table 3. Wheat yield as influenced by tillage treatments after three previous crops, year **2.**

Tillage Treatment	Previous Crop			Average All Crops
	Soybean	Bahiagrass	Bermudagrass	
turning plow	**63.5** a[1]	**61.5** b	**52.5** a	**59.2**
chisel plow	**65.8** a	**59.0** b	**54.2** a	**59.7**
harrow	**64.3** a	**75.3** a	**54.7** a	**64.8**
no-till	**66.9** a	**42.4** c	**47.7** a	**52.3**
avg. over tillage trt.	**65.1**	**59.6**	**59.6**	

[1] Means in a column followed by different letters are statistically different at the **55** level of probability according to Duncan's Multiple Range Test.

Table 4. Three years of tillage influence on soil resistance when planted after soybeans.

Soil depth (in.)	Primary Tillage Method											
	Turning Plow			Chisel Plow			Harrow			No-till		
	Year											
	1	2	3	1	2	3	1	2	3	1	2	3
	soil resistance (lbs sq in[-1])											
2	0	48	31	0	25	0	0	42	19	54	a	~a
4	0	54	81	0	46	69	8	75	56	104	8	163
6	21	83	106	75	133	131	171	133	200	242	8	250
8	63	79	113	183	221	243	329	270	269	404	63	300
12	321	79	112	425	383	381	471	420	300	396	183	475

Table 5. Wheat yield as influenced by tillage treatments after three previous crops, year 3.

Tillage Treatment	Previous Crop Soybeans	Bahiagrass	Bermudagrass	Average All Crops
turning plow	55.7 b[1]	60.5 a	60.1 a	58.8
chisel plow	70.0 a	62.8 a	62.2 a	65.0
harrow	61.7 ab	54.4 a	64.4 a	60.2
no-till	53.7 b	37.4 b	41.6 b	44.2
Avg. over tillage trt.	60.3	53.8	57.1	

[1] Means in a column followed by different letters are statistically different at the 5% level of probability according to Duncan's Multiple Range Test.

Table 6. Three year average wheat yields as influenced by tillage and previous crop.

Ti11age Treatment	Previous Crop Soybeans	Bahiagrass	Bermudagrass	Average All Crops
turning plow	60.0 a[1]	54.8 a	53.5 a	56.1
chisel plow	63.1 a	52.9 a	55.5 a	57.2
harrow	58.2 a	57.0 a	57.0 a	57.4
no-till	52.3 b	33.5 b	45.5 b	43.8
Avg. over tillage trt.	58.4	49.6	52.9	
no-till % of tillage treatment	86%	61%	82%	

[1] Means in a column followed by different letters are statistically different at the 5% level of probability according to Duncan's Multiple Range Test.