Reduced Tillage Research with Peanut in North Carolina (1997-2009)

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Abstract

Reduced tillage peanut (*Arachis hypogaea* L.) production continues to gain interest in North Carolina. Fifty-four experiments were conducted from 1997 through 2009 to compare peanut yield in conventional tillage systems to yield of peanut strip tilled into stubble from the previous crop, into small grain residue, or in sod-based systems including tall fescue. When pooled over all experiments, pod yield in conventional tillage was 131 lb/acre or 3.8% higher than when peanut was strip tilled. Yield varied by less than 5% in 37% of the experiments, and in these experiments yield of conventional tillage exceeded that of strip tillage in 55% of experiments. When yield differed by 5 to 10%, yield in strip tillage exceeded that of conventional tillage in 55% of experiments. Yield differences of 10 to 15% were higher in strip tillage in 55% of experiments. However, when yield differences exceeded 15%, yield always favored conventional tillage. Major differences in yield (exceeding 15%) were generally noted on finer-textured soils often considered less conducive to peanut production. These data indicate that strip tillage is increasingly a viable option for peanut growers in North Carolina.

Introduction

Research indicates that peanut response to reduced tillage can be inconsistent (Baldwin and Hook, 1998; Brandenburg et al., 1998). However, advantages to reduced tillage peanut production exist, and more recently recommendations on reducing tomato spotted wilt of peanut have included planting peanut in reduced tillage systems (Brown et al., 2005; Hurt et al., 2003). Farmers in North Carolina planted peanut in reduced tillage systems, on at least a portion of their operations, at levels of 10% (1998), 23% (2003), and 41% (2009) (Table 1). Determining the impact of tillage on peanut yield continues across the peanut belt, and defining interactions among tillage systems and other production and pest management practices is important in order to develop recommendations for growers, especially for those planting Virginia market types. Objectives of this article are to provide a summary of experiments conducted from 1997-2009 in North Carolina where conventional tillage systems and strip tillage systems were compared.

Materials and Methods

Experiments were conducted in North Carolina from 1997 through 2009 at a variety of locations, on several soils, and with various Virginia market type cultivars (Table 2). Although these experiments often had multiple variables, in this article peanut response to tillage systems was pooled over treatment factors to compare general trends.

Results and Discussion

When averaged over the 54 experiments, peanut pod yield was 131 lb/acre higher in conventional tillage compared with strip tillage into stubble, killed cover crop, or tall fescue sod (Table 2). Yield varied by less than 5% in 37% of the experiments, and in these experiments yield of conventional tillage exceeded that of strip tillage in 55% of experiments (Table 3). When yield differed by 5 to 10%, yield in strip tillage exceeded that of conventional tillage in 55% of experiments (Table 3). Yield differences of 10 to 15% were higher in strip tillage in 55% of experiments. However, when yield differences exceeded 15%, yield always favored conventional tillage (Table 3). The range of differences in percent yield varied from conventional tillage being 14.6% lower to 29.9% higher compared with yields in strip tillage (Table 2). In many instances lower yields in strip tillage were noted on finer textured soils. However, fewer growers are now planting Virginia market type peanut on finer textured soils due to lower yield potential often associated with digging losses in either conventional or reduced tillage systems. Growers continuing to produce peanut on coarser textured soils may be able to plant in reduced tillage systems without sacrificing yield. Considerable variation in yield was noted among experiments, soil series, and other treatment factors, and results from these individual experiments have been reported elsewhere (Jordan et al., 2001, 2002, 2003, 2004a, 2004b, 2005).

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Table 1. Percentages of North Carolina peanut growers implementing specific tillage practices during 1998, 2004, and 2009 on a portion of their farms.

Tillage	1998	2004	2009
Disk	90	78	71
Chisel	25	23	27
Moldboard plow	58	17	7
Field cultivate	75	55	42
Rip and bed	49	39	40
Bed	44	35	32
Reduced tillage	10	23	41

Table 2. Year, location, soil series, conventional tillage system, seedbed present during strip-till operation, cultivar, actual yield difference, and percent yield difference from 54 trials comparing peanut in conventional tillage to strip tillage in North Carolina during 1997-2009. A positive value for actual and percent yield indicates that peanut yield was higher in conventional tillage systems compared with strip tillage systems.

						Yield difference	
		Soil	Tillage‡				
Year	Location	series†	Conventional	Strip	Cultivars	lb/A	%
1997	Tyner	CLS	D/R-B	Wheat	Multiple§	-327	-8.3
1997	Edenton	RSL	D/C-B	Cotton	Multiple¶	+905	+21.7
1997	Lewiston	NSL	D/R-B	Corn	NC 10C	-458	-9.7
1997	Rock Mount	GLS	D/R-B	Corn	NC 10C	-463	-10.6
1997	Lewiston	NSL	D/R-B	Cereal rye	NC 7	-438	-10.7
1998	Lewiston	NSL	D/C/R-B	Corn	NC 9	-116	-2.9
1998	Edenton	RSL	D/C/B	Cotton	NC 7	+938	+27.1
1998	Edenton	RSL	D/C/B	Corn	NC 7	+148	+4.8
1998	Halifax	NSL	D/C/R-B	Wheat	NC-V 11	+277	+7.2
1998	Lewiston	NSL	D/R/B	Wheat	NC 7	+317	+11.0
1998	Woodland	CrSL	D/C/R-B	Cotton	NC-V 11	+274	+9.4
1999	Woodland	CrSL	D/C/R-B	Cotton	NC-V 11	+1069	+29.9
1999	Scotland Neck	NSL	D/R/B	Wheat	NC-V 11	+729	+14.9
1999	Halifax	NSL	D/C/R-B	Wheat	NC 12C	-192	-4.2
1999	Rocky Mount	GSL	D/R-B	Cotton	VA 98R	+258	+9.5
1999	Edenton	PSL	D/C/R-B	Cotton	NC-V 11	+115	+3.4
1999	Edenton	PSL	D/C/B	Cotton	NC-V 11	+981	+24.3
1999	Lewiston	NSL	D/C/R-B	Corn	NC 9	+614	+17.2
1999	Lewiston	NSL	D/R/B	Cereal rye	NC 7	-258	-6.3
1999	Gatesville	CLS	D/R/B	Cotton	Multiple#	+146	+3.1
1999	Williamston	GLS	D/R/B	Corn	Multiple#	+4	+0.2
1999	Tyner	CSL	D	Cotton	Multiple#	-162	-4.5
1999	Whitakers	GSL	D/R-B	Cotton	Multiple#	-149	-4.1
2000	Woodland	CrSL	D/R-B	Wheat	NC-V 11	+546	+23.2
2000	Lewiston	NSL	D/R-B	Corn	NC 12C	+202	+4.5
2000	Lewiston	NSL	D/R-B	Corn	Multiple††	-258	-6.3
2000	Lewiston	NSL	D/C/R-B	Wheat	NC 12C	+17	+0.5
2000	Rocky Mount	GSL	D/R-B	Cotton	NC-V 11	+273	+7.2
2001	Lewiston	NSL	D/R-B	Corn	Multiple††	+53	+2.0
2001	Lewiston	NSL	D/R-B	Corn	NC 12C	-120	-4.3
2002	Lewiston	NSL	D/R-B	Corn	Multiple‡‡	-715	-14.6
2002	Lewiston	NSL	D/R-B	Corn	NC 12C	-210	-9.2
2002	Rocky Mount	GSL	D/R-B	Cotton	VA 98R	+330	+8.6
2003	Lewiston	NSL	D/R-B	Corn	Multiple‡‡	+517	+11.4
2003	Tyner	WFS	D/R-B	Wheat	Multiple‡‡	-54	-1.0
2003	Rocky Mount	GSL	D/R-B	Wheat	Multiple‡‡	-455	-12.2
2004	Rocky Mount	GSL	D/R-B	Cotton	Multiple‡‡	-90	-2.4
2004	Lewiston	NSL	D/R-B	Corn	Multiple‡‡	-304	-6.6

2004	Lewiston	NSL	D/R-B	Crop§§	NC 12C	-551	-12.4
2004	Rocky Mount	GSL	D/R-B	Cotton	VA 98R	-141	-4.1
2005	Lewiston	NSL	D/R-B	Stale¶¶	NC-V 11	+468	+16.8
2006	Lewiston	NSL	D/R-B	Stale¶¶	NC-V 11	+250	+6.9
2006	Lewiston	NSL	D/R-B	Wheat	NC 12C	+70	+1.8
2006	Rocky Mount	GSL	D/R-B	Cotton	VA 98R	+1090	+27.5
2007	Rocky Mount	GSL	D/R-B	Cotton	VA 98R	-139	-4.6
2008	Rocky Mount	GSL	D/R-B	Cotton	VA 98R	+944	+20.9
2008	Lewiston	NSL	D/R-B	Cotton	Multiple‡‡‡	+164	+3.4
2009	Lewiston	GSL	D/R-B	Corn	Multiple§§§	-291	-8.3
2009	Lewiston	GSL	D/R-B	Cotton	Multiple§§§	+355	+10.0
2009	Rocky Mount	GSL	D/R-B	Corn	Multiple§§§	-465	-13.2
2009	Lewiston	GSL	D/R-B	Crops†††	Phillips	+580	+10.9
2009	Edenton	PSL	D/B	Crops†††	Phillips	+50	+1.5
2009	Rocky Mount	GSL	D/R-B	Crops†††	Phillips	+695	+21.0
2009	Rocky Hock	VLS	D/R-B	Crops†††	Phillips	+32	+1.5
Average (1997-2009) 54		-	-	-	-	+131	+3.8

†Abbreviation: CLS, Conetoe loamy sand; CrSL, Craven silt loam; GSL Goldsboro sandy loam; NSL, Norfolk sandy loam; PSL, Perquimans silt loam; RSL, Roanoke silt loam; VLS, Valhalla loamy sand; WFS, Wanda fine sand.

‡Abbreviations: D, disk; C, chisel; R-B, in-row rip and bed; B, bed. In-row sub-soiling was included at all locations except Edenton when strip tilling except in 2009.

§Averaged over the cultivars NC 7, Gregory, and NC-V 11.

¶Averaged over the cultivars NC 7, VA 93B, and VA-C 92R.

#Averaged over the cultivars Georgia Green, NC 10C, NC-V 11, NC 12C, Perry, and VA 98R.

††Averaged over the cultivars NC-V 11, NC 12C, Perry, and VA98R.

‡‡Averaged over cultivars Gregory and Perry.

§§Averaged over the rotation crops cotton and corn.

¶¶Averaged over the rotation crops corn and grain sorghum. Stale seedbeds prepared one month prior to planting into a strip tilled zone.

†††Averaged over cotton and tall fescue treatments.

‡‡‡Averaged over the cultivars CHAMPS, Gregory, Perry, Phillips, and VA 98R.

§§§Averaged over the cultivars CHAMPS, Bailey, Gregory, Perry, Phillips, and VA 98R.

Table 3. Comparison of percent differences in peanut yield between conventional tillage and strip tillage from 54 experiments conducted from 1997-2009 in North Carolina.

Percent difference between conventional and reduced tillage	Number of comparisons falling within a range of percentages	Experiments were yield of conventional tillage exceeded strip tillage	
		Number	%
0 to 5.0	20	11	55
5.1 to 10.0	13	6	46
10.1 to 15.0	11	5	45
15.1 to 20.0	2	2	100
20.1 to 25.0	5	5	100
25.1 to 30.0	3	3	100
>30.1	0	0	0
Total	54	32	59