EFFECTS OF THREE TILLAGE SYSTEMS ON WHEAT YIELD AND DOUBLE CROP SOYBEAN YIELD

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INTRODUCTION

Increasingly southeast Virginia farmers are limiting tillage to build up soil organic matter and decrease erosion. Slagle, a fine, sandy loam soil common in this area, is an excellent productive soil. However these sandy soils are prone to developing hardpans from discing and vehicular traffic during the growing and harvest season (Busscher et al., 1986). These hardpans limit root growth and thereby the acquisition of moisture and nutrients by the plant. Subsoiling has been investigated as a technique to break up the hardpan while limiting disturbance to the soil surface. Busscher and coworkers (2006) demonstrated an increase in wheat yield in subsoiled plots when compared to non deep tilled. Also corn yields were greater after subsoiling when compared to no tillage or slit tillage (Busscher et al., 1995). The objective of this research trial was to determine the effect of deep tillage, compared to no tillage and traditional discing and planting on wheat yields and subsequent double crop soybean yields in a sandy loam field determined to have a hardpan.

MATERIALS AND METHODS

Following cotton harvest, stalks were mowed and three tillage treatments were employed. Each treatment was replicated four times in a randomized complete block design. Treatment 1 (TRT 1) consisted of traditional discing, followed by drilling wheat on 7 inch rows. Treatment 2 (TRT 2) was drilled wheat with no additional tillage. Treatment 3 (TRT 3) included ripping 36 inch on center (between previously ripped cotton rows) followed by drilled wheat, on 7 inch rows. Wheat was harvested and yield, test weight and moisture were determined. Soybeans were no-till drilled in 7-inch rows in the same treatment plots as the wheat. At harvest soybean yield and moisture were measured. There was a significant wheat yield increase for TRT 3 when compared to TRT 1 and TRT 2. There was no difference between TRT 1 and TRT 2. TRT 3 also produced a significant yield increase in double-cropped soybeans when compared to TRT 2.

A Slagle fine sandy loam field was tested using a penetrometer and found to have a uniform hardpan at a 6-8 inch depth. Following cotton harvest, three treatments were replicated four times across the field in 30 foot by approximately 500 foot plots. The first treatment consisted of discing the plots. There was no tillage prior to drilling wheat in Treatment 2. Treatment 3 consisted of ripping to a depth of 12 inches, 36 inch on center between cotton rows ripped at planting. All three treatments were followed by drilling wheat in 7.5 inch rows at a 1.5 inch depth with 22 seeds per foot. Fertilization and pest management followed Virginia Cooperative Extension recommendations and were applied the same across all treatments. A 22 foot swath of wheat was harvested from the center of each plot, weighed, moisture tested and yield per acre calculated. Soybeans were no-till drilled into wheat stubble. Once again, seeding rate, fertilization and pest management were the same across treatments. Soybeans were

In M.S. Reiter (ed.) A multidisciplinary approach to conservation. Proc. 31st Southern Conservation Agric. Systems Conf., Melfa, VA. 20-23 July 2009. Extension Publ. 2910-1417. Dep. Crop and Soil Environ. Sci., Eastern Shore Agric. Res. Ext. Cntr., Virginia Polytechnic Inst. and State Univ., Painter, VA. Available at: http://pubs.ext.vt.edu/2910/2910-1417/2910-1407.html.

harvested from a 20 foot swath in the center of each plot, weighed, moisture tested, and yield determined. Treatment effect was compared for yields of wheat and soybean using analysis of variance (SAS; Cary NC) followed by multiple comparisons between means.

RESULTS

There was a significant wheat yield increase with deep tillage when compared to traditional discing and no tillage. There was no difference between traditional discing and no tillage. Deep tillage also produced a significant yield increase in double-cropped soybeans when compared to no tillage.

Table 1. Effect of three tillage types on wheat yields.

TREATMENT	YIELD (BU/ACRE)
Traditional discing	99.87[a]
No tillage	98.33[a]
Deep tillage (ripped)	104.08[b]

Treatments with different letters indicate a statistically significant difference in yield ($P < .05$).

Table 2. Effect of three tillage types on soybean yields.

TREATMENT	YIELD (BU/ACRE)
Traditional discing	44.00[ab]
No tillage	42.75[a]
Deep tillage (ripped)	44.45[b]

Treatment with different letters indicate a statistically significant difference in yield ($P< .05$)

CONCLUSION

Deep tillage increased wheat and soybean yields in a continuous no till field affected by hardpan. However there was no difference in double crop soybean yields between deep tillage and discing prior to drilling wheat. Coventry and coworkers (1987) demonstrated that deep ripping increased the amount of root growth and decreased the negative impact of the hardpan on the depth of root growth. They found that wheat yield was increased by deep ripping during a drought year. Rainfall was not a limiting factor in crop production in the year this trial was performed. While differences in yield were evidenced it is likely those differences would be amplified in a drier growing season. Deep tillage may be a valuable tool to increase production in continuous no till fields with uniform hardpan.

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