

# **INDIRECT BENEFIT OF NO-TILL WHEAT: ENHANCED YIELD OF ROTATIONAL CORN AND SOYBEANS**

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## **BACKGROUND:**

A study at the University of Kentucky has shown benefits for no-till wheat on the production of soybeans and corn in rotation with the wheat. Both soybeans and corn were planted using no-till methods. The research showed a 3% yield benefit for soybeans and an 8% yield benefit for corn when those crops followed no-till wheat compared with tilled wheat. It appears that enhanced moisture availability occurs with continuous no-tilled systems. Soil research in the different treatments found greater amounts of mid-range pore sizes in the soil, perhaps explained by enhanced microbial activity. This is caused by soil structure changes that occur in the no-till system.

These test results were obtained from small plot research on a specific location. So, can farmers obtain similar corn and soybean yield benefit by planting their wheat crop by no-till methods? They will be integrating across more soil types and across more environmental conditions.

## **OBJECTIVES:**

1. To determine if no-till wheat production enhances yields of rotational corn and soybeans on Kentucky farms.
2. To determine if measurable soil characteristics can explain any variation in the response of corn and soybeans to no-till wheat production across several Kentucky landscapes.

## **RESEARCH APPROACH:**

The test has been established on 3 locations. The soil types are predominantly Pembroke with some Nolin and Huntington soil types also present. The fields are large fields and the fields were split. Tilled wheat was planted on one part of the field and no-till wheat was planted on another part. All 3 fields had a history of tilled wheat plantings followed by no-tilled double-cropped soybeans and no-till corn the next year.

All sites were GPSed in the winter and specific topography landscape areas in each field were identified (foot slopes, back slopes and summits) and specific areas identified for soil scientific comparisons. These specific areas were sampled and analyzed for soil texture, bulk densities, aggregate size and water retention curves. This information will be used as baseline data for future comparisons.

Each field was harvested with a combine that had a calibrated GPS yield monitor. Yields of the identified topographical areas were selected for comparison in the individual 3 fields.

The 3 fields were then no-till planted to double cropped soybeans shortly after harvest. These fields are scouted for differences according to tillage treatments.

The 3 fields are:

- 1) Gary Lester Farm - (Christian County)  
Pembroke and Nolin soil types  
Wheat planted: Tilled (Oct. 10) No-Tilled (Oct. 13)  
Plant stands: Tilled (25.6 plants/sq. Ft.) No-Tilled (29.1 plants/sq. Ft.)  
Wheat harvested: June 18  
Soybean stands: Tilled area (4.1 plants/row ft.)  
No-Tilled area (4.5 plants/row ft.)
- 2) Larry Thompson - Nabb Farm (Todd County)  
Pembroke, Crider and Huntington soil types  
Wheat planted: Oct. 13 and 14
- 3) Don Halcomb Farm - (Logan County)  
Pembroke and Nolin soil types  
Wheat planted: Oct. 25  
Seeding rate: Tilled (36 seeds/sq ft)  
No-Tilled (44 seeds/sq ft)  
Wheat harvested: June 23  
Soybeans planted: June 26

**RESULTS AND DISCUSSION:**

<b>TABLE 1. SOIL BACKGROUND DATA</b>				
<b>Farm</b>	<b>Clay (%)</b>	<b>Soil Density (g/cm<sup>3</sup>)</b>	<b>Aggregate Size (mm)</b>	<b>Water Holding Capacity (in./6 in.)</b>
Halcomb	21.9	1.24	10.3	0.61
Lester	16.5	1.19	9.0	0.64
Thompson	16.1	1.25	13.6	0.61
<b>Landscape Position</b>	<b>Clay (%)</b>	<b>Soil Density (g/cm<sup>3</sup>)</b>	<b>Aggregate Size (mm)</b>	<b>Water Holding Capacity (in./6 in.)</b>
Foot slope	16.0	1.23	10.7	0.57
Back slope	21.7	1.22	11.6	0.67
Summit	17.0	1.22	10.5	0.62
<b>Tillage</b>	<b>Clay (%)</b>	<b>Soil Density (g/cm<sup>3</sup>)</b>	<b>Aggregate Size (mm)</b>	<b>Water Holding Capacity (in./6 in.)</b>
No-Till	18.0	1.26	11.4	0.64
Tilled	18.4	1.04	5.2	0.51

**SOIL BACKGROUND DATA**

Table 1 shows the background data and compares the data by farm, landscape position and tillage.

***Farm***

There were little differences in texture, soil density, aggregate size and water holding capacity when the fields among farms are compared. This is to be

expected since the soil types are similar as well as the past history.

***Landscape Position***

There were also little differences in the same soil physical measurements when compared by landscape position. The exception is the back slope position.

This position has the highest slope percentage which has resulted in the most erosion over the years. So, it is not surprising that the clay is higher and the aggregate size is slightly higher.

***Tillage***

When the soil data is compared between tilled and no-tilled treatments, there are differences. The amount of clay is very similar, but the tillage in the fall has resulted in a lower soil density, a smaller aggregate size and a reduced water holding capacity. These measurements should move closer to the no-till measurements with time since there will be no more tillage until wheat planting in 2 years.

**WHEAT YIELDS**

<b>TABLE 2. 2001 WHEAT YIELDS</b>	
<b>Farm</b>	<b>Yield (bu/ac) @ 13.5% H<sub>2</sub>O</b>
Halcomb	83.8
Lester	109.1
Thompson*	86.0
*Data lost on most of field due to a computer crash.	
<b>Landscape Position*</b>	
Foot slope	98.9
Back slope	91.1
Summit	100.1
* (on 2 farms)	
<b>Tillage</b>	
No-Tillage	96.4

The yields on all farms were high (Table 2). The data on the Thompson farm is not complete due to a computer crash which resulted in the loss of most of the yields in the field. A small area was retrieved and allowed a side by side tillage comparison.

When the data was compared by landscape position, the summit and foot slope positions were similar. The back slope position, where previous erosion had existed, resulted in lower yields. This will probably not always be true over the years.

When the yields are compared by tillage treatment, they are almost identical. The stands on all 3 fields were good for both tillage treatments and the visual appearances throughout the growing season was also good for both treatments. The effects of any freeze damage that occurred on April 18 were not very apparent in either tillage treatment and had little if any effect on the yield.

#### **SUMMARY AND FUTURE PLANS:**

The project is in the beginning stages and the soil background data has been taken on the fields and there are few differences except for the effects of past erosion on the back slope locations. The yields were excellent and not affected by tillage treatments.

At least 4 more fields will be added this fall to complete the total number of fields to be studied. The same type of data gathered from the above fields will be gathered on the new fields. The growth and yields of the no-tilled soybean and corn crops will also be followed.

#### **ACKNOWLEDGEMENTS:**

The Researchers owe a great deal of thanks and appreciation to the Farmers who so graciously agreed to make the sacrifices in time, effort and equipment to make this study a reality.

We also want to thank the Kentucky Small Grain Grower's Association for their financial assistance and positive encouragement.