

# Western Illinois University/ School of Agriculture

## 2012 No-Till Soybean Study

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### Introduction:

Aspects of no-till soybean production were studied in 2012 at the Allison Organic Research Farm in southern Warren County, IL for the 4<sup>th</sup> consecutive year. Growing cereal rye to a certain stage and terminating it mechanically by means of rolling/crimping has shown promise for a successful organic no-till system, but more research is needed.

This study analyzed yields of 2 different no-till treatments. The 1<sup>st</sup> treatment consisted of rolling the rye prior to drilling the soybeans and the 2<sup>nd</sup> treatment consisted of drilling the soybeans with 2 passes of the drill set for half rate. The extra pass was to take the place of the roller and provide more uniform placement of the rye seed due to the 2<sup>nd</sup> pass being offset ~ 4" using RTK guidance.

Many farmers do not have a roller, so we are studying the effects of using the no-till drill on the extra pass in lieu of the roller. If this proves to be effective farmers will have the option to drill no-till organic soybeans without needing to purchase an additional piece of equipment. More uniform rye seed placement could lead to better weed control and possibly higher yields if enough weeds are reduced.

### Methods:

The soil in field 3-4 was prepared for drilling Aroostook winter rye in early Oct, 2011 by tilling it with a Howard Rotavator. The following day, Oct 8<sup>th</sup>, rye was drilled at an average of 124 lbs/a with a John Deere 10' wide conventional drill.

On May 10<sup>th</sup>, 2012 Blue River Hybrid 34A7 soybeans were no-till drilled into both the treatments using a 15' wide John Deere 750 no-till drill set with heavy down pressure on the drill units. The tractor used for this experiment relied on RTK guidance.

Treatment 1 consisted of rolling/crimping the rye at the anthesis stage, with a 15' wide custom made roller, and drilling the rye the same day at an intended rate of 220,000 seeds/a.

Treatment 2 consisted of drilling the soybeans without using a roller. Proper crimping of the rye relied on 2 passes from the drill. The soybean intended rate for each pass was set at half (110,000 seeds/a) for a total of 220,000 seeds/a. (Actual total rate may have been closer to 250,000 seeds/a). Using RTK guidance on the tractor, the 2<sup>nd</sup> pass was positioned ~ 4" parallel to the 1<sup>st</sup> pass to get more even distribution of the seeding and better crimping of the rye.

Plot harvesting took place on 10/29/12 using a KEM plot combine. Each plot was 5' wide of ranged from ~40' to 60' in length. Each of the 2 treatments were replicated 4 times.

## Results:

The (2 drill pass) treatment proved to do a better job overall crimping the rye than the (rolled and 1 drill pass) treatment. The only issue we observed with the drill serving as a roller was a lack of rye crimping on the edges of each pass. Some rye stood back up for both treatments, but had lodged by the end of the season. A uniform amount of rye went to seed and germinated before soybean harvest, but did not interfere with the harvest. The result of this is a very good stand of rye covering the whole field, which may be left to grow for a rye grain crop.

Treatment 1 (rolled and 1 drill pass) had an average yield of 36.2 bu/a and treatment 2 (2 drill passes) had an average yield of 32.9 bu/a. This 3.3 bu/a difference was not statistically significantly different at (alpha 0.05), but was significantly different at the less strict level of (alpha 0.20) (table 1).

The economics comparison (table 2) reveals the conventional till treatment planted nearby and about a month later (June 7<sup>th</sup>) as the most profitable system. Its net profit of \$1,554 is \$694 more profitable than the most profitable no-till treatment. The net income difference between the 2 no-till treatments is \$110/a. A majority of the amount was due to the 3.3 bu/a yield difference, but some of the difference (\$17) is due to more soybean seed cost.

Table 1: No-Till Soybean Yields

Treatment	Yield (Bu/A)	Yield (Bu/A)
Rolled with 1 Drill Pass	36.2 <sup>a</sup>	36.2 <sup>a</sup>
2 Drill Passes	32.9 <sup>a</sup>	32.9 <sup>b</sup>
	LSD (alpha 0.05) = 5.0	LSD (alpha 0.20) = 2.9

LSD = Least Significant Difference

Different (superscript) letters associated with yields in the table indicate significant differences among treatments.

Table 2: Economics of No-Till Soybeans

Treatment/System	Soybean Yield (bu/a)	Gross Profit @ \$28/bu	Cost of System* per acre	Net Profit
Rolled with 1 Drill Pass (No-Till)	36.2	\$1,014	\$154	\$860
2 Drill Passes (No-Till)	32.9	\$921	\$171	\$750
Conventional Till <sup>1</sup>	60	\$1,680	\$126	\$1,554
Conventional Till at No-Till Yield Average	34.6	\$969	\$126	\$843

\*Does not include land or fertilizer costs.

<sup>1</sup> Calculations are based on a conventional soybean field at the same site with closest comparables.

### **Discussion:**

Previous no-till soybean studies at the Allison Organic Research Farm revealed higher soybean yields (53.8 bu/a in 2009 and 44.4 bu/a in 2010), but the 2012 yields are better than expected considering the rye likely withdrew a significant amount of moisture from the soil early in the spring. This lack of moisture placed the no-till soybeans at a disadvantage to the neighboring conventional till soybeans, which averaged almost 25 bu/a higher.

It is possible the treatment with 2 drill passes yielded slightly less than the treatment using the roller because of less soil moisture available to the soybeans. Notes about the drilling reveal the 2 pass treatment inadvertently had a higher seeding rate of soybeans. Obtaining an exact population for the soybeans in both treatments was difficult when setting the drill for different rates. In most years, the higher rate of soybeans may not have made any difference in the yield, but during a drought the extra soybean population in this particular treatment may have hindered soybean yields. A soybean population study at the same site in 2012 revealed a 5.2 bu/a reduction in soybean yield when soybean population was increased from 174,000/a seeding rate to 224,000/a seeding rate in 30" wide rows. It is very likely the soybean plants at the higher rates were competing excessively with each other for moisture in both cases.

Generally speaking, the soybeans in this study were very slow to emerge and grow during the 1<sup>st</sup> month or longer since there was very little precipitation. As a result, many of the seeds/seedlings may have died, thus leading to an even more compromised yield.

It is difficult to draw any conclusions regarding the economics of this study due to the effects of the drought and possible long term benefits of the no-till treatments. The no-till treatments did save time in the summer because there was no need to rotary hoe or row crop cultivate, but the total expenses were an average of ~\$37/ac higher than the conventional till. A yield advantage of 2 bu/a or more with the no-till treatment will more than offset the extra costs associated with this system. Also, the benefits of having the rye residue and adding more organic matter to the soil should last more than just a year. The rye also has great soil erosion control qualities that are difficult to quantify economically, especially since soil types and slopes can vary substantially. The sequestering of soil nutrients by the rye from this no-till system can also add financial value, not mentioned in this report.

### **Conclusion:**

The 2012 drought certainly was challenging for a study, such as this one, where a cover crop (rye) competed with the crop for soil moisture, thus contributing to reduced soybean yields. We need to take into consideration that no-till treatments on the same farm have yielded more than the conventional tilled treatments in recent years and it is important to observe multiple years of data before drawing any conclusions.

If a farmer is quite certain his or her land will be experiencing a drought or very dry conditions for the upcoming season and they have rye growing ahead of a crop; it might be prudent to till it under before it removes too much moisture. Otherwise, the benefits of saving time, nutrients, soil, reducing weed pressure, and increasing

organic matter may make an organic no-till system worth the risk. As with any new slightly risky undertaking, one might want to try this system only on a few acres until they are more skilled and confident in it.

See photos below!

Drilling Soybeans/Rolling Rye in 1<sup>st</sup> of 2 Passes



Rye Crimped after 2 Passes with Drill (2nd Pass offset 4")



Soybeans Growing through Rye in June



No-Till Soybeans at Maturity

