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Cooperating Departments: Agricultural Economics, Biosystems and Agricultural Engineering, Entomology, Plant Pathology , and Plant and Soil Sciences

Editor: Chad Lee

In this issue

1. Soybeans for 2009: GMO or non-GMO?

Chad Lee and Greg Halich, Plant and Soil Sciences and Agricultural Economics, University of Kentucky

Many farmers are weighing the options of GMO and non-GMO soybeans for 2009. Two scenarios are presented here to help you decide.

We determined that the non-GMO soybeans will get a burndown application of Authority MTZ plus Prowl 3.3 EC plus generic glyphosate followed by a postemergence application of Pursuit plus Select Max, including adjuvants and 28% UAN. Herbicides for GMO soybean included a burndown of generic glyphosate followed by a postemergence application of glyphosate, including adjuvants. The non-GMO herbicide program was estimated at about $63.00 per acre and the GMO program with generic glyphosate was estimated at about $22.00 per acre.

Price premiums for non-GMO soybeans ranged from $1.00 to $1.75 per bushel and yield differences favoring GMO varieties included 3.5 and 7 bushels per acre. Based on soybean variety trials, a yield difference of 3.5 bushels per acre is probably a good assumption, although some of the better non-GMO varieties have performed as well as the better GMO varieties.

The scenario in Table 1 has non-GMO seed at $30 per bag and GMO seed at $50 per bag. If there are 2,800 seeds per pound and a seeding rate of 140,000 seeds per acre, then the per acre seed costs were $30 and $50 for the non-GMO and GMO, respectively. With the yield differences and premium represented, the non-GMO soybeans resulted in better net revenue differences (net revenue GMO minus net revenue non-GMO) for most of the situations. Only when yield differences are high and premiums are low, do the economics favor GMO soybeans. Positive results in the tables indicate an advantage for GMO soybeans. Negative results indicate an advantage for non-GMO soybeans.

In Table 2, the scenario includes a lower price for the GMO seed at $40 per bag (or $40 per acre in this scenario). All other components of the scenario are the same as in Table 1. Again, the non-GMO soybeans resulted in better net revenue differences for most of the situations.

UNIVERSITY OF KENTUCKY, KENTUCKY STATE UNIVERSITY, U.S. DEPARTMENT OF AGRICULTURE, AND KENTUCKY COUNTIES, COOPERATING

While the scenarios presented here are generally more favorable to non-GMO soybeans, you need to run your own numbers on your own production systems to make your own conclusions.

Some other things to consider. The non-GMO contract may have certain limits on the quality of harvested seed, the location of shipment and even the dates of shipment. You may need to store the harvested seed before delivery. There may be limited varieties and seed available for non-GMO soybeans. If only a portion of your total soybean acreage will be non-GMO, then you will need to keep very good records of where GMO and non-GMO soybean fields are located…and you will need to accurately convey this to anyone doing the spraying. For non-GMO soybean, you will need to be timelier with herbicide applications, often targeting weeds at 2 to 4 inches tall. For non-GMO soybean, you will need to be ready to accept more crop injury from herbicides. Usually, any kind of seed staining (i.e. purpling from black nightshade) results in severe docking. Shriveled and shrunken seeds as well as any foreign material will also result in heavy docking.

If you are willing to put up with the extra management, delivery requirements and demands on quality, then non-GMO soybeans may be a very viable option for 2009.

For more questions on GMO and non-GMO soybean, contact your county extension office.

Table 1: Net Revenue Differences ($/acre) for GMO and non-GMO soybeans.
($50 GMO seed/acre, $30 non-GMO seed/acre).

Yield Increase GMO (bu/ac)	Price Premium Non-GMO, $/bu			
	$1.00	***$1.25***	***$1.50***	***$1.75***
	GMO Net Revenue less non-GMO Net Revenue, $/acre†			
0	-$27	-$39	-$51	-$63
3.5	-$3	-$15	-$27	-$39
7.0	$20	$8	-$4	-$16

Table 2: Net Revenue Differences ($/acre) for GMO and non-GMO soybeans.
($40 GMO seed/acre, $30 non-GMO seed/acre).

Yield Increase GMO (bu/ac)	Price Premium Non-GMO, $/bu			
	$1.00	***$1.25***	***$1.50***	***$1.75***
	GMO Net Revenue less non-GMO Net Revenue, $/acre			
0	-$17	-$29	-$41	-$53
3.5	$7	-$5	-$17	-$29
7.0	$30	$18	$6	-$6

† Positive net revenue values favor GMO soybean while negative net revenue values favor non-GMO soybeans. Seed costs based on 50-lb bag, 2800 seeds per pound and 140,000 seeds per acre. Elevator price of $8.00/bu for GMO soybeans. Base yield of 48 bu/a for non-GMO soybeans. Additional harvest cost of $0.29/bu above base yield of non-GMO. Additional trucking $0.12/bu above base yield of non-GMO (15 miles one-way and $2.50 /gallon of diesel). Additional P_2O_5 and K_2O removed at 0.75 and 1.1 lbs/bu, respectively, and both priced at $0.50/lb.

2. Yield Advantage for GMO Corn

Chad Lee, Plant and Soil Sciences, University of Kentucky

There is a strong market to grow non-GMO corn for the premiums in Kentucky. However, farmers are concerned that they may be losing yield compared with GMO hybrids.

The Shelby County Corn Hybrid Test was conducted to compare non-GMO, or "base" hybrids to closely-related GMO "sister" hybrids. Each company submitted the hybrids they wished to include in the study.

The Ellis Brothers worked with the Shelby County Extension Office to set up the study, plant the field and harvest the crop. Each seed company submitted their own hybrids. The study was a randomized complete block design with three replications. The Ellis Brothers used their equipment to plant the plots, manage the plots (fertilizer, herbicides, etc.) and harvest the plots.

Harvested corn grain was dumped into a weigh wagon and weight, grain moisture and test weight was determined for each replication of each hybrid. Yields were calculated based on the measurements taken.

Ten hybrids were non-GMO "base" hybrids and GMO "sister" hybrids, for five pairs. In these direct comparisons, the GMO hybrid yielded greater than the non-GMO sister by a range from 2.5 to 25.5 bushels per acre (Table 1). Based on the hybrids in this test, we would expect the GMO hybrid to outperform the non-GMO counterpart in future comparisons.

While this was an excellent study conducted by farmers, it is only a single location and a relatively limited number of hybrids to compare. We would like to compare more non-GMO/GMO pairs in the future to determine if these differences are consistent across a larger number of hybrids, or if we just happened to have five pairs that favored the GMO hybrid.

Table 1. Comparison of GMO and non-GMO hybrids, Shelby County, 2008‡

Brand	Hybrid	Trait^	Test Weight (lb/bu)	Grain Moist. (%)	Yield (Bu/A)	Difference GMO - Base	
Pioneer	31P41	Base	59.0	10.5	179.7	18.1	***
Pioneer	31P42	HX1RR2	60.5	11.5	197.8		
Pioneer	33M54	Base	61.8	10.5	167.5	17.4	**
Pioneer	33M57	HX1RR2	61.2	10.7	184.9		
NK Brand	71R7	Base	59.7	10.3	187.7	2.5	**
NK Brand	72Q6	CBLL	59.0	10.9	190.2		
Crows	C4847	Base	58.3	10.3	183.9	25.5	**
Crows	C4846T	RR2YGPL	58.2	10.2	209.4		
Wyffels	W8680	Base	58.5	10.6	194.3	3.0	**
Wyffels	W8681	VT3RR2YGCB	58.5	11.3	197.3		

‡ Worth and Dee Ellis Farms, Shelby County, Kentucky,
^ Traits: "base" refers to non-GMO base genetics.
, * = significant at 0.05 and 0.001 probabilities, respectively, ns = not significant; comparison for each GMO/non-GMO pair based on orthoganol contrasts.

3. Ear Injury Possible from Application Targeting Corn Diseases

Paul Vincelli, Don Hershman, and Chad Lee, Plant Pathology and Plant and Soil Sciences, University of Kentucky

Over the past several years, infrequent instances of corn ear deformities in producer fields have been thought to possibly be due to fungicide applications. Last summer, demonstration trials were conducted by corn extension agronomists Drs. Emerson Nafziger and Bob Nielson (University of Illinois and Purdue University, respectively) to attempt to determine what might be responsible for these problems. BASF has also conducted experiments addressing this issue.

All three testing programs have so far implicated pre-tassel applications of non-ionic surfactants as a potential cause of a variety of ear problems. Injury symptoms reported by the agronomists include:

1. "Bouquet ears", where more than one ear forms from the same ear shank;
2. "Arrested ears" (see links below); and
3. Occasionally, plants with no ears

Details of the work done at the University of Illinois and Purdue University, along with excellent photos showing the damage observed, can be found at:

Purdue: http://www.agry.purdue.edu/ext/corn/news/articles.08/arrestedears-1209.html

Illinois: http://www.ipm.uiuc.edu/bulletin/print.php?id=1033

BASF's experiments also implicate pre-tassel application of non-ionic surfactants as a cause of the occasional ear deformities observed with fungicide applications on corn.

Bottom line: Based on the work done thus far, corn producers should avoid pre-tassel applications of non-ionic surfactants. "Cocktail" mixes of fungicides with several other compounds could be risky as well. Pre-tassel fungicide applications without non-ionic surfactants do not appear to pose a significant risk of ear injury. However, pre-tassel applications are not ideal from a disease control standpoint: the greatest benefit from fungicides in corn comes from a single application between tasseling and brown silk. Likewise, work thus far suggests that nonionic surfactants can be used safely if applied at or after tasseling. Stay tuned, as more research will be conducted on this topic in 2009.

4. What Are My Crop Residues Worth? – A Case Study

John H. Grove, Plant and Soil Sciences, University of Kentucky

There has been much discussion about using crop residues such as wheat straw and corn stover as alternative energy sources. These residues could be burned, fermented, or gasified/charred to generate energy. All of these strategies require crop residue to be removed from the field. One aspect often not considered is that these crop residues also add value to the crop production system. The question is: How much value?

To help answer this question, corn residues in a large rotation experiment were shifted among equal-sized areas in the fall of 2007 to create rates of 0.0, 3.5 and 7.0 tons dry matter per acre (0X, 1X and 2X, respectively) ahead of spring 2008 corn planting. The corn residue rates were established following corn and doublecrop soybean. The study included four replications of each treatment. The 2008 corn was no-till planted. Nutrients were not limiting, weed control was excellent, and both foliar disease and insect pressure were low. The 2008 season was initially cool and wet, but turned hot and dry.

Yield results for the study are shown in Figure 1. Treatment average yields ranged between 135 and 165 bu/acre. Three things are evident. First, there was a large rotation response (+18 bu/acre), independent of whether corn residue was present, or not. This indicates that corn residue removal will not remove the "rotation effect". It also indicates that adding corn residues to non-corn fields will not cause the "rotation effect" to occur. Second, complete removal of corn residue (0X rate) resulted in a yield decrease (-9 bu/acre) relative to the 1X rate. The 2008 season was hot and dry and the 1X rate of residue likely contributed to greater water use efficiency. Third, shifting the removed residue to create the 2X rate also resulted in a yield loss (-14 bu/acre) relative to the 1X rate. A decline in corn plant population at the 2X residue rate may have caused the lower yields.

Removing corn residues from the field resulted in yield losses and nutrient losses. Corn yield losses were valued at $36/acre (9 bu/acre x $4/bu) loss. Corn residues contain nutrients, especially N, P_2O_5 and K_2O and those losses were calculated at $116.53 (Table 1). Total per acre losses of removing corn stover resulted in $152.53/acre or nearly $45/ton of dry matter of corn stover. You can determine these nutrient replacement costs, for your fields, by plugging your own numbers for corn yield, corn stover nutrient concentrations, and fertilizer prices into the electronic version of Table 1 (available online).

In conclusion, remember that these are the results of only one year of study. The residue benefit may be more, or less, in other years and other fields. The economic consequence of nutrient loss depends on the residue removal rate, the residue nutrient concentrations, and the anticipated replacement prices for those nutrients.

Figure 1. Corn yield response to previous crop and the corn residue rate, Lexington, KY, 2008.

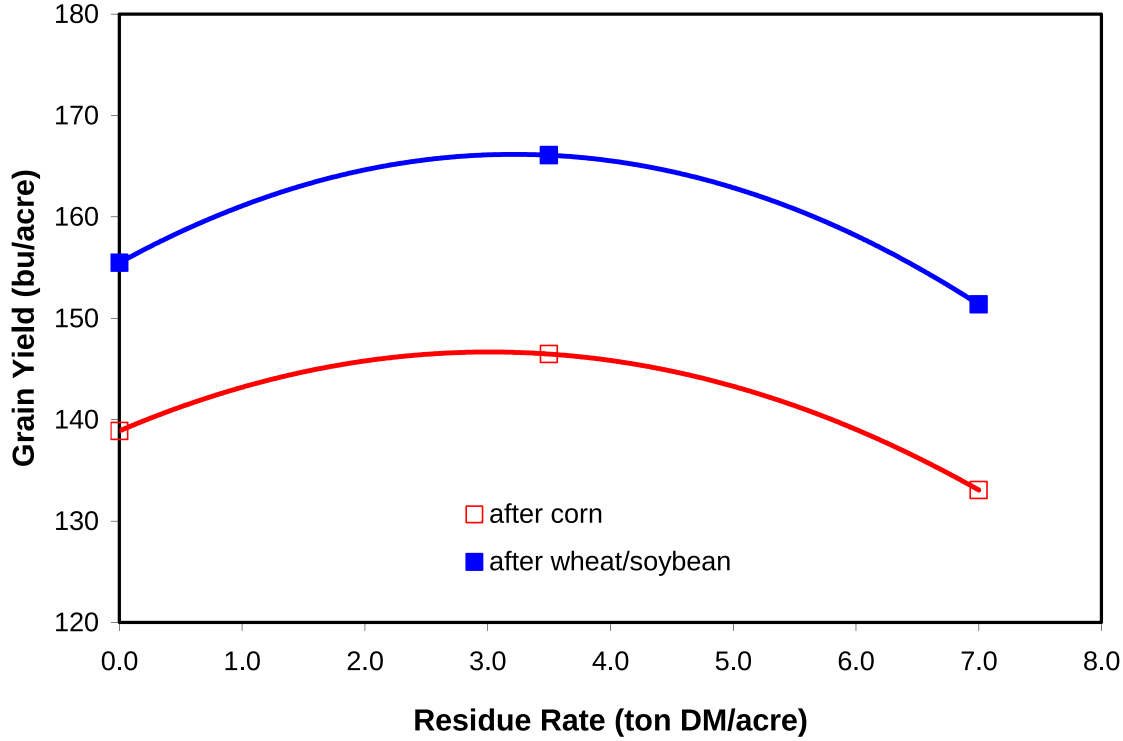

Table 1. Determining the Nutrient Value of Corn Residue:

Corn Grain Yield (bushels/acre):	**150**	**Price of urea, 46-0-0 ($/ton):**	**600**
Corn Stover Yield (tons/acre):	**3.5**	**Price of DAP, 18-46-0 ($/ton):**	**925**
		Price of potash, 0-0-60 ($/ton):	**840**

Corn Stover Nutrient Composition:

N (%)	**P (%)**	**K (%)**
1.31	**0.29**	**0.35**

N (lb/ton)	**P_2O_5 (lb/ton)**	**K_2O (lb/ton)**
26.3	**13.1**	**8.4**

Fertilizer Nutrient Cost ($/lb):

N	**P_2O_5**	**K_2O**
0.65	**0.75**	**0.70**

Stover Nutrient Value ($/acre):

N	**P_2O_5**	**K_2O**	**total**
60.79	**34.93**	**20.81**	**116.53**

An electronic version is available online at: www.uky.edu/Ag/CornSoy/cornsoy8_4.htm

UK Ag EXTENSION

Chad D. Lee, Grain Crops Extension Specialist
423 Plant Sciences Building
1405 Veterans Drive
Lexington, KY 40546-0312

COOPERATIVE EXTENSION SERVICE

UK UNIVERSITY OF KENTUCKY College of Agriculture

Cooperative Extension Service
University of Kentucky
Plant and Soil Sciences
Ag. Distribution Center
229 Stadium View Road
Lexington KY 40546-0229

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