UK COOPERATIVE EXTENSION SERVICE
University of Kentucky – College of Agriculture

LEXINGTON, KY 40546

Corn & Soybean News

December 2008, Volume 8, Issue 3

Available online at: www.uky.edu/Ag/CornSoy

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

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In this issue

1. Reducing Fertilizer Rates While Maintaining Yields

Lloyd Murdock, Extension Soil Specialist, University of Kentucky

The prices of fertilizer inputs have increased at an astounding rate the last two years. With the decrease in commodity prices, fertilizer inputs cost may now be the dominate factor in determining a profit. Efficient and wise use of fertilizers and the nutrients in the soil become important in determining the crop grown as well as its profit.

Below are listed points one should consider to make the fertilizer purchased and the nutrients in the soil profitable for you.

A. **Soil Testing**. Probably the most important step. If there was ever a year to use the reserves of P and K in the soil – this is it! To do this, a good soil test should be taken.
   a. Make sure a large number of samples are taken from each field.
   b. Do not sample a field or area of a field larger than 20 acres, especially if the different areas in the field vary a lot in yield or have been managed differently in the past (crops, manures, etc.)
   c. Use grid sampling if you are unfamiliar with the field's past history.
   d. If you are mainly no-till, use a 4-inch deep soil sample.

B. **Use the Fertility in Your Soil** – If you soil test P is 45 lbs/ac or greater and soil test K is 250 lb/ac greater, no additional fertilizer is required for that crop that year. You already have enough in the soil to take care of it. Why add fertilizer just to increase your expense?

   If the soil test P is between 30 and 45 or the soil test K is between 200 and 250, use only a maintenance amount of P and K fertilizers. That is sufficient for maximum yields.

   If you are in the low range for P & K (below 30 and 200), add the UK recommended rate of fertilizer or use row fertilizer to reduce the amount needed.

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

C. **Row Fertilizers** – When you are in the low range of P or K soil test, the fertilizer can be banded beside the row and improve the efficiency of use. Fertilizer rates can be reduced by 1/3 to ½ of that recommended for broadcast treatments.

D. **Maintain a Proper pH** – The best pH for most crops is between 6.2 and 7.0. When in this range, fertilizers are used more efficiently. Phosphorus can be as much as 20-25% more available in this pH range as opposed to a pH in the 5's.

E. **Manures are an excellent source** of fertilizers and are usually much cheaper than purchased commercial fertilizers. Good distribution and nutrient testing are the keys to the use of manures as fertilizers. They will usually build P levels and maintain K levels when used. The N availability is somewhat unpredictable but good estimates can be made for the conditions under which the manure was used.

F. **K fertilizer timing** is important on crops when the vegetation is the harvested crop such as silage, hay or straw. The plant will take up more K than is needed for production if it is available for uptake. This is called luxury consumption. If vegetation is going to be removed, then K fertilizer should be applied before each crop. For example, if wheat straw is to be harvested, then K fertilizer should be applied before wheat and again before double crop soybeans. If growing alfalfa, K should be applied after the 1st harvest and again after the 3rd harvest.

G. **Nitrogen rates** for grain cannot be changed with the present economics. However, sidedressing some of the N on poorly or somewhat poorly drained soils will improve nitrogen efficiency and rates can be reduced by 35 lbs/ac from preplant recommendations.

2. "Risk Scale", When Fungicide Use on Grain Crops Might Pay

Paul Vincelli and Don Hershman, Extension Plant Pathologists, University of Kentucky

During recent years, interest in the use of fungicides on corn and soybeans has grown dramatically. This interest has been especially high during growing seasons with high grain prices. With falling grain prices and increasing input costs, producers are increasingly interested in deciding how to best use fungicides—or whether to use them at all—on their grain crops.

Grain producers understand well the fact that they deal with risks and probabilities throughout the production and marketing of their crop. For example, weather reports issue forecasts of precipitation probabilities. Another example: a producer who sows corn in a field that normally averages 150 bushels per acre knows there is a low probability that the current crop will yield 270 bushels per acre. Risk is inherent to crop production, and nothing about it is certain—probabilities underlie every aspect of crop production.

This principle applies to fungicide use in grains, as well. It doesn't make sense to ask, "Will the fungicide *Blightban* (a fictitious name) increase my profit margin?" It only makes sense to ask, "How likely is it that Blightban will increase my profit margin?"

So we've framed the correct question: "How likely is it that Blightban will increase my profit margin"? Wouldn't it be nice to know a precise answer to this question, just like a precipitation probability? For example, wouldn't it be nice to know that Blightban had a 70% chance of increasing your profit margin in Field A, a 30% chance in Field B, and a 10% chance in Field C? It would be wonderful, of course. The problem is, no one can tell you this with even a smidgeon of accuracy (at least not yet).

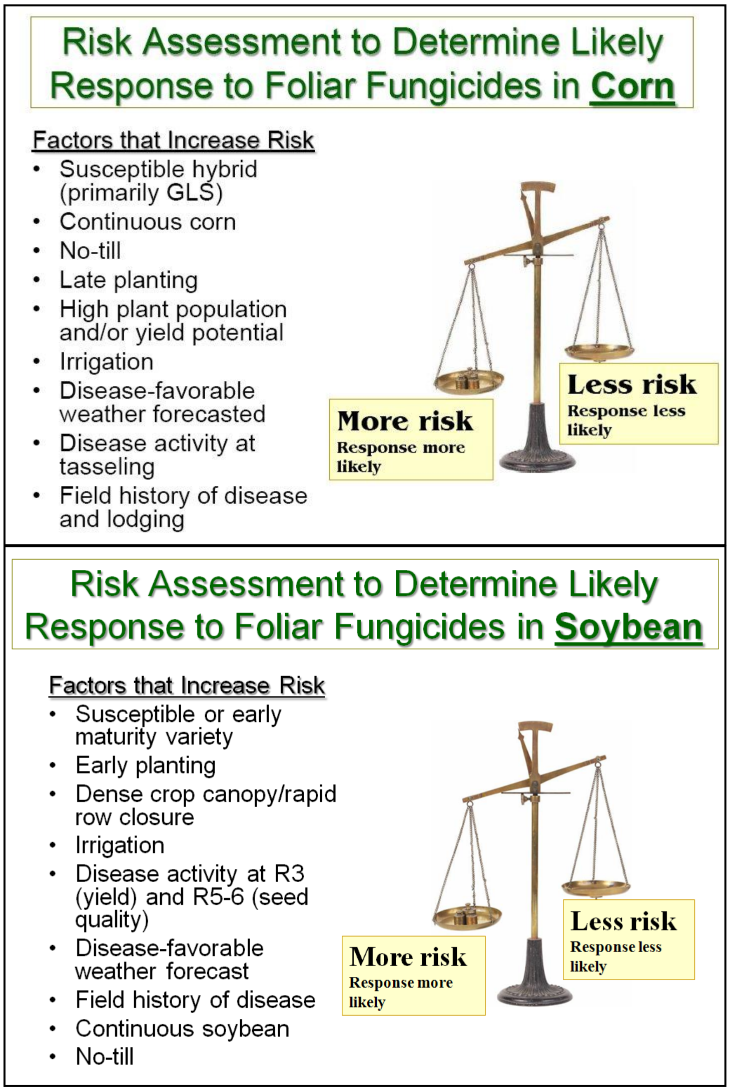


Figure 1. Factors that increase risk of foliar disease on corn and soybean.

But what you ***can*** do, as grain crop producers, is identify the factors that increase the probability of getting a profit from a fungicide application. That is what the three accompanying figures do, one each for corn, soybeans, and wheat. In these figures, we list the factors that increase the risk of disease, listing the more important one toward the top of the figure. The more of these are in place in a given field, the higher the probability that a fungicide will give an increased profit (i.e., economical yield response). Conversely, the fewer of these that are in place, the higher the probability that you will lose money by applying a fungicide.

Our focus is on factors that increase the risk of key diseases that are controlled by foliar fungicides, such as gray leaf spot of corn, frogeye leaf spot of soybean or speckled leaf blotch of wheat. However, factors that increase the risk of viruses, stalk rots, root rots, nematode diseases, and other diseases not controlled by foliar fungicides are not factored into these risk scales. These other diseases may negate any benefit from using foliar fungicides even if every decision leading up to a fungicide application, and the application itself, was made perfectly. This, again, highlights the uncertainty inherent in crop production.

Bottom Line: During 2009, see how many of the factors listed in Figure 1 apply to each of your fields. The more of these factors you have in a field, the better chance you have of making a profit with a fungicide application.

3. The Kentucky Soybean Performance Test Puts Money in Your Pocket

Roger Rhodes, D.B. Egli and Chad Lee, Plant and Soil Sciences, University of Kentucky

Would you like to increase your soybean yields by several bushels per acre without spending any money? All it may take is a hard look at the results of the Kentucky Soybean Performance Test. A recent investigation suggests that Kentucky soybean producers are losing money by not always using the best varieties.

According to a 2007 survey published in Kentucky Agricultural Statistics (2006-2007), the most popular soybean variety in the state was a relatively poor yielder in the Kentucky, Tennessee and Missouri 2007 Soybean Performance Tests. This variety was grown on 92,000 acres in Kentucky in 2007

(8% of the 1.15 million acres planted), but its three-year average yield was 5.4 bushels less that the average of the three highest yielding varieties with similar maturities (Table 1). Farmers using this variety lost nearly $50 per acre, assuming $9.00 beans, which would just about cover the cost of seed in 2009.

The picture was a little better if we look at the top five varieties in the survey – two were equal to the best and the other two were only 2 to 3 bushels below the best (Table 1). Five of the top nine varieties in 2007 were equal to the best varieties in the test. Many Kentucky producers are doing a good job of picking varieties, but there is room for improvement.

Data from county and industry yield trials, demonstration plots and the Kentucky Soybean Performance Test are available to help you select the best variety. The University of Kentucky variety testing program measures yield at five locations each year and many varieties are in the test for two or three years. Yields are published every fall in the Kentucky Soybean Performance Test Bulletin available online at http://www.uky.edu/Ag/GrainCrops/varietytesting.htm or at your county Extension office.

The best predictor of next year's performance is the average yield across all locations and years in the bulletin. The top yielding varieties in 2008 from relative maturity group 4.6 to 4.9 are shown in Table 2. Varieties that rank at the top of the test for the one-, two- and three-year comparisons are most likely to perform well next year. Planting a sub-par variety leaves dollars in the field instead of in your pocket.

When asked why he robbed banks, Willie Sutton replied, "Because that's where the money is." Paraphrasing Willie -- look in the variety test bulletin, that's where the money is. You can get your hands on that money by spending some time studying the performance test results and selecting top-yielding varieties.

Table 1. Performance of the five most popular soybean varieties in Kentucky in 2007.
These five varieties were planted on 316,000 acres (27.5 % of the planted acres) in 2007. Kentucky Agricultural Statistics, 2006-2007.

Variety[1]	Rank	Percent of planted acreage	2005-2007 Yield[2]	Advantage for 'best' varieties[3]	Loss for not using best variety[4]
		%	Bu/acre	Bu/acre	$/acre
Pioneer 94M80	1	8.0	48.8	5.4	48.60
NK S49-Q9	2	6.6	51.5	2.8	25.20
Asgrow AG4703	3	4.9	53.4	0.0 [5]	0.00
Pioneer 94B73	4	4.1	53.4	0.0	0.00
Pioneer 94M30	5	3.0	52.3	2.1	18.90

[1] Data from 2007 variety survey, Kentucky Agricultural Statistics and Annual Report, 2006-2007. p. 55.
[2] Three year average across locations. Kentucky Soybean Performance Test Bulletin, 2007.
[3] Average of the top three varieties in the same maturity group, three year, all location mean. Kentucky Soybean Performance Test Bulletin, 2007.
[4] Assuming a price of $9.00/bushel.
[5] Yield was not significantly different from top-yielding variety in the test.

Table 2. The top-yielding soybean varieties in the Relative Maturity Group 4.6 to 4.9 in the 2008 Kentucky Soybean Performance Test.

TYPE		BRAND -- VARIETY	YIELD (BU/AC)[A] 2008	07-08	06-08	LODGING 2008
		MATURITY GROUP LATE IV (RELATIVE MG 4.6-4.9)				
	*	PIONEER 94Y70	**46.6**			1.7
	*	ASGROW DKB46-51	46.5	42.2	47.3	1.4
	*	ASGROW AG4606	46.5			1.4
	*	PROGENY P4908 RR	46.3			1.5
	*	ARMOR 48-J3	46.1	45.1		1.4
	*	DELTA GROW 4970 RR	45.9	40.6	47.2	1.9
	*	BECK 474NRR	45.7			1.3
		ASGROW AG4903	45.5	42.5	48.0	1.4
	*	UNISOUTH GENETICS USG 74A76	45.4	42.7	48.0	1.6
	*	VIGORO V47N9RS	45.3			1.3
	*	CROW'S C4820R	45.0			1.3
		DELTA GROW 4870 RR	45.0			1.5
	*	SEED CONSULTANTS SCS 9479RR	45.0			1.4
	*	UNISOUTH GENETICS USG 74G78	45.0			1.1
EXP	*	NK BRAND XR4881	44.8			1.2
	*	SOUTHERN CROSS RUFUS 4.7 N, RR, STS	44.6			1.2
	*	PROGENY P4606 RR	44.4	43.3		1.2
	*	SOUTHERN STATES RT 4808N	44.4	43.9	**49.2**	1.6
		DAIRYLAND 8482/RR	44.4	42.0		1.5
	*	SOUTHERN STATES RT 4888N	44.2			1.4
	*	PROGENY P4918 RR	44.2			1.6
		LATE GROUP IV AVERAGE	42.8	40.8	47.2	1.4
		LSD (0.10)	2.2	3.8	2.5	0.1

* Resistant to soybean cyst nematode.
A Within a maturity group, shaded yields are not significantly different (0.10 level) from the highest yielding cultivar (bold data) of that maturity group and year column.
EXP. Entries with an EXP prefix are varieties that are still under development or soon to be released.

4. Soybean Seed Rates for 2009

Chad Lee and Jim Herbek, University of Kentucky

A final stand of about 100,000 plants per acre in full season soybeans is sufficient for maximum yield. One obvious question is, how many seeds to I need to plant to get a final stand of 100,000 plants per acre? The answer…it depends!!

The correct seeding rate depends on seed germination and how many seedlings do not emerge from the soil, i.e. the expected stand loss for each field. Below is Table 1 to help make those decisions. For example, if your target population is 100,000 plants per acre and your seed germination is 95%, then you would need 105,263 seeds per acre. If you are planting in excellent conditions, then you might assume a minimal stand loss of 5%. So, you would need to plant 110,803 seeds per acre to get a target stand of 100,000 plants per acre. If, your seed germination rate is the same (95%), but you are planting into poor conditions, you might assume a 30% stand loss and then plant 150,376 seeds per acre.

Your challenge is to determine what kind of stand loss you expect in your fields. If you are planting into fields that have a history of crusting or a history of staying wet in the spring or planting into cool soil conditions, you may want to assume a higher stand loss. If you are planting into fields that have a history of good emergence, you may want to assume a much lower stand loss.

Determining the seeding rates you will use can impact your input dollars. If projected prices for 2009 soybeans are accurate, then you could easily spend $70 per acre in seed. Two tables below provide some simple cost estimates based on a 50-lb bag of seed including two different seed sizes (Table 2) or based on bags with a specified number of seeds (Table 3).

Hopefully, these tables can help sharpen your pencils for 2009. If you have more questions about seeding rates or seed costs, contact your county extension office.

Table 1. Soybean Seeding Rate Calculations

Seeding rate should be based on germination rate as well as expected stand losses. Stand losses are typically more severe in damp, cool conditions with heavy residue or with soil crusting. Stand losses are typically less with warm conditions and adequate soil moisture.

Full Season Soybeans							
Target Stand plants/acre	**Seed Germ.**	**Initial Seeding Rate** seeds/acre	**Assumed Stand Loss**	**Final Seeding Rate** seeds/acre	**Row Spacing (inches)** **7.5**	**15** Seeds per foot	**30**
100,000	85%	117,647	5%	123,839	1.8	3.6	7.1
100,000	90%	111,111	5%	116,959	1.7	3.4	6.7
100,000	95%	105,263	5%	110,803	1.6	3.2	6.4
100,000	85%	117,647	10%	130,719	1.9	3.8	7.5
100,000	90%	111,111	10%	123,457	1.8	3.5	7.1
100,000	95%	105,263	10%	116,959	1.7	3.4	6.7
100,000	85%	117,647	20%	147,059	2.1	4.2	8.4
100,000	90%	111,111	20%	138,889	2.0	4.0	8.0
100,000	95%	105,263	20%	131,579	1.9	3.8	7.6
100,000	85%	117,647	30%	168,067	2.4	4.8	9.6
100,000	90%	111,111	30%	158,730	2.3	4.6	9.1
100,000	95%	105,263	30%	150,376	2.2	4.3	8.6

Table 2. Soybean Seed Costs for a 50-pound bag.

Costs for a 50 lb bag (not adjusted to a specific seed number).

Seed Cost $/50-lb bag	**Seed Size** seeds/lb	**Seed Rate** seed/acre	lb/acre	bags/acre	**Seed Cost** $/acre	**Seed Cost** $/50-lb bag	**Seed Size** seeds/lb	**Seed Rate** seed/acre	lb/acre	bags/acre	**Seed Cost** $/acre
50.00	2800	120,000	43	0.86	42.86	50.00	3200	120,000	38	0.75	37.50
50.00	2800	160,000	57	1.14	57.14	50.00	3200	160,000	50	1.00	50.00
50.00	2800	200,000	71	1.43	71.43	50.00	3200	200,000	63	1.25	62.50
40.00	2800	120,000	43	0.86	34.29	40.00	3200	120,000	38	0.75	30.00
40.00	2800	160,000	57	1.14	45.71	40.00	3200	160,000	50	1.00	40.00
40.00	2800	200,000	71	1.43	57.14	40.00	3200	200,000	63	1.25	50.00
30.00	2800	120,000	43	0.86	25.71	30.00	3200	120,000	38	0.75	22.50
30.00	2800	160,000	57	1.14	34.29	30.00	3200	160,000	50	1.00	30.00
30.00	2800	200,000	71	1.43	42.86	30.00	3200	200,000	63	1.25	37.50

* calculation: $/acre = ($ per bag/(seed size x 50 lb))x seedrate

Table 3. Soybean seed costs for bags sold with a specified seed number.

A) Costs for a 140,000 unit bag.

Seed Cost	**Seed Rate**	**Seed Cost**
$/140K bag	seed/acre	$/acre
$ 50.00	120,000	$ 42.86
$ 50.00	160,000	$ 57.14
$ 50.00	200,000	$ 71.43
$ 40.00	120,000	$ 34.29
$ 40.00	160,000	$ 45.71
$ 40.00	200,000	$ 57.14
$ 30.00	120,000	$ 25.71
$ 30.00	160,000	$ 34.29
$ 30.00	200,000	$ 42.86

B) Costs for a 130,000 unit bag.

Seed Cost	**Seed Rate**	**Seed Cost**
$/130K bag	seed/acre	$/acre
$ 50.00	120,000	$ 46.15
$ 50.00	160,000	$ 61.54
$ 50.00	200,000	$ 76.92
$ 40.00	120,000	$ 36.92
$ 40.00	160,000	$ 49.23
$ 40.00	200,000	$ 61.54
$ 30.00	120,000	$ 27.69
$ 30.00	160,000	$ 36.92
$ 30.00	200,000	$ 46.15

5. Choosing Fields for Grid Sampling/Precision Nutrient Management

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

Precision nutrient management is grid sampling followed by variable rate application and it can allocate lime and fertilizer phosphorus (P) and potassium (K), within the field. Field areas with greater or fertility receive less while areas with or lower fertility receive more. Precision nutrient management can reduce input costs when identifying more fertile areas, while optimizing the probability of an economic response to lime and fertilizer by identifying less fertile field areas. However, precision nutrient management has greater costs – up to $5/acre extra for grid sampling and $5/acre extra for each variable rate application (liming would be separate from P and K application).

So, when is it likely that the value of precision nutrient management is greater than the cost? What should do you look for? What are the "signals" that a field is a candidate for precision nutrient management? The soil test data from 46 grid-sampled fields, ranging in size from 35 to 140 acres, and totaling 2500 acres were examined in order to answer these questions. The soil pH, soil test P (STP) and soil test K (STK) were used to generate lime and fertilizer P and K recommendations, respectively, for the following year's corn crop from AGR-1 (2008-2009 Lime and Nutrient Recommendations).

The amount of 'redistributed' lime and fertilizer P and K that would result from precision nutrient management was calculated. 'Redistributed' refers to both the lime and fertilizer not applied to more fertile field areas, as well as the additional lime and fertilizer applied to less fertile field areas. This was done for each field and expressed as ton lime/acre, lb P_2O_5/acre and lb K_2O/acre.

In these 46 fields, the quantity of redistributed input was highest when the field-average soil test value was close to the threshold that triggered the first increment of lime or fertilizer P or K. Figures 1 and 2 illustrate these relationships for lime and fertilizer K, respectively. A lime recommendation for corn is triggered when the soil pH falls to 6.1, while fertilizer P and K recommendations (corn for grain) are triggered when STP and STK decline to 60 and 300, respectively.

Though the field-average soil test status was the best predictor of a probable benefit from precision nutrient management, the next-best indicator was the variability of a given soil test parameter within a field. This is illustrated, using STK as an example, in Figure 3. Generally, as the variation in STK rises, the amount of fertilizer K redistributed via precision management also rises.

So, with corn for grain, precision soil sampling is most justified when the soil pH is between 5.8 and 6.4, when Mehlich III STP is between 40 and 80, and/or when Mehlich III STK is between 240 and 360. This is especially true if there is significant variability in that soil test parameter within the field. However, knowing what to look for is not the same as knowing how to find it.

First, look at a field's soil test history. Field's with values for two out of three (pH, STP or STK) soil test parameters approaching lime or fertilizer P or K 'triggers' are likely grid sampling candidates. Fields without soil test history can be pre-sampled, taking 3 to 5 samples from distinct field areas, and having these analyzed separately in order to generate both average and variability information.

Figure 1. Lime redistribution with precision nutrient management as related to the field-average soil pH level in the 46 grid-sampled fields. 'Redistributed' refers to both the lime and fertilizer not applied to more fertile field areas, as well as the additional lime and fertilizer applied to less fertile field areas.

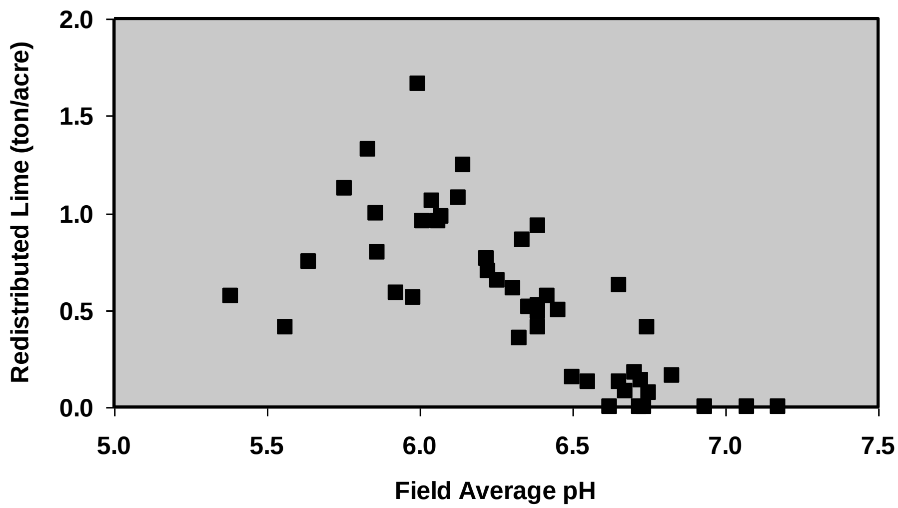


Figure 2. Fertilizer K redistribution with precision nutrient management as related to the field-average soil test K (STK) level in the 46 grid-sampled fields. 'Redistributed' refers to both the lime and fertilizer not applied to more fertile field areas, as well as the additional lime and fertilizer applied to less fertile field areas.

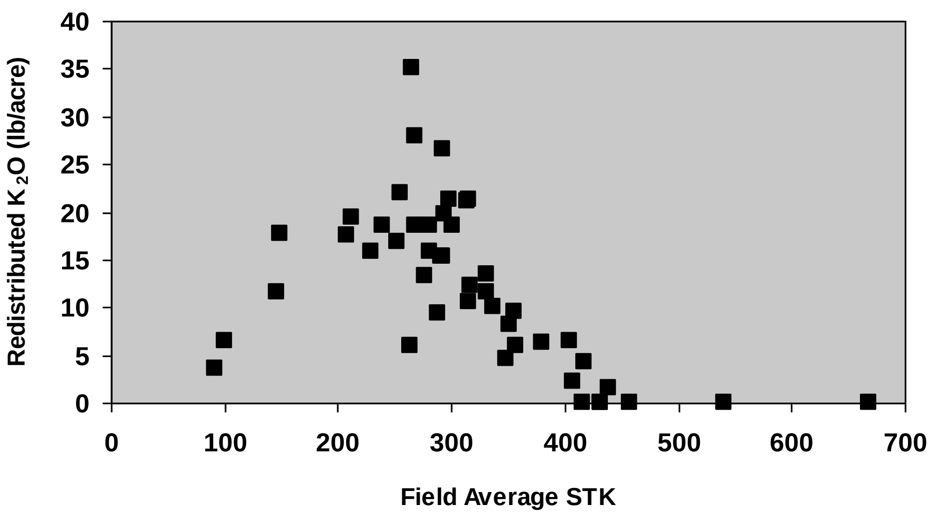
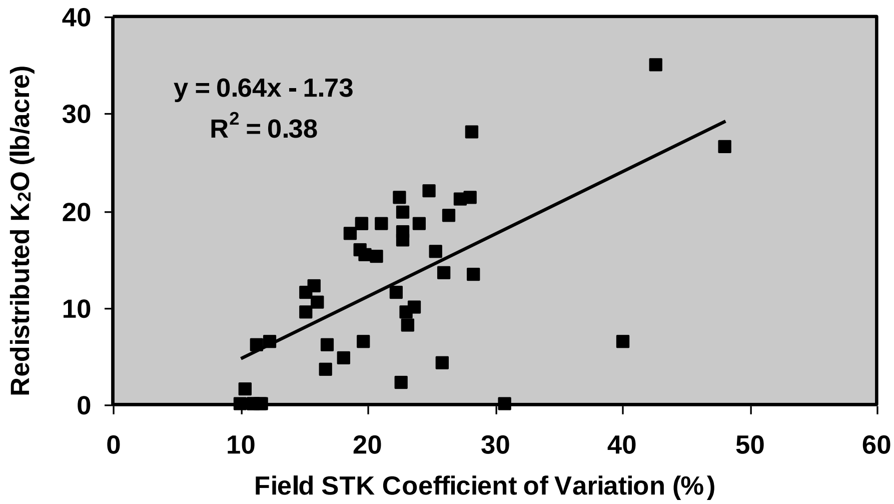


Figure 3. Fertilizer K redistribution with precision nutrient management as related to the field's variability in soil test K (STK). 'Redistributed' refers to both the lime and fertilizer not applied to more fertile field areas, as well as the additional lime and fertilizer applied to less fertile field areas.



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