



Mid-Atlantic Regional Agronomist Quarterly Newsletter

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Strategies for Minimizing the Impact of High Fertilizer Costs During Corn Production

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Introduction

The cost of nitrogen (N) and potassium (K) fertilizers are at all time highs. The higher N prices have been caused primarily by the accelerating costs for natural gas, which is a basic ingredient for the production of all N fertilizers. The higher than normal prices for K fertilizers have been caused by increasing worldwide demand, thereby, reducing the available supplies of K fertilizers in the US. The goal of this article is to provide ideas for minimizing the impact of these higher fertilizer prices on the profitability of corn production.

Phosphorus (P), Potassium, and Lime

Application rates of P, K, and lime should be based on soil testing. Soil test results for P & K are usually expressed as low, medium, optimum, high, very high, or excessive. It is important to remember that a soil test value basically gives you an indication of the likelihood of obtaining a response to added fertilizer. A soil test value that is low indicates that there is a very high probability of obtaining a yield response to added fertilizer, while a soil test value that is very high or excessive indicates a very low chance of obtaining a yield response to added fertilizer.

When fertilizer recommendations are made based on a soil test value, it is important to understand the philosophy of that recommendation. There are three different philosophies that are often used to make fertilizer recommendations: 1) build-and-maintain philosophy, 2) the sufficiency philosophy, and 3) the cation-balance philosophy.

With the build and maintain philosophy, the first goal is to build the soil test to some ideal concentration. Once the soil test is at this ideal concentration, then the rate of fertilizer that is recommended is equal to the amount of nutrient that is expected to be removed from the field in the harvested crop (i.e., crop removal). Therefore, this build-and-maintain philosophy will always recommend some fertilizer.

The sufficiency philosophy suggests that fertilizer is only needed when the soil test value drops below some critical concentration. The amount of fertilizer that is recommended depends on how far under the critical concentration the soil test value is for a given field. With this philosophy, if the soil test value is greater than the critical concentration then no fertilizer is recommended because the soil already has enough available nutrients to supply the needs of the planned crop. This soil test philosophy usually results in the least amount of fertilizer being applied and the greatest net returns on those dollars invested in fertilizer. This philosophy has been shown in research studies to be the philosophy that provides the greatest economic benefits to the crop producer.

The third philosophy is the cation-balance philosophy. With this philosophy, there is a belief that the cation exchange sites in the soil should contain a specific ratio of calcium, magnesium, and potassium. If the ratio is out of balance, then fertilizer is recommended. This philosophy often results in the greatest amount of fertilizer being recommended.

The University of Delaware uses the sufficiency philosophy in their recommendations. For example, the University's recommendation is that no fertilizer P is needed if the soil test P concentration is greater than 50 FIV, which is equivalent to 50 ppm (100 lb/acre) of Mehlich 3P. A recent six-year study with corn at two locations on Delmarva showed that the application of P fertilizer consistently resulted in a net economic loss when soil test P was in the optimal range (Table 1). These data show the total corn grain yield from 2000 through 2005 at Georgetown, DE and Rock Hall, MD. The Delaware site had an initial soil test P value of 60 FIV, while the Maryland site was at 90 FIV.

Table 1. Corn yield and net economic returns at two locations on Delmarva.

P Rate ^a lb P ₂ O ₅ /ac	Georgetown, DE		Rock Hall, MD	
	Grain Yield ^b bu/ac	Net Returns ^c \$/ac	Grain Yield ^b bu/ac	Net Returns ^c \$/ac
0	906		857	
20	894	-\$77	817	-\$150
40	935	-\$1	854	-\$85
60	921	-\$64	800	-\$247
140	951	-\$97	808	-\$333

^aThese treatments were applied in 2000, 2001, 2002, and 2005. No P was applied in 2003 and 2004.

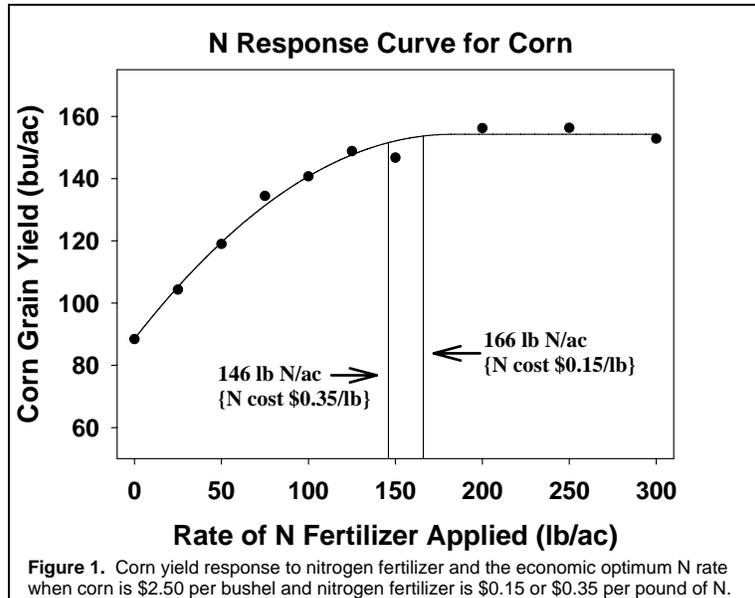
^bThis is the total yield for the six years combined.

^cBased on \$2.50 corn, \$310/ton for P fertilizer, & an application cost of \$5.25/ac.

There was no yield response to P fertilizer at the Rock Hall site because the treatment that received no P fertilizer had the highest total yield over the six years (857 bu/ac) compared to all the treatments that received P fertilizer. At the Georgetown site, the treatment that received 140 lb P₂O₅/ac had the highest yield of all treatments (951 bu/ac); however, the net economic returns were negative for all P fertilizer applications when compared to applying no P fertilizer. Therefore, the most economical treatment at both locations was to apply no P fertilizer, which is what would have been recommended based on the initial soil test P values.

Nitrogen

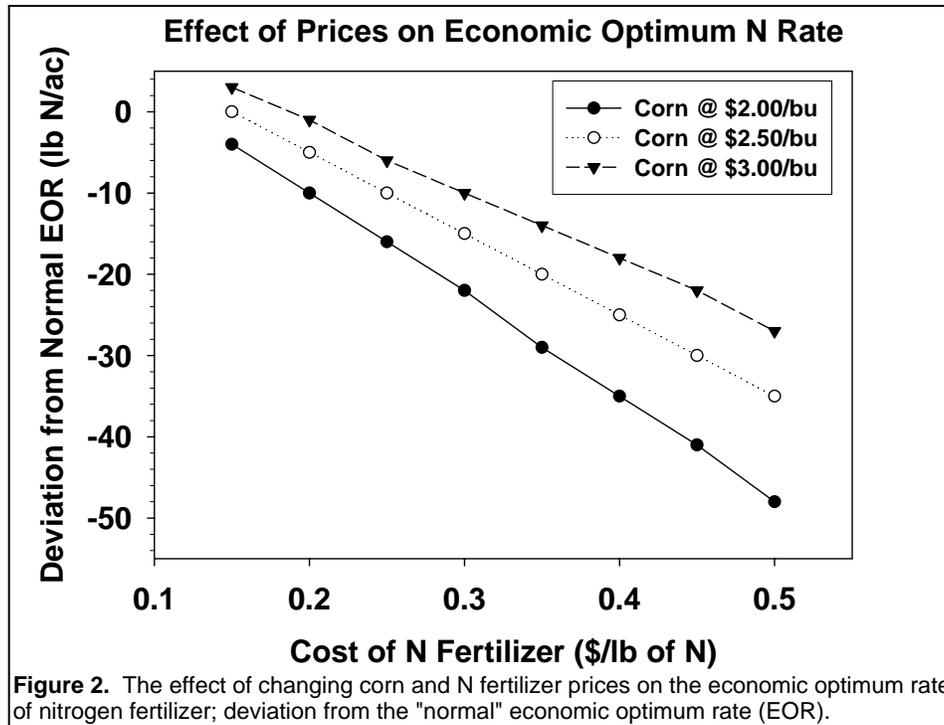
Typically, N recommendations for corn are based on expected yield and in this region the recommendation is to apply 1 pound of N for each bushel of expected corn yield. Nitrogen fertilizer recommendations have been developed by conducting research studies where multiple rates of N are applied ranging from no N to a high rate of N and then yields are measured for each N rate so a N response curve can be developed as demonstrated in Figure 1. Once the N response curve has been determined, the economic optimum rate of fertilizer can be calculated. The economic optimum is the rate of N that maximizes the net returns to N fertilizer. In other



words, this is the point where the last increment in money spent on N fertilizer is just equal to the money returned from the grain yield response to that N fertilizer.

Current N fertilizer recommendations are based on N response curves that were developed many years ago when N fertilizer prices were significant less than today. In fact, most N recommendations are based on a corn price of \$2.50 per bushel and an N cost of \$0.15 per pound of N. In the example in Figure 1, the economic optimum N rate is 166 lb N/ac when the corn price is \$2.50/bu and the cost of N is \$0.15/lb, but the economic optimum is reduced to 146 lb N/ac when the cost of N is \$0.35/lb at the same corn price. These data indicate that the economic optimum N rate is decreased by 1 lb/ac for each \$0.01 increase in the cost of N fertilizer above \$0.15/lb when the selling price for corn is \$2.50/bu.

Figure 2 shows how the economic optimum N rate deviates from normal as fertilizer N and corn prices change. The zero point is when the corn price is \$2.50 per bushel and the fertilizer N price is \$0.15 per pound of N. The data in this figure show that increasing the N fertilizer price from \$0.15 to \$0.50 per pound of N at the same corn price has a greater effect on the economic optimum N rate than does decreasing the price of corn from \$3.00 to \$2.00 per bushel. For example at \$2.00 per bushel corn, changing the N fertilizer price from \$0.15 to \$0.50 per pound of N reduces the economic optimum N rate by 44 lb N/ac; whereas at \$0.50 per pound of N, changing the price of corn from \$3.00 to \$2.00 per bushel reduces the economic optimum N rate by only 21 lb N/ac. These data also demonstrate that the impact of different corn prices on economic optimum is greater at higher N fertilizer prices than when N fertilizer prices are relatively low.



Another important part of managing N fertilizer costs is to reduce N rates for any N credits from other sources of N. Examples of these N credits include: N from animal manures, N that is applied through irrigation water, or N that is left in the soil from previous legume crops (e.g., alfalfa, clover, or soybean). The application of animal manures will supply different amounts of N depending on the animal species and the rate of manure that is applied. Because the amount of N that mineralizes (i.e., becomes available) from animal manures can vary with weather conditions, the PSNT (Pre-Sidedress Nitrate Soil test) is an excellent tool for determining how much, if any, additional N fertilizer is needed at sidedressing time.

As for quantifying N in irrigation water, this can be done by having a sample of the irrigation water analyzed for nitrate concentration at an appropriate laboratory. The cost of analyzing irrigation water for N is only about \$5 to \$10 per sample and can be done by most soil testing laboratories. There are some irrigation wells in this region that have significant quantities of N in the water that should be accounted for when making N fertilizer decisions. To determine how many pounds of plant available N are in an acre-inch of water, multiply the concentration of nitrate-N (units should be in ppm) by 0.227. As an example, irrigation water with a concentration of 9 ppm of nitrate-N will supply 2 lb N/ac for each inch of water that is applied. By accounting for N in irrigation water, significant savings can be made on N fertilizer, and this will also reduce the potential for further contamination of groundwater supplies from excess N.

Soybean Seeding Rates and Profitability

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It is easy to get confused between maximizing crop yields and maximizing profits. The two are generally not the same. The attainment of maximum crop yield conveys the message that you may also have to maximize your inputs. Maximization of inputs also means that you are maximizing your per acre investment. During the past year, there have been dramatic increases in fuel and fertilizer prices. These increases are having a major impact upon a farmer’s “bottom line”. The successful farmer has always been concerned with ways to avoid “red ink”. One potential cost cutting cultural practice that farmers may want to consider this coming season is to adjust their seeding rate for soybeans to a more profitable rate.

As seen in Figure 1, soybean yields respond directly to the number of seeds that are planted. This response is linear to approximately 100,000 (full season production) and 125,000 (double crop production) soybeans per acre. The linear response changes to a curvilinear response between approximately 100,000 and 150,000 soybeans per acre for full season production and 125,000 and 175,000 soybeans per acre for double crop production indicating that the rate of yield increase is slowing as the seeding rates increase. Finally the yield response reaches a plateau for both systems indicating that either very little or no change in yield is observed with additional seeds planted. Profitability becomes the key seeding rate determining factor for both systems once you reach the curvilinear and plateau portions of the yield curves.

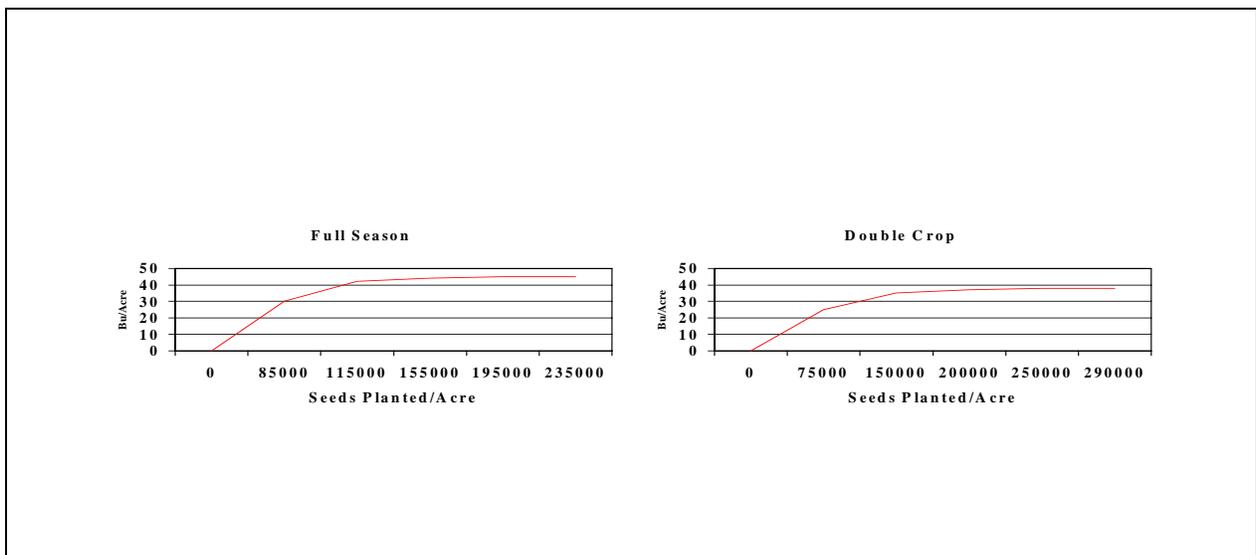


Figure 1. Yield response to soybean seeding rates for full season and double crop production systems.

During the years 2000 to 2002, seeding rates for Roundup Ready soybean varieties for both full season and double crop production systems were the subject of a Maryland investigation. The seeding rates evaluated were 20 and 40% less and 20% greater than the current University

recommendations for full season (175,000 viable seeds per acre) and double crop (225,000 viable seeds per acre) production systems. Viable seeds designate seeds that will germinate. For both systems, the 20% reduced seeding rate produced the same as the University recommendations. That research was the basis for new University seeding rate recommendations for full season (140,000 viable seed per acre) and double crop (180,000 seed per acre) systems.

Though the 40% reduced rates that were evaluated for full season and double crop systems (105,000 and 135,000 viable soybeans per acre, respectively) were determined to be significantly less than the new recommendations, these rates had yields that were only 1.5 to 2 bu per acre less. At that time (2003), a simple economic analysis was conducted to determine the profitability attained by changing to the new recommendations. Using a seed cost of \$25.00 per 50 lb. unit and a selling price of \$5.25 per bushel for the harvested crop, the new recommendations were found to be the most profitable.

Since that time, soybean seed costs have increased considerably with the 2005 U.S. average selling price for Roundup Ready soybean seed at \$34.50 per unit. I have heard reports of soybean seed being quoted as high as \$38 per unit for farmers for 2006. Based upon these increased costs for Roundup Ready soybean seed and the fact that the 40% seeding rate reduction had produced only slightly less than the new recommendations, I decided to re-evaluate soybean seeding rate profitability. The analyses were done over a range of seed costs (\$25 to \$50 per unit) and soybean selling prices (\$5.00 to \$6.50 per bu). A seed unit was 50 lb. Since soybean seed can vary considerably in size, the analyses were done with seed sizes ranging from 2000 to 3000 seeds per lb). In addition, seed lots can vary for seed germination. In the case of these analyses, a 90% germination rate was used to calculate total number of seeds per acre. The results of these analyses for full season and double crop production systems are shown in Table 1.

Table 1. Unit cost for soybean seed that profitably justifies a reduction from 140,000 and 180,000 viable seeds per acre for full season and double crop production systems to rates of 105,000 (full season) and 135,000 (double crop) viable seeds per acre.

Soybean selling price \$ per bu	Soybean seed cost required to change seeding rate for full season system to 105,000 viable seeds per acre			Soybean seed cost required to change seeding rate for double crop system to 135,000 viable seeds per acre		
	Large seed (2000/lb)	Average seed (2500/lb)	Small seed (3000/lb)	Large seed (2000/lb)	Average seed (2500/lb)	Small seed (3000/lb)
\$5.00	\$25	\$31	\$37	\$20	\$25	\$30
\$5.50	\$28	\$34	\$41	\$22	\$27	\$33
\$6.00	\$30	\$37	\$45	\$24	\$30	\$36
\$6.50	\$32	\$41	\$49	\$26	\$32	\$39

These analyses indicate that the cost of soybean seed has already reached the level to reduce seeding rates for a full season production system when the soybean selling price is \$5.50 or less and the seed size is 2500 seed per lb or less for seed being planted. The double crop production system has an even more favorable profitability argument for a reduced seeding rate. In this case

it appears profitable to make the change for even a small seed size lot of soybeans at a selling price of \$6.00 or less.

Pennsylvania Hulless Barley Evaluation Study

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Winter barley breeding efforts at Virginia Tech have led to the first released public hulless barley variety “Doyce” for the Mid Atlantic. Since the release of Doyce, efforts have continued for breeding the hulless trait at Virginia Tech. Because of interest in ethanol production from alternative feedstocks, improving the export potential of Pennsylvania/Mid Atlantic barley, utilizing hulless barley as a livestock feed, and maintaining winter barley in Pennsylvania cropping rotations, we developed a project to evaluate the agronomic performance and grain quality under Pennsylvania conditions. This research was supported in part by agricultural research funds administered by The Pennsylvania Department of Agriculture.

This study was designed to address three objectives: 1) to compare the agronomic performance of experimental hulless barley lines and Doyce relative to leading hulled barley varieties 2) to evaluate the consistency of hulless barley for basic grain quality parameters which are important for both feed and ethanol production and 3) determine the price necessary for hulless barley to be equally as profitable as hulled barley production.

Four conventional hulled barley varieties were tested against eighteen advanced hulless barley breeding lines and one released hulless variety for a total of twenty-three entries at five different locations in 2004 and 2005. In 2004, two experiment sites were located in Lancaster County (Landisville and Rheems), and in 2005 sites were located in Centre County (Rock Springs), Perry County (Millerstown), and Lancaster County (Landisville).

Grain yields of the top three advanced hulless barley lines and the the top three conventional hulled lines are shown in Table 1. The three top yielding hulless lines were VA00H-65, VA00H-70, and Doyce. Compared to the top three hulled lines, these varieties yielded about 83.5% of the hulless lines. The experimental line VA00H-65 yielded about 4.5 % higher than Doyce. Agronomic characteristics of the VA00H-65 line also tended to be superior to Doyce. VA00H-65 had superior winterhardiness and spring vigor, was slightly taller and had higher test weights than Doyce (Table 2). It was more susceptible to disease, especially net blotch, however. One of the limitations of Doyce in our environments is its low spring vigor ratings compared to many of the conventional hulled lines. This difference is noticeable in the field and could likely limit the acceptance of the variety.

All of the lines were evaluated for starch, protein and oil content. Hulless lines averaged less than 3 percentage units higher than the hulled lines. Two of the newer hulled lines, MacGregor

and Thoroughbred had starch levels comparable to some of the hulless lines. VA00H-65 tended to have high starch levels relative to the average hulless. There was a wide range of starch content among environments. The small difference in starch levels between the hulled and hulless lines was surprising.

Ethanol yields on a per acre and per ton basis were estimated based on equations provided by USDA scientists at ERRC in Wyndmoor, PA . This analysis revealed that hulled and hulless barley have the potential to produce an average of 189 and 168 gallons of ethanol per acre plus an average of 2214 and 1768 pounds of distillers grains per acre. In addition these crops would provide 1 to 1.5 tons of straw. The analysis showed that hulled barley ethanol yields per acre were higher than hulless barley ethanol yields, due to the high starch content of some of the lines and the high yields per acre. Hulled barley lines are not well adapted to processing in ethanol plants. Of the hulless lines, the VA00H-65 line also tended to have higher ethanol and distiller's grain yields than most of the other hulless lines.

A simple economic analysis was conducted to determine the price required for hulless barley to be economically justified relative to hulled barley. Assuming the price of hulled barley is \$2.00 per bushel, or \$0.0416/lb, then an equivalent price for hulless barley would need to be \$0.0498/lb to provide the same revenue for producers. Using a test weight of 56 pounds per bushel, this would translate into \$2.79/bushel for the hulless barley.

Conclusions

This study has shown that hulless barley can be produced in Pennsylvania, but higher prices will be necessary to justify its production. In these trials, hulless barley yields averaged about 83.5% of hulled yields. Winter hardiness, spring vigor, height and maturity are key agronomic traits that need to be considered in future hulless barley development. In these trials, the variety "Doyce" was one of the top yielding hulless lines but its winter hardiness and spring vigor levels were not quite as high as the hulled lines. Future experimental lines like VA00H-65 should have more potential in Pennsylvania than Doyce. We will continue to work with Virginia Tech to evaluate a limited number of promising hulless winter barley lines in our trials in Pennsylvania.

Comparison of Conventional Corn Hybrids with Their RR and *Bt* Trait Counterparts

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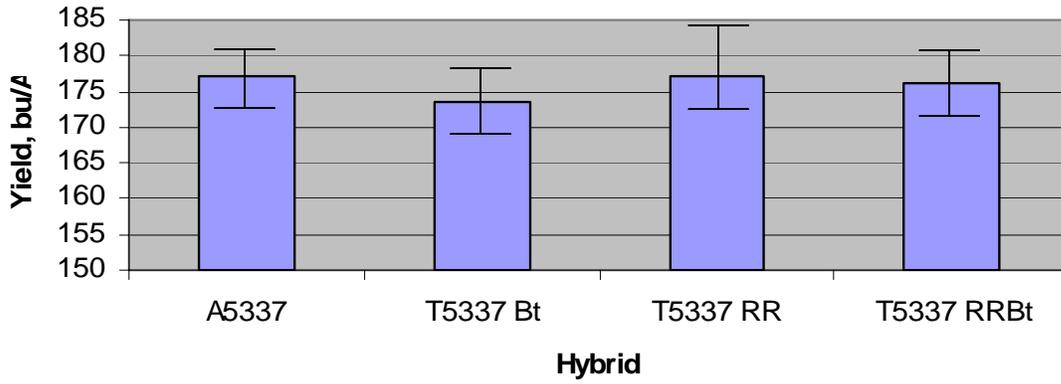
The use of corn hybrids with genes providing tolerance to certain herbicides and insects inserted is increasing in Virginia. We have seen evidence that Roundup Ready[®] (RR) weed management programs can be very beneficial in circumstances with hard to control weeds. Similarly, the *Bt* trait has proven effective against European corn borer (ECB) and has demonstrated the ability to prevent economic losses when pests are present at otherwise economically damaging levels. In addition, there has been some evidence to suggest that the addition of these traits may be synergist with yield in some hybrids, even in the absence of pests.

To evaluate this hypothesis, hybrids from three seed companies (Augusta, Dekalb, and Pioneer) representing a base genetic line, base + RR trait, base + *Bt*, and base + RR*Bt* were planted in large strips at five locations in the Coastal Plain of Virginia in 2005. Management practices varied among locations but were consistent with high-yield production. Grain yield was measured either with a yield-monitor equipped combine or weigh wagon. All yields are adjusted to 15.5% moisture.

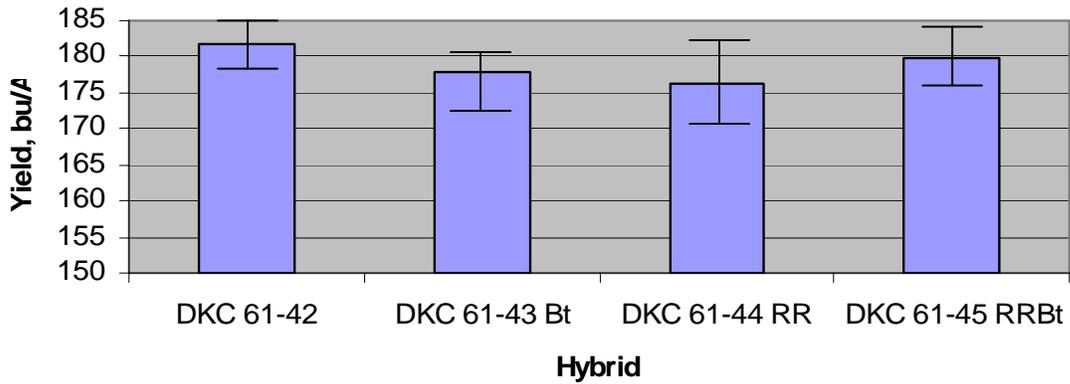
No significant pressure from ECB or weeds was noted at any of the sites. While there were differences in hybrid performance from one location to another due to rainfall and soils, analyzed across locations only the Pioneer hybrids exhibited any differences with the RR version yielding less than the others. Based on this initial year of testing, it seems that without ECB problems or hard to control weeds, the conventional hybrid genetics can yield equal to their trait-added counterparts. The authors would like to thank all the participating growers for their help this season. We plan to continue this study in the 2006 growing season.

Comparison of conventional corn hybrids with their RR and *Bt* trait counterparts, Augusta, Dekalb, and Pioneer hybrids, 2005.

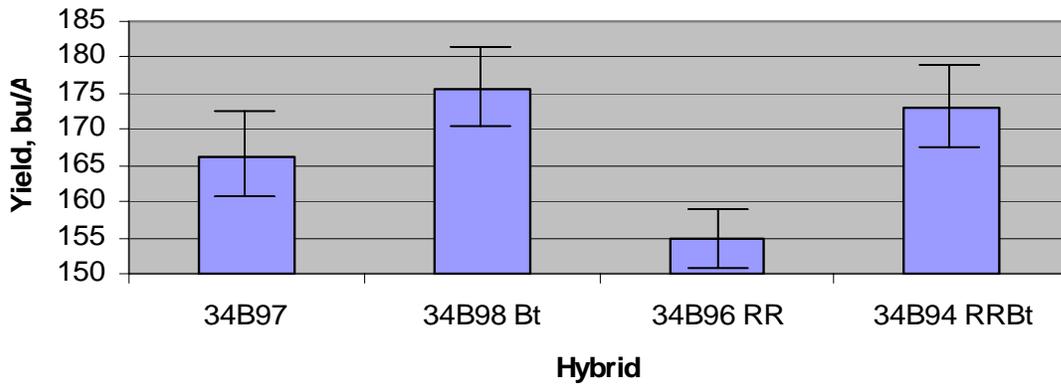
Augusta



Dekalb



Pioneer



Alfalfa Fertilization Practices for Maximum Economic Yield

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Whether grown for quality hay or as a component in either pure or mixed legume-grass stands for use in a grazing-based system, alfalfa is often an essential part of dairy production. The dairy producer's goal is to grow and harvest the most protein and digestible dry matter at the least cost.

Alfalfa removes considerable quantities of K_2O (about 50 lbs per ton) and can produce economic yield increases up to 500 to 750 lbs K_2O /ac, depending on price structure. The current P:K (phosphorus to potassium or potash) ratio of 1:4 is not adequate to maintain more than surface (0 to 6 inch) soil test P concentrations. To maintain minimal soil test P concentrations at depths greater than 6 inches, a higher ratio of 1:3 (P:K) may be necessary. Alfalfa needs not only adequate quantities of P and K but also sulfur (S), boron (B), and lime [calcium (Ca) and magnesium (Mg)].

Research conducted by Dr. Ed Jones, Harris Swain, and Sandra Jacobsen at Delaware State University was recently released as Bulletin No. A-112. The research was conducted from 1990 through 1998 and examined sustainable fertilization of alfalfa in Delaware.

The research indicated that K fertilization was essential for maximum economic yield in long-term alfalfa production fields. By the third production year, yield was significantly impacted by the rate of K fertilizer applied. Averaged over the seven year study after significant differences among treatments occurred, a rate of 500 lbs K_2O /ac/year yielded 1.1 tons DM/ac more than a rate of 250 lbs K_2O /ac/year and both far out yielded (6 and 4.9 tons DM/ac, respectively) the zero potash treatment. The lowest application rate (250 lbs K_2O /ac/year) yielded 1 T/A more than the control the first production year, 1.5 T/A more in the second year, and 2 T/A more by the third year when significant differences occurred among the application rates. By the seventh production year (the alfalfa stand was killed and reseeded after six years), even a rate of 500 lbs K_2O /ac/year was not enough to sustain either yield production levels or soil test values. The next highest rate (750 lbs K_2O /ac/year) did maintain production and produced about 1 T/A more than a rate of 500 lbs K_2O /ac/year.

Dr. Jones' team did evaluate the effect of residual K fertilization rates and after ten years of experience concluded that production can be maintained for only two to three years without fertilizer additions regardless of the initial rates. They found that increasing K fertilization rates did not meaningfully extend this grace period without having an adverse effect on yield.

The team also evaluated protein production as affected by fertilization practices. In about a quarter of the harvests, there was a significantly reduced protein yield at any level of K fertilization. This likely was due to a dilution effect of increased yield levels that reduced the crude protein concentration in the alfalfa hay. When evaluating residual K fertilization effects,

their results indicated that you could go one additional year (three to four rather than two to three) without fertilizer additions before total protein yield began to decline.

Another interesting finding of the group was related to the effect fertilization had on soil nutrient levels. Soil was tested in six-inch increments down to 2 ½ feet. Even though the field was limed with 2 ton/A every four years, reduced soil Ca concentrations were found at a depth of 1-foot while soil Mg concentration was higher at depths of 1 to 2 ½ feet. Although both Ca and Mg concentrations remained adequate for alfalfa growth, the depletion of soil calcium at deeper depths may indicate a need for more frequent lime applications even though the total amount applied need not be changed.

A P:K ratio of 1:4 was used during the study but soil test results indicated that soil P concentrations declined at four of the five depth intervals tested at K fertilization rates of 250 to 500 lbs. K₂O/A/year. Only the surface six-inch increment remained unchanged at these rates. At the highest K fertilization rates, only the surface six-inch depth increased in soil test P level while the deeper depths again declined to very low levels.

For soil K concentrations, rates of 250 and 500 lbs. K₂O/A/year still allowed reductions in K concentration at depths greater than 6 inches. The rate of 750 lbs. K₂O/A/year increased soil K concentration at the 0 to 6 inch and 6 to 12 inch depths and only just maintained the original K concentration at greater depths.

In summary, fertilization of well-managed high yielding alfalfa fields at a rate between 500 and 750 lbs. K₂O/A/year can produce economic yield increases, depending on the price structure of the hay, P, and K. Annual fertilization with B at a rate of 2 to 4 lbs./A is also important. The current recommended ratio of 1:4 P:K appeared to be inadequate to maximize yield or maintain soil fertility levels. Depending on the cost of fertilizer a ratio closer to 1:3 is more appropriate for high production alfalfa fields. Finally, more frequent lime application without changing the quantity applied per year may maintain soil test Ca concentrations.

Evaluating Alfalfa Stands in the Spring

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When and how should you evaluate an alfalfa stand? Below are descriptions of two methods that can be used to determine the viability of an alfalfa stand. An alfalfa producer should use not only one of these methods but their feel for the vigor of the particular stand they wish to evaluate as well as the production history of that field.

The first method consists of counting the number of plants per square foot. Current research information suggests that when stand counts fall below 3 to 5 plants per square foot, it's time to either rotate out of pure alfalfa or interseed a grass crop such as festulolium, tetraploid ryegrass,

annual ryegrass, or orchardgrass or interseed another legume not hurt by the autotoxicity seen in year old or older alfalfa stands. Red clover is the legume of choice and should be planted at 6 to 8 lbs pure live seed per acre either by broadcasting it on in very early spring or seeding it with a no-till drill (plant either in very early spring or in early to mid-Sept after the last harvest of the season).

The second evaluation method derives from research out of Wisconsin by Dr. Dennis Cosgrove that indicates that stem number rather than plant number is a more accurate determination of when to plow down or interseed an alfalfa stand. Cosgrove suggests using a value of 55 or more stems per square foot to indicate that the stand will produce maximum yield. A reduction in stem number per square foot to 40 stems or less will result in a 25 percent yield reduction. At this critical level, alfalfa fields begin to lose profitability and should be rotated to another crop for one or two years.

Although you can get some idea on the potential of your alfalfa stand by counting either the number of plants or the number of tillers per square foot, you will need also to consider checking on the health of those plants to have an accurate basis for a decision on keeping or destroying an alfalfa stand. To do this in the spring when new growth is about 4 to 6 inches tall, check a random one square foot site for each 5 to 10 acres of alfalfa or at least 4 to 5 sites on small fields. Dig up several plants at each site and slice open the crown and root (longitudinally) with a sharp knife to determine the health of the crown and tap root. Healthy roots and crowns will be firm and white to slightly yellow in color. Diseased roots will have dark brown areas extending down the center, especially if crown rot is a problem. Reduce your counts of plants per square foot or tillers per square foot so only the healthy plants present are counted. Plants with roots that are mushy or soft are likely to die; and although those with a few brown spots may survive, the overall vigor of the stand will be compromised by the presence of disease.

If you must decide on whether to reseed before growth begins in the spring (and you do not plan to take a first harvest of alfalfa before planting another crop) or after a very hard winter with significant heaving or winter injury, base your decision to reseed on the number of plants per square foot (Table 1). If a decision to reseed can be made during the growing season or after about 4 to 6 inches of growth has occurred in the spring, either evaluation method can be used (Table 1). In Table 1 below, I've modified various estimates for good, marginal, and poor stands to give the grower possible guidelines to consider in making a decision on keeping the stand or interseeding a grass or other legume.

Table 1. Suggested plants per square foot or tillers per square foot () criteria for evaluating alfalfa stands on Delmarva.			
Age of stand	Good stand	Marginal stand	Consider replacement* or renovation** with interseeded grass or red clover
Plants per square foot with spring tillers per square foot in parentheses			
New	25-40 plts (> 75)	15-25 plts (< 55)	< 15 plts (< 50)
1 year old	> 12 plts (> 60)	8-12 plts (< 55)	< 8 plts (< 45)
2 years old	> 8 plts (> 55)	5-7 plts (< 50)	< 5 plts (< 40)
3 years old	> 6 plts (> 50)	4-6 plts (< 45)	< 4 plts (< 40)
4 years old or older	> 4 plts (> 50)	3-4 plts (< 40)	< 3 plts (< 40)

* , If the stand is to be plowed for replacement, growers often find it economically favorable to take a first cutting and then plow and plant a rotational crop that can use the nitrogen mineralized from the

decomposing alfalfa plants. Rotate out of alfalfa at least until the next fall (14 to 18 months) but preferably for 2 to 4 years. This will allow time for a reduction in the potential for alfalfa diseases and provide the grower the opportunity to correct soil nutrient and pH (acidity) problems as well as make use of the residual N mineralization potential that exists in a field following an alfalfa crop.

^{**}, If you consider renovation or extending the stand life, try no-tilling a grass crop such as orchardgrass, tetraploid annual or perennial ryegrass, or one of the new varieties of festulolium (a cross between meadow fescue and one of the ryegrasses). The grass will increase your tonnage especially if you fertilize for the grass with nitrogen fertilizer. This also has the effect of driving out alfalfa at the same time as production levels are maintained for an additional year or two. Another option for extending an alfalfa stand's life for 1 to 2 years is to seed in 6 to 8 lbs of red clover per acre. This option will maintain the higher protein production from the field.

Mid-Atlantic Grain and Forage Journal

A Compilation of Research and Extension Projects on Corn, Soybean, Small Grain and Forage Production

2004-2005 Edition Now Available!

The 2004-2005 *Mid-Atlantic Grain and Forage Journal* is on the web at www.rce.rutgers.edu/pubs/magfj. This web-based, peer reviewed journal contains findings from research and Extension projects on corn, soybean and forage production in the Mid-Atlantic region.

Current and past issues may be of interest to colleagues, Extension personnel, students, farmers and others. If possible, links from web sites advertising the Journal as an informational resource would be appreciated. Any questions can be directed to Dan Kluchinski, Editor, at 732-932-5000 x588 or kluchinski@rce.rutgers.edu.

Call for Papers for the 2006-2007 Edition Announced!

We are seeking submissions of articles for the 2006-2007 edition of the *Mid-Atlantic Grain and Forage Journal* from field and forage crop Extension agents, specialists and researchers from land-grant colleges and universities in the Mid-Atlantic region. Articles should be on research or quantifiable demonstrations that address field and forage crop production, preferably conducted in the past 3 to 5 years. Projects associating crop production and livestock or dairy production are also acceptable. Significant unique field observations may also be submitted for publication. Figures, tables, graphics and photographs may be used. General newsletter type articles that are not associated with specific research or demonstrations are not acceptable.

Paper submissions are due May 1, 2006 to the editor. For information on submission formats, protocol, sample articles, timetables and review process, click on:

[Protocols for Submitting Articles for the 2006-2007 Mid-Atlantic Grain and Forage Journal](#)

Any questions can be directed to Dan Kluchinski, Editor, at 732-932-5000 x588 or kluchinski@rce.rutgers.edu.

Leaving Corn in the Field Through the Winter: How Much Do You Lose?

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I recently received a question asking how much grain yield is lost when corn is left standing through the winter? In Ohio, we generally don't see much corn standing in the field during the winter. However, late plantings combined with cool, wet conditions at maturity may result in a corn crop with excessive grain moisture that ceases to dry down in the fall when temperatures turn cold. If wet weather persists following maturity, harvesting may be delayed until late winter.

We have data from a 2004 study that may give some idea as to the yield losses that occur when corn is left in the field through the winter. This 2004 study was part of a larger research project evaluating effects of harvest date and plant population effects on the agronomic performance of four hybrids differing in maturity and stalk quality (for more on this study see "Effects of Harvest Delays on Yield, Grain Moisture and Stalk Lodging in Corn" C.O.R.N (Crop Observation and Recommendation Network at <http://corn.osu.edu/>) Newsletter 2005-34; October 10, 2005 - October 18, 2005). Four plant populations were considered (24,000, 30,000, 36,000, and 42,000 plants/A). The targeted harvest dates were early October, November, and December. However, at the Apple Creek test site in NE Ohio, the third harvest was delayed until March 22, 2005 due to above average rainfall that made soil conditions unsuitable for field harvesting.

Yield differences among hybrids and plant population were generally small on the first harvest date. With harvest delays, major yield losses occurred at the higher plant populations, especially 42,000 plants/A, due to increased stalk lodging. Yields averaged across hybrids and plant populations decreased from 207 bu/A on Oct. 13 to 185 bu/A on Nov. 9, to 158 bu/A on March 22 (for a 24% yield loss over the four month harvest delay). Between the Oct. 13 and March 22 harvest dates, yields at 24,000 plants/A, averaged across hybrids, fell 15%, whereas at 42,000 plants/A yields dropped 36%. Stalk lodging increased from about 1% on Oct. 13 to 40% on Nov. 9, to 93% on March 22. Grain moisture averaged 24.8% on Oct. 13, 20.2% on Nov. 9, and 18.9% on March 22. Test weights remained the same between the Oct. and Nov. harvest dates, averaging 60.7 lbs/bu but dropping to 56.8 lbs/bu on March 22. Hybrids with lower stalk quality ratings exhibited greater stalk rot, lodging, and yield loss when harvest was delayed. Averaged across plant populations, the hybrid associated with the greatest lodging on March 22 averaged yields 28% less than on Oct. 13, whereas the hybrid exhibiting the least lodging, averaged yields 16% less than on Oct. 13.

Leaving corn to stand in the field through the winter is more common in northern states. According to Dr. Joe Lauer, the corn extension agronomist at the University of Wisconsin, if stalks stay standing and there isn't much ear drop, snow cover, or wildlife damage, a crop can get through the winter with limited yield loss. In a 2004 report ("Some Pros and Cons of Letting Corn Stand in the Field Through the Winter"; Wisconsin Crop Manager 11(26): 170-171), Dr. Lauer concluded that in years with heavy snow cover, grain yield loss can decrease significantly. At the test site he monitored during 2000, a year with heavy snow cover, grain yield by spring (April) was 37% lower than October harvest. This contrasted with the winter of 2001 (little snow cover) when grain yield by spring was only 10% lower than October harvest.

Miscellaneous Notes:

Losses are determined by a number of factors – how much weathering occurs; the number of rainy, snowy, windy days; and major swings in temperature.

Quality of corn in the fall – if there was minimal stalk lodging, then corn is more likely to handle harvest delays better – was it standing well.

In our studies nearly all the time, corn was standing well with less than 5-10% lodging in early October. However if significant lodging had already started before harvest maturity was attained, then the crop might not have handled delays well and greater weathering losses might have occurred.

Assessing Potential Differences Among Hybrids for Ethanol Production

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We recently collected data on total fermentables in grain of hybrids entered in the 2005 Ohio Corn Performance Regional Tests. Measurements of total fermentables have been widely used to assess the ethanol potential of grain for dry grind ethanol plants. The ethanol plants currently under construction in Ohio are all dry grind ethanol operations. Some of these plants may be purchasing corn grain for ethanol production within the next one to two years. We are grateful to Mike Newland at Greater Ohio Ethanol, LLC for conducting these analyses of total fermentables, expressed as grams CO₂ per 100 grams dry weight. Analyses of total fermentables were determined using a FOSS 1241 NIR analyzer.

Total fermentables in grain were collected for three 2005 test sites, South Charleston, Bucyrus, and Hoytville. The average and range in values among hybrids at each location are shown in Table 1 below. Averages for total fermentables across the three sites ranged from 38.4 grams CO₂ per 100 grams dry weight of grain at Bucyrus to 38.7 grams CO₂ per 100 grams dry weight of grain at South Charleston. Although the range in values for total fermentables in grain

was usually less than 5% at any location, these small differences can be highly significant according to operators of dry grind ethanol facilities.

The results of this evaluation suggest that many of the hybrids entered in the Ohio Corn Performance Test would be suitable for use by dry grind ethanol operations. One of the companies currently building a dry grind ethanol plant in Ohio has indicated that it might pay a premium for grain with high total fermentables. Grain with total fermentables of 38.3-38.4 grams CO₂ per 100 grams dry weight might receive a premium of \$0.02/bu. With higher total fermentables, 38.7-38.8 grams CO₂ per 100 grams dry weight, premiums could increase to \$0.06/bu. Our measurements of hybrid total fermentables indicated that 68% to 88% of the hybrids entered in the three regional 2005 test locations had levels of total fermentables equal to or exceeding 38.3 grams CO₂ per 100 grams dry weight and 37% to 50% of the hybrids entered had levels of total fermentables equal to or exceeding 38.7 grams CO₂ per 100 grams dry weight.

Table 1. Total fermentables as grams CO₂ per 100grams dry weight of grain in grain of hybrid entries at three Ohio Corn Performance Test locations in 2005.

Location	Average value	Range of values
South Charleston	38.7 (107)*	37.6 - 39.4
Hoytville	38.5 (123)	37.5 - 39.5
Bucyrus	38.4 (82)	37.3 - 39.3

* Number of hybrid entries in parentheses

Preliminary data from 2005 also suggests that differences in total fermentables in grain among hybrids were fairly consistent across locations, despite marked differences in rainfall during the growing season. Total fermentables were measured in nine hybrids ranging in maturity from 107 to 112 days planted at six Ohio locations. Hybrids producing the highest and lowest total fermentables were usually the same ones at each test site.