Integrated Pest & Crop Management

Recent Fluctuations in Temperature Reinforce Importance of Aeration

By Charles Ellis

Aeration is the practice of moving air through stored grain to reduce the rate of grain deterioration and prevent storage losses. Spoilage in stored grain is caused by mold growth and insect activity, which is related to the moisture content and temperature of the stored grain. Aeration greatly improves the "storability" of grain by maintaining a cool, uniform temperature throughout the storage to reduce mold development and insect activity and to prevent moisture migration.

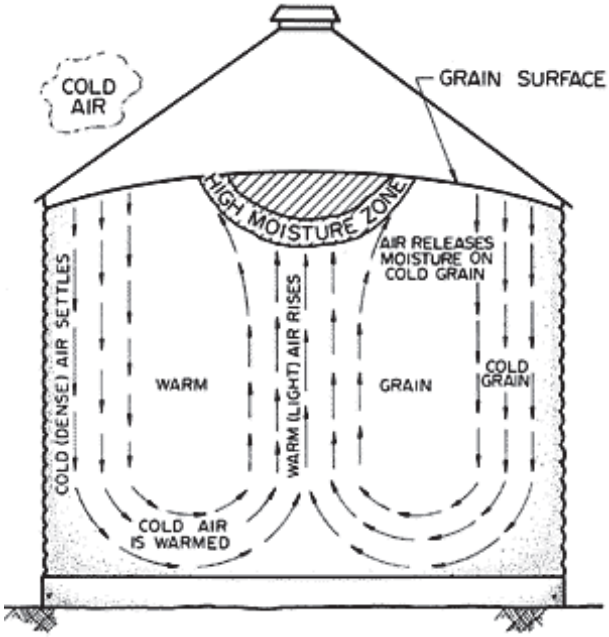

Figure 1. Moisture migration in grain stored without aeration.

Temperature differences in a bin of stored grain cause moisture to migrate from warmer areas to colder areas. Figure 1 shows moisture migration in a bin when grain temperature differences are created due to colder weather. The warm air rising in the center of the bin cools when it reaches the cold grain near the surface. This results in moisture condensation near the surface and leads to rapid spoilage when the weather turns warmer. Crusting on the surface of stored grain is a common symptom of moisture migration. Moisture can also migrate to colder grain near the bin walls during cold winter weather. It is also possible to get moisture migration inward if the outside temperature is warmer than the grain. This is usually not as serious as the moisture migration upward and outward during cold winter weather.

Aeration changes the temperature of stored grain in response to seasonal temperature changes and maintains uniform temperatures throughout the storage. Aeration is not a grain drying system and must not be considered as such. Some changes in grain moisture content occur as a result of aeration. The heat removed during cooling results in some drying. Grain moisture content will be reduced about one-fourth percent for each 10° F reduction in temperature. Little moisture change results from the drying or re-wetting capacity of the small amounts of air necessary for changing the temperature of the grain. However, significant changes in moisture content can occur if substantially more air is moved through the grain than is required for a temperature change. This can happen when high airflows are used for extended periods beyond that necessary for changing the grain temperature

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Nitrogen Loss in 2008

By Peter Scharf

The two biggest fertilizer stories for 2008 are nitrogen loss and fertilizer prices (see other story this issue). My current estimate is that nitrogen loss cost Missouri corn producers $305 million in 2008. The problem was widespread across the midwest, and I estimate that total corn yield loss was about 460 million bushels. Due to a sharp decline in fuel prices, demand for corn (ethanol) is also down and the lost production is not causing major problems for grain users. This means that the price of corn is staying relatively low, so at least the grain production that was lost was not worth what it might have been.

Wet weather and nitrogen loss

How did this happen? All across the midwest, spring and early summer precipitation was heavy. Nearly all of Missouri and Iowa had more than 16 inches of rain from April through June, along with southern Illinois, southern Indiana, southern Wisconsin, eastern Nebraska, eastern Kansas, and southeastern Minnesota. All nitrogen fertilizer eventually converts to nitrate in soil, and nitrate is vulnerable to loss during wet weather.

This year that vulnerability translated into real and widespread nitrogen loss. How do I know this? In early August, I drove almost 2000 miles through Missouri, Kansas, Iowa, Illinois, and Wisconsin, and I also had a pilot take about 1500 aerial photographs in Missouri and Iowa. I saw light-green or yellow-green fields of corn in all of those places with the exception of Illinois north of Interstate 80. In most of these fields, the color was patchy, which I believe related to wetter vs. drier areas of the fields. I stopped to look carefully at 6 or 8 fields and all of them had the classic nitrogen deficiency symptom: a yellow or brown 'arrow' of dying tissue pointing up the midrib of the leaf toward the stem. This symptom is caused by nitrogen deficiency and nothing else.

In southern Wisconsin, where I'm from, I saw several fields in the neighborhood of 100 acres that I estimated would yield 100 bushels below their yield potential due to severe and widespread nitrogen deficiency. That's a 10,000 bushel hit in a single field. At $4 corn, that would be nearly enough to pay for a used high-clearance machine just to take care of that one field.

Any field showing nitrogen deficiency symptoms in early August has lost yield potential. I estimated the amount of yield potential lost in each region based on corn color and more than ten years of experience with tracking yield loss due to nitrogen deficiency. A presentation showing these yield loss estimates and some of the aerial photographs is available online, along with other articles on N loss in 2008, at: http://plantsci.missouri.edu/nutrientmanagement/nitrogen/loss.htm.

Nitrogen management

Often fields with severe deficiency were adjacent to fields with minimal or no deficiency. Nitrogen management, as well as soil properties and weather, had an impact on how much nitrogen and how much yield potential was lost. Sidedress application of nitrogen paid big dividends this year: there was a 44 bushel yield advantage in our experiment near Columbia. Although wet weather creates the risk that sidedressing won't get finished, all of the producers that I know who sidedress all of their corn were able to finish.

Among pre-plant application strategies, spring application of anhydrous ammonia has the lowest risk of N loss. However, I saw a field at the University of Missouri's Hundley-Whaley research farm in northwest Missouri that received 180 lb. N as preplant anhydrous ammonia and another 50 lb. N with the herbicide but that was still severely nitrogen-deficient. Any nitrogen management strategy can be overwhelmed by weather.

Nitrogen loss inhibitors (N-Serve, Agrotain, ESN coated urea) probably produced substantial benefits this year. I didn't have any experiments with N-Serve, but Agrotain-treated urea produced a 14 bushel yield benefit and ESN produced a 31 bushel yield benefit relative to urea broadcast at planting in an experiment near Columbia.

Rescue nitrogen applications: do they work?

Rescue application of nitrogen fertilizer is the key to maintaining yield and profit potential in a year like 2008. I sometimes run into people who are skeptical about recovering yield once the corn has experienced substantial nitrogen stress. My experience and research shows that corn has great capacity to use rescue N to produce additional yield until at least silking. Research by others suggest that this capacity extends at least a week and probably usually two weeks past silking. However, the likelihood of reaching the full yield potential of the crop drops off if rescue applications are delayed until after silking.

I worked with some southeast Kansas producers who applied all of their N preplant but received excessive spring rainfall in 2005. They used a high-clearance sprayer to apply 12 gallons of 32% UAN solution (40 lb N) per acre on June 29 to corn that was head-high. This nitrogen was not applied to the whole field, but to alternating strips (100 feet with N, 100 feet without), resulting in 8 strips with rescue N and 8 without. On about half the field the corn was light green, and in this area the strips that received rescue N were clearly visible from the ground and in an aerial photo taken on July 16. Side-by-side comparisons of yield monitor data showed an average yield response of 35 bushels/acre in the area of the field where stress was visible (light green color). About half of the field did not show stress symptoms, and in this area the rescue N strips were not visible and produced only a 2 bu/acre yield benefit. It's clear to me that rescue N can pay big dividends, but only when an actual N deficiency exists.

Diagnosing deficiency

This leads to another question: How do you know whether a nitrogen deficiency exists? How do you make the decision on whether to pull the trigger on rescue N applications?

This is a difficult question to answer. Soil samples are one possibility. Ron Catlett of Central Missouri Agri-Services in Saline County sampled a number of fields for a customer this year and found N loss ranging from 40 to 100 lb N/acre. Details on how to do this can be found in MU Extension guide G9177 (http://extension.missouri.edu/explorepdf/agguides/soils/G09177.pdf).

However, soil samples need to be deep to work. When weather has been wet enough to cause N loss, it has been wet enough to move much or most of the N into the subsoil. Deep sampling of wet soil on a lot of fields is an unpleasant job, it takes a lot of time, and then you probably will wait at least a week for the lab results even though you may have a short window for rescue N application.

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Nitrogen Loss in 2008 *continued from page 2*

I like aerial photographs as a tool for diagnosing deficiency. They work best if taken when the corn is waist high or taller, so that soil color is not an issue. However, this limits your rescue N options to high-clearance equipment or airplanes. I've known others who were able to identify and treat nitrogen deficiency in knee-high corn using aerial photographs.

Aerial photographs also work best after the field is no longer saturated and the corn has time to take up whatever nitrogen is left. Corn will appear nitrogen-deficient (and actually be nitrogen-deficient) in saturated soils even if the nitrogen has not been lost.

The biggest advantage of aerial photographs is speed. You can probably photograph all of your corn fields in a few hours. Usually it's not very expensive to hire a pilot for a few hours. A high-wing plane works best, so that the wing is not between you and your fields. It's generally pretty obvious where the problems are.

August 1 aerial photograph of a corn field in the Missouri river bottom in northwest Missouri with severe and patchy nitrogen deficiency. There are a few drowned-out areas, but nitrogen loss is limiting yield much more than stand loss. The dark (dark green if you're seeing the photo in color) areas have sufficient nitrogen, and the light areas are highly nitrogen-deficient. The streaky, patchy mix of color in this field reflects the topography and where water runs or stands in the field. The nitrogen-deficient areas are the lower, wetter parts of the field. Applying rescue N only to the deficient areas could potentially be done using a plane or using a ground-based applicator equipped with crop color sensors.

We have developed a procedure for turning an aerial photograph into a map of potential yield loss if rescue N is not applied. When you're thinking about dollars and effort required to make a rescue application, it would be helpful to have some knowledge of how much you're losing if you don't make the application. This product is not currently available commercially, although we are looking for ways to get it on the market (we were trying to license it to John Deere's aerial imagery program before they got out of the business in fall 2007). If and when this service becomes available, I think that it will be the fastest and most reliable way to make decisions about rescue N applications.

Making rescue nitrogen applications

I think that every producer, retailer, and retail organization in Missouri and the humid corn belt should have a 'Plan B' of exactly how they will apply rescue nitrogen if it's needed. If this plan is not in place before planting, it's unlikely to be successfully developed in the heat of the moment. Although I saw more nitrogen-deficient corn in 2008 than in any other year in the last 12, nitrogen-deficient corn due to wet weather has been a problem somewhere in Missouri almost every year.

Virtually any method of making rescue N applications is a good method, with the exception of broadcasting UAN solution onto a crop that is taller than one foot. That said, we have compared several methods and learned that:

1) Broadcast urea causes almost no yield loss due to leaf burn. In our research, we applied 150 lb N/acre as urea on corn up to four feet tall, and the yield difference between broadcast and in-row placement of urea was generally less than 4 bushels/acre. However, we made an attempt to use non-dusty urea at times when no dew was on leaves. Dusty urea on wet leaves might cause more yield loss. Urea is clearly a better N source than ammonium nitrate for aerial application (see #3 below).

2) Agrotain coating of urea improved yield response of corn when the corn was 1 or 2 feet tall, but not when the corn was 3 or 4 feet tall. The taller corn has less air movement at the soil surface, which probably reduces volatilization loss from the urea. Also, corn leaves can absorb ammonia from air, so ammonia that volatilizes from urea applied to tall corn may be captured by the leaves before escaping into the air above the canopy.

3) Ammonium nitrate causes substantial yield loss (about 20 bushels/acre) due to leaf burn when broadcast over 3 or 4 foot tall corn, moderate yield loss (8 bushels/acre) when broadcast over 2 foot tall corn, and no yield loss when broadcast over 1 foot tall corn.

4) UAN solution dribbled between rows was an effective rescue N treatment. Broadcast UAN solution caused severe yield loss due to leaf burn.

Spatial variability and rescue N applications

The aerial photograph shows a field with severe but patchy nitrogen deficiency. This is typical because the amount of nitrogen lost depends on wetness, which is different in different parts of the field. There are areas that need no nitrogen, and other areas that probably need more than 100 pounds of N per acre. How would you fertilize this field once you had equipment in place that could apply N?

If you apply a uniform application that will bring the most deficient areas to full yield, large amounts of fertilizer will be wasted

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Nitrogen Loss in 2008 *continued from page 3*

in the areas that already have enough N. If you apply a half rate, you will lose yield potential. Ideally you would apply the N only to areas where you will get a yield response and return to investment.

The simplest way to do this would be to hire an aerial applicator with instructions to follow the light green streaks with the plane. With an ground-based applicator, it's probably necessary to drive through the N-sufficient areas, but preferable to not apply fertilizer in them. One way to accomplish this is to equip the applicator with crop color sensors; then you could turn off (or at least down) the fertilizer rate applied in these areas, while applying high rates in the deficient areas. We've worked extensively with using crop sensors to control variable-rate N applications, which I will write about for another newsletter in the near future. Another way would be to use an application map based on an aerial photograph that would only apply N in the deficient areas.

Logistics of rescue N application

Equipment is a major issue in making rescue N applications. Many producers do not have equipment that can apply N once corn is too tall for tractor clearance, and if they do it's probably busy spraying beans and not plumbed for N. These two factors apply to much of the equipment at retail locations as well. Figuring out which piece(s) of equipment will be used for rescue N applications if a severe N deficiency situation develops, and making modifications in the off-season if needed, is the biggest part of a successful 'Plan B'.

Except in the bootheel, there is minimal tradition and availability of aerial applications in Missouri. This has changed somewhat over the past two years as fungicide applications have taken the midwest by storm. Aerial applications are an excellent option for rescue N application.

I have heard that there is simply not enough equipment available in the midwest to have taken care of all the nitrogen deficient corn fields this year. This is probably true. I have estimated that there were almost 15 million acres of corn where it would have been clearly profitable to apply rescue N this year. By comparison, Laura Sweets estimates that we went from less than 100 thousand acres receiving fungicide in 2006 to 12 million acres receiving fungicide in 2007. Much of the equipment used for fungicide application could also be used for rescue nitrogen application, and in 2008 probably it should have been. In my opinion, lack of information and decision tools limited acres of rescue N in 2008 much more than equipment availability did.

Another important logistical consideration in a year like 2008, once we get our act together and TRY to rescue the corn, is whether the fertilizer can be moved into place in time. This is an important question as we move away from domestic production of nitrogen fertilizer. Not much nitrogen is warehoused in North America in excess of anticipated seasonal needs any more. I estimated that it would take 300 million lb N to take care of all of the profitable rescue applications in 2008. If supplied all as urea (one of the most easily mobilized and easily spread forms of N), this would be roughly 300,000 tons. I spoke with Mike Stegmann of Lange-Stegmann in St. Louis and he felt that this could all be moved into the corn belt by July 1 if orders and signals of need started by mid-May, but that rail car availability might be a bottleneck. Adding in UAN as part of the solution (sorry) would make the logistics easier.

How orders could start by mid-May is a problem. My thought is that this is where computer models might come in. An online program called Adapt-N has been brought online in New York. It uses weather, soil, and management data to predict how much N loss might have occurred, might occur in the future, and what the likelihood of a yield response to rescue N would be. I do not think this approach would be as accurate as aerial photography for field-by-field diagnosis, but I think it could work earlier to 'sound the alarm' at a regional scale and put in motion the process of moving more fertilizer into the region.

Summary

- 2008 started with a wet spring and late planting. The wet weather continued into early summer, with more than 16" of rain from April to June over most of Missouri.
- The wet weather was widespread over the corn belt states.
- In windshield and aerial photo surveys over five states I saw lots of nitrogen-deficient corn. This was due to excess water causing nitrogen loss.
- My estimate of yield loss due to N deficiency is 68 million bushels for Missouri and 460 million bushels across the midwest.
- Sidedress N application out-yielded preplant N application by 44 bushels in our experiment near Columbia.
- Anhydrous ammonia was probably the preplant N source least vulnerable to loss.
- N-Serve, Agrotain, and ESN coated urea were probably very profitable this year.
- Application of rescue N would have been very profitable in many corn fields in Missouri. My impression is that only a small percentage of stressed fields received in-season nitrogen fertilizer.
- Obstacles to rescue N application include:
  - difficulty in deciding how big the problem is
  - equipment availability and setup
  - possibly fertilizer availability if rescue applications are done on millions of acres
- I think that every producer, retailer, and retail organization should have a plan in place as to what equipment and fertilizer they will use to make rescue N applications in years when they are needed.
- The most practical options for rescue N are:
  - UAN solution dribbled or injected between rows.
  - urea broadcast with an airplane or a high-clearance spinner or boom spreader.

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Minimizing Stand Establishment Diseases in 2009

By Laura Sweets

It is difficult at this point in the year to know what conditions will be like during the upcoming planting season. However, much of the state was unusually wet during 2008 with some areas and cities setting all time records for the amount of precipitation received. Although the last few months have not followed this trend of unusually wet conditions, soils throughout much of the state remain saturated. If spring conditions are wet or the spring is a cool, wet one, the potential for seed decay, seedling blights and root rot problems in both corn and soybeans could be higher than normal.

Many of the seed decay, seedling blight and root rot problems on both corn and soybean are caused by fungi present in the soil. *Pythium* species can cause early-season diseases on both corn and soybean. Many of the *Pythium* species are favored by cool, wet conditions at planting. Seed decay and seedling blight tend to be more severe in low-lying areas in a field, and in soils that have been compacted or remain wet for an extended period of time. Low soil temperatures (below 50-55 degrees F) favor seed rot and seedling blight. Disease severity is also affected by planting depth, soil type, seed quality, mechanical injury to seed, crusting, herbicide injury or other factors which delay germination and emergence of seedlings.

Phytophthora sojae is another soil-inhabiting fungus that causes seed decay, preemergence or postemergence damping-off and seedling blight of soybean but not of corn. Phytophthora root rot is more severe in areas that are low or poorly drained, in compacted areas or in clay or heavy soils, but the disease can appear on plants growing in lighter soils or higher ground if the soil remains wet after planting. When soils are flooded or saturated, the fungus releases spores which are attracted to the growing soybean root tip where infection occurs. Planting varieties with either race-specific resistance or tolerance or a combination of race-specific resistance and tolerance in fields with a history of Phytophthora is a critical management strategy. Planting under good seedbed conditions and using an appropriate fungicide seed treatment (products containing either metalaxyl or mefenoxam as an active ingredient are particularly effective against water mold fungi such as *Phytophthora sojae*) are also important management options.

Rhizoctonia solani and several *Fusarium* species may also cause seedling blights on corn and soybean. *Rhizoctonia solani* can survive under a wide range of soil moistures and soil temperatures but may decline when soils are flooded or soil temperatures are unusually high. Fusarium root rots may be most severe when the soil is saturated and soil temperatures are around 57 degrees F. Crusting, hard pan layers, herbicide injury, deep planting, poor seed quality, insect damage, mechanical injuries, poor fertility or other factors which delay germination and emergence favor the development of these early-season diseases.

The bottom line is that 2009 may be a season to take precautions to minimize stand establishment problems caused by diseases in both corn and soybean. Planting high quality seed with a high germination rate is always recommended but may be especially important this season. Corn seed comes with fungicide seed treatments already applied. Be sure that the fungicides on the seed purchased are active ingredients and rates that will be effective against the early-season diseases described above. Seed treatment fungicides are not as standard on soybean seed. If the soybean seed purchased is not treated, it may be wise to consider appropriate fungicide seed treatments applied prior to seed delivery or to use on-farm treatments. The 2009 Missouri Pest Management Guide University of Missouri Extension Publication M171 contains tables of fungicides labeled for use as seed treatments on corn and on soybean. Monitoring soil temperatures and soil moisture conditions as planting approaches will also be important. Ideally, corn and beans would be planted under the best possible seedbed conditions. Mother Nature doesn't always allow that luxury but following field conditions and weather forecasts may lead to planting under the best possible conditions for 2009. Finally, avoiding any other stresses which delay germination or emergence may reduce the incidence and severity of the early-season diseases. Proper planting depth, avoiding conditions that would lead to crusting or herbicide injury, proper fertility and preventing insect damage can reduce the damage from early-season diseases.

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Managing Tall Fescue for Seed Production

By Robert Kallenbach

Most acres of tall fescue harvested for seed in Missouri are also used for hay or grazing at some point in the year. While this is a good way to maximize total returns from tall fescue, it often results in lower seed yields than if managed primarily for seed. For highest seed yields, tall fescue should be seeded thinly in rows and managed like other row crops. If grown like a row crop, seed yields can exceed 1,000 lb/acre in Missouri in good years. However, this is type of production is seldom done in Missouri, where the seed crop is secondary to the forage production.

Two management practices are of primary importance for producing high seed yields. They are: 1) removal existing forage (aftermath) in the summer prior seed harvest the next year, and 2) the application of nitrogen fertilizer during late summer and again winter.

The summer before a seed crop is desired, the stubble should be clipped, grazed or hayed to a height of 3 to 4 inches in July or August. If the fescue was not harvested for seed the previous year and is intended for seed the next, clipping or grazing should be done by mid-August. If the forage is over mature, it may be impossible to get livestock to consume the forage evenly. In this case, clipping the field after livestock are removed is best. If seed is to be grown on the same field for multiple years, the removal of the aftermath should be done immediately following seed harvest.

Removing the forage is necessary for the development of next year's seed tillers. These tillers develop during the fall and early winter, and they require direct light. So removing the forage permits sunlight to penetrate the plant canopy and stimulate tiller growth. Failure to clip or graze the forage to a stubble height of 3 or 4 inches may reduce the following year's seed crop by as much as 30 percent. The new growth that occurs in the autumn can be grazed lightly but should not be overgrazed.

Whereas summer clipping determines the number of tillers and seed stalks for the next seed crop, proper nitrogen fertilization determines the number of individual seed in the seedheads. In other words, nitrogen is primarily responsible for how well the seedheads "fill." If used only for seed, 30 to 40 lb/acre of N should be applied in late summer to allow for proper tiller development, followed by a topdressing of 60 to 90 lbs of nitrogen during January. Timing of winter nitrogen applications affects seed yields. Nitrogen applied in the early fall or late summer may not be available at the time it is needed in spring; it may be have been metabolized by fall growth. Nitrogen applied too late in the winter (often as early as Feb. 1 in Southern Missouri) causes lodging and excessive leaf growth instead of heavier seedheads.

In Missouri, determining the proper amount of nitrogen for a seed crop is often complicated by the applications nitrogen during late summer nitrogen (August); such applications are often applied to encourage fall growth for winter grazing. Some additional nitrogen should be applied in December or January for seed production, but the amount will depend upon the amount applied in the late summer or early fall (August-September), the amount of leafy fall growth, the grazing intensity, the amount of clover present, the rainfall before freezing, and a few other factors. A rule of thumb is that if no nitrogen was fall applied, 70 to 100 lb/acre should be topdressed during the winter; if 50 or 60 lb/acre was used in the fall, then use 50 to 80 lbs in the winter.

Phosphorus and potassium levels should be maintained at least in the medium range. On pure tall fescue stands the pH should be maintained above a pH of 5.5.

Since most of the tall fescue seed fields in Missouri are grazed during the fall or winter, cattle management becomes an important factor in seed production. For maximum seed production, grazing pressures should not be too heavy during August, September and October. It is during this time that tiller development occurs. After the first of November, grazing pressures may be increased and all growth should be removed by mid-January. Cattle should be removed from seed fields before March 15 in Southern Missouri and April 1 in North Missouri, otherwise, many of the potential seed heads will be grazed.

The seed of tall fescue shatters easily when ripe. Shattering due to harvest delays is common, usually caused by rains, unavailability of harvesting machines, or high winds; such shattering can easily reduce yields by 50% or more. Even under favorable conditions, extreme care and skill by the combine operator is necessary to prevent serious losses.

Fescue seed may be harvested by direct combining or windrowed and then combined. If the acreage of fescue seed to be harvested is small (can be combined in 1 or 2 days) and a combine is available without delay, then direct combining is a feasible method of harvesting. Combining should begin when 5-15 percent of the seeds are immature. Many of the late heads will still be immature at this time. Harvesting with more than 20 percent immature seed usually results in low yields, excessive seed moisture which will cause heating in storing, weak seed vigor and low germination.

If the amount of seed acreage is large or delays are expected in obtaining harvesting equipment, then the best method is windrowing and curing the seed in the windrow then using a combine with a pickup attachment. Fescue should be mowed at an earlier stage of seed head maturity when windrowed than when directly combined. Windrowing should be started when the straw in the head is yellowing. At this stage, an occasional seed will shatter from the earliest maturing heads in the field when the stem is tapped below the head.

The windrower should cut high enough to leave much of the grass stubble and the windrow placed on top of the stubble. Air will circulate through it and decrease drying time. The fescue should be combined as soon as the windrows are thoroughly dry, which can take 3 to 10 days depending on weather conditions.

The combine should be set according to the manufacturer's manual. Aggressive cylinder action is not necessary. Chaff should

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be examined for seed from time to time as harvest proceeds. The glumes, which do not contain seed, will often confuse an inexperienced operator and give the impression that seed is being blown out.

It is also helpful to consult seed dealers or buyers prior to harvest. They may suggest procedures about timing of harvest and handling that will help the producer to save more seed and improve seed quality as well.

(The original work of Howell N. Wheaton as a source of this material is gratefully acknowledged)

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Why Were Fertilizer Prices So High?

By John Lory

Fertilizer prices have been changing rapidly and, at times, in unanticipated directions. I have attended a number of talks in past couple years where industry experts have prognosticated price and supply moving in one direction only to have the opposite happen.

In this era of uncertainty an understanding of what has affected prices in the recent past may help farmers better predict what will happen in the near future.

The recent high point in fertilizer prices for nitrogen, phosphorus and potassium was in late summer and early fall of 2008. A couple global trends worked to push fertilizer prices to record highs.

The rapidly expanding world economy in 2007 and 2008 led to increasing worldwide grain production. Worldwide grain production has increased about 10% in the past two years according to USDA statistics. Expanding grain production increases demand for fertilizer.

Another important trend was the weakening dollar. The US dollar lost more than 20% of its value compared to a number of international currencies. Most nitrogen and potassium fertilizer is purchased outside the country so a weak dollar pushes up US fertilizer costs.

Nitrogen price is dominated by energy costs. Record natural gas prices ushered in record high nitrogen fertilizer costs. Nitrogen imported from overseas is also affected by shipping rates which have been high until the recent economic downturn.

Inputs into phosphate fertilizers include the mined phosphate rock, sulfur to make the acid to treat the rock and ammonia used in making DAP and MAP. The cost of all these inputs increased dramatically in 2008. A short-term disruption in sulfur production in the US caused a shortage in 2008. Both India and China took steps in 2008 that increased phosphate usage in each country while reducing phosphate fertilizer available in the world market. This "perfect storm" of higher input costs coupled with demand exceeding supply created the unanticipated and unprecedented spike in phosphate fertilizer prices.

Potassium market forecasts have anticipated tight supplies and higher prices for at least a couple of years. Potash production was actually lower in 2008 than in 2007 because of infrastructure issues such as the flooding of the Berezniki potash mine in Russia in July 2007. A labor strike in 2008 in Canada further crimped supplies this fall.

As I write this article in early January 2009 nitrogen and phosphate prices are in a downward freefall reaching levels not seen for a couple years. What can we expect next?

Will nitrogen prices be higher? Consider where fertilizer demand and energy prices are likely to go. Demand will increase as we approach the growing season in the northern hemisphere and energy costs seem to be increasing once more.

Dropping prices have almost eliminated demand for phosphate fertilizer while retailers and farmers look for the bottom price in the market. Demand has dropped to the point where some phosphate mines are being idled. As recently as October 2008 industry experts were predicting demand would exceed supply for the next three years. With the economic downturn demand has dropped but so has production. My best guess is that we are in for a period of high volatility in phosphate fertilizer prices.

Potash supplies are forecast to remain tight for at least the next three years. If demand continues to fall price will inevitably follow. Up to now events have conspired to keep supply on the tight side despite the economic downturn.

The local fertilizer industry faces some daunting challenges this spring. Those suppliers who bought fertilizer this fall have high priced material that would be sold at a substantial loss at current prices. At the same time many suppliers have hesitated to buy fertilizer in preparation for the spring crunch. Fertilizer tonnage bought in Missouri dropped by over 40% in the second half of 2008 compared to 2007. It is unclear if we have the infrastructure to meet the pent up demand for fertilizer that will inevitably occur as we approach the growing season.

So the only thing we can say with any assurance about fertilizer prices and supply in 2009 is that they will likely be as unpredictable as they were in 2008.

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Weather Data for the Week Ending January 15, 2009

By Pat Guinan

		Weekly Temperature (oF)						Monthly Precipitation (in.)		Growing Degree Days‡	
Station	County	Avg. Max.	Avg. Min.	Extreme High	Extreme Low	Mean	Departure from long term avg.	Sep 1-22-Sep	Departure from long term avg.	Accumulated Since Apr. 1	Departure from long term avg.
Corning	Atchison	35	8	52	-9	20	-4	0.00	-0.38	*	*
St. Joseph	Buchanan	35	9	57	-8	21	-6	0.00	-0.33	*	*
Brunswick	Carroll	36	10	59	-7	23	-3	0.00	-0.57	*	*
Albany	Gentry	34	8	56	-9	20	-5	0.01	-0.40	*	*
Auxvasse	Audrain	37	13	64	-5	24	-3	0.00	-0.84	*	*
Vandalia	Audrain	35	13	63	-5	24	-3	0.00	-1.05	*	*
Columbia-Jefferson Farm	Boone	38	13	67	-4	25	-4	0.01	-0.77	*	*
Columbia-South Farms	Boone	38	13	66	-4	25	-4	0.01	-0.77	*	*
Williamsburg	Callaway	38	13	65	-3	25	-3	0.05	-1.09	*	*
Novelty	Knox	33	9	57	-10	20	-5	0.00	-0.59	*	*
Linneus	Linn	35	9	59	-9	21	-4	0.00	-0.45	*	*
Monroe City	Monroe	34	12	63	-7	22	-6	0.00	-0.69	*	*
Versailles	Morgan	41	15	69	-2	27	-3	0.00	-0.85	*	*
Green Ridge	Pettis	39	13	67	-3	25	-2	0.10	-0.70	*	*
Lamar	Barton	40	17	64	5	29	-2	0.00	-0.78	*	*
Cook Station	Crawford	43	15	64	-2	28	-4	0.21	-0.92	*	*
Alley Spring	Shannon	*	*	*	*	*	*	*	*	*	*
Mountain Grove	Wright	43	16	62	2	28	-2	0.03	-1.46	*	*
Delta	Cape Girardeau	43	21	52	7	31	-2	0.16	-1.18	*	*
Cardwell	Dunklin	47	25	59	13	35	0	0.60	-1.03	*	*
Clarkton	Dunklin	46	24	58	10	34	0	0.26	-1.32	*	*
Glennonville	Dunklin	46	24	57	11	34	-1	0.11	-1.44	*	*
Charleston	Mississippi	45	23	59	9	33	0	0.61	-1.10	*	*
Portageville-Delta Center	Pemiscot	46	26	60	11	35	0	0.70	-1.10	*	*
Portageville-Lee Farm	Pemiscot	46	25	61	12	35	0	0.72	-0.99	*	*
Steele	Pemiscot	47	27	59	14	36	+1	0.81	-0.72	*	*

* Complete data not available for report

‡Growing degree days are calculated by subtracting a 50 degree (Fahrenheit) base temperature from the average daily temperature. Thus, if the average temperature for the day is 75 degrees, then 25 growing degree days will have been accumulated.

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