February 2008

Mississippi State University Extension Service

Agronomy Notes

Corn

by Dr. Erick Larson

Fertility Keys for Corn - I believe Mississippi producers generally do a very good job of addressing corn nitrogen needs. But, we are much more likely to overlook other major fertility needs and sometimes micronutrients, particularly at the higher yield levels we are now producing. The first fertility issue, which must be addressed before any other supplemental nutrients are applied, is low soil pH (below 6.0). Low pH will substantially restrict nutrient availability and stunt crop growth drastically (resulting from increased availability of toxic elements) when pH is below 5.5. Corn requires nearly twice as much phosphorus and about 40-50% more potassium, compared to cotton and soybeans. Corn potassium deficiency often occurs following a high-yielding soybean crop, since soybeans remove double the potassium from the soil as a cotton crop. Potassium deficiency is particularly prevalent in no-tillage systems, where uneven soybean residue distribution (windrowing) may occur by the combine spreader during soybean harvest. Sulfur, magnesium and zinc deficiencies are also becoming more common. These nutrient requirements, except for sulfur, can be proactively addressed by a sound soil testing program. Plant tissue analyses during the crop season will indicate sulfur availability and will be helpful in confirming plant uptake for all nutrients.

Managing Limitations/Early Planting - Growing corn in Mississippi can be very profitable, but does have considerable risk, which producers should address with management practices. The primary environmental risks include wet springs and hot, dry summers. Growers should utilize raised beds on fields with marginal drainage to relieve potential waterlogging and warm the soil to promote better seedling establishment and vegetative development. Early burndown herbicide application helps both these problems because it promotes warmer, drier seedbeds during the spring and encourages earlier planting. Early planting helps corn avoid stress associated with mid-summer drought. Irrigation can help alleviate water stress, but does not override the importance of early planting (because of heat stress).

Burndown Herbicide Timing - Moist soil conditions often severely restrict planting time during the optimum corn planting period. Utilizing a late winter burndown herbicide to control winter vegetation allows producers to manipulate soil moisture and encourage earlier planting. Killing winter weeds several weeks before planting allows the soil to absorb much more solar energy, compared to soils covered by a blanket of lush weed vegetation until immediately prior to planting. This warms and dries the soil, which allows earlier planting and promotes corn seedling vigor. Burndown herbicides utilizing glyphosate should be applied four to six weeks before planting to gain these advantages.

Risk of Ultra-Early Planting - Abnormally warm, dry conditions sometimes allow an opportunity to plant corn during late February or early March. Although early planting is a critical component of successful corn production, planting corn extremely early (well before recommended dates), even if soil temperatures are warm, provides little, if any crop development advantages, while risking stand failure. Extraordinarily early planting enhances maturity very little, because corn growth rate is correlated to temperature, and heat unit accumulation (GDD 50) is historically very low during early March.

Guidelines for Corn Planting Date - The standard guideline for determining earliest planting date is when morning soil temperature at a 2-inch soil depth is 55 degrees F and 50 degrees F at a 6-inch soil depth. Planting before the soil temperature is warm enough for germination greatly increases the potential for stand failure, because germination growth rate is dependent upon soil temperature. Soil temperature may vary considerably depending upon amount and type of plant residue, soil texture and slope. Thus, randomly measuring soil temperature with a thermometer within a field should provide a reliable indicator of desirable conditions for stand establishment. Corn produces highest yields when planted within 4 to 5 weeks after soil temperature is warm enough for germination. This has historically corresponded with the following calendar dates:

Geographical Region of Mississippi:

Southern: February 25 - March 15

Central: March 5 - April 10

North-Central: March 15 - April 20

Northern: March 20 - April 25

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Wheat
by Dr. Erick Larson

Keys for Successful N fertilization - There are several keys to successful wheat nitrogen fertilization in Mississippi. Split application of nitrogen fertilizer is likely more important for wheat than any other crop, including corn. This is because nitrogen for wheat production must be applied during the wettest months of the year – in a high rainfall, warm regional climate. Thus, considerable nitrogen loss may occur before the crop utilizes it, if nitrogen is exposed to prolonged, soggy weather. Likewise, nitrogen application timing is very important, particularly for the first spring application. Seasonal weather and weekly temperature fluctuation can greatly influence wheat development (along with specific planting date and variety). Therefore, wheat producers can make better fertility decisions, by closely monitoring wheat health and development, and evaluating the weather forecast. This knowledge can help you make more appropriate fertility decisions, rather than exclusively relying on specific calendar dates and rate guidelines. Using best management practices can substantially improve fertilizer efficiency, crop yields and profitability - especially since both nitrogen and wheat prices are extremely high.

Split Application Guide - I believe the most prudent method to apply nitrogen to southern wheat is either a 2-way or a 3-way split with at least 2/3 of the nitrogen applied in the late split(s). Using split nitrogen applications with the majority of fertilizer applied late will satisfy crop demand without subjecting a substantial amount of expensive N to denitrification loss during wet, saturated conditions typical during the early spring. Only a small amount of the total N is theoretically needed in the first topdress application (20-30 lbs. N/a.), because rapid wheat nitrogen uptake does not occur until wheat stem elongation begins. The initial topdress of a split application should be applied when dormancy breaks in late-winter while wheat is hopefully in prostrate, tillering stages (Feekes growth stage 3 or 4 - normally early February). Neglecting wheat nutritional needs during tillering stages limits the number of tillers which will produce viable heads. Thus, proper nitrogen timing is essential to produce high wheat yields. Thereafter, N can be applied according to crop needs, which are correlated to wheat development stage. A second nitrogen application should occur when plants become strongly erect and stem elongation begins (normally around March 1), and again prior to boot stage (late March), if you choose to make a third application.

Nitrogen Sources - Urea is the most commonly used nitrogen source on wheat because it is generally the most economical nitrogen source, it can be applied by air, and volatility is less likely to be substantial during the wheat season (because temperatures are cool and rain is frequent), than during the summer. Likewise, the need for urease inhibitors, such as Agrotain, is less than for late-spring or summer applications of urea-based nitrogen sources. Ammonium sulfate should be applied in an early application, if sulfur is needed. Liquid nitrogen solution (UAN) can potentially burn leaf tissue, especially if high rates are broadcast on erect wheat, so granular nitrogen sources are generally preferred, particularly for single, or the latter split applications.

Nitrogen Rates - Our wet southern climate may influence nitrogen use efficiency considerably depending upon seasonal rainfall frequency and amount. Thus, specific nitrogen rate suggestions based solely upon crop yield goal are not very reliable for wheat production in the South. Since soil texture significantly influences soil-water relations and potential nitrogen loss during typical wet springs, our general recommended spring nitrogen rates vary depending on soil texture. I normally suggest from 90 - 140 lbs. N/a. on light-textured soils and 120 - 170 lbs. N/a. on heavy clay soils. However, monitoring crop response to nutrition, culture and environmental conditions offers producers substantial opportunity to address needs more specifically.

Manipulating potential freeze damage? Warm winter conditions that promote excessive wheat development also raise questions about susceptibility to freeze damage. Wheat tolerance to cold temperatures is dependent upon the growth stage, with younger wheat being more tolerant than older wheat. For more information regarding potential freeze damage at various growth stages, please refer to the "Frequently Asked Questions" and last season's newsletters addressing spring freeze damage on the Wheat page on MSUcares.com. There is little, if any method to manipulate crop maturity to influence susceptibility to freezing temperatures, including nitrogen application timing. Nitrogen nutrition does not influence wheat maturation – maturation is determined by planting date and variety response to temperatures and photoperiod. Thus, delaying nitrogen application will only reduce wheat yield potential by depriving plants of nutrition. Our best hope for early-planted wheat is that cool temperatures prevail through February and March, slowing wheat maturation until the threat of a hard freeze is remote.

Nutrient and Soil Management by Dr. Larry Oldham

Fertilizer prices continue to raise issues: volatility in recent years usually could be traced to factors such as Katrina, the four Florida hurricanes, or energy prices. Now we are seeing a response to a number of market forces, not just the energy complex which normally influences nitrogen prices. Depressed global grain stocks have increased grain prices around the world which has increased fertilizer demand by crop producers. The declining value of the dollar is a major influence because significant amounts of fertilizers are imported. About 90% of the potash used in the United States originates in Canada; the value of the American dollar has declined about one third against the Canadian dollar in recent years. Transportation costs are increasing all along the fertilizer supply lines. Economies in Brazil, India, and China have increased demand for meat protein which increases fertilizer based crop production to produce the meat. Some forecasts predict the fertilizer situation will be volatile until the 2010 crop year because of the time required to grow crops, deal with weather, increase fertilizer supplies and transportation.

Meanwhile, we consider again how we cope with this in Mississippi in 2008. The basics of soil fertility management apply:

1.) Soil test to determine your need for nutrients. Soils with medium to very high soil test phosphate or potash have diminishing returns to applied fertilizers.

2.) Avoid unnecessary applications. (see number 1)

3.) Don't skimp on fertilizer when it is really needed. Consider what happens when crops such as corn do not have sufficient nitrogen. While grain crop prices are good, other plant growers may be tempted to forego fertilizer altogether – if you are in this category, make sure to consider the consequences, and see number 1.

4.) Speaking of nitrogen, be realistic and know your production potential considering the soils, availability of irrigation, and other agronomic variables.

5.) Maintain soil pH through a soil test based liming program. The efficiency of fertilizers that you apply, and the nutrients already in the soil, is higher when soil acidity issues are addressed.

6.) Improve fertilizer efficiency through equipment calibration, split applications, and other management options.

7.) If available and economically feasible, use manures or other by-products in the fertility program.

8.) Make sure soybean seed is inoculated with the proper bacteria to promote nitrogen fixation. It's considerably cheaper than a remedial application of 100 pounds of nitrogen.

9.) Don't expect any miracle products to actually produce a miracle.

10.) Start and maintain a good relationship with your supplier. Availability of some materials will be closely related to transportation and capital costs. Higher fertilizer prices are not at your retailers alone, prices are higher beginning with the point of production or mining. Local sales points are coping with committing significantly more capital to fertilizer inventory costs.

Forages
by Dr. Rocky Lemus

Mississippi has soils and climate that favor growth of a wide range of productive, high-quality forage species (grasses and legumes). An effective rotational grazing system can be an economically feasible approach that provides forage to grazing livestock while reducing feeding costs year-round. Rotational grazing is accomplished by allowing livestock to graze a specific rested area (paddock) for as little 2 hours up to 14 days depending on the forage growth instead of a time schedule. Rotational grazing will allow faster plant regrowth(recovery) and allow plants to thrive in a nutritious vegetative stage. However, to optimize a grazing management system, planning and maintaining a good fencing system is important.

Farm Resources

Before starting the layout of a fencing system, it is important to evaluate the farm resources (**Fig. 1**) and their utilization. By evaluating those resources, a producer will be able to develop a layout that will efficiently utilize available forage while providing proper rest periods for plant growth and recovery. Pastures should have the same soil type, slope, and aspect to provide uniform forage production and grazing distribution.

Providing water is another capital requirement for rotational grazing systems and a critical component of the semi-permanent resources. Water consumption can range from 8 to 25 gallons per day depending on the type of livestock and environmental conditions (mainly heat and humidity). During hot weather, water consumption by livestock could increase from 25 to 60% (**Table 1**). Water should be available in each paddock and within a walking distance of 300 to 400 feet if possible. If not, a central water source within 900 feet should be incorporated into the fencing system to allow access from all the paddocks.

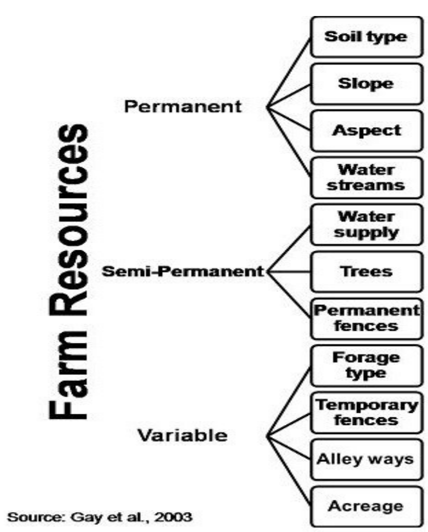

Figure 1. Resources to start a good fencing layout plan.

Fence Layout

One of the initial management considerations in designing grazing systems is selection and installation of the proper fencing system. A good fencing layout for rotational grazing should include a combination of permanent and temporary fences (**Fig. 2**). This will provide flexibility when adjusting paddock size, depending on the amount of livestock present and their daily nutritional needs.

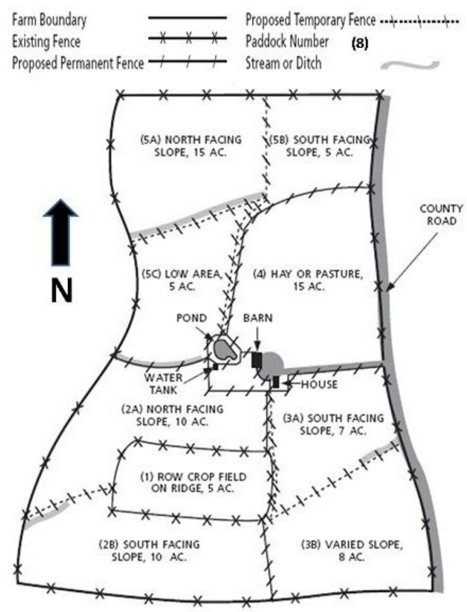

Figure 2. Subdivision of 80 acres pasture into eight paddock using permanent and temporary fences. Source: Marsh, 2001. Virginia Coop. Ext. Serv. P442-755.

The optimum number of fenced paddocks may vary with both forage species and type of livestock, depending on utilization and performance goals, grazing pressure, plant recovery, and economic capability. Paddocks should be designed on square shapes with little soil variation and following landscape changes. Square paddocks usually require a minimum amount of fencing and reduce distance to water sources. Rectangular paddocks should not be more than 4 times as long as they are wide. Information on determining the number of paddocks and temporary fences needed can be found in MSU Cares Publication P-2459.

To develop proper paddock layout and to estimate the required amount of fence needed, several resources could be used such as aerial photos available through the National Resource Conservation Service (NRCS) or Farm Service Agency (FSA).

Forages continued…
by Dr. Rocky Lemus

A soil survey will also aid in dividing the paddocks with similar production capability. Producers should plan for straight fences—they are more economical and easier to delineate. Locating gates and passageways for livestock and equipment in the corner of each field closest to the central water source and buildings is also essential. When designing a fence lay-out, also take into consideration any possible laws related to legal rights and responsibilities to avoid potential disputes with adjacent land owners. Remember that "good fences make good neighbors."

Table 1. Water consumption for different livestock.

	Water Consumption	
Livestock	**Average**	**Hot Weather**
	-----gal/day---	
Cattle		
Beef	8 – 12	20 – 25
Calves	4 – 5	9 – 10
Dry cow	10 – 15	20 – 25
Milking Cow	20 – 25	25 – 40
Horse	8 – 12	20 – 25
Sheep	2 – 3	3 – 4

Source: Marsh, 2001. Virginia Coop. Ext. Serv. Pub. 442-755.

Rice
by Dr. Nathan Buehring

Seed treatments are items of consideration right now. We very seldom see a yield increase with the use of fungicide seed treatments because we plant about twice as much seed needed to establish an adequate for maximum yields and rice has the ability to compensate for thin stands. However, fungicide seed treatments are a very minimal cost in the overall rice production budget and they provide many agronomic benefits, such as having a healthy and uniform stand that will help you sleep better at night during the planting season.

Growth regulator seed treatments will also provide some agronomic benefits as well. The only recommended growth regulator seed treatment is gibberellic acid (GA) or Release. GA treated seed is recommended on semidwarf varieties, varieties with poor seedling vigor, clay soils, and early planted rice. GA treated seed has shown to be a benefit for uniform emergence, and an increased speed of germination and emergence.

Fungicide seed treatments definitely need to be considered when planting rice in April, on clay soils, or have a historic problem with seedling diseases. Protection from *Pythium* seedling diseases is the main concern in rice; however, we have seen *Rhizoctonia solani* to be an issue in some areas.

For protection against *Pythium* seedling disease, Apron XL LS and Allegiance are the products of choice. Where *Rhizoctonia solani* may be an issue, products such as Maxim, Dynasty and Trilex are the best options.

To see how the different fungicide seed treatments compared, a trial was planted on March 30, 2007 at Stoneville, MS. This trial included most of the current standard fungicide seed treatments for rice (Table 1). In this trial, Allegiance at 0.394 to 0.787 fl oz/cwt and Apron XL LS at 0.32 to 0.64 fl oz/cwt resulted similar rice stand densities. When Trilex (0.64 fl oz/cwt) was applied with Allegiance (0.394 fl oz/cwt), the average stand density was increased by 26% over Allegiance alone; and when Maxim was applied with Apron XL LS, the average stand density was increased by 14% over Apron XL LS alone. The data from this trial also indicated that the addition of Dynasty to Apron XL LS + Maxim did not increase the average stand density above Apron XL LS + Maxim alone. There was no significant difference between the treatments for rice yield. This shows that rice can overcome a thin stands to produce good rice yields. However, knowing that you have a good rice stand leaves time for you to worry about other things.

Cotton
by Dr. Darrin Dodds

Burndown timing is key in gaining control of problematic winter weed species. Research from the Mississippi State University – Delta Research and Extension Center has shown that burndown applications made from February through early- to mid-March are more efficacious than those delayed until late March. Common winter weed species found in Mississippi include: horseweed (or marestail), henbit, Italian ryegrass, and annual bluegrass among others. Populations of horseweed and Italian ryegrass in Mississippi with confirmed resistance to glyphosate (Roundup™, Touchdown™, ClearOut 41™, Glyfos™, Glyphomax™, etc.) were documented in 2003 and 2005, respectively.

Recommendations for control of glyphosate-resistant horseweed generally involve the addition of dicamba (Clarity™) and/or flumioxazin (Valor™) to glyphosate. However, label restrictions in regard to application timing and rainfall must be followed. These restrictions are listed in Table 1. Mississippi State University scientists have observed cotton injury when the correct number of days between herbicide application and cotton planting was observed; however, no rainfall or irrigation was received during that same period. Glyphosate-resistant Italian ryegrass can be very difficult to control in the spring due to several factors. Italian ryegrass tends to have vigourous growth and is also very competitive. Preliminary research indicates that Italian ryegrass control in the spring will not be achieved with a single herbicide application (due to growth stage at the time of application). Single applications of glyphosate, paraquat (Gramoxone Inteon™), glufosinate (Ignite 280™), clethodim (Select Max™), and glyphosate plus clethodim all provided less than 65% control of Italian ryegrass. Sequential applications of clethodim plus glyphosate followed by clethodim, paraquat followed by paraquat, and paraquat followed clethodim all provided 80-85% control of Italian ryegrass. Clethodim followed by paraquat or paraquat alone provided 65-75% control. Fall applications of s-metolachlor (Dual Magnum™) and clomazone (Command™) provided 85% control whereas fall tillage only gave 30% control of Italian ryegrass.

Herbicide resistance is defined as the inherited ability of a weed population to survive a herbicide application that is normally lethal to the vast majority of the individuals of that species (Powles et al. 1997).

Weed populations evolve herbicide resistance through selection pressure imparted by frequent use of one or more herbicides with the same mode of action or metabolic degradation pathway on one location over an extended period of time (Christoffers 1999).

It is often thought that selection pressure forces the weeds to mutate and become resistant. However, there were probably always a few plants of any given species that were resistant to a given herbicide present. The use of a single herbicide (or herbicides with the same mode of action) repeatedly for many years (depending on the mode of action) tend to control the susceptible plants and select for plants with natural resistance. Factors that tend to promote resistance include: reliance on a single mode of action for weed control, using the same herbicide more than one time in a season, using the same herbicide in consecutive seasons, and no inclusion of other control methods (tillage, other modes of action, etc.) Resistance is no longer someone else's problem, we have it in Mississippi and it is a force to be reckoned with when planning for this year's crop.

Table1. Time (days) required between herbicide application and cotton planting.

Herbicide	Application Rate	Rainfall or Irrigation Required	Interval Between Herbicide Application and Planting
Clarity™	8 fluid ounces	1"	21 days for every 8 fluid ounces of Clarity™ applied.
Valor™ (No-till or Strip-till)	1 ounce	1"	14 days
Valor™ (No-till or Strip-till)	1.5 – 2 ounces	1"	21 days
Valor™ (Conventional-till)	1 – 2 ounces	1"	30 days

Cotton continued...
by Dr. Darrin Dodds

Horseweed

Photo Courtesy of: Dr. Dan Poston.

Horseweed population of 40,000 plants per acre.

Photo Courtesy of Dr. Dan Poston.

Italian ryegrass

Photo Courtesy of: Dr. Trey Koger

To receive Agronomy Notes via email, please contact Tammy Scott at (662) 325-2701.

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