1976 crop and fertilizer guidelines for Mississippi.

Mississippi State University

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The monetary returns resulting from the reported fertilization rates and the fertilization rates that will maximize returns (minimize losses) from fertilization cannot be projected precisely.

All application rates are based largely on past agronomic performance and are intended as guidelines only. The rate of application that will maximize profits or minimize losses for each crop depends upon weather, differences in the level of efficiency of utilization of forages and changes in the prices of livestock and crops relative to the prices of fertilizer.

Unfavorable product/input price relationships may make it impossible to produce a farm product profitably. In this event the choice is whether to produce in the short run or abandon the enterprise. Continuing the enterprise requires the use of fertilizer at rates that will minimize short-run losses.

Varieties listed herein have shown dependable performance; however, this list is not all-inclusive.
TABLE OF CONTENTS

Soil Testing Service .................................................................
Plant Nutrients .............................................................................
Solid or Liquid Fertilizers ..............................................................
Soil pH and Liming ........................................................................
When to Fertilize ...........................................................................
How to Fertilize ............................................................................
Foliar Feeding ............................................................................... 
Corn ............................................................................................... 
Cotton, Delta .................................................................................
Cotton, Hill ...................................................................................
Soybeans ....................................................................................... 
Rice .................................................................................................
Sorghum, Grain and Silage ............................................................
Sorghum, Syrup ............................................................................
Sugarcane, Syrup ...........................................................................
Peanuts ...........................................................................................
Grasses, Legumes and Small Grains ..............................................
Cop and fertilizer guide-lines are given annually by MAFES. These guidelines incorporate the latest research findings at Mississippi State and the Branch Ext- rient Stations. Included is information on varieties, fertiliza- tion and seeding practices for crops commonly grown in the state, as well as information on lawns and other turf areas.

Because of varying soil and weather conditions and other local factors, no single crop variety or fertilizer practice is ideally suitable for all of the state, or even one county; nevertheless these general guidelines are useful for crop production. These guidelines are given with the assumption, of course, that other good farming practices will be followed.

If more specific information is needed, it may be obtained from the Cooperative Extension Service, MAFES, your County Agent, or other trained agricultural workers in your county.

Yu get maximum profit from fertilizer only when you use the right kind and amount on each crop. Through the Soil Testing Department of the Cooperative Extension Service every farmer can get information on recommended fertilizer rates as well as recommendations for exceptionally high production goals. Also, the Soil Testing Service provides information on liming practices.

Soil Testing Service

Soil testing is a free service. Soil sample boxes, mailing cartons, and instructions for collecting samples are available in each county agent’s office and in the offices of other agricultural agencies.

Plant Nutrients

Mixed fertilizers contain two or more of the fertilizer nutrients. Each fertilizer bag is labeled with a set of numbers to show how much of each nutrient it contains. The first number shows the percentage of nitrogen (N); the second, the percentage of available phosphate (P₂O₅); and the third, the percentage of available (water-soluble) potassium (K₂O). One hundred pounds of a 10-20-20 fertilizer thus contains 10 pounds of total N, 20 lbs. of available P₂O₅, and 20 lbs. of available K₂O.

Fertilizer ratio refers to the relative amounts of these nutrients. The fertilizer grade gives the guaranteed amounts of each fertilizer nutrient as a percentage. For example 8-8-8 and 10-10-10 are two different grades in a 1-1-1 ratio. Similarly 6-18-18 and 8-24-24 are two grades in a 1-3-3 ratio. Materials such as ordinary superphosphate may be labeled as 0-20-0.

Presently, fertilizer nutrients are either expressed as the oxide—phosphorus as P₂O₅—or as the element—nitrogen as N—but there is a trend toward expressing all fertilizer nutrients on the elemental basis. Accordingly, phosphate would be expressed as (P) and potash as (K) by using the chemical symbols for phosphorus and potassium, respectively. The primary “fertilizer nutrients” expressed on the elemental basis would then be shown as N-P-K on the fertilizer bag.

Some fertilizers are labeled both ways to familiarize consumers with the new labeling trend. When labeled on an elemental basis a 10-20-20 (N-P₂O₅-K₂O) would become a 10-8.2-16.5 (N-P-K). The conversion factors for potash are: K₂O x 0.83 = K; K x 1.21 = K₂O. The conversion factors for phosphate are:
Calcium and magnesium are also essential for plant growth and are usually applied to soils as agricultural limestone. On soils requiring lime, the addition of a water-soluble source of magnesium is often necessary. Mixed fertilizers are a convenient method of supplying magnesium.

The second group of nutrients referred to variously as elements, minor elements, and micronutrients. They are needed in very small amounts and include iron, manganese, copper, boron, molybdenum, and chlorine. Thus far, only three (iron, boron, and molybdenum) of these have been found to be appreciably deficient for crop production in Mississippi. These deficiencies have not occurred on all crops, but have been restricted mostly to the Hill area.

When used properly, solid and liquid mixed fertilizers are equally effective for crop production in most instances. Therefore, the choice as to which to use should be based primarily upon such factors as comparative costs, ease and uniformity of application, availability of application equipment and labor requirements rather than on differences in agronomic value.

Solid complete fertilizers that contain highly-ammoniated ordinary superphosphate (20% P2O5) are less effective than other complete fertilizers (both liquid and solid). Ammoniation of ordinary superphosphate converts some of the highly-effective water-soluble monocalcium phosphate to a much less effective water-insoluble apatite-like calcium phosphate, the quantity of which increases progressively with increasing ammoniation.

In general, farmers are assured of good results from mixed fertilizer if 40 percent of the available phosphorus is water-soluble. Some manufacturers show the water-soluble phosphorus content of their fertilizers, though this is not required by law.

A substantial amount of nitrogen in liquid mixed fertilizers usually is derived from urea and ammonium nitrate. Nitro solutions containing either urea or ammonium nitrate have been proven much less effective in deep placement than liquid urea or ammonium nitrate. Therefore, solid complete fertilizers can be expected to be more effective for summer pastures than urea in liquid fertilizers containing ammonium nitrate.

Liquid NPK fertilizers are formulated with ingredients that do not contain fur.

Soil pH and Liming

Excessive soil acidity results in reduced crop yields. A recent summary of soil test results by the Cooperative Extension Soil Testing Department showed that 70 percent of the soils tested needed lime for legumes and 40 percent for non-legumes.

The degree of acidity or alkalinity of a soil is expressed by its pH; values below 7.0 indicate an acid soil, values above 7.0, an alkaline soil. Soil reaction, or pH, affects availability of some of the more important plant nutrients in the soil. Phosphorus and molybdenum, particularly molybdenum, are much less available to plants

The major objective of liming is to neutralize soil acidity.

Ammoniation of superphosphate to add nitrogen in the formulation and mixed fertilizers is a common practice. The production of ordinary superphosphate is declining rapidly. If the trend continues, its use in mixed fertilizers will be discontinued in the near future.
Acid soils than in slightly acid or mildly alkaline soils. On the hand, in strongly and very strongly acid soils (pH below 5.5), main elements such as manganese and aluminum may be so available as to be toxic to plants.

Micronutrients such as iron, manganese, boron and zinc rapidly go less available as the pH of the soil is increased above 6.0. This is the reason why soils should not be limed.

Experience in Mississippi has shown that plant injury from deficiencies of boron and zinc is likely to be associated with liming. In the case of cotton, legumes, plant injury is very likely to be due to boron deficiency with corn, and perhaps other crops, to zinc deficiency.

Soils with a pH of 6.0 to 7.0 are well supplied with lime. If the pH is below 5.5, the soil is strongly acid and needs liming. Most non-legumes grow best at soil pH values of 5.5 while most legumes do well if the pH is maintained above 6.0. Alfalfa does best at soil pH values above 6.5.

The amount of lime required to raise the pH of the soil to a desired level depends both on the initial acidity and the lime-holding capacity of the soil. For soils of Mississippi having a pH of 5.5 or slightly lower, the application of 3000 pounds of lime per acre to sandy soil, 5000 or 6000 pounds to a sandy loam soil, and 7000 to 8000 pounds to clay loam and clay soils, respectively, has satisfactorily corrected lime deficiency for many years.

Since about two-thirds of the state have pH values of 5.5 or above (with 95 percent of these soils rated as 5.0), these rates of lime would raise the pH of most of the soils of the state within the range that is safe for legumes. However, some soils need more, some less, and some none. Therefore, the best practice is to test the soils for pH and lime requirement and apply lime as needed to maintain the pH within the desired range.

Lime is lost naturally from the soil by crop removal and by leaching. The use of acid-forming nitrogen and the turning under of legumes as soil builders accelerate leaching losses. For example, 100 pounds of nitrogen from such sources as ammonium nitrate, anhydrous ammonia and urea will cause the loss of calcium and other bases equal to about 200 pounds of lime. When applied annually at this rate, the loss would amount to one ton of lime every ten years due to fertilizer alone. Because of these losses, soils need to be limed periodically.

Generally, on sandy loam, loam and silt loam soils, a maintenance application of 2000 to 3000 pounds of lime per acre once every five to seven years is required for legumes and for non-legumes fertilized with nitrogen as recommended. On clay loam and clay soils, less frequent but larger applications are required. Except for the dark upland soils and the bottom soils of the Northeast Blackland area, maintenance application should be made to soils that have not been limed during the past five to seven years.

Although lime may be needed badly for non-legumes on some soils, the deficiency is not widespread enough to warrant a general recommendation for rates in excess of maintenance requirements. When there is doubt have the soil tested.

Areas going into permanent grass sod should receive the initial maintenance application of lime before sod is established. Subsequent maintenance applications may be broadcast on the established sod.

The principal liming materials available in Mississippi are ground calcic and dolomitic limestones, crushed chalk or marl from Mississippi deposits, and basic slag. Calcic limestones contain calcium carbonate while dolomitic limestones contain both calcium and magnesium carbonates. Lime materials from Mississippi deposits contain only calcium carbonate. Basic slag, a material containing a minimum of six percent P2O5 and the equivalent of about 60 percent lime, should be used only where both the lime and phosphate are needed. The cost of its use as a liming material only is prohibitive.

Research has shown that all of these materials are very effective in neutralizing soil acidity, providing the calcic and dolomitic limestones are finely ground. Particles not passing a 40-mesh (40 holes per linear inch) screen are not very effective in neutralizing soil acidity. For this reason, 90 to 100 percent of calcic and dolomitic limestones should pass a 10-mesh screen and 50 percent a 100-mesh screen. Particle size is not as important in the case of chalk because it contains clay impurity which causes the particles to break down within the soil. It must be crushed finely enough, however, to be spread uniformly.

Generally, the Delta and Loess soils are supplied with magnesium; therefore, dolomitic lime is of no advantage in these areas. In other soils of the state, however, magnesium levels tend to be lower and a liming material containing considerable magnesium, such as dolomitic lime, should be used, particularly in the Northeast Blacklands.

For best results lime should be mixed thoroughly with the top six to eight inches of the soil. However, depending on the texture of the soil, maintenance treatments of 1000 to 2000 pounds per acre may be made as a surface application to permanent pastures, or other permanent sods.

The primary benefits of liming acid soils are: (1) increased availability of phosphorus and molybdenum; (2) correction and/or prevention of aluminum and
manganese toxicity; (3) reduced loss of potash by leaching, especially on sandy loam and silt loam soils; and (4) increased supply of available calcium, and magnesium where dolomitic lime is used.

To be used most profitably lime should be applied before there are reductions in yield due to acid-soil infertility. Though soil productivity may be restored by liming, loss in yield due to acid-soil infertility can never be recovered.

Unlike phosphate, the effectiveness of potash fertilizers is reduced greatly by fixation in Mississippi soils. But there is some by leaching, particularly from more sandy soils. Where leaching is significant, annual or seasonal applications result in more efficient utilization of potash than less frequent or off-season applications. Because of uptake of potash in excess of need and removal in the harvested crop, annual and sometimes seasonal applications are necessary for optimum efficiency for hay crops.

Farmers are becoming increasingly interested in further mechanization, in more use of custom services, and in spreading their work-load to increase efficiency. One way of spreading the work-load is to combine fertilizer application with fall land preparation and spring-seeded crops, where this is feasible.

Fall application of nitrogen to spring-seeded crops is not practiced in Mississippi. However, the levels of phosphorus and potash in most crops are higher than in the better crop land are such that recommended rates may be applied. But in the fall with little or no leaching from potash in the fall with little if any reduction in yield, except on very sandy soils where excess leaching of potash may occur. Potash losses by leaching may be reduced by broadcasting the fertilizer and by liming acid soils to keep the pH above 6.0. A leaching losses may be compensated by higher rates of application, which may be an acceptable alternative to early spring application in some cases.

When to Fertilize

The formation of sparingly soluble phosphates and their subsequent reduction in availability to plants is referred to as "phosphate fixation." Because of fixation, greater efficiency generally is obtained from annual, seasonal applications of phosphorus fertilizers than from less frequent or off-season applications, especially on moderately to strongly acid soils. Accordingly, it is usually suggested that phosphate fertilizers be applied at or just before planting, or near the beginning of the growing period for perennial crops.

How to Fertilize

Attaining maximum plant utilization of fertilizers requires that the two components of available calcium, and magnesium where dolomitic lime is used.

Attaining maximum plant utilization of fertilizers requires that the two components of availability (chemical and positional), be optimized concurrently. Chemical availability refers to the capacity of the fertilizer and soil-reaction products to supply nutrients to plants. Position
Vilability refers to the location of a fertilizer with respect to the plant roots. For example, fertilizer placed in the soil a foot or so from where it is positioned in the soil. However, the effectiveness of highly reactive phosphates is reduced by reducing their contact in the soil. This slows the rate of phosphorus fixation and may be further reduced by band placement in the soil or by granulation of the fertilizer at the factory. Since most of fertilizers sold in Mississippi are granulated or pellets, method of application has a greater effect than chemical available in the soil.

To assure effective positional availability, fertilizers should be placed so that they are moved to the roots with the soil water or so that the fertilized zone is intercepted by plant roots at the appropriate time. As plants grow and feed their roots both horizontally and vertically, the volume of soil in which nutrients may be absorbed is increased. Consequently, fertilizers that are positioned unavailable during early plant growth may be available later.

Phosphate does not move appreciably in soils and the movement of potash is somewhat different, especially on soils of fine texture. Therefore, fertilizer must be placed so that the fertilized zone is intercepted by plant roots. For drilled and row crops, phosphate of potash should be placed deep enough to be in the moist soil where plants feed as they grow. For such crops, surface application or incorporation, such as by plowing, would be expected to give inferior results because of poor positional availability.

Nitrogen as nitrate moves with soil water to plant roots. Its over-all efficiency is not affected greatly by degree of concentration or its location within the root zone in soils of medium to coarse texture, but enough nitrogen should be positionally available for good growth of young plants. However, on clay and loam and on clay soils, band application in the soil at the edge of the root zone may be superior to broadcast application for row crops, because of increased positional availability and reduced risk of loss of nitrogen by denitrification.

Nitrogenous fertilizers applied to the surface of dry soils are positionally unavailable until dissolved and moved down into plants’ root zone by percolating water. Before ammonium in fertilizers is moved down into the root zone, it must be changed (nitrified) by soil bacteria to nitrate, a process requiring two or four weeks for completion in moist soil during warm seasons. Poor positional availability is avoided by applying nitrogenous fertilizers far enough in advance for the necessary transformation and movement into the root zone by moisture migration to occur by the time the nitrogen is needed by the crop.

Optimum efficiency of immobile fertilizer nutrients such as phosphorus and potassium results from localized concentration of materials near the row or drill, such as results from band application. This provides a very favorable opportunity for early interception by plant roots and for extensive root development within the fertilizer zone. An outstanding benefit from phosphorus is its favorable influence on the early growth and development of plants, which is enhanced by localized placement of fertilizer near the row.

Although maximum efficiency of phosphate and potash is usually obtained by band placement for row crops and drill-seeded crops, top yields can be obtained with broadcast application of these fertilizers. But on soils that are low to very low in phosphate and potash, attaining the same increase in yield requires higher rates for broadcast than for band application. This is especially true where the fertilizer is incorporated by shallow disking instead of being plowed under. Because of accumulation from previous application or because of high native fertility, only a small percentage of the land previously cropped to cotton and fertilized as recommended over a long period would be expected to require appreciably higher broadcast rates of phosphorus and potash.

Poor stands and stunted growth may result from localized placement of fertilizers too near the row because of salt injury to seeds and seedlings. Since fertilizer salts, such as nitrates and chlorides, move mostly upward and downward with soil water rather than laterally by diffusion, salt injury can be avoided by placing the fertilizer to the side of rather than beneath the seed. The distance of separation required depends upon the kind of fertilizer and the rate of application. For recommended rates of phosphate and potash and up to about 40 pounds of nitrogen per acre, the minimum distance of separation should be three to four inches to one side and three to four inches deeper than the seed. With higher rates of nitrogen or potash, both the horizontal and vertical distances between seed and fertilizer should be increased or the fertilizer should be broadcast and plowed under.

Surface application of phosphate and potash to sod crops is more effective than row crops. This is due in part to the development and persistence of plant roots near the surface. Because it is both convenient and effective, this method of application is recommended for maintenance fertilizers on perennial, close-growing crops.
Solid sources of nitrogen are much more effective for surface application to summer pastures than are the urea-ammonium nitrogen solutions such as N-Sol-32 and URAN. These solutions have ranged in effectiveness from 66 to 74 percent of that of solid ammonium nitrate. Urea solid has been equal to ammonium nitrate when applied in June, but when applied a month earlier its relative value was about 85 percent of that of ammonium nitrate.

Surface application of solid urea should not be made to pastures or other areas in sod in the spring or summer when the soil is too wet or when the grass is wet. Surface application of either the soil or grass would require several applications of rather dilute solutions during the growing season. Therefore, foliar feeding with insecticides and fungicides. A typical example is the application of boron to cotton with the insecticide. So far, under Mississippi conditions, there appears to be no need for both foliar and soil application of micronutrients where they are needed for crop production.

The primary (nitrogen, phosphorus, and potassium) and the secondary (sulfur, calcium, and magnesium) nutrients, are absorbed in relatively large quantities by crops. Thus, to supply a substantial part of the total requirement of these nutrients without burning the leaves of plants would require several applications of rather dilute solutions during the growing season. Therefore, foliar feeding with insecticides and fungicides is foliar feeding of micronutrients.

Increases in the yield of corn have been obtained by foliar feeding of the primary nutrients under certain conditions, but it has not been shown so far to be a desirable or economical alternative to soil application of these nutrients. Therefore, foliar feeding is not now recommended routinely in lieu of or as supplement to soil application of macronutrients.

**GUIDELINES FOR MAJOR FIELD CROPS**

**Corn**

*Hybrid:* Detailed results of hybrid corn trials are published annually in MAFES Research Highlights.

*Seeding Dates and Rates and Land Selection:* Plant in North Mississippi from April 1 to April 25, in North Central Mississippi from March 25 to April 20, in South Central Mississippi from February 25 to March 15.

Corn should be planted on deep to moderately deep soil with fair to good surface drainage. Steep, stony, and eroded hill sides are not suitable for corn.

Stands should be adjusted to yield and generally should be within the range of 12,000 to 18,000 plants for average yields of 80 to 120 bushels per acre. A good rule of thumb is to provide approximately 150 plants for each bushel of corn expected. Thus, on land that will produce an average yield of 80 bushels, the stand should be 12,000 plants per acre, for 100 bushels 15,000 plants, and for 120 bushels 18,000 plants. On land well adapted to corn, yields usually will fall within the range of 80 to 120 bushels per acre under good cultural practices. However, average yield goals in excess of 100 bushels per acre generally should not be set unless supplemental irrigation is available.

*Fertilization — Hill Area:* Soils of the Hill areas generally require a complete fertilizer for corn. Soils should be limed to maintain the pH above 5.5. Occasionally, following the application of lime, zinc deficiency may occur, especially on soils of medium to coarse texture. Therefore, a mixed fertilizer which contains enough zinc to meet 2-3 pounds per acre should be applied for two or three years after liming, particularly on sandy loam and loamy soils. No other micronutrient deficiencies have been observed in corn.

*Time:* Apply all of the phosphorus and potash before planting. Nitrogen may be applied before planting or in split application. Do not split, one-fourth to one-third before planting and the remainder side dressing by the time the corn is knee high.

*Rate:* Rate of fertilization should be adjusted to expected yield or expected yields of 120, 100, and 80 bushels per acre, the respective N-P2O5-K2O rates should be 160-60-60, 130-50-50, and 100-40-40 pounds per acre. When corn is grown for silage the respective N-P2O5-K2O rates should be increased to 200-70-70, 150-50-50, and 120-40-40 pounds per acre.
Varieties: Results of variety tests are published annually in AFES Research Highlights.

Seeding Dates and Rates: Plant flat at a depth of two inches soon after April 1 as weather permits, but not until the soil temperature is 68°F; hill dropped—1 to 22 pounds delinted seed per acre; drilled—30 to 40 pounds of delinted seed per acre; drilled for loss plowing—60 pounds of delinted seed per acre. Seed should be of good viability.

Fertilization: Many Delta soils need only nitrogen, but deficiencies of potash and phosphates do occur, especially of potash. For example it is estimated that 20 percent of the sandy loam soils, 75 percent of the loamy-to-somewhat poorly-drained loam soils and 30 percent of the very clay loam soils will respond to phosphates. Thirty percent of the sandy loam and silt loam soils may need potash. Therefore, soils should be tested for phosphate and potash, as well as for lime. Also, sandy soils that are low in organic matter, or that have been leveled, should be tested for sulfur needs.

Time: Apply nitrogen in the spring at or before planting, except on sandy loam soils having very good to excessive internal drainage and on clay soils with poor surface drainage. On such soils, make split application of nitrogen, one-third to one-half at or before planting and the rest as a side-dressing, preferably by mid-June. Split application of nitrogen on clays with poor surface drainage is recommended because of possible loss of nitrogen by denitrification during wet periods.

Rate: On sandy loam, loam, and silt loam soils use 90 to 100 pounds of nitrogen per planted acre. Use one hundred to 120 pounds of nitrogen per acre on the silty clay loams, silty clays, and clays for all planting patterns, except that for clays with poor surface drainage use 120 to 150 pounds. In a 4x4 or 2x2 planting pattern it is obvious that only one-half of the land area is planted.

For cotton following soybeans or pasture sod, the nitrogen rate should be reduced 20 to 30 and 40 to 50 pounds per acre, respectively.

On soils where stalk growth is too rank, maturity too late, and boll rot is a problem because of excess nitrogen, the nitrogen rate should be reduced by 30 percent.

Sixty pounds of potash banded or broadcast are suggested for the poorly to somewhat poorly drained silt loam and silty clay loam soils (Forestdale and similar types). Phosphates is not recommended but, if applied with potash, use a mixed fertilizer having a $P_2O_5:K_2O$ ratio of 1:3. Neither potash nor phosphates is recommended on other soils except when indicated by a soil test.

Method: Application practices for nitrogen are the same as for corn in the Delta area. Side-dress applications of nitrogen made after mid-June should be placed in the soil. Banded phosphate and potash should be placed three to four inches to one side and three to four inches deeper than the seed. Broadcast phosphate and potash should be worked into the soil by double disking with a breaking disk, or plowed in with a moldboard plow.
Varieties: Results of variety tests are published annually in MAFES Research Highlights.

Seeding Dates and Rates: Plant between April 10 and May 10 as weather permits; hill drilled—use 16 to 22 pounds of machine delinted seed or 12 to 16 pounds of acid delinted seed per acre; drilled—use 20 to 30 pounds of machine delinted or 15 to 20 pounds of acid delinted seed per acre. Seed should be of good quality.

Fertilization: A complete fertilizer (NPK) containing sulfur and boron is needed in the Hill area. The fertilizer should supply 4 to 8 pounds of sulfur and 0.3 to 0.5 pounds of boron per acre. No more than 0.5 pounds of boron should be applied if the fertilizer is banded or drilled beside the row. Fertilizers for the dark upland soils of the Northeast Blackland area, having a pH above 6.0, should contain enough water-soluble magnesium to supply at least one-half and preferably as much as magesia (MgO) as potash. On soils more acid than pH 6.0, magnesium deficiency may be corrected by applying dolomitic lime at the rate of one to two tons per acre, or as indicated by a soil test.

Acid soils should be limed according to soil tests to maintain the pH above 5.5.

Time: Apply the phosphate and potash and all or part of the nitrogen at or a few weeks before planting time.

Varieties: For all areas north of U. S. Highway 84, best adapted varieties are Hill, Mack, Forrest, Tracy, Davis, Lee 74, Pickett 71, and Bragg (listed in order of maturity).

South of U. S. Highway 82, best adapted varieties are Tracy, Pickett 71, Bragg, Hutton, Coker 338, and Cobb (listed in order of maturity). Forrest and Coker 136 are satisfactory where early matur-

Cotton in Hill Areas

On deep sandy or sandy loam soils with good to excessive internal drainage and on clay loam and clay soils with poor to slow surface drainage, sidedress one-half to two-thirds of the nitrogen for most effective results. Nitrate nitrogen is lost by leaching from the sandy and sandy loam soils and by denitrification from the clay and clay loam soils during extended periods of wet weather in late spring and early summer. Make sidedress applications preferably by mid-June (a week earlier for anhydrous ammonia or where you surface apply solid sources or non-pressure solutions) but no later than July 1.

On most soils, phosphate and potash may also be applied in the fall—see section on When to Fertilize, page 4.

Rate: A recent soil test summary shows that more than 50 percent of the soils tested for cotton in the Hill area were high in phosphate and approximately 35 percent were high in potash. An economic response to phosphate and potash is unlikely on high testing soils and only maintenance if any fertilization is justified. An annual application of 25 to 30 pounds of phosphate and potash is usually adequate for maintenance with current yields. Accordingly, farmers now applying rates higher than these to high testing soils have an opportunity to reduce fertilizer costs through soil testing.

Soybeans

Without a soil test, the nitrogen (N) - phosphate (P2O5) - potash (K2O) should be approximately 72-48-48 pounds per acre except as follows: Increase the nitrogen to 120 pounds on the dark upland to 100 pounds on the bottom soils of the Blackland areas and to 80 pounds per acre on the drained bottom and level to good sloping upland soils of the Upland Coastal Plain.

Excessive seed growth and delayed maturity indicate much nitrogen. Somewhat stubby growth associated with yellow leaves and the early yellowing and premature shedding of leaves indicates too little nitrogen. When these conditions are observed nitrogen rates should be adjusted accordingly.

Where a skip-row planter pattern is used, the rate of nitrogen per planted acre should be the same as for solid-planted cotton. In a 4 or 2 x 2 planting pattern, it is obvious that only one-half of the land is planted to cotton. Do not fertilize the unplanted area.

Method: Same as for corn in Hill area. Contact placement of seed and fertilizer or placement directly beneath seed should be avoided. Side-dress application of nitrogen made after mid-June should be placed in the soil.

If a preemergence herbicide is to be broadcast and worked into the topsoil, phosphate and potash applied to the broadcast should be plowed down before the herbicide is applied.

Inoculation: If not planted in land where a crop of well-nodulated soybeans has grown within the last five years, the seed should be inoculated. To be effective seed must be moistened slightly before applying inoculum, or else the inoculant will not be effective. Applying inoculum dry into the planter box is very ineffective.

Because of injury to the bacterial culture, the inoculant and sodium
molybdate or other soluble molybdate salts should not be premixed more than 24 hours before being applied to beans that are planted immediately following treatment. The safest procedure is to apply the inoculant and molybdate salt separately and then stir the beans thoroughly to assure treatment of beans.

On land where soybeans have not been grown previously, the safest procedure to insure good inoculation is to apply the molybdate salt as a foliar spray as indicated later rather than as a seed treatment. Proper inoculation is essential for maximum yields and profitable production.

**Fertilization—Delta:** Soybeans do not require either phosphate or potash on most Delta soils, but many soils need liming. The need for lime as well as phosphate and potash can be determined by a soil test.

Molybdenum usually is needed on sandy loam, silt loam, and clay loams having a pH below 6.0. The need for molybdenum is not as great on the clay soils; however, yields may be increased in some instances, particularly where the pH is below 5.5.

Molybdenum may be applied as a seed treatment or as a foliar spray, as a seed treatment, one-half ounce of sodium molybdate per acre, or its equivalent, is recommended. As a foliar spray, one ounce of sodium or ammonium molybdate per acre in 8 to 12 gallons of water is recommended when or just before the soybeans begin to bloom. Seed treatment usually is more convenient and less expensive.

**Fertilization—Hill Area:** In the Hill area, phosphate, potash, sulfur, molybdenum, and lime usually are needed for top yields. Nitrogen does not increase yields where lime and molybdenum are adequate and the soybeans are nodulated with effective strains of *Rhizobia*.

Soybeans do not respond profitably to phosphate and potash on soils testing high in these nutrients. On soils testing medium, rates that maintain soil fertility levels are adequate and with yields near 30 bushels per acre, an annual application of 30 pounds of phosphate and 60 pounds of potash per acre is sufficient. More than 50 percent of the soils tested for soybean production in 1975 by the Extension Soil Testing Laboratory were either medium or high in phosphate and potash. Soils testing low require rates in excess of maintenance, therefore fertilizer, as well as lime needs, are best determined by a soil test.

In the absence of a soil test, use a sulfur-containing mixed fertilizer of 0-1-1 or 0-1-2 ratio that supplies 4 to 8 pounds of sulfur per acre. On land where crops have been well fertilized for many years, such as cotton or soybeans, use a fertilizer of 0-1-2 ratio at a rate to give 30 pounds of phosphate and 60 pounds of potash per acre, except on clay loam and clay soils of the Blackland Areas. Elsewhere and when an 0-1-2 ratio is not available, use a fertilizer of 0-1-1 ratio at the rate of 40 to 50 pounds each of phosphate and potash. On land recently cleared or in pasture where little if any fertilizer was used, the fertilizer rate for the first 3 years should be about 70 pounds each of phosphate and potash per acre.

The fertilizer may be banded or broadcast. If banded, it should be placed 3 to 4 inches to one side and 3 to 4 inches deeper than the seed. Avoid contact placement with the seed as well as placement directly beneath the seed.

Where double cropping of soybeans and wheat is practiced, all of the phosphate and potash recommended for both crops may be applied to either crop. The fertilizer should be broadcast and worked into the soil.

A recent soil test summary shows that 70 percent of the soils tested for soybeans in the Hill area (excluding the Northeast Blacklands) need liming for top yields when molybdenum is not applied. At soil pH values below 5.5, liming not only increases the availability of molybdenum but also increases yields by correcting manganese and aluminum toxicity (especially manganese toxicity) which sometimes causes crop failure.

When molybdenum is applied on only 30 percent of the soils tested need liming for top yields. The use of molybdenum on soils with pH of 5.5 or higher reduces the response of soybeans to lime because the major and possibly only result of liming is to increase the availability of native soil molybdenum. This in turn increases the nitrogen-fixing capacity of the nodule bacteria, which increases bean yields.

**Farmers planning to apply lime should have their soils tested and apply lime first to those soils having a pH below 5.5.** Even farmers who rent land for only one year may find it profitable to apply a ton of lime per acre, especially to soils of medium to coarse texture (sandy loam, silt loam and loams) with a pH below 5.5. On such soils, liming usually increases the yield two to four bushels per acre even though molybdenum is applied.

Many soils show some yield increase for molybdenum even when limed to pH 6.0 to 6.5. Accordingly, its use is recommended for soybeans on all soils of the Hill area, the rate and method of application being the same as for the Delta area.

**Rice**

**Varieties:** Long Grain - Starbonnet, Bluebelle, Lébonnet and abelle which mature in 135, 125, 124, and 123 days, respectively. Medium Grain - Nova 66, Brazos, and Vista which mature in 130,
to mid-June, depending upon variety. The very early maturing varieties should not be planted until June. Plant 90 to 110 pounds if drilled and 110 to 135 pounds if broadcast or water seeded.

**Fertilization:** Most Delta soils need only nitrogen for top production. Soil test for phosphate and potash needs. Apply 110 to 135 pounds of nitrogen per acre on old cropped land. New land will probably require no nitrogen for the first one or two years. The ammonium forms of nitrogen such as ammonium sulfate and urea are recommended. Nitrogen fertilizer may be applied: all at one time at the time the field is being flooded (full season, continuous flood must be maintained); or one-half when the field is being flooded and one-half at the correct time of Silage. Bird-resistant grain, high quality silage crop. Non-bird-resistant grain sorghum hybrids are recommended for silage. Sugar and syrup varieties are to be avoided as a silage crop due to the high dry matter loss during the ensiling process.

**Sorghums for Grain or Silage:**

**Seeding Dates and Rates:** Plant from April 20 to July 15. The earlier date is preferred because yields are higher and first harvest by July 25 permits a second cutting if soil moisture is adequate. Seed 5 to 7 lbs. per acre in rows. Nitrogen - Grain: In the Delta, generally only nitrogen is needed. Test soils for phosphate and potash. Depending upon the average yield, apply 80 to 130 pounds of nitrogen per acre: the lower rate for yields of 60 to 70 bushels per acre, the higher rate for yields of 100 to 120 bushels, and 100 pounds of nitrogen per acre for yields of 80 to 90 bushels. In the Hills, phosphate and potash as well as nitrogen usually are needed. On good land, yields should be in the range of 80 to 100 bushels per acre and for such yields the nitrogen rate should be 100 to 120 pounds per acre. On other lands, yields are likely to be lower and the nitrogen rate should be reduced to 70 or 80 pounds per acre. Phosphorus (P₂O₅) and potash (K₂O) should be applied at the rate of 30 to 40 pounds per acre. Except on soils of very productivity, or because of extreme weather conditions, yields should be in the range of 60 to 100 bushels per acre for early plantings when good cultural practices are followed. Average yields for late plantings (after July 1) are considerably lower.

Where a stubble crop is grown, apply an additional 40 to 60 pounds of nitrogen per acre after the fall planting. All of the phosphate and potash and all or part of the nitrogen may be applied at or prior to planting. Nitrogen sidedressing should be applied by the time the plants are a foot tall - six to eight leaves showing.

**Method:** Same as for corn in Hill areas.

**Fertilization - Silage:** Same as for grain except double the rate of potash.

**Sorghums for Syrup**

Every six inches in the drill or four plants every 24 inches in hills.

**Fertilization:** At planting, apply 40 to 50 pounds each of nitrogen, phosphate (P₂O₅) and potash (K₂O) per acre. No side-dressing should be applied later.

**Harvesting:** Sweet sorghum should be harvested in the dough stage of seed development for maximum yield of high quality syrup. Syrup quality is improved by stripping the leaves, removing the heads and the top joint, and delaying milling for a week after the stalks are cut.
**Varieties:** Plant C.P. 36-111 and P. 67-500, on deep, well drained loists of light texture.

**Seeding Dates and Rates:** Cut and cane at the top mature joint at ground level, but do not strip for planting. Plant in the Fall (October 15) at the rate of two links, that is, place stalks end to end with a whole stalk at the union. Cut the cane in four-foot rows on land that has been broken five to six inches deep a few weeks earlier.

To protect from cold and to provide good drainage, cover the cane six to eight inches deep by forming a ridge over it so that the drainage furrows between the rows are two to four inches deeper than the cane.

**Fertilization:** In the spring, apply 40 to 50 pounds each of nitrogen, phosphate (P₂O₅) and potash (K₂O) per acre shortly after germination of the eyes or just before regrowth from stubble. Place the fertilizer in a band so that it will be four to six inches to the side of the row and three to five inches deep after the ridges have worked down (one to two inches deeper than the cane).

**Harvesting:** Strip, top and cut the cane before freezing weather. Harvesting as much as a month before processing improves syrup quality and reduces "sugaring."

**Peanuts**

Peanuts do not require fertilization with nitrogen if properly inoculated. However, in some areas of the Southeast, 20 to 30 pounds of nitrogen per acre is recommended on Spanish types. Peanuts should not be planted behind either soybeans or peanuts. Crop residues should be buried deeply by plowing in the fall as a disease control measure. Commercial producers should check with their county agent for more details about production practices.

**Grasses, Legumes, and Small Grains**

**Selection of Varieties:** The use of inoculated seed will reduce the risk of infestation with noxious weeds and will result in better performance.

**Grass or Grass-Legume Mixtures:** In most instances a grass-legume mixture will provide less exudation and more nutritious forage than grass grown alone and fertilized with nitrogen. Grasses not only improve quality by minimizing or eliminating losses from such maladies as grass stag, fescue foot and nitrate poisoning. Proper use of forage legumes may result in better use of resources by increasing total production, and extending the grazing season. Therefore, where practical, new pastures should be seeded to the desired grass plus one or more legumes. Major considerations in the choice of the legume species are the availability and price of seed and the time that forage will be needed.

Grass-legume mixtures for winter pastures sometimes "grow off" more slowly than grass alone fertilized with nitrogen; therefore, it may be advisable to plant a portion of the winter pasture to grass (small grain and ryegrass) alone and fertilize with nitrogen as recommended in the tables.

**Inoculation of Clovers:** All seed of clovers and other forage legumes should be inoculated with the proper culture of *Rhizobia* before planting. For inoculation to be effective the bacteria must be viable and they must be made to adhere to individual seed. This can be done by treatment with a commercial sticker before mixing the inoculant with the seed. It is imperative that seeds of new clovers like Arrowleaf be inoculated.

**Planting:** Where equipment is available, drill or band placement of seed and fertilizer usually is more effective for the establishment of most pasture and forage crops.

With small-seeded legumes and grasses, care must be taken not to plant the seed too deeply. A seeding depth of no more than ten times the diameter of the seed is recommended. Where plantings are made by broadcasting the seeds on the soil surface, it is advisable to cultipack the seedbed immediately after seeding.

**Renovation of Grass-Legume Pasture:** Where the stand of legumes in a pasture has degenerated to less than 15 percent...
or has been lost entirely, it would pay to reseed legumes. This is best done in the fall season. The pasture should be closely grazed or mowed for hay and the clover seed broadcast or drilled. A fertilizer containing phosphorus and potash should be applied, preferably as indicated by a soil test.

**Fertilization General:** Seventy percent of the soils tested for pasture and forage crops in the Hill area need liming for top production of legumes, grown alone or in mixtures with grasses. Fertilization of grasses with phosphorus and potash is of little or no benefit unless they are grown in association with a legume or fertilized with nitrogen. Therefore, it is essential that land used for legumes and grass-legume mixtures be properly limed. Weeds compete with desirable species for space, nutrients, and moisture, therefore, weed control is necessary to obtain maximum response to fertilizers. There is no profit in fertilizing weeds or brush.

Because of the wide variety of soils to which these guidelines for fertilization of pasture and hay crops will be applied, and of the extensive nature of the typical commercial livestock operation in Mississippi, particularly beef cattle, the fertilizer guidelines are generally presented as a range rather than a single more arbitrary figure.

The lower rate is estimated to be sufficient (1) for reasonable yields of forage on soils well adapted to the particular pasture crop under consideration, (2) for periods of economic stress during which it is still necessary to maintain a reasonable supply of forage in the least expensive manner, and (3) where acreage per animal unit is not a seriously limiting factor.

The higher rate should be used where the (1) soil type, (2) management systems, (3) type of livestock enterprise, and (4) prices of fertilizer and livestock are such as to justify it.

An estimate of the fertilizer requirements for the production of 100 pounds of beef in different enterprises on soils testing low in phosphate and potash is shown in Table 1.

With current beef and fertilizer prices (Fall, 1975) it is not profitable to fertilize permanent pastures with phosphate and potash at soil test levels of medium and higher. Therefore, cattlemen are encouraged to test their soils and use phosphate and potash on those testing low to very low where the need is much more critical.

Fall application of phosphate or potash to pastures is recommended if these nutrients are necessary to establish forage seedlings in the fall. However, spring application is slightly more effective for spring and summer growth of perennial plants and those which come up in the spring. In general, fertilizers should be applied as close as practical to the time they are to be used by plants, therefore seasonal, annual applications are indicated in Tables 2, 3 and 4. If phosphate and potash are applied only once in two years, double the annual application rate.

**Utilization of Forage:** To obtain the benefits from fertilizer applied to pastures, livestock producers must adjust the stocking rate to use the additional forage efficiently, or harvest it for hay.

**Fertilization of Grass-Legume Mixtures:** Grass-legume mixtures should be fertilized to meet the needs of the legume for phosphate, potash and lime. Liming practices and phosphate and potash rates that are sufficient for the legume will also be adequate for the grass. Because of symbiotic fixation by the nodules bacteria, legumes provide their own nitrogen and indirectly increase the amount of nitrogen available to grass. The application of nitrogen to grass-legume pastures reduces the nitrogen-fixing efficiency of the legume. Therefore, it usually is unwise to fertilize permanent grass-legume mixtures when the legume constitutes 15 percent or more of the stand.

Where permanent grass pastures are overseeded annually with clover or arrowleaf clovers, or with cyanobacterium-legume mixtures, the application of nitrogen in the spring and early summer may be advantageous if additional forage is needed. It should be recognized that the extra forage must be harvested or used to a short stubble by intensive grazing or by close mowing for successful reseeding or maintaining stands where clovers are reseeded.

**Caution:** When conditions are especially favorable for legumes and there is danger of bloat may prevent full utilization when seeded alone, or with grasses to give mixtures such as Dallisgrass and white clover. An excellent way to reduce the danger of bloat while producing additional forage is to drill wheat or ryegrass (also orchard grass in North Mississippi) to such pastures. The danger of bloat can be avoided by providing grazing animals with a palatable chemical that prevents bloat.

**Fertilization of Grass Pastures:** The yield of grass pastures is greatly increased by nitrogen fertilization and varies with weather conditions. High growth does not result in economic advantage unless the response is obtained to high rates of nitrogen. For example, the response of grass such as Dallisgrass, common muhagragrass, sorghum-sudangrass hybrids, bahiagrass, and ryegrass small grain mixtures is sometimes linear to rates of nitrogen as high as 200 to 300 pounds per acre. For Coastal and Alicia muhagragrass this type of response may extend to rates greater than 400 pounds per acre. The actual economical rate of nitrogen will depend upon the weather, the efficiency of forage utilization and economic trends.

To increase the efficiency of nitrogen and to obtain a for
favorable distribution of forage production, split applications of nitrogen are recommended for both summer and winter pastures. Applications may range from 45 to 80 pounds per acre. Except for Cristal and Alicia bermudagrass, the last application may be late August, the last application of nitrogen to permanent summer pastures should be made by mid-July, and two weeks earlier if anhydrous ammonia is used. Because of the frequency of drought, mid-summer applications of nitrogen are usually less effective than applications of nitrogen made in the spring and early summer.

For summer temporary grazing crops, one-half of the nitrogen should be incorporated into the seedbed with phosphate and potash before planting. The remainder should be applied in one or two applications after grazing or cutting.

Caution: Excessive amounts of nitrogen applied in a single application may result in nitrate poisoning, or contribute to grass tetany.
Table 1. Approximate Fertilizer Requirement for the Production of 100 Pounds of Beef from Pastures on Soils Testing Low in Phosphate and Potash when Fertilized as Recommended in Tables for the Hill Area.

<table>
<thead>
<tr>
<th>Type of Pasture</th>
<th>Enterprise and Pounds of Fertilizer for 100 Pounds of Beef</th>
<th>Cow-Calf</th>
<th>Steer Grazing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>P$_2$O$_5$</td>
<td>K$_2$O</td>
</tr>
<tr>
<td>Coastal Bermuda</td>
<td>75</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Bahiagrass, Dallisgrass, Common</td>
<td>90</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Bermuda, or Fescue</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ryegrass or Wheat - Ryegrass Mixture</td>
<td>138</td>
<td>60</td>
<td>30</td>
</tr>
<tr>
<td>Sorghum - Sudan Hybrid</td>
<td>138</td>
<td>46</td>
<td>46</td>
</tr>
<tr>
<td>Dallisgrass and/or</td>
<td>0</td>
<td>64</td>
<td>64</td>
</tr>
<tr>
<td>Common Bermuda or Fescue with White</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clover</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coastal Bermuda overseeded with</td>
<td>0</td>
<td>64</td>
<td>64</td>
</tr>
<tr>
<td>Crimson or Arrowleaf Clover</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ryegrass-Crimson Clover Mixture</td>
<td>0</td>
<td>60</td>
<td>60</td>
</tr>
</tbody>
</table>

1Based on the annual feed requirements for maintenance and replacement of brood cows and sires and growth of calves to 450-500 pounds with a calf crop of 85 to 90 percent.

2Average grazing weight of 700 pounds.

3Average grazing weight of 500 pounds.
| Pasture or Hay Crop | Recommended Varieties | Rate of Seeding Per Acre | Time of Planting | Fertilization, lbs.-A  
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfalfa</td>
<td>Cody, Delta and Florida 66</td>
<td>15-20 lbs.</td>
<td>Sept.-Nov.</td>
<td>Test soil for lime, phosphorus, and potash needs</td>
</tr>
<tr>
<td>Bermudagrass</td>
<td>Coastal or Alicia</td>
<td>20 bu. sprigs. or 1200-1500 lbs. fresh forage disked in</td>
<td>Feb.-May 2</td>
<td>150-240 lbs. N, 2-3 applications beginning June 1, for grazing; for Hay, 300-400 lbs. N</td>
</tr>
<tr>
<td>Bermudagrass White Clover</td>
<td>Regal or La.S-1</td>
<td>2 lbs.</td>
<td>Plant Clover Sept.-Nov.</td>
<td>Test soil for lime, phosphorus, and potash needs</td>
</tr>
<tr>
<td>Red Clover</td>
<td>Orbit, Kenland or Nolin's Red</td>
<td>10-15 lbs. seed alone or in small grains</td>
<td>Sept.-Nov.</td>
<td>Test for lime, phosphorus, and potash.</td>
</tr>
<tr>
<td>Arrowleaf Clover 4</td>
<td>Meechee or Yuchi</td>
<td>12-15 lbs.</td>
<td>Sept.-Nov.</td>
<td>Test soil for lime, phosphorus, and potash.</td>
</tr>
<tr>
<td>Sorghum-Sudan hybrids</td>
<td>Commercial Varieties</td>
<td>20 lbs. in rows 35 lbs. broadcast</td>
<td>Apr.-July</td>
<td>60 lbs. N prior to planting 60 lbs. N after 1st and 2nd cutting.</td>
</tr>
<tr>
<td>Annual Lespedeza</td>
<td>Climax or Summit</td>
<td>20-25 lbs. seed in small grains</td>
<td>Feb.-Apr.</td>
<td>Test soil for lime, phosphorus, and potash.</td>
</tr>
<tr>
<td>Wheat</td>
<td>Arthur 71, Abe, Coker 68-15, or Oasis</td>
<td>120 lbs. for grazing 90 lbs. for grain</td>
<td>Same as Oats</td>
<td>Grazing: Same as Oats Grain: 90-100 lbs. N about March 1.</td>
</tr>
<tr>
<td>Rye</td>
<td>Acco 118, Explorer, Elbon McNair's Vitagraze or Wren's Abruzzi</td>
<td>120 lbs. for grazing</td>
<td>Same as Oats</td>
<td>Grazing: Same as Oats Grain: 90-100 lbs. N about March 1.</td>
</tr>
<tr>
<td>Barley 5</td>
<td>Dayton, Harrison, or Jefferson</td>
<td>Same as Wheat</td>
<td>Same as Oats</td>
<td>Same as Oats</td>
</tr>
</tbody>
</table>

1 All areas should be tested for lime, phosphorus, and potash needs.
2 If irrigated, Coastal may be planted from April 1 to Sept. 1.
3 Where clover disappears in the grass-clover mixture apply 60 lbs. N in the fall.
4 Specify scarified seed.
5 Barley yields are generally quite low except in extreme North Mississippi. Barley yellow dwarf disease is a serious problem and none of the varieties are resistant.
Table 3. Guidelines for Pastures and Forages in Hill Area

<table>
<thead>
<tr>
<th>Pasture of Hay Crop</th>
<th>Recommended Varieties</th>
<th>Rate of Seeding Per Acre</th>
<th>Time of Planting</th>
<th>Fertilization, lbs.-A (^1) Annual Application</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Established Warm Season Grasses (Permanent)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bahiagrass</td>
<td>Pensacola, Wilmington, (Argentine-South Mississippi only)</td>
<td>20 lbs./A</td>
<td>Feb.-May</td>
<td>120-160 lbs. N in split applications and 30 to 40 lbs. each of (P_2O_5) and (K_2O). Total application in a 4:1:1 ratio.</td>
</tr>
<tr>
<td>Bermudagrass</td>
<td>Common</td>
<td>5 lbs. seed</td>
<td>Feb.-May</td>
<td>Same as for Bahiagrass</td>
</tr>
<tr>
<td></td>
<td>Coastal</td>
<td>20 bu. of sprigs</td>
<td>Feb.-May</td>
<td>For Grazing: 120 to 200 lbs. N in split applications and 30 to 50 lbs. each of (P_2O_5) and (K_2O). Total application in a 4:1:1 ratio. For Hay: 200 to 300 lbs. N in split application; 50 to 90 lbs. of (P_2O_5); 100 to 180 lbs. (K_2O). Total application in a 4:1:2 ratio.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1200 to 1500 lbs. fresh forage disked in</td>
<td>June-Aug.</td>
<td></td>
</tr>
<tr>
<td>Dallisgrass</td>
<td>Commercial</td>
<td>10 lbs. (live seed)</td>
<td>Feb.-May</td>
<td>Same as Bahiagrass.</td>
</tr>
<tr>
<td>Johnsongrass</td>
<td>Commercial</td>
<td>15-25 lbs. (live seed)</td>
<td>April 1 to May 15</td>
<td>Same as for Coastal Bermudagrass</td>
</tr>
<tr>
<td><strong>Established Cool Season Grasses (Permanent)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tall Fescue</td>
<td>Alta, Kentucky-31</td>
<td>15 lbs.</td>
<td>Sept.-Nov.</td>
<td>80 to 120 lbs. N, split-fall and spring; 40-60 lbs. each of (P_2O_5) and (K_2O) in a 1:1 ratio.</td>
</tr>
<tr>
<td>Orchardgrass (North Miss. only)</td>
<td>Potomac or Boone</td>
<td>15 lbs.</td>
<td>Sept.-Nov.</td>
<td>Same as Tall Fescue</td>
</tr>
<tr>
<td><strong>Warm Season Grass-Legume Mixtures (Permanent)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bahiagrass</td>
<td>As before</td>
<td>As before</td>
<td></td>
<td>Establishment: 60 to 90 lbs. of (P_2O_5) and (K_2O) in a 1:1 ratio and 0.5 lbs. of boron. Maintenance: 40 to 60 lbs. each of (P_2O_5) and (K_2O) in a 1:1 ratio and 0.5 lbs. of boron.</td>
</tr>
<tr>
<td>Bermudagrass</td>
<td>As before</td>
<td>As before</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dallisgrass with one of the following legumes.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crimson Clover</td>
<td>Dixie, Chief, Autauga</td>
<td>25 lbs.</td>
<td>Sept.-Nov.</td>
<td>Same as for White Clover</td>
</tr>
</tbody>
</table>
### Subterranean Clover
- **Mt. Barker, Woogenellup, or Tallarrow**: 12-16 lbs. Sept.-Nov.
- Same as for White Clover

### Annual Lespedeza
- Climax or Summit: 25 lbs. Feb.-Apr.

### Johnsongrass with One of the following for hay:
- **Alfalfa**
  - Florida 66, Delta Cody: (live seed) 15 lbs. Sept.-Nov.
- **Red Clover**
  - Orbit, Kenland, Chesapeake, or Nolin's Red: 10 lbs. Sept.-Nov. or March-April on clean land.
- **Rough Peas**

### Warm Season Grasses (Annual or Temporary)
- **Millet**
  - All hybrid Varieties: 15 lbs. in rows 35 lbs. broadcast Apr.-June 120-150 lbs. N, split application; 60 lbs. P₂O₅ and 60 lbs. K₂O.
- **Sorghum-Sudan**
  - Commercially available varieties: 15 lbs. in rows 35 lbs. broadcast Apr.-June 120 to 180 lbs. N in split applications; 60 lbs. P₂O₅ 60 lbs. K₂O.

### Cool Season Grass-Legume Mixtures (Annual or Temporary)
- **Annual Ryegrass with one of the following:**
  - Gulf Magnolia, Blends (common in North Miss. only): 25 lbs. Sept.-Nov. 60-80 lbs. each of P₂O₅ and K₂O in a 1:1 ratio at seeding time.
- **Arrowleaf Clover**
  - Meechee or Yuchi: 10 lbs. Sept.-Nov.
  - Tibbee, or Dixie: 10 lbs. Sept.-Nov.
- **Subterranean Clover**
- **Annual Ryegrass and wheat or oats with legumes (as with ryegrass)**
  - As above: 25 lbs. Sept.-Nov.
  - See wheat and oats: 90 lbs. Sept.-Nov.
- **Small Grains and Legume (as with ryegrass)**
  - Oats, rye or wheat (see varieties under grass): 90 lbs. of small grain Sept.-Nov. Same as Above

(Table 3 continued next page)
(Table 3. Continued from last page)

### Cool Season Grass-Legume Mixtures (Permanent)

| Tall Fescue or Orchardgrass | Alta, Kentucky-31 or Goar Commercial, Boone or Potomac | 10 lbs. in 20” rows | Sept.-Nov. | Establishment: 60 to 90 lbs. each of P$_2$O$_5$ and K$_2$O in a 1:1 ratio
| White Cover                | Regal, Tillman, La.S-1 or Nolin                     | 3 lbs.               | Sept.-Nov. | Maintenance: 40-60 lbs. each of P$_2$O$_5$ and K$_2$O in a 1:1 ratio. |

### Annual Cool Season Grasses and Small Grains

| Annual Ryegrass            | Gulf or Magnolia (Common in North Miss. only)       | 30-40 lbs.           | Sept.-Oct. | 120 to 220 lbs. of N, split fall and spring; 60 to 80 lbs. P$_2$O$_5$ and 30 to 40 lbs. K$_2$O in a 2:1 ratio |
| Barley (Grain only)        | Harrison, (Barsoy), Jefferson, Keowee or McNair 601 | 90 lbs.              | Oct.-Nov.  | 10-20 lbs. N, 30-40 lbs. each of P$_2$O$_5$ and K$_2$O at seeding. Topdress with 60 to 90 lbs. N about March 1. |
| Oats                       | Coker 234, Coker 227, Florida 501, or Coronado       | For Forage: 120 lbs. | For Forage: Sept.-Nov. | Same as Ryegrass. |
|                           |                                                      | For Grain: 90 lbs.   | For Grain: | Same as Barley, use lower rate of nitrogen |
|                           |                                                      |                     | Oct.-Nov.  | Same as Ryegrass |
| Rye                       | Abruzzi, Balboa, Elbon, Explorer Vitagraze          | For Forage: 120 lbs. | For Forage: Same as Oats | Same as Ryegrass |
|                           |                                                      | For grain: 90 lbs.   | For grain: | Same as Barley |
|                           |                                                      |                     | Oct.-Nov.  | Same as Ryegrass |
| Wheat                     | Abe, Arthur-71, Coker 68-15, or Oasis               | For Forage: 120 lbs. | Same as for Rye | Same as Ryegrass |
|                           |                                                      | For Grain: 90 lbs.   |                          | 10-20 lbs. N, 40 lbs. each of P$_2$O$_5$ and K$_2$O at planting. Topdress with 90 to 100 lbs. N about March 1. |

### Legumes

| Alfalfa (Hay)             | Florida 66, Delta, or Cody                          | 15-20 lbs.           | Sept.-Nov. | Establishment: 120 to 160 lbs. each of P$_2$O$_5$ and K$_2$O in a 1:1 ratio and 1.5 lbs. boron. |
|                          |                                                      |                     |            | Maintenance: 60-80 lbs. |

**Note:** The table provides information on the cultivation of different grasses and small grains, emphasizing the timing and quantity of nutrient application.
<table>
<thead>
<tr>
<th>Crop</th>
<th>Varieties</th>
<th>Seed Rate</th>
<th>Sowing Date</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austrian Winter Peas</td>
<td>Commercial</td>
<td>50 lbs.</td>
<td>Sept.-Oct.</td>
<td>Same as for Arrowleaf Clover</td>
</tr>
<tr>
<td>Crimson Clover</td>
<td>Autauga, Chief, Dixie or Tibbee</td>
<td>20-30 lbs.</td>
<td>Sept.-Oct.</td>
<td>Same as for Arrowleaf Clover</td>
</tr>
<tr>
<td>Lespedeza (Annual)</td>
<td>Climax, or Summit</td>
<td>25 lbs.</td>
<td>Feb.-Apr.</td>
<td>Same as for Arrowleaf Clover</td>
</tr>
<tr>
<td>Sericea (Perennial)</td>
<td>Serala, or Commercial</td>
<td>30 lbs.</td>
<td>Feb.-June</td>
<td>Same as for Arrowleaf Clover</td>
</tr>
<tr>
<td>Rough Pea</td>
<td>Commercial-also known as Singletary, Caley and Wild Winter peas.</td>
<td>40 lbs.</td>
<td>Sept.-Oct.</td>
<td>Same as for Arrowleaf Clover</td>
</tr>
<tr>
<td>Subterranean Clover</td>
<td>Mt. Barker, Woogenellup, or Tallarook</td>
<td>12-16 lbs.</td>
<td>Sept.-Nov.</td>
<td>Same as for Arrowleaf Clover</td>
</tr>
<tr>
<td>Vetch</td>
<td>Warrior</td>
<td>30 lbs.</td>
<td>Sept.-Oct.</td>
<td>Same as for Arrowleaf Clover</td>
</tr>
<tr>
<td>White Clover</td>
<td>Regal, La.-S1</td>
<td>3 lbs.</td>
<td>Sept.-Nov.</td>
<td>Same as for Arrowleaf Clover</td>
</tr>
</tbody>
</table>

¹Established stand. If clipped for hay, increase the K₂O rate about 30 pounds for each ton of hay. If phosphate and potash are applied on alternate years, double the annual rate.
²When irrigated, Coastal may be planted from April 1 to September 1.
³Specify scarified seed.
⁴Use orchardgrass in North Mississippi only.
⁵Barley yields are generally quite low except in extreme North Mississippi. Barley yellow dwarf disease is a serious problem and none of the varieties are resistant.
⁶All legume seed should be inoculated with the proper culture immediately before planting.
### Table 4. Guidelines For Lawns and Similar Turf Areas

<table>
<thead>
<tr>
<th>Grass</th>
<th>Recommended Varieties</th>
<th>Method of Planting</th>
<th>Rate of Planting</th>
<th>Fertilization per 1000 Sq. ft. per Yr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bahiagrass</td>
<td>Pensacola or Wilmington</td>
<td>Seed</td>
<td>5-10 lbs/1000 sq. ft.</td>
<td>6 lbs. nitrogen</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 lbs. P$_2$O$_5$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4 lbs. K$_2$O split into 4 applications</td>
</tr>
<tr>
<td>Bermudagrass</td>
<td>Common</td>
<td>Seed</td>
<td>2 lbs/1000 sq. ft.</td>
<td>6-8 lbs. nitrogen</td>
</tr>
<tr>
<td></td>
<td>Tiflawn, Ormond</td>
<td>Sprig or plug</td>
<td>Sprig or plug 6-12 ins. apart on 6-12 in. rows</td>
<td>2 lbs. P$_2$O$_5$</td>
</tr>
<tr>
<td></td>
<td>Tifway or Tifdwarf</td>
<td></td>
<td></td>
<td>4 lbs. K$_2$O split into 4 applications</td>
</tr>
<tr>
<td>Carpetgrass</td>
<td>Common</td>
<td>Stolonize</td>
<td>2.5 bu./1000 sq. ft.</td>
<td>2.3 lbs. nitrogen</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 lb. P$_2$O$_5$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1-2 lbs. K$_2$O, split into 2-3 applications</td>
</tr>
<tr>
<td>Centipedegrass</td>
<td>Common, or Oklawn</td>
<td>Seed or Sprig or plug</td>
<td>4 oz./1000 sq. ft. Sprig or plug 6-12 ins. apart on 6-12 in. rows</td>
<td>Same as carpet</td>
</tr>
<tr>
<td>Fescue</td>
<td>K-31</td>
<td>Seed</td>
<td>7-10 lbs./1000 sq. ft.</td>
<td>4 lbs. nitrogen</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(2 in fall, 2 in spring)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 lbs. P$_2$O$_5$ and 4 lbs. K$_2$O</td>
</tr>
<tr>
<td>Ryegrass</td>
<td>Gulf or Magnolia</td>
<td>Overseed permanent lawns</td>
<td>8-10 lb./1000 sq. ft.</td>
<td>1 lb. nitrogen</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>in January and March</td>
</tr>
<tr>
<td>St. Augustine grass</td>
<td>Common</td>
<td>Sprig or plug</td>
<td>Sprig or plug 6-12 ins. apart on 6-12 in. rows</td>
<td>Same as bahia</td>
</tr>
<tr>
<td>Zoysiagrass</td>
<td>Emerald, Matrella, or Meyer</td>
<td>Sprig or plug</td>
<td>Sprig or plug 6 in. apart on 6 in. rows</td>
<td>Same as bahia</td>
</tr>
</tbody>
</table>

*When establishing a new lawn incorporate 2-3 lbs. of N; 4-6 lbs. of P$_2$O$_5$ and 2-3 lbs. of K$_2$O per 1000 sq. ft. into the seedbed before planting.*
This map shows land resource areas of the state and how Experiment Station locations fit into them. Number 1 is the headquarters at Miss. State. Branch stations are: 2 Brooksville, 3 Newton, 4 Poplarville, 5 Crystal Springs, 6 Raymond, 7 Stoneville, 8 Holly Springs, 9 Verona, 10 Pontotoc, and 11 Alcorn.
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