1971 crop and fertilizer recommendations for Mississippi.

Mississippi State University

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1971
Crop and Fertilizer Recommendations For Mississippi

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MISSISSIPPI STATE UNIVERSITY
AGRICULTURAL AND FORESTRY EXPERIMENT STATION
JAMES H. ANDERSON, Director
This map shows land resource areas of the state and how Experiment Station locations fit into them. Number 1 is the main station at State College. Branch stations are: 2 Brooksville, 3 Newton, 4 Poplarville, 5 Crystal Springs, 6 Raymond, Stoneville, 8 Holly Springs, 9 Verona, and 10 Pontotoc.
CROP AND FERTILIZER RECOMMENDATIONS
FOR MISSISSIPPI

Crop and fertilizer recommendations are made annually by the Mississippi Agricultural and Forestry Experiment Station. These recommendations incorporate the latest research findings at the College and the Branch Experiment Stations. Included is information on varieties and fertilization and seeding dates for crops commonly grown in a 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 recommendation will fit the entire state perfectly; nonetheless, these general recommendations are useful guides for crop production. Of course these recommendations assume that other good liming practices will be followed.

If more specific information is needed, may be obtained from the Extension Service, the Experiment Station, your county Agent, or other trained agricultural workers in your locality.

Soil Testing Service

The farmer gets maximum profit from fertilizer only when the right kind and amount are used on each field. Through the Soil Testing Department the Cooperative Extension Service every farmer can get this information as well as information on liming practices. Furthermore, the Soil Testing Service takes recommendations for exceptionally high production goals which may not be provided for in the general recommendations.

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

Plant Nutrients

Plant nutrients can be divided into two groups: (1) Those elements used by crops in relatively large amounts, the macronutrients; and (2) those needed in very small amounts, the micronutrients.

The first group includes nitrogen, phosphorus, potassium, calcium, magnesium, and sulfur. These are usually subdivided into the primary fertilizer nutrients — nitrogen, phosphorus, and potassium — and the secondary fertilizer nutrients — calcium, magnesium, and sulfur. The primary nutrients are applied to crops either as materials or as mixed fertilizers. A fertilizer material usually contains only one fertilizer nutrient. Some examples of fertilizer materials are listed below:

<table>
<thead>
<tr>
<th>Material</th>
<th>Total Nitrogen N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonium nitrate</td>
<td>33.5%</td>
</tr>
<tr>
<td>Anhydrous Ammonia</td>
<td>82%</td>
</tr>
<tr>
<td>Nitrate of soda</td>
<td>16%</td>
</tr>
<tr>
<td>Available Phosphate</td>
<td>18% to 20%</td>
</tr>
<tr>
<td>Superphosphate</td>
<td></td>
</tr>
<tr>
<td>Available Potash (K2O)</td>
<td></td>
</tr>
<tr>
<td>Muriate of potash</td>
<td>60%</td>
</tr>
</tbody>
</table>

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 percentage available phosphate (P2O5), and the third the percentage water-soluble potash (K2O). One hundred pounds of a 5-10-10 fertilizer thus contains 5 lbs. of total N., 10 lbs. of available P2O5, and 10 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, 6-8-8 and 9-12-12 are two grades in a 3-4-4 ratio. Materials such as ordinary superphosphate may be labeled as 0-20-0.

At present fertilizer nutrients are either expressed as the oxide, phosphorus as phosphorus pentoxide (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-P₂O₅K₂O) 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 factor for phosphate are: P₂O₅ x 0.436 = P; P x 2.29 = P₂O₅. Only the method of labeling is changed not the plant nutrient value of the fertilizer.

For the most part fertilizer recommendations are given in this bulletin as pounds of N, P₂O₅, and K₂O needed per acre. Usually the farmer will have a choice of more than one fertilizer grade. For example, 48 lbs. N, 48 lbs. P₂O₅, and 48 lbs. K₂O may be supplied with 600 lbs. of 8-8-8 or 400 lbs. of 12-12-12. Since some deviation from the general recommendation does not affect net yield greatly, it is not necessary to apply exactly the amount of N, P₂O₅, or K₂O as indicated.

Both the need for and the presence of the secondary nutrients in fertilizers is variable. Research has shown that sulfur deficiency is likely to occur on soils in the Hill Section when sulfur-free fertilizers are used. Accordingly, sulfur is recommended for crop production in this area especially for cotton and legumes. A convenient and economical way to get the sulfur is to use mixed fertilizers that contain sulfur. Most solid mix fertilizers sold in Mississippi contain adequate sulfur, but most liquid mix fertilizers do not unless special provisions are made for the addition of sulfur.

Scattered instances of sulfur deficiency have been observed in the Delta A. These deficiencies have been associated with land leveling and very sandy soils that are low in organic matter. Since mixed fertilizers are less commonly used in this area, other sources of sulfur may be more economical or convenient to apply. Sources of sulfur that may be used include gypsum, elemental sulfur, ammonium sulfate, and ordinary superphosphate.

Calcium and magnesium are usually applied to soils as agricultural limestone although a major objective of liming is to neutralize soil acidity. A more complete discussion of liming is given elsewhere. On soils needing magnesium but not requiring lime, the addition of water-soluble source of magnesium mixed fertilizers is a very convenient method of applying the magnesiu.

The second group of nutrients referred to variously as "trace elements," "minor elements," and "micronutrients" they are needed by crops in very small amounts. Included are iron, manganese, zinc, copper, boron, molybdenum, and chlorine. Thus far, only three (boron, and molybdenum) of these have been found to be deficient to appreciable extent for crop production in Mississippi. These deficiencies have occurred on all crops and have been restricted almost entirely to the Hill Section. Specific recommendations for micronutrients are given later for crops which need them.

Solid or Liquid Fertilizers

Mixed fertilizers are available in both solid and liquid forms. Liquid fertilizers have given, or would be expected to give, excellent results in most cases, but there are no more effective than many, if not most, solid mixed fertilizers.

The inferiority of some solid mix
fertilizers to liquid mixed fertilizers and other solids can be attributed primarily to the phosphate component of these fertilizers. Only highly water soluble phosphates are, of necessity, used in the formulation of liquid mixed fertilizers, because their water solubility as well as other characteristics of the phosphate materials of solid mixed fertilizer may vary widely. Highly water soluble phosphates are effective fertilizers but all those of water solubility are not.

Liquid mixed fertilizers formulated with ammonium phosphates and ammoniated superphosphate contain a very high percentage of their phosphorus in a water-soluble form and are just as effective as liquid mixed fertilizers. Ammoniation of ordinary and concentrated superphosphates to ammonium phosphates is a common practice, inverts some of the highly effective water-soluble mono-calcium phosphate to less soluble calcium phosphate some of which may be somewhat less effective in crop production. This is particularly true with ordinary superphosphate (20%) because of the formation of an alite-like calcium phosphate, the entropy of which increases progressively with increasing ammoniation. In a sense rock phosphate is formed. Consequently, mixed fertilizers formulated from highly ammoniated binary superphosphate are not as effective as liquid mixed fertilizer, or other high quality solids. Unfortunately, most of the phosphorus in the apatite-like phosphates formed upon ammoniation of binary superphosphate is determined to be “available” by the chemical method currently used for control purposes.

With the sources of phosphorus usually used in the formulation of mixed fertilizers in Mississippi farmers are reasonably assured of good results if 50 to 60 percent of the “available” phosphorus is also water-soluble. Some manufacturers give the water-soluble phosphorus content of their fertilizers though this is not required by law.

A substantial amount of nitrogen in liquid mixed fertilizers is derived from urea and/or ammonium nitrate. As will be indicated later nitrogen solutions containing either urea or urea and ammonium nitrate have been much less effective for surface application to summer pastures than either solid urea or ammonium nitrate. Therefore, liquid complete fertilizers would not be expected to be as effective for summer pastures as solid complete (NPK) fertilizers.

Soil pH and Liming

Excessive soil acidity and associated factors reduce crop yields. A recent summary of soil test results by the Cooperative Extension Soil Testing Department showed that some 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, above 7.0 an alkaline soil. Soil reaction, or pH, affects the availability of some of the more important plant nutrients in the soil. Phosphate is much less available in very acid soils than in slightly acid to mildly alkaline soils. In very strongly acid soils (pH below 5.0) certain elements such as manganese and aluminum may become available in such quantities as to be toxic to plants. On the other hand micronutrients such as iron, manganese, boron and zinc rapidly become less available as the pH of the soil is increased above 6.0. This is one reason why one must not overlime. Experience has shown that overliming injury in Mississippi is very likely to be associated with deficiencies of boron and zinc. In the case of cotton and legumes, it is very likely to be due to boron deficiency and with corn, and perhaps other grasses, to zinc deficiency.

Soils with a pH of 6.0 to 7.0 are well supplied with lime. If the pH is less than 5.0, the soil is very strongly acid and is
extremely deficient in lime. Most non-legumes grow best at soil pH values of 5.5 and above while most legumes do best 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 value depends both on the initial pH and the lime holding capacity of the soil. For soils of Mississippi having a pH of 5.5 or slightly below, the application of 3000 pounds of lime per acre to sandy loam soils, 5000 or 6000 pounds to loam and silt loam soils, and 7000 to 9000 pounds to clay loam and clay soils, respectively, has been satisfactory in correcting lime deficiency for legumes. Since about two-thirds of the soils of the state have pH values of 5.5 or above, and 95% above 5.0, these rates of lime would bring the pH of most of the soils of the state within the range that is favorable for legumes. However, some soils need more, some less, and some need no lime. 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 sources of nitrogen and the turning under of legumes as soil builders accelerates 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 5 to 7 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. Although lime may be needed badly on some soils for non-legumes, the deficiency is widespread enough to warrant a general recommendation for rates in excess of maintenance requirements for these crops. Where lime is needed in the absence of a soil test. Areas go into permanent grass sod should receive the initial maintenance application of lime prior to establishment. Subsequent maintenance applications may be applied to the surface.

Except for the dark upland soils and the bottom soils of the Mississippi Delta area, maintenance applications should be made to soils that have been limed during the past 5 to 7 years.

The principal liming materials available in Mississippi are ground calcic dolomitic limestones, crushed chalk marl from Mississippi deposits and basic slag. Calcic limestones contain calcic carbonate while dolomitic limestones contain both calcium and magnesian carbonates. Liming materials from Mississippi deposits contain calcic carbonate only. Basic slag, a material containing a minimum of 6 percent P2O5 and the equivalent of about 60 percent lime should be used only where both lime and phosphate are needed. The cost of its use as a liming material only prohibitive.

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

Generally, the Delta and Deep Loess soil areas are abundantly supplied wit
CROP AND FERTILIZER RECOMMENDATIONS

Rutensium, therefore, dolomitic lime is no advantage in these areas. In the river soil areas of the state, however, rutensium levels tend to be lower and a large amount containing considerable rutensium, such as dolomitic lime, could 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, a maintenance application of 1000 to 2000 pounds per acre may be made as a surface application to permanent pastures, or other permanent sods.

When to Fertilize
Following their application to the soil, fertilizers become less available to plants. This occurs because they may be lost by leaching and volatilization or be converted to less available forms within the soil. Nitrogen is both leached and volatilized. Potassium is leached from the soils but phosphate is not. But phosphate is changed to less available forms.

Fertilizers may contain nitrate or ammonium nitrogen, or both, or other forms (urea and Cyanamide) that are ranged rather rapidly to ammonium when applied to the soil. Nitrate salts and in fertilizers and in soils are highly soluble in water and are not retained chemically by the soil. Therefore, they remain in solution and move freely with the soil water being easily leached from the root zone, particularly on sandy loam, loam and silt loam soils, or other soils where water percolates readily. Under water-logged conditions, which are more likely in clay soils, nitrates may be changed by soil bacteria to gaseous nitrogen (denitrified) which escapes into the atmosphere. Ammonium nitrogen is not denitrified nor is it easily leached, but does not persist for long periods. It is changed (nitrified) by soil bacteria to nitrate.

Since nitrogenous fertilizers are not held in soils for long periods they are used more efficiently for crop production when applied at or near planting time or during the growing season.

Phosphate fertilizers are not lost by leaching because they react with certain soil constituents to become only sparingly soluble in water. In acid soils the reaction is mostly with iron and aluminum but in neutral and alkaline soils calcium phosphates of very low water solubility also are formed. The soil-phosphate reaction products themselves become less available with time but the process is more rapid in acid soils, particularly at pH values below 6.0.

The formation in soils of sparingly soluble phosphates and their subsequent reduction in availability to plants collectively is referred to as “phosphate fixation.” Because of fixation, greater efficiency generally is obtained from annual, seasonal applications of phosphate fertilizer 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 prior to planting, or near the beginning of the growing period for perennial crops.

Unlike phosphate, the effectiveness of potash fertilizers is not reduced appreciably by fixation in Mississippi soils. But there is some loss by leaching, particularly from the more sandy soils. Where leaching is significant annual, seasonal applications result in more efficient utilization of potash than less frequent or off-season applications. Because of uptake in excess of need and its removal in the harvested crop, annual and sometimes split applications of potash are necessary for optimum efficiency for forage crops.

Because of rising costs and labor shortages, farmers increasingly are more interested in greater mechanization, custom services and in spreading their work load to increase efficiency. One way of spreading the work load is to increase
land preparation and application of fertilizers in the fall where feasible for spring-seeded crops.

Fall application of nitrogen for spring-seeded crops is not practical in Mississippi but there are opportunities for fall application of phosphate and potash where fall plowing is practiced. Because of previous fertilization or native fertility, levels of available phosphate and potash in much of our good crop land now are at the point where only small increases in yield, if any, are obtained each year from the application of these fertilizers. At these fertility levels, which a soil test will show, no more than maintenance rates are needed for maximum economic returns from fertilizer. Under such conditions the crop yield is affected only slightly, if at all, by the time or method of application of the fertilizer. Here there is an opportunity for fall application of phosphate and potash in connection with fall plowing.

Fall application of phosphate and potash need not be restricted to conditions where maintenance rates are required. On slightly acid to alkaline clay and clay loam soils of the Blackland Area that are very deficient in phosphorus, fall application of phosphate has been just as effective as spring application. Similar results would be expected on other soils having similar native pH values. Top yields also can result from fall application of phosphate or other soils that are low in available phosphorus; but, because of fixation, a higher rate would be needed in the fall than in the spring, especially on acid soils having a pH below 6.0. Eventually, though, the phosphate would build up in these very deficient soils to the point that a maintenance rate would be sufficient either for fall or spring application.

Except for leaching losses, potash applied in the fall for spring-seeded crops would be expected to be about as effective as that applied in the spring. Leaching losses are not particularly significant on clay and clay loam soils. But, as indicated before, leaching losses do occur on the lighter soils. Leaching losses are reduced by broadcasting the fertilizer and maintaining the soil pH above 6.0 by liming. With broad application on properly limed soils, substantial losses by leaching probably would not occur except on light sand soils. Potash losses by leaching can be compensated by higher rates application which might be an acceptable alternative to spring application in some cases.

**How to Fertilize**

To obtain maximum utilization of fertilizers, the two components availability, namely chemical and positional, must be optimized concurrently. Chemical availability refers to the capacity of the fertilizer and soil-reaction products to supply nutrients to plants. Positional availability refers to the location of the fertilizer with respect to the plant roots. For example, fertilizer placed in the soil a foot or so from the row is positionally unavailable to seedling plants.

The chemical availability of nitrogen and potassium in fertilizers usually is affected greatly by degree of contact with the soil. However, the effectiveness of highly reactive phosphates is protected by reducing their contact with the soil which slows the rate of phosphate fixation. This may be done either by band placement in the soil or by granulation of the fertilizer at the factory. Since most solid fertilizers sold in Mississippi are granulated or pelletized, method of application has a greater effect on positional than on chemical availability.

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

Phosphate does not move appreciably in dry soils and the movement of potash is somewhat limited, especially on soils of medium to fine texture. Therefore, these fertilizers must be placed so as to be perceived by plant roots. For till-seeded and row crops they should be placed in the soil deep enough to be in a moist soil where plants feed as they grow. For such crops, surface application or shallow incorporation, as by disk irrigation, will be expected to give inferior results because of poor positional availability.

Nitrogen as nitrate moves with the soil water to plant roots. Its over-all efficiency is not affected greatly by free of concentration or its location within the root zone except that enough nitrogen should be available for the optimum growth of young plants.

Nitrogenous fertilizers applied to the surface of dry soils remain positionally available for the most part until they are dissolved and moved down into the root zone by percolating water. Before it is changed (nitrified) by soil bacteria to nitrate, a process requiring two to four weeks for completion in moist soil during warm season. Unfavorable positional availability is avoided by applying nitrogenous fertilizers far enough in advance of the necessary transformation so that movement into the root zone by percolation to occur by the time the nitrogen is needed by the crop.

Localized concentration of immobile nutrients, such as phosphorus and potassium, near the row or drill, as results from band application, provides a favorable opportunity for early perception by plant roots as well as for intensive root development within the fertilized zone later, a condition which contributes to optimum fertilizer efficiency. An outstanding benefit from phosphorus is its favorable influence on the early growth and development of plants. This effect 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 rather low in phosphate and potash, higher rates are needed for broadcast than for band application to obtain the same increase in yield. This is especially true where the fertilizer is incorporated by shallow disk instead of being plowed under.

Because of accumulation from previous applications, only a small percentage of the row-crop land previously cropped to cotton and fertilized as recommended over a long period would be expected to be so low in phosphate and potash as to require an appreciable increase in the recommended rate to obtain essentially the same yields when broadcast as when banded beside the row.

A hazard of localized placement of the fertilizers near the row is salt injury to seeds and seedlings resulting in poor stands and stunted growth. 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 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 3 to 4 inches to the side of and 3 to 4 inches below 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 for 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 nitrate solutions such as N-Sol-32 and urea. Thus far, these solutions have ranged in effectiveness from 55 to 75 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.

Foliar Feeding

Plants absorb and utilize nutrients applied in solution to their leaves and if a deficiency exists, yields and/or quality may be improved by foliar application. Because they are required in such small amounts, very dilute nutrient salt solutions of the micronutrient (trace elements) may be used quite satisfactorily as foliar sprays to correct deficiencies without injury (burning) to foliage. In some areas foliar feeding of these elements has become a somewhat standard practice for crop production. Frequently, micronutrients are applied conveniently and inexpensively along with insecticides and fungicides. An example is the application of boron to cotton with the insecticide. However, under Mississippi conditions it appears to be no need for both foliar soil application of micronutrients when they are needed for crop production.

The primary (nitrogen, phosphorus, potassium) and the secondary (calcium, magnesium, and sulfur) nutrients are absorbed in relatively large quantities in crops. Thus, to supply a substantial portion of the total requirement of these nutrients without burning the leaves, plants would require several applications of rather dilute solutions during the growing season. Therefore, foliar feeding of these nutrients is not as feasible as foliar feeding of the micronutrients. Increases in the yield of cotton have been obtained in Mississippi under certain conditions from foliar feeding of primary nutrients, but it has not been shown so far to be a desirable economical alternative to soil application of these nutrients. Therefore, foliar feeding is not now recommended routinely in lieu of or as a supplement to soil application of plant nutrient.

Recommendations for Major Field Crops

CORN

Varieties: Detailed results of variety trials are published annually in Mississippi Farm Research. Only those varieties that are resistant to Southern Corn leaf blight should be planted. Plants from seed produced on normal (N) cytoplasm should be tolerant to Southern Corn leaf blight that caused serious losses in 1970. Plants from seed produced on Texas (T) male sterile cytoplasm will be susceptible to this disease. Seed sold in 1971 will be labeled with the percentage of (N) and/or (T) cytoplasm in the bag. If hybrid seed produced on normal (N) cytoplasm is not available for planting in 1971, consult Extension personnel for information on expected results from blends, F1, open-pollinated varieties, and other seed corn.

Seeding Dates and Rates and Lot 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 March 5 to April 15, and in South Mississippi from...
January 25 to March 15.
Corn should be planted on deep to moderately deep soil with fair to good base drainage. Steep, dry soils, and hillside areas are not well suited to corn.

Soils should be adjusted to expected yields and in Mississippi should range from 12,000 to 18,000 plants per acre. It is desirable to use the minimum seed that will give near maximum yield of a given set of conditions. A good rule of thumb is to provide about 130 plants per bushel of expected yield. For example, with an average expected yield of 120 bushels per acre, the stand should be between 15,000 and 16,000 plants. At lower yields the stand would be reduced proportionately; but, because of the advantage of shading in weed control, should never be below 12,000 plants per acre. On the more productive soils, such as bottomland soils and deep, nearly level to gentle rolling upland soils, average yields of 80 to 120 bushels per acre reasonably should be expected with good cultural practices including proper fertilization.

Fertilization—Hill and Delta Foothill Areas: Soils of the Hill and Delta Foothill Area 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 be countered, especially on soils of medium to coarse texture. When this occurs, a mixed fertilizer which contains enough zinc to give 2-3 pounds per acre could be used for two to three years. No other micronutrient deficiencies have been observed in corn.

Time: Apply all of the phosphate and potash before planting. Nitrogen may be applied before planting or in split applications: one-fourth to one-third before planting and the remainder as a side dressing by the time the corn is knee high.

Rate: Apply 120 to 250 pounds of nitrogen and 40 to 70 pounds each of phosphate (P2O5) and potash (K2O) in approximately 3-1-1 ratio, but adjust the rate to the expected average yield. For an expected yield of 120 bushels per acre the rate is 210 lbs. N, 70 lbs. P2O5, 70 lbs. K2O. At lower yields the rate is reduced proportionately, being 162 lbs. N, 54 lbs. P2O5, 54 lbs. K2O per acre for a 100-bushel yield and 120 lbs. N, 40 lbs. P2O5, 40 K2O for one of 80 bushels. If corn is grown continuously for silage for several years, apply 50 to 60 lbs. of phosphate and 100 to 120 pounds of potash per acre in a 1:2 ratio.

For broadcasted applications of phosphate and potash, the rate should be 60 to 80 pounds of each per acre on soils known to be very deficient in these nutrients.

Method: All of the phosphate and potash and up to 40 pounds of nitrogen per acre may be placed in a band located 3 to 4 inches to one side and 3 to 4 inches below the seed. The remaining nitrogen may be drilled at least 6 inches from the row, broadcast, or applied later as a side dressing. All or part of the nitrogen may be broadcast as a mixture with phosphate and potash, however, the fertilizer should be plowed down as should all broadcast applications of phosphate and potash. Preplant applications of anhydrous ammonia should be placed at least 6 inches to the side of and 6 inches below the seed.

Place side-dress applications of nitrogen a foot or more from the row, nonpressure solutions and solid sources at a depth of 4 inches and anhydrous ammonia at a depth of 6 inches. Surface, sidedress, application of solid sources and non-pressure solutions is almost as effective as in-soil placement.

Fertilization—Delta Area: For soils in this area, only nitrogen is needed generally for top production. Soil test for phosphate and potash needs.
Time: Nitrogen may be applied just prior to planting or in split application: one-half at or before planting and the rest as a side-dressing before the corn is knee high.

Rate: 120 to 250 pounds of nitrogen per acre, increasing the rate as the expected yield increases.

Method: Place preplant applications of nitrogen 6 or more inches from the drill row, non-pressure solutions and solid sources at a depth of 4 or more inches and anhydrous ammonia at a depth of 6 inches below the level of the seed. Side dress applications of nitrogen should be placed 1 foot or more from the row, non-pressure solution and solid at a depth of 4 inches and anhydrous ammonia at a depth of 6 inches. Surface application of solid sources and non-pressure solutions is only slightly less effective than in-soil placement.

**COTTON IN THE DELTA**

Varieties: Results of variety tests are published annually in Mississippi Farm Research.

Seeding Dates and Rates: Plant as soon after April 1, as weather permits, but not in cold soil. Hill dropped – 16 to 22 pounds of delinted seed per acre. Drilled – 30 to 40 pounds of delinted seed per acre. Drilled for cross plowing – 60 pounds of delinted seed per acre. Seed should be of good viability.

Fertilization: Delta soils generally need only nitrogen for most profitable yields but deficiencies of phosphate and potash do occur occasionally. This is especially true for potash on sandy loam and silt loam soils of the Eastern Delta and Foothill Area. Therefore, soils should be tested for phosphate and potash needs. 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 prior to planting, except on sandy loam soils having very good to excessive internal drainage and on clayey soils with poor surface drainage. On such soils, split application of nitrogen should be made one-half at or prior to planting and rest as a side dressing preferably mid-June. Split application of nitrogen clays with poor surface drainage recommended because of possible loss nitrogen by denitrification during v periods.

Rate: On sandy loam, loam, and loam soils rates from 90 to 100 pounds nitrogen per acre are recommended solid planted cotton and for all skip patterns. One hundred to 120 pounds nitrogen per acre is recommended for silty clay loam, silty clay, and clays regardless of the planting pattern, except that for clays with poor surface drainage the rate should be 120 to 150 pounds nitrogen per acre.

For cotton following soybeans pasture sod, the nitrogen rate should not exceed 60 pounds per acre, especially following pasture sod.

On soils where stalk growth is too rapid maturity too late, and boll rot is a problem because of excess nitrogen, nitrogen rate should not exceed 70 pounds per acre.

All nitrogen fertilizer recommendations are on the basis of a planted a regardless of the planting pattern, that whether skiprow or solid.

Method: Same as for corn in the Delta Area.

**COTTON IN HILL AREAS**

Varieties: Results of variety tests are published annually in Mississippi Farm Research.

Seeding Dates and Rates: Plant between April 10 and May 10 as weather permits. Hill dropped – use 16 to 22 pounds well delinted seed or 12 to 16 pounds acid delinted seed per acre. Drilled – use 20 to 30 pounds of well delinted seed 15-20 pounds of acid delinted seed per acre. All seed planted should be of good quality.
FERTILIZATION: A complete fertilizer (N, K) containing sulfur and boron is recommended in the Hill Sections. Fertilizers for dark upland soils of the Northeast Coastal Area having a pH above 6.0 should contain enough water-soluble magnesium to supply at least one-half and preferably as much as magnesium (MgO) as potassium. On soils more acid than pH 6.0, magnesium deficiency may be corrected by applying dolomitic lime at the rate of 1 to 2 tons per acre, or as indicated by soil test.

Enough boron is provided when the applied fertilizer contains boron and phosphate in the proportion of 0.3 pounds to 48, respectively, or a boron to phosphate ratio of 1:160. No more than 20 pounds of water-soluble boron should be added with the fertilizer.

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

Time: Apply the phosphate and potash broadcast in all or part of the nitrogen at or a few days before planting time. On deep sandy soils with very good drainage, side-dress one-half to two-thirds of the nitrogen for best effective results. Make side-dress applications of nitrogen by mid-June (a week or more earlier if anhydrous ammonia is used), or at early square formation.

Phosphate and potash may be applied the fall under certain conditions — see section on When to Fertilize.

Rate: Apply 72 pounds of nitrogen (N) and 48 pounds each of phosphate (P₂O₅) and potash (K₂O) per acre except as follows: Increase the nitrogen to 120 pounds and the phosphate and potash to 90 pounds each per acre on the dark upland soils of the Blackland Areas, and increase the nitrogen to 90 pounds per acre on the well-drained bottom and on the level to gently sloping upland soils of the Upper Coastal Plain. Excessive stalk growth and delayed maturity indicate too much nitrogen. Somewhat stunted growth associated with yellowish green foliage and the early yellowing and premature shedding of the leaves indicate too little nitrogen. When these conditions are observed nitrogen rates should be adjusted accordingly.

Where a skip row planting pattern is followed the rate of nitrogen per planted acre should be the same as is recommended for solid cotton but the rate of phosphate and potash should be increased to 60 pounds of each per acre where a lower rate is recommended for solid cotton. In a 4 x 4 or 2 x 2 planting pattern there is, of course, only one-half acre of planted cotton.

Method: Same as for corn in Hill and Delta Foot Hill Areas. Contact placement of seed and fertilizer as well as placement directly beneath the seed should be avoided.

If the phosphate and potash are applied broadcast, the rate should be increased to 72 pounds of each per acre on soils known to be somewhat low in these nutrients. A soil test will indicate such conditions. However, as pointed out elsewhere, a higher rate generally will not be required on land previously cropped to cotton and fertilized as recommended. If a preemergence herbicide is to be broadcast and worked into the soil, phosphate and potash applied broadcast should be plowed down before the herbicide is applied.

SOYBEANS

Varieties: Delta Area — Hill, Dare, Davis, Lee, Semmes, and Bragg (listed in order of maturity).

Hill Section: North — Hill, Dare, Hood, Lee and Bragg. South — Dare, Bragg and Hampton 266; Hardee in extreme south. For all areas where soils are infested with cyst nematode use either the Pickett or Dyer variety.

Soils: Soybeans are adapted to all Delta soils and to most soils of the Hill area,
but lower yields may be expected on
droughty soils such as eroded and shallow
upland soils.

Seeding Dates and Rates: May 1 to
June 15 except extreme South Mississippi
May 20 to June 20. Plant 40-50 pounds
of good seed per acre.

Inoculation: If not on land where a
crop of well nodulated soybeans has
grown within the last five years, the seed
should be inoculated.

Fertilization — Delta Area: Soybeans
require no fertilizer on most Delta soils
but a high percentage need lime. A soil
test will indicate the need for lime as well
as phosphate and potash.

In the Eastern Delta and Foothills Area
a molybdenum seed treatment is needed for
top yields on all soils that were
previously acid regardless of current lime
status, and elsewhere in the Delta on soils
having a pH below 6.0. A seed treatment
of 1/2 oz. of sodium molybdate per acre,
or its equivalent is recommended.

Fertilization — Hill Area: In the Hill
Area, phosphate and potash as well as
lime usually are needed. Except for the
dark soils of the Blackland Area of
Northeast Mississippi, some 70 percent of
the soils of the Hill Area need lime for
top yield. In the absence of a soil test,
apply both phosphate (P₂O₅) and potash
(K₂O) in a 0-1-1 ratio at the rate of 40 to
50 pounds per acre. The fertilizer may be
banded or broadcast. If broadcast, it
should be plowed-in instead of disked-in
for best results. If banded the fertilizer
should be placed 3 to 4 inches below the
seed. Avoid contact placement with the
seed as well as band placement directly
beneath the seed. Much newly cleared
land, as well as land in unfertilized
pastures, is extremely deficient in
phosphorus and the rates indicated above
probably will not be adequate for most
profitable yields if this land is planted to
soybeans. On such land the phosphate
should be increased to 80 pounds per acre
for a few years by using a mixed fertilizer
of 0-4-3 ratio.

In some parts of the state double
cropping of small grain and soybeans may
be practiced. In such a system it would
satisfactory to apply all of the phospho-
and potash recommended for both crop
to the small grain but they should
broadcast and worked into the soil.

In the Hill areas a seed treatment
1/2 oz. of sodium molybdate per acre,
its equivalent, is recommended on all soils
and especially on soils having a pH below
6.0.

Because of injury to the bacterial
culture, the inoculant and sodium
molybdate or other soluble molybdate
other soluble molybdenum salts, should
not be premixed for more than 24 hours
before being applied to seed beans that
are planted immediately following
treatment. Actually, the best practice
is to apply the inoculation and molybda-
salt separately and then mix both with
the beans in the same operation.

RICE IN THE DELTA

Varieties: Long Grain: Bluebonnet, Starbonnet, Dawn, and Bluebell will
mature in 150, 142, 130 and 115 days, respectively. Medium Grain, Saturn, Na,
and Nova 66 which mature in 125-130 days.

Seeding Dates and Rates: Rice can be seeded from mid-April to mid-June
depending upon variety. The very early varieties should not be planted until June.
Seeding rate 90 to 110 pounds if drilled and 110 to 135 pounds if broadcast
water seeded.

Fertilization: Apply from 100 to 120 pounds of nitrogen per acre on old
cropland. 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. Fertilizer may be applied before seeding if covered by
approximately 2 inches of soil. Otherwise, it may be applied just before
the first flood or one-half before the first
For Grain: In the Delta Area only nitrogen is needed generally. Depending upon the average yield, apply 100 to 180 pounds of N per acre, the lower rate for average yields of 60 to 70 bushels per acre and the higher rate for average yields of 100 to 120 bushels per acre. For intermediate yields, intermediate rates of nitrogen are recommended.

In the Hill Areas phosphate and potash as well as nitrogen generally are required. For average yields of 50 to 60 bushels per acre, apply 80 to 100 pounds of nitrogen (N) and 30 to 40 pounds each of phosphate (P₂O₅) and potash (K₂O) per acre. For average yields of 90 to 100 bushels per acre 140 to 160 pounds each of P₂O₅ and K₂O.

Where a stubble crop is desired, apply an additional 40 to 60 pounds of nitrogen after the first crop.

Depending on soil productivity, average yields can be expected to range from 50 to 90 bushels per acre for early plantings where proper cultural and fertilization practices are followed. However, average yields above 80 bushels per acre can reasonably be expected only on the most highly productive soils, which would also be expected to yield 80 to 100 bushels of corn per acre. Average yields from late plantings (past July 1) would be considerably lower.

For Silage: Apply as for grain, except double the rate of potash.

Method of Application: Same as for corn.

SUGARCANE FOR SYRUP

Varieties: C. P. 36-111. On deep, well drained soils of light texture.

Seeding Dates and Rates: Cut seed cane at the top mature joint and at ground level, but do not strip before planting. Plant in the Fall (October 15) at the rate
of 2 stalks, that is, place stalks end to end with a whole stalk at the union. Plant the cane in 4-foot rows on land that has been broken 5 to 6 inches deep a few weeks earlier. To protect from cold and to provide good drainage, cover the cane 6 to 8 inches deep by forming a ridge over it so that the drainage furrows between the rows are 2 to 4 inches deeper than the cane.

Fertilization: In the spring apply 40 to 50 pounds each of nitrogen and phosphate (P₂O₅) and potash (K₂O) per acre shortly after germination of the eyes or just before re-growth from stub. Place the fertilizer in a band so that it be 4 to 6 inches to the side of the ridge and 3 to 5 inches deep after the ridge has been worked down, or 1 to 2 inches deeper than the cane. Sidedress about 30 pounds of nitrogen per acre before July. Place side-dressing nitrogen in the edge of the root zone deep enough to be in moist soil without being disturbed by subsequent cultivation. Strip, top, and cut the cane before freezing weather. Harvesting as much as possible a month before processing improves sirki quality and reduces “sugaring.”

GRASSES, LEGUMES, AND SMALL GRAINS

Supplementary Information on Pasture Recommendations for the Hill Section

Planting:

If equipment is available, drill or band placement of seed and fertilizer is recommended for the establishment of all pasture and forage crops. With small-seeded legumes and grasses, care must be taken not to seed too deep. A seeding depth no more than ½-inch is recommended. Most plantings are made by broadcasting the seeds on the soil surface. In which case the seedbed should be cultipacked immediately before or after seeding.

Clover Pastures and Bloat:

Where conditions are especially favorable for legumes the danger of bloat may prevent full utilization of legumes seeded alone or of grass-legume combinations such as Dallis-grass and white clover, particularly in the Deep Loess area. The drilling of small grains or ryegrass into such a pasture will lessen the bloat problem and supply additional forage. In North Mississippi, orchardgrass may be seeded to reduce bloat in clover pastures.

Fertilization: For established pastures, solid and liquid complete fertilizers and solid sources of nitrogen may be top-dressed. On summer grass pasture, however, the efficiency of top-dress urea-ammonium nitrate (non-pressure) solutions has been quite low compared to solid ammonium nitrate.

Because of the wide variety of soils which these pasture recommendations will be applied, and of the extensive nature of the typical commercial livestock operation in Mississippi, particularly beef cattle, the pasture fertilizer recommendations are generally presented as a range instead of a single and more arbitrary figure.

The lower limit of the recommendation is estimated to be sufficient for plant establishment and (1) for general yields of forage on soil 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 cheap forage, and (3) where acreages per animal unit is not a serious limiting factor.

The upper limit of the fertilizer recommendations continues to be the agronomic optimum and should be used where the (1) soil type, (2) management system, (3) type of livestock enterprise, and (4) economic trend are such as to justify the considerably higher
es of forage that result from its use. For winter growing grass-legume mixtures, the amount of nitrogen and the time of application depend primarily upon when grazing is needed upon the desired proportion of grass to legume. Although there is very little difference in the total season’s production of forage, fall applications at plant establishment, increase fall and winter yields, and tend to provide a more favorable grass-legume ratio. For milking, lambs and other classes of livestock, the system of managements where fall and winter grazing is important, and where an effect of blaze exists, application of 50 lbs. N at planting time is recommended.

The yield of grass forages is greatly increased by application of nitrogen and, where weather conditions do not limit growth, excellent response is obtained to rates of nitrogen; therefore, the most economical rate will depend upon temperature, availability of moisture, and use made of the additional forage.

To increase the utilization of the forage or to obtain a more favorable distribution of pasture production, split applications of nitrogen are recommended for both summer and fall grass pastures, with 60-120 pounds applied each time.

For winter growing grass or grass-legume pastures that are seeded late and in which no fall or winter grazing can be expected the nitrogen application should not exceed 30 lbs. at seeding per acre. For coastal bermudagrass, where there is no fall or winter grazing, the last application may be as late as late May, the last application of nitrogen to permanent summer pastures should be made no later than July 15, and two weeks earlier if anhydrous ammonia is used. Because of the frequency of drought, mid-summer applications of nitrogen are generally less effective than applications made in the spring and early summer. For this reason more nitrogen should be applied in the spring than in summer season.

It may be economical to apply up to 200 pounds of nitrogen per acre to millet and sudangrass; 200 pounds to common Bermudagrass, Dallisgrass, and Bahiagrass, and 240 pounds to Coastal Bermudagrass pasture.

For summer temporary grazing crops, best response is obtained from nitrogen incorporated into the seedbed with phosphorus and potash prior to planting. Surface applications after each grazing or cutting are effective if rainfall is adequate.

Fall application of phosphorus 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 the following tables on forage and pasture crops. If phosphate and potash are applied only once in two years to permanent pastures the rate per application should be twice the annual rate.

Inoculation of clovers: All seed of clovers and other forage legumes should be inoculated with the proper culture prior to planting. It is imperative that seeds of new clovers like Arrowleaf be inoculated just prior to planting. Failure to inoculate legumes will result in low yields and may cause stand failure.
<table>
<thead>
<tr>
<th>Pasture Crop</th>
<th>Recommended Varieties</th>
<th>Rate of Seeding Per acre</th>
<th>Time of Planting</th>
<th>Fertilization, lbs./A. Annual Application, Except Lime</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfalfa</td>
<td>Delta, Buffalo or Cody</td>
<td>15-20 lbs.</td>
<td>Sept. 1-Oct. 15</td>
<td>Test soil for lime, Phosphorus, and potash needs.</td>
</tr>
<tr>
<td>Bermudagrass</td>
<td>Coastal (Irrigated)</td>
<td>20 bu. sprigs</td>
<td>Nov. 1-May 1</td>
<td>180 lbs. N, 2-3 applications beginning June 1 for grazing For hay, 300 lbs. N.</td>
</tr>
<tr>
<td>Bermudagrass</td>
<td>Regal, Tillman, or La. S-1.</td>
<td>2 lbs.</td>
<td>Plant Clover</td>
<td>Test soil for lime, phosphorus, and potash needs.</td>
</tr>
<tr>
<td>Fescue and White Clover</td>
<td>Kentucky-31 Fescue, Regal or La. S-1 White Clover</td>
<td>1-2 lbs. Clover</td>
<td>Feb. 1-May 1</td>
<td>Test soil for lime, phosphate, and potash needs.</td>
</tr>
<tr>
<td>Red Clover</td>
<td>Orbit or Kenland</td>
<td>10-15 lbs. seed alone</td>
<td>Oct. 1-Nov. 1</td>
<td>Test soil for lime, phosphate and potash.</td>
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<tr>
<td></td>
<td>or in small grains</td>
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<tr>
<td>White Clover</td>
<td>Tillman, Regal, or La. S-1, or Merit</td>
<td>2-3 lbs.</td>
<td>Oct. 1-Nov. 1</td>
<td>Test soil for lime, phosphate and potash.</td>
</tr>
<tr>
<td>Arrowleaf Clover</td>
<td>Meechee or Yuchi</td>
<td>12-15 lbs.</td>
<td>Oct. 1-Nov. 1</td>
<td>Test soil for lime, phosphate and potash.</td>
</tr>
<tr>
<td>Sorghum-Sudan hybrids</td>
<td>Commercial varieties</td>
<td>20 lbs. in rows</td>
<td>Apr. 15-June 15</td>
<td>60 lbs. N prior to planting. 60 lbs. N after 1st and 2nd cutting.</td>
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<td>35 lbs. broadcast</td>
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<tr>
<td>Korean Lespedeza</td>
<td>Climax or Summit</td>
<td>20-25 lbs. seed</td>
<td>Feb. 15-Mar. 15</td>
<td>Test soil for lime, phosphate, and potash.</td>
</tr>
<tr>
<td></td>
<td>in small grains</td>
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</tr>
<tr>
<td>Oats</td>
<td>Coker 242, Nora, or Florida 501</td>
<td>3 bu. for grazing</td>
<td>For grazing: early</td>
<td>Grazing: 60 lbs. N at planting</td>
</tr>
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<td></td>
<td></td>
<td>2½ bu. for grain</td>
<td>Sept. 1 or grain</td>
<td>and 60 lbs. in Feb. Grain: 45</td>
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<td></td>
<td>mid-Oct.</td>
<td>to 60 lbs. N March 1-March 15</td>
</tr>
<tr>
<td>Wheat</td>
<td>Benhur, Bledsoc, Blueboy, Coker 65-20, or Wakeland</td>
<td>1¼ bu. for grain</td>
<td>Same as Oats</td>
<td>Same as Oats</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1½ bu for grazing</td>
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</tr>
<tr>
<td>Rye</td>
<td>Explorer or Filbon</td>
<td>1¼ bu. for grain</td>
<td>Same as Oats</td>
<td>Same as Oats</td>
</tr>
<tr>
<td>Pasture Crop</td>
<td>Recommended Varieties</td>
<td>Time and Planting</td>
<td>Rate of seeding Per Acre</td>
<td>Fertilization, lbs./A Annual Fertilization¹</td>
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<tr>
<td></td>
<td><strong>WARM SEASON GRASSES (PERMANENT)</strong></td>
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<tr>
<td>Bahiagrass</td>
<td>Pensacola, Wilmington. (Argentine - South Mississippi only)</td>
<td>Feb.-April, or Aug.-Oct.</td>
<td>15 lbs./A</td>
<td>120 to 180 lbs. N in split applications and 30 to 45 lbs. each of P₂O₅ and K₂O. Total application in a 4-1-1 ratio.</td>
</tr>
<tr>
<td></td>
<td>Bermuda grass</td>
<td>Feb.-May</td>
<td>3-5 lbs. seed</td>
<td>Same as for Bahiagrass.</td>
</tr>
<tr>
<td></td>
<td>Coastal</td>
<td>Feb.-May</td>
<td>20 bu. of sprigs per acre</td>
<td>For Grazing: 120 to 240 lbs. N in split applications and 30 to 60 lbs. each of P₂O₅ and K₂O. Total application in 4-1-1 ratio. For Hay: 200 to 300 lbs. N in split application: 50 to 90 lbs. of P₂O₅; 100 to 180 lbs. K₂O. Total application in a 4-1-2 ratio.</td>
</tr>
<tr>
<td>Dallisgrass</td>
<td>Commercial</td>
<td>Feb.-April; Aug.-Oct.</td>
<td>10 lbs. (live seed)</td>
<td>Same as Bahiagrass.</td>
</tr>
<tr>
<td>Johnsongrass</td>
<td>Commercial</td>
<td>Feb.-June</td>
<td>15-25 lbs. (live seed)</td>
<td>Same as for Coastal Bermuda grass.</td>
</tr>
<tr>
<td></td>
<td><strong>COOL SEASON GRASSES (PERMANENT)</strong></td>
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</tr>
<tr>
<td>Tall Fescue</td>
<td>Kentucky-31 or Kenwell.</td>
<td>Aug.-Oct. 15</td>
<td>15 lbs.</td>
<td>80 to 140 lbs. N, split-fall and spring; 40 to 60 lbs. each of P₂O₅ and K₂O in a 1:1 ratio.</td>
</tr>
<tr>
<td>Orchardgrass</td>
<td>Jackson or Boone</td>
<td>Aug.-Oct. 15</td>
<td>15 lbs.</td>
<td>Same as Tall Fescue</td>
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<tr>
<td>(North Miss. only)</td>
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</tbody>
</table>
## Recommendations For Pastures In Hill Sections—(Continued)

<table>
<thead>
<tr>
<th>Pasture Crop</th>
<th>Recommended varieties</th>
<th>Time of Planting</th>
<th>Seeding Per Acre</th>
<th>Fertilization, lbs./A. Annual Application¹</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WARM SEASON GRASS-LEGUME MIXTURES (PERMANENT)</strong></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Bahiagrass, Bermudagrass</td>
<td></td>
<td></td>
<td></td>
<td>Establishment: 60 to 100 lbs. of P₂O₅ and 30 to 50 lbs. K₂O in a 2:1 ratio.</td>
</tr>
<tr>
<td>Dallisgrass with one of the following legumes:</td>
<td></td>
<td></td>
<td></td>
<td>Maintenance: 30 to 60 lbs. of P₂O₅ and K₂O in a 1:1 ratio.</td>
</tr>
<tr>
<td>White Clover</td>
<td>Regal, Tillman or Merit</td>
<td>Sept. 1-Oct. 15</td>
<td>1-3 lbs.</td>
<td>Same as above. For seed production add 0.5 to 1 lb. of boron.</td>
</tr>
<tr>
<td>Crimson Clover</td>
<td>Chief, Autauga or Tibbee</td>
<td>Sept. 1-Oct. 15</td>
<td>25 lbs.</td>
<td>Same as Crimson Clover.</td>
</tr>
<tr>
<td>Arrowleaf¹ Lespedeza</td>
<td>Meechee or Yuehi Climax, or Summit</td>
<td>Sept. 1-Oct. 15</td>
<td>10-15 lbs.</td>
<td>Establishment: 40-60 lbs. each of P₂O₅ and K₂O in a 1:1 ratio.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Feb.-April</td>
<td>20 lbs.</td>
<td>Maintenance: 40 lbs. each of P₂O₅ and K₂O.</td>
</tr>
<tr>
<td>Johnsongrass with one of the following for hay:</td>
<td>Commercial</td>
<td>Feb.-June</td>
<td>15-25 lbs.</td>
<td>Establishment: 120 to 160 lbs. each of P₂O₅ and K₂O in a 1:1 ratio.</td>
</tr>
<tr>
<td>Red Clover</td>
<td>Orbit, Kenland or Chesapeake</td>
<td>Sept.-Oct. or March 1-April 15 on clean land.</td>
<td>10 lbs.</td>
<td>Same as with Alfalfa.</td>
</tr>
<tr>
<td>Rough Peas</td>
<td>Commercial, also known as Caley, Singletary, and</td>
<td>Sept.-Oct.</td>
<td>30 lbs.</td>
<td>60 to 90 lbs. P₂O₅ and 120 to 180 lbs. K₂O in a 1:2 ratio.</td>
</tr>
<tr>
<td>Crop</td>
<td>Seed Variety</td>
<td>Sowing Date</td>
<td>Fertilizer Recommendation</td>
<td></td>
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<tr>
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</tr>
<tr>
<td>Millet</td>
<td>Gain-H. Millex. or Perley</td>
<td>Apr. 15-June 15</td>
<td>120 lbs. N split application, 60 lbs. P2O5 and 60 lbs. K2O.</td>
<td></td>
</tr>
<tr>
<td>Sorghum-Sudan hybrids</td>
<td>Commercially available varieties</td>
<td>April 15-June 15</td>
<td>120 to 180 lbs. N in split applications, 60 lbs. P2O5 and 60 lbs. K2O.</td>
<td></td>
</tr>
</tbody>
</table>

**COOL SEASON GRASS-LEGUME MIXTURES (ANNUAL OR TEMPORARY)**

- **Annual Ryegrass with one of the following:**
  - Gilb. Magnolia, Blends or common in North Miss. only
  - Arrowhead Clover 1
  - Crimson Clover

- **Annual Ryegrass and wheat or oats with legume (as with ryegrass):**
  - As above
  - See wheat and oats

- **Small Grains and Legume (Use same as with ryegrass):**
  - Oats, rye or wheat (See varieties under grass)

**COOL SEASON GRASS-LEGUME MIXTURES (PERMANENT)**

- **Tall Fescue:**
  - Alta, Kentucky-M or Kenwell
  - Establishment: 60 to 100 lbs. of P2O5 and 30 to 50 lbs. of K2O in a 2:1 ratio.
  - Maintenance: 40 to 60 lbs. of P2O5 and K2O in a 1:1 ratio.

- **Orchardgrass (North Mississippi only)**
  - Commercial, Boone, or Jackson
  - Aug. 20-Oct. 15

- **White Clover**
  - Regal, Tillman, or La. S-1
  - Aug. 20-Oct. 15

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1 Specify scarified seed
# Recommendations For Pastures In Hill Sections—(Continued)

<table>
<thead>
<tr>
<th>Pasture Crop</th>
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<th>Time of Planting</th>
<th>Seeding Per Acre</th>
<th>Fertilization, lbs./A. Annual Application</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ANNUAL COOL SEASON GRASSES AND SMALL GRAINS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual Ryegrass</td>
<td>Gulf, Magnolia, or Florida Rust Resistant, (Common in North Miss. only)</td>
<td>Aug. 20-Oct. 15</td>
<td>20-30 lbs.</td>
<td>120 to 220 lbs. of N, split fall and spring; 80 to 100 lbs. P₂O₅ and 40 to 50 lbs. K₂O in a 2:1 ratio.</td>
</tr>
<tr>
<td>Oats</td>
<td>'Coker 242,' 'Forager,' 'Moregrain 211,' 'Nora,' or 'Sumpter'</td>
<td>For Forage: Aug. 20-Oct 1</td>
<td>128 lbs. (4 bu.) For Grain: Oct. 1-Nov. 15</td>
<td>2½ bu. Same as Ryegrass.</td>
</tr>
<tr>
<td>Rye</td>
<td>'Albon,' 'Explorer' or 'Abruzzi NC'</td>
<td>For Forage: Same as Oats</td>
<td>90 lbs. For Grain: Oct. 1-Nov. 1</td>
<td>Same as Oryegrass. Same as Barley.</td>
</tr>
<tr>
<td>Wheat</td>
<td>'Arthur,' 'Blueboy,' 'Coker 65-20,' 'Georgia 1123,' 'Andhox,' 'Wakeland,' or 'Coker 68-15'</td>
<td>Same as for Rye</td>
<td>For Forage: 90 lbs. For Grain: 1½ bu.</td>
<td>Same as Ryegrass. Same as Barley.</td>
</tr>
</tbody>
</table>

*For forage only.
<table>
<thead>
<tr>
<th>Crop</th>
<th>Type/Location</th>
<th>Sowing Date</th>
<th>Fertilizer</th>
<th>Establishment Guidelines</th>
<th>Maintenance Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfalfa (Hay)</td>
<td>Florida 66. Dela, Cody, or Buffalo</td>
<td>Aug. 15-Oct. 15</td>
<td>15-25 lbs.</td>
<td>60 lbs each of P2O5 and K2O in a 1:1 ratio and 1.5 lbs. boron.</td>
<td>60-80 lbs. P2O5 and 180 to 240 lbs. K2O in a 1:3 ratio and add 1 lb. boron.</td>
</tr>
<tr>
<td>Arrowleaf Clover</td>
<td>Meechee or Yuchi</td>
<td>Sept.-Oct. 15</td>
<td>10 lbs.</td>
<td>Same as for Arrowleaf Clover.</td>
<td>Same as for Arrowleaf Clover.</td>
</tr>
<tr>
<td>Austrian Winter Peas</td>
<td>Commercial</td>
<td>Sept.-Oct. 15</td>
<td>50 lbs.</td>
<td>Same as for Arrowleaf Clover.</td>
<td></td>
</tr>
<tr>
<td>Crimson Clover</td>
<td>Autauga, Chief, or Frontier</td>
<td>Sept.-Oct. 15</td>
<td>20-30 lbs.</td>
<td>Same as for Arrowleaf Clover.</td>
<td></td>
</tr>
<tr>
<td>Lespedeza (Annual)</td>
<td>Climax, or Summit Seral, or Commercial</td>
<td>Feb.-April 15</td>
<td>25 lbs.</td>
<td>Establishment: 60 to 100 lbs. each of P2O5 and K2O in a 1:1 ratio.</td>
<td>Maintenance: 50 lbs. P2O5 and 100 lbs. K2O in a 1:2 ratio.</td>
</tr>
<tr>
<td>Sericea (Perennial)</td>
<td></td>
<td>Feb.-June</td>
<td>30-40 lbs.</td>
<td>Same as for Arrowleaf Clover.</td>
<td></td>
</tr>
<tr>
<td>Red Clover (Hay)</td>
<td>Orbit, Kenland or Chesapeake</td>
<td>Sept. 1-Aug. 15</td>
<td>10 lbs.</td>
<td>Same as for Arrowleaf Clover.</td>
<td></td>
</tr>
<tr>
<td>Rough Pea</td>
<td>Commercial also known as Singletary, Caley and Wild Winter peas.</td>
<td>Sept. 1-Oct. 15</td>
<td>40 lbs.</td>
<td>Same as for Arrowleaf Clover.</td>
<td></td>
</tr>
<tr>
<td>Vetch</td>
<td>Warrior</td>
<td>Sept. 1-Oct. 15</td>
<td>30 lbs.</td>
<td>Same as for Arrowleaf Clover.</td>
<td></td>
</tr>
<tr>
<td>White Clover</td>
<td>Regal or Merit</td>
<td>Sept. 1-Oct. 15</td>
<td>2-3 lbs.</td>
<td>Same as for Arrowleaf Clover.</td>
<td></td>
</tr>
</tbody>
</table>

1 For legumes and grass-legume combinations, soil should be limed initially to establish and subsequently to maintain a pH of 6.0 to 7.0; for non-legumes the pH range should be 5.5 to 6.5. Refer to section on Soil pH and Liming. Unless indicated otherwise fertilizer recommendations are for grazing. When forage and pasture crops are harvested repeatedly from the same area for hay or silage instead of being grazed, the rate of potash should be about twice that recommended for grazing.

2 Specify scarified seed.
<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.¹</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. P₂O₅</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4 lbs. K₂O split into</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>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. P₂O₅</td>
</tr>
<tr>
<td></td>
<td>Tifway, Tifdwarf,</td>
<td></td>
<td></td>
<td>3 lbs. K₂O split into</td>
</tr>
<tr>
<td></td>
<td>Tex-turf 10</td>
<td>Stolonize</td>
<td>2-5 bu./1000 sq. ft.</td>
<td>4 applications</td>
</tr>
<tr>
<td>Carpetgrass</td>
<td>Common</td>
<td>Seed</td>
<td>5 lb./1000 sq. ft.</td>
<td>2-3 lbs. nitrogen</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 lb. P₂O₅</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1-2 lbs. K₂O, split into</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2-3 applications</td>
</tr>
<tr>
<td>Centipedegrass</td>
<td>Common, or Oklawn</td>
<td>Seed</td>
<td>4 oz./1000 sq. ft.</td>
<td>Same as carpet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sprig or plug</td>
<td>Sprig or plug 6-12 ins. apart on 6-12 in. rows</td>
<td></td>
</tr>
<tr>
<td>Festuca</td>
<td>K-31, or Kenwell</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. P₂O₅ and 4 lbs. K₂O</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 in January if needed</td>
</tr>
<tr>
<td>St. Augustinegrass</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,</td>
<td>Sprig or plug</td>
<td>Sprig or plug 6 ins. apart on 6 in. rows</td>
<td>Same as bahia</td>
</tr>
<tr>
<td></td>
<td>or Meyer</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹When establishing a new lawn incorporate 2-3 lbs. of N; 4-6 lbs. of P₂O₅ and 2-3 lbs. of K₂O per 1000 sq. ft. into the seedbed prior to planting.