



General
FERTILIZER RECOMMENDATIONS
for Alabama

SPECIAL LEAFLET
OCTOBER 1956

AGRICULTURAL EXPERIMENT STATION
of the ALABAMA POLYTECHNIC INSTITUTE

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COVER PHOTOGRAPHS. Upper left: Left—cotton that received no potash; right—recommended amounts of potash applied. Upper right: No lime was applied to soil in foreground, whereas lime was added at sides and background. Lower left: Plot at left was fertilized with recommended rate of potash; no potash applied at right. Lower right: Top—peanuts that did not receive lime or fertilizer; bottom—adequate phosphate, potash, and lime applied to this plot.

General FERTILIZER RECOMMENDATIONS *for Alabama*

FERTILIZER NEEDS depend on the crop to be grown and the nature of the soil. Some crops have higher requirements for certain plant nutrients than others, and some soils, either because of origin or previous treatment, contain greater amounts of certain plant nutrients than others. Therefore, one fertilizer recommendation cannot be made for all conditions in Alabama.

In order to determine the fertilizer needs of different crops on various soils, the Agricultural Experiment Station of the Alabama Polytechnic Institute has conducted fertilizer studies with the important agricultural crops on the more extensive soil types of the State. The general fertilizer recommendations given herein are based on results obtained from these field tests.

Many factors affect the efficiency of applied fertilizers. These include climatic conditions, soil type, lime content of the soil, time of planting, kind of crop, variety of crop, stand, and disease, insect, and weed control. The recommendations given here are made on the assumption that other good farming practices will be followed.

General fertilizer recommendations by soil regions do not apply equally well on all farms in any one area. This is due to the lack of uniformity of the soils on the same farm and often in the same field.

USE of SOIL TESTS in MAKING RECOMMENDATIONS

The best way to determine the fertilizer and lime needs of a crop on a particular piece of land would be to conduct a detailed fertilizer experiment in that field. Since it is impractical to do this, soil chemists have developed soil tests that indicate the amount of lime and fertilizers needed by the various crops. Considerable progress has been made in recent years in correlating the results of chemical soil tests with crop responses in the field. Therefore, information obtained by soil tests can be used to make specific fertilizer and lime recommendations.

A soil testing laboratory located at Auburn is operated by the API Agricultural Experiment Station in cooperation with the Extension Service. It is recommended that farmers have their soils tested so lime and fertilizer recommendations can be made that will fit the needs of individual fields much more accurately than general recommendations. Information on the procedure for having soils tested can be obtained from county agents.

LIME and FERTILIZER MATERIALS

Lime—Needs and Sources

Lime must be added to many soils of the State for best crop production. The amount of lime needed can be determined satisfactorily by a soil test. Most crops grow best on soils that are neutral or only slightly acid, which means soils that have a pH value of 6.0 to 7.0.

Long-time cropping or continued use of acid-forming fertilizers without adding lime will cause soils to become sufficiently acid to reduce crop yields. To offset this, farmers should develop a definite liming program, especially for the growth of legumes, whether the legumes are for pasture, hay, soil improvement, or seed. Specific lime requirements will vary widely on different soils and for different crops.

For crops especially sensitive to soil acidity, lime as well as fertilizer recommendations are given. However, in order to be certain that soils are limed adequately and to avoid overliming, lime should be applied according to soil test recommendations.

In the following recommendations, the amounts of lime recommended are for agricultural limestone. Liming materials that may be available locally and that may be used for agricultural purposes are listed in the following table:

Kind or source	Pounds of material equivalent to 1 ton of pure limestone	Also contains
High calcitic lime	2,100 to 2,350	
Dolomitic lime	1,850 to 2,100	10-20% MgO
Ground shells	2,200 to 2,500	
Basic slag	2,800 to 3,000	8-10% P ₂ O ₅
Blast furnace slag	2,700 to 3,000	
Calcium silicate slag	2,700 to 3,000	
Flue dust (Lime-Ox)	2,100	about 3% K ₂ O
Hydrated lime	1,500	
Burned lime	1,100	

Any liming material used should be of sufficient fineness that 90 per cent will pass through a 10-mesh sieve and 50 per cent through a 60-mesh sieve.

Many of the Sumter soils of the Black Belt contain 50 per

cent or more lime. These soils may be used for liming on the basis of their limestone equivalent. For example, soils containing 50 per cent lime may be used at the rate of 2 tons per acre for each ton of agricultural lime recommended.

Nitrogen Materials

The recommendations give the amounts of nitrogen recommended in pounds of nitrogen (N) per acre. To calculate the amounts of different nitrogenous materials required to supply the amount of nitrogen recommended, the following table may be used:

Material	Pounds of nitrogen in following amounts of material					
	100 lb.	200 lb.	300 lb.	400 lb.	500 lb.	600 lb.
Nitrate of soda	16.0	32.0	48.0	64.0	80.0	96.0
Calcium cyanamid	20.0	40.0	60.0	80.0	100.0	---
Ammonium sulfate	20.5	41.0	61.5	82.0	102.5	---
Ammonium nitrate-lime mixtures	20.5	41.0	61.5	82.0	102.5	---
Ammonium nitrate	33.5	67.0	100.5	134.0	---	---
Urea	45.0	90.0	135.0	---	---	---
Anhydrous ammonia	82.0	164.0	---	---	---	---

Experiment station results have shown that the efficiency of the nitrogen contained in all of these materials is about the same. Under particular conditions, certain other qualities may make one material more desirable than others. For example, ammonium sulfate, ammonium nitrate, urea, and anhydrous ammonia are acid forming, and, if used year after year on the same ground without use of lime, the soil will become too acid for satisfactory crop production. If enough lime is added to correct this acidity, all of these materials are excellent sources of nitrogen. The amounts of pure ground limestone required to correct the acidity produced by 100 pounds of these materials are given in the following table:

Material	Limestone required to correct acidity from 100 pounds of material (approximate)
	Pounds
Ammonium sulfate	120
Ammonium nitrate	60
Urea	75
Anhydrous ammonia	150

Cyanamid, when first applied, is toxic to seed and plant roots. Therefore, it should be applied 2 weeks before planting or before growth begins when used as a topdressing for dormant crops.

When used for horticultural crops or at higher rates of application, apply 3 to 4 weeks before planting or transplanting.

Ammonia sources of nitrogen may not be as efficient as nitrate sources for topdressing crops grown on the lime soils of the Black Belt because reaction between the lime and the ammonia sources results in loss of part of the nitrogen as a gas before it can be used by the crop. For this reason, nitrate forms of nitrogen are more highly recommended than the ammonia forms for topdressing crops grown on lime soils.

Phosphate Materials

The recommendations for phosphorus are usually given in pounds of superphosphate containing 20 per cent P_2O_5 . If 18 per cent superphosphate is used, the amounts needed will be about 10 per cent greater than those shown. If concentrated (triple) superphosphate containing 45 to 50 per cent P_2O_5 is used, the amounts needed will be about 1 pound of concentrated superphosphate for each $2\frac{1}{2}$ pounds of 20 per cent superphosphate recommended.

Basic slag contains 8 to 10 per cent P_2O_5 as compared with 18 to 20 per cent P_2O_5 contained in superphosphate. Basic slag may be used instead of superphosphate on basis of 2 to $2\frac{1}{2}$ pounds of basic slag for each pound of superphosphate recommended.

Basic slag and concentrated superphosphate contain little or no sulfur, which is an essential plant nutrient. The use of these materials as sole sources of phosphorus over a period of several years may result in sulfur deficiency unless other materials containing sulfur are used occasionally. Sulfur deficiency probably can be avoided by using 18 to 20 per cent superphosphate or a mixed fertilizer containing this material every other year.

Potash Materials

The amounts of muriate of potash recommended are based on a content of 60 per cent potash (K_2O). If 50 per cent muriate is used, the amounts should be about 20 per cent greater than the amounts shown for 60 per cent muriate.

Minor Elements

Boron, zinc, copper, manganese, and molybdenum are minor elements required in very small amounts for plant growth. Ala-

bama soils have enough of these elements for maximum growth of most crops. The main exception is the boron needs for alfalfa on all soils of the State. Other exceptions are (1) boron for crimson and white clover seed production and for certain horticultural crops on sandy soils, and (2) zinc for corn, pecan, and tung production on sandy soils. Where a need for a particular minor element is indicated, this element may be included in the regular fertilizer mixture.

Mixed Fertilizers

Of the grades of fertilizers approved for sale in Alabama by the State Board of Agriculture and Industries for the year October 1, 1956, to September 30, 1957, the following are recommended by the Experiment Station:

<i>Ratio</i>	<i>Minimum grade</i>	<i>Multiple grades</i>
1-1-1	8-8-8	10-10-10, 13-13-13, 14-14-14
1-3-3	4-12-12	
1-4-2	4-16-8	
1-2-4	4-8-16	
0-1-1	0-14-14	0-20-20
0-2-1	0-16-8	0-28-14
0-1-2	0-10-20	

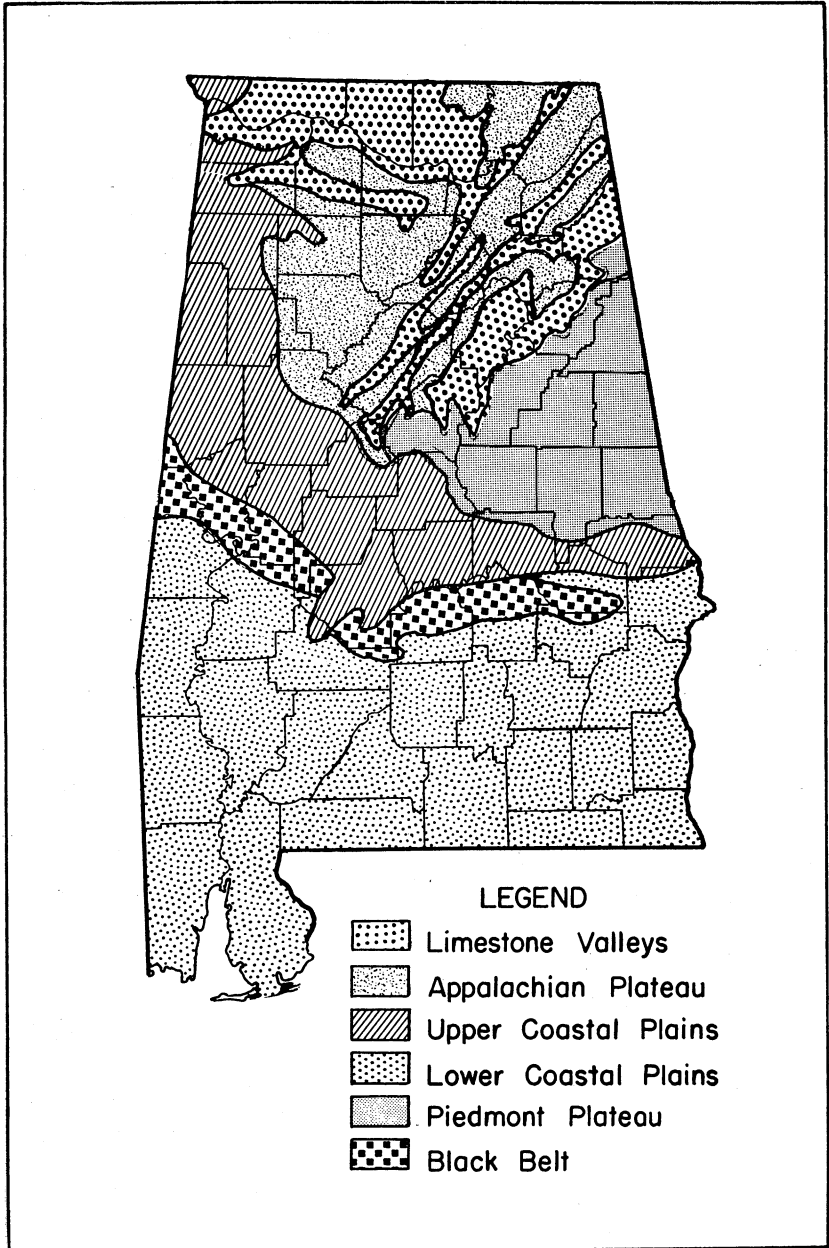
In addition to the above generally recommended grades, others recommended for special purposes are as follows:

4-12-12 (tobacco special with majority of potash as potassium sulfate and containing not more than 2.5 per cent chlorine)

8-8-2 (fish pond special)

14-0-14 (sidedressing material where both nitrogen and potash sidedressing are desired)

6-24-24 (approved on trial basis)



SOIL AREAS OF ALABAMA

Although the Upper and Lower Coastal Plains are shown as separate areas, fertilizer recommendations for the two regions are the same.

FERTILIZER RECOMMENDATIONS *for* FIELD CROPS

Alfalfa

The soil should be limed to pH 6.5 to 7.5; for most soils this requires 3 to 4 tons of lime per acre. The lime should be applied several months before seeding and worked thoroughly into the seedbed. This application should last throughout the average life of the alfalfa stand.

Apply 100 pounds of P_2O_5 , 200 pounds of K_2O , and 20 to 25 pounds of borax shortly before or at the time of planting. This should carry the alfalfa through the first year. Each year thereafter, apply these amounts of fertilizer in the winter or after first cutting in the spring, except in the Black Belt or on other heavy soils where fall application may be advisable because of wet conditions in the spring. These amounts of fertilizer may be obtained from 1,000 pounds of 0-10-20 (with borax), or phosphorus may be applied as 1,250 pounds of basic slag or 500 pounds of superphosphate and potash as 300 to 350 pounds of muriate of potash. Apply borax at the rate of 20 to 25 pounds per acre. If basic slag is used to supply all the phosphorus for both establishment and maintenance, the lime application may be cut in half. General exceptions to these recommendations are:

BLACK BELT. At present, alfalfa is not recommended on the heavy acid clay soils of this region; no lime is needed on the lime soils.

TENNESSEE VALLEY. Two tons of lime are usually adequate on the fertile red soils of this region.

GULF COAST. In this area, where more cuttings can be made than in the remainder of the State, the rate of K_2O may need to be increased. This may be accomplished by increasing the rate of 0-10-20 to 1,200 pounds, or, if separate materials are used, increase the rate of muriate of potash to 400 pounds per acre.

Specific lime and fertilizer recommendations for this crop should be obtained by soil test.

Corn (Grain or Silage)

Nitrogen is the fertilizer most commonly needed for corn in Alabama. Under normal weather conditions, adapted hybrids properly spaced will produce about 1 bushel for each 2 pounds of nitrogen up to the rates recommended here. When weather conditions are particularly favorable, corn may respond to higher rates of nitrogen than those generally recommended.

Phosphorus and potassium are required for corn production, but the amounts remaining in the soil following crops well fer-

tilized with these materials are usually enough that adding them may not give much increase in yields. However, it has been observed that, where these elements are added, corn grows off more rapidly and cultivation is made easier. Therefore, phosphorus and potash are usually recommended, especially when corn follows a crop that has not been well fertilized.

General Recommendations

For most soils of the State, apply 60 to 90 pounds of N and 30 pounds each of P_2O_5 and K_2O per acre. These amounts may be supplied by using 250 pounds per acre of 4-12-12 or 350 pounds of 8-8-8 fertilizer before planting and sidedressing at the second cultivation or approximately 30 days after planting with 40 to 75 pounds of nitrogen. Amounts of the various nitrogen materials required to furnish this much nitrogen are given in the table under "Nitrogen Materials" on page 5.

Following Winter Legumes

A good crop of winter legumes usually will supply all the nitrogen needed for corn under normal weather conditions. A good crop of winter legumes is one on which the average growth in the field will yield 25 or more pounds of green weight per 100 square feet for vetches, Austrian peas, clover, Caley peas, and 50 or more pounds for lupines. Where corn follows such crops of winter legumes, extra nitrogen need not be added, but sufficient 0-16-8 or 0-14-14 should be applied to either the legume or the corn to furnish the potash and phosphate requirements.

Zinc Requirements

Many of the light-colored, sandy soils of the State may not contain enough zinc for the best yields of corn. Shortage of zinc is indicated by yellow to white streaks in the leaves of corn early in the season. This is commonly known as "white bud." After the condition appears, it usually cannot be corrected by sidedressing with zinc. On areas where corn has shown zinc deficiency symptoms in previous years, zinc should be applied at or before planting at the rate of 10 pounds of zinc sulfate per acre in order to avoid such damage.

Cotton

General Recommendations

With the exceptions outlined below, cotton on most Alabama soils should be fertilized with 50 to 60 pounds per acre each of

N, P_2O_5 , and K_2O . These amounts may be applied as 400 to 500 pounds of 4-12-12 per acre at planting followed by sidedressing with about 25 to 40 pounds of N at the first or second cultivation after chopping. The fertilizer applied to cotton at planting should contain sulfur. Most of the complete fertilizers on the market in Alabama at the present time contain enough sulfur to supply the needs of cotton.

Tennessee Valley

On the fertile red soils of the Tennessee Valley, the Experiment Station recommends about 300 pounds of 4-16-8 plus 24 pounds of nitrogen as sidedressing, or 500 pounds of 8-8-8 if the cotton is not to be sidedressed. On the less fertile red soils and on the gray lands of this region, apply 400 pounds of 4-12-12 per acre and sidedress with 36 pounds of nitrogen, or apply 600 pounds of an 8-8-8 fertilizer at planting.

Appalachian Plateau (Sand Mountain)

Cotton planted at the recommended time (April 20-25) on Sand Mountain soils responds to higher rates of nitrogen than are recommended elsewhere. Under these conditions, 75 pounds of N and 50 to 60 pounds each of P_2O_5 and K_2O are recommended. These amounts may be applied as 400 to 500 pounds of 4-12-12 or 600 to 800 pounds of 8-8-8 per acre plus additional nitrogen sidedressing sufficient to bring the total N up to 75 pounds.

Following Legumes

On most soils of Alabama where cotton follows a good crop of winter legumes, only P_2O_5 and K_2O will be needed. These can be applied as 300 to 400 pounds of 0-16-8. On soils where rust occurs, apply 300 to 400 pounds per acre of 0-14-14.

Where cotton follows 3 or 4 years of alfalfa, sericea, or peanuts that did not receive the recommended amounts of potash each year, an additional 40 to 80 pounds per acre of K_2O should be applied.

Summer Grass Crops

(Sudan, Johnson, Sweet Sorghum, Millet, Common Bermudagrass, Bahiagrass, Coastal Bermudagrass, Dallisgrass)

For Hay or Grazing

All moderately or highly acid soils should be limed, using about 1 ton of lime per acre on sandy soils and 2 tons per acre

on heavy soils. If the crop follows a good crop of winter legumes, apply 40 to 50 pounds each of P_2O_5 and K_2O per acre, using 300 pounds of 0-14-14. Where the crop is not grown in rotation or in association with a legume, apply 50 to 60 pounds of nitrogen in addition to the recommended amounts of phosphorus and potash. This may be done by applying 400 pounds of 4-12-12 plus a topdressing of 40 pounds of nitrogen per acre. On deep, medium-textured soils where moisture is not usually a limiting factor, Coastal Bermuda will respond to higher rates of nitrogen. Rates of N up to 200 pounds per acre may prove profitable under these conditions.

Winter Grass Crops Seeded Alone

(Small Grains, Rescuegrass, Ryegrass, Fescue, Orchardgrass)

For Grain and Grazing or for Grazing Only

Fifty pounds of N and 40 to 50 pounds each of P_2O_5 and K_2O are recommended for establishment. These amounts can be applied as 400 pounds of 4-12-12 before planting, followed by a topdressing of 34 pounds of nitrogen as soon as a stand is obtained, or from 600 pounds of 8-8-8 before planting. The crop should be topdressed again during the latter part of February or by March 1 at the rate of 50 pounds of nitrogen per acre.

For Grain or Seed Only

Apply 200 to 300 pounds of 0-14-14 per acre before planting. Apply 50 pounds of nitrogen per acre during February. When planted following crops that have been fertilized with 500 to 600 pounds per acre of a complete fertilizer, the fall applications of fertilizer may be omitted.

Kudzu

Apply 300 pounds of superphosphate or 600 pounds of basic slag per acre before planting Kudzu crowns. Apply the same amount annually for maintenance of established Kudzu stands.

Legumes, Winter or Summer

(Austrian Peas, Caley Peas, Vetches, Crimson Clover, Lupine, Cowpeas and Soybeans for Hay, and Velvet Beans)

If the soil is acid and the land has not been limed recently, lime should be applied at the rate of 1 ton per acre on sandy soils and 2 tons per acre on clay soils.

Forty to 50 pounds each of P_2O_5 and K_2O per acre are rec-

ommended for either winter or summer legumes. Approximately these amounts would be obtained in:

- (1) 300 pounds of 0-14-14, or
- (2) 200 to 250 pounds of superphosphate and 70 to 80 pounds of muriate of potash, or
- (3) 500 to 600 pounds of basic slag and 70 to 80 pounds of muriate of potash.

On soils known to be high in potash, only 200 to 250 pounds of superphosphate or 500 to 600 pounds of basic slag need be applied per acre.

Apply 10 pounds of borax per acre for crimson clover seed production on light sandy soils.

Legume-Grass Mixtures for Winter Grazing

(Crimson Clover-Ryegrass, Crimson Clover-Rescuegrass, Small Grain-Winter Legume)

Apply lime to all acid soils well in advance of seeding at the rate of 1 ton of ground limestone per acre on sandy soils and 2 tons per acre on heavy soils. Forty to 50 pounds each of N, P_2O_5 , and K_2O are recommended. These amounts may be applied as (1) 400 pounds of 4-12-12 in the fall before planting plus a top-dressing of 30 pounds of N as soon as the plants are up, or (2) 600 pounds of 8-8-8 before planting, or (3) 350 pounds of 0-14-14 before planting and topdressing with 50 pounds of N.

Permanent Pasture (Perennial Legume-Grass Mixtures)

(Intermediate White or Ladino Clover with Dallisgrass, Bermudagrass, Fescue, Orchardgrass, Bahiagrass, or Bluegrass)

General Recommendations

For establishing clover-grass permanent pastures, apply lime to all acid soils well in advance of seeding. The rate should be about 1 ton of ground limestone per acre on sandy soils and 2 tons per acre on heavy clays. Rates of P_2O_5 and K_2O for establishment and maintenance of legume-grass mixtures on most soils of the State are:

ESTABLISHMENT	ANNUAL MAINTENANCE
<i>Per acre</i>	<i>Per acre</i>
130-160 lb. P_2O_5	65-80 lb. P_2O_5
65-80 lb. K_2O	30-40 lb. K_2O

The amounts of P_2O_5 and K_2O for establishment can be supplied with 800 to 1,000 pounds of 0-16-8 per acre. For main-

taining established legume-grass sods, 400 to 500 pounds per acre of 0-16-8 or 250 to 300 pounds of 0-28-14 should be applied annually.

Some soils need more potash than that recommended above. The amount of potash needed can be determined by soil test. Basic slag and muriate of potash or superphosphate and potash may be used to replace the above mixtures both for establishing and maintaining pastures. Where slag is used both for establishment and maintenance, it will supply all the lime needed except on extremely acid soils.

Black Belt (Bottom Lands and Acid Soils)

Many of these soils that have not been phosphated or grazed heavily contain enough potassium for establishment of pastures. When establishing pastures on these soils, apply 600 to 800 pounds of superphosphate per acre. Two tons of lime should be applied to acid soils, but the neutral bottom lands do not require liming. After a few years of fertilization with phosphate, the available potassium in these soils may be depleted to the point that they require potash. This point can be determined by a soil test or careful observation of the clover decline. When the potash becomes deficient, it should be applied at the rate shown in the annual maintenance recommendation.

Peanuts

Peanuts should be grown in rotation with other crops rather than continuously. When grown in a rotation with other crops that are **well fertilized**, peanuts seldom give large responses in yield from applied fertilizer. However, where both nuts and hay are removed from the land, large amounts of calcium (lime) and potash are removed from the soil. Under these conditions, apply lime if needed, 20 to 30 pounds of P_2O_5 , and 30 to 40 pounds of K_2O per acre. Nitrogen seldom increases the yield of runner peanuts and is not recommended.

Where peanuts are grown continuously, apply 30 to 40 pounds of P_2O_5 and 60 to 80 pounds of K_2O per acre annually to maintain soil fertility, and apply lime or gypsum as recommended below.

Fertilizer

For peanuts in rotation with other well-fertilized crops, apply 150 to 200 pounds of 0-10-20 per acre.

For continuous peanuts, apply 300 to 400 pounds of 0-10-20 per acre, or use 200 to 300 pounds of superphosphate and 100 to

150 pounds of muriate of potash per acre, or, if basic slag is used to furnish lime, apply only 100 to 150 pounds of muriate of potash per acre (basic slag will provide the phosphate).

Lime

A high percentage of pops or a low percentage of sound, mature kernels is good indication that the soil is deficient in calcium and needs some form of lime for peanuts. On land that has not been recently limed, apply:

- (1) 1 ton of ground limestone per acre broadcast prior to planting (this should be effective for 3 to 6 years), or
- (2) 500 pounds per acre of gypsum (land plaster) dusted on the plants when they are blooming each year, or
- (3) 1,000 pounds of basic slag per acre broadcast prior to planting (applied to each peanut crop until soil test indicates that no more lime is needed).

Sericea Lespedeza

For establishment, apply 1 ton of lime and 500 to 600 pounds of 0-16-8 per acre. *Sericea lespedeza* is not recommended for the lime soils of the Black Belt.

Apply 500 to 600 pounds per acre of 0-16-8 for maintenance of sericea stands.

Basic slag and muriate of potash or superphosphate and muriate may be used instead of the above mixtures. Where slag is used both for establishing and maintaining sericea, it should supply all the lime needed for this crop.

Grain Sorghum and Sweet Sorghum

All moderate or very acid soils should be limed for grain sorghum, using about 1 ton of lime per acre on sandy soils and 2 tons per acre on heavy soils. Apply 40 to 60 pounds of N and 30 pounds each of P_2O_5 and K_2O per acre. These amounts may be supplied by using 250 pounds of 4-12-12 or 350 pounds of 8-8-8 per acre before planting and sidedressing with sufficient nitrogen to bring the total up to the recommended rate.

Soybeans for Seed

In cropping systems that permit the application of lime, it should be applied to all moderate or very acid soils, using about 1 ton of lime per acre on sandy soils and 2 tons per acre on heavy soils.

When soybeans are grown in rotation with crops that have not been highly fertilized, 40 to 60 pounds each of P_2O_5 and K_2O are recommended. These amounts can be obtained from 300 to 400 pounds of 0-14-14. On light sandy soils, nitrogen may be beneficial; for these soils, 400 to 500 pounds of 4-12-12 is recommended.

No fertilizer is recommended for soybeans following heavily fertilized crops such as truck crops.

Sugar Cane

Approximately 60 pounds each of N, P_2O_5 , and K_2O per acre are recommended. These amounts may be obtained from 500 pounds of 4-12-12 per acre plus a sidedressing of 40 pounds of nitrogen per acre, or from 750 pounds of 8-8-8 per acre at the first cultivation.

FERTILIZER RECOMMENDATIONS *for* CROPS GROWN *under* IRRIGATION

When fields are irrigated to eliminate moisture shortage as a limiting factor in crop production, special measures are recommended.

Soil samples should be submitted to the Soil Testing Laboratory for recommendations that take into consideration the fertilizer needs for crops grown **under irrigation**. Recommendations for nonirrigated crops take into consideration certain moisture shortages that are expected during periods of normal rainfall. It is especially important that the soil be properly limed for crops grown under irrigation and that adequate and balanced amounts of N, P_2O_5 , and K_2O be applied in order to obtain maximum benefits from the water.

When additional fertilizer is recommended, precautions should be taken to prevent stand damage due to excessive salts near the seed. It may be advisable to broadcast the additional fertilizer and work it into the soil before planting; however, placing the fertilizer 2 to 3 inches to the side and below the seed at planting time may be adequate precaution. Top- or sidedressings can be applied in split applications as a safety precaution when the fertilizer rate needed is unusually large.

Insects and disease problems increase with the increased vegetative growth obtained from crops grown under irrigation. Control measures need to be investigated before planting.

Research information concerning the fertility requirements of crops grown under irrigation is limited, but the following general fertilizer recommendations are based on research and observations of the last few years and are given as guides for average soil conditions. They should not take the place of recommendations based on soil analysis. With each recommendation, the assumption is made that the additional hazards mentioned above are taken into consideration and that the soil is adequately limed.

Alfalfa

When sufficient water is applied to produce 7 or 8 tons of hay per acre annually, apply 100 pounds of P_2O_5 , 400 pounds of K_2O , and 25 pounds of borax annually. These amounts can be applied as 1,000 pounds of 0-10-20 (with borax) for establishment and annually thereafter for maintenance. In addition to the annual application, apply 300 to 400 pounds of muriate of potash after the second cutting of hay in the spring.

Corn

Apply 150 pounds of N and 60 pounds each of P_2O_5 and K_2O . These amounts may be obtained from 500 pounds of 4-12-12 plus 130 pounds of N applied as a sidedressing in two applications.

Cotton

Apply 100 to 120 pounds each of N, P_2O_5 , and K_2O . These amounts may be obtained from 1,000 pounds of 4-12-12 plus 60 to 80 pounds of N applied at the second cultivation.

On the more fertile soils such as the red soils of the Tennessee Valley, 75 pounds of N, 100 pounds of P_2O_5 , and 50 pounds of K_2O are recommended. These amounts may be obtained from 600 pounds of 4-16-8 plus 50 pounds of N applied at the second cultivation.

Peanuts and Soybeans

The fertilizer rates recommended for crops grown without irrigation are adequate for maximum expected yields of 3,000 pounds of peanuts and 40 bushels of soybeans.

Summer Grass Crops for Hay or Silage

Apply 100 pounds of N and 50 pounds each of P_2O_5 and K_2O . These amounts may be obtained from 400 pounds of 4-12-12 plus 80 pounds of N applied in a split application.

Permanent Pasture

White clover, Dallisgrass, Ladino clover, Orchardgrass:

For establishment—same as general recommendations for these crops grown without irrigation.

Annual maintenance—same as for establishment.

When a good legume is not present and a crop with high production potential such as Coastal Bermudagrass is used for pasture and hay, apply 50 to 60 pounds of N after each cutting of hay, or make three or four applications during spring and summer.

Truck Crops

Truck crops grown under irrigation should receive 12 tons of stable manure. In addition, the rate of fertilizer is increased 25 per cent over the regular rate for nonirrigated crops. The complete fertilizer should be applied in two equal applications plus a second application of nitrogen.

FERTILIZER RECOMMENDATIONS

***for* HORTICULTURAL CROPS**

Vegetable Crops and Gardens

The suggested rates of nitrogen, phosphorus, and potassium for the several groups of crops are those that should give high to highest yields on soils of medium to high fertility. Rates of phosphorus applied to second and third crops grown in succession may be reduced; nitrogen and potassium rates usually should be the same for successive crops.

Applications of complete fertilizers above 1,200 pounds per acre on sandy soils usually should be divided into two equal applications. Extra nitrogen for short-season crops should be applied in a single sidedressing, whereas for long-season crops it should be applied in two sidedressings. Fertilizers should be applied 10 days before planting of seed or plants, or applied to each side of seed or plants at time of planting. This is especially important during dry weather.

Stable manure is excellent for garden and truck crops. Where manure is used (12 tons or more per acre), the complete fertilizer may be reduced about one-third or one-fourth. Some soils may need boron, magnesium, or lime.

FERTILIZERS RECOMMENDED FOR VEGETABLE CROPS AND GARDENS

Crops	Plant food ^{1 2}			Fertilizer at planting time		Side application	
	N	P ₂ O ₅	K ₂ O	Rate	Grade	Rate	Kind
	<i>Lb./acre</i>	<i>Lb./acre</i>	<i>Lb./acre</i>	<i>Lb./acre</i>		<i>Lb./acre</i>	
Irish potatoes	90-120	160-200	160-200	1,000-1,200 ²	4-12-12 ²	600-800	8-8-8 ²
Sweetpotatoes	40-60	80-120	80-120	600-800	4-12-12	200-300 ³	8-8-8
Turnips, beets, carrots, rutabagas, and other root crops	90-120	90-120	90-120	800-1,000 ^{1 2}	8-8-8	300-400	8-8-8
Beans, tomatoes, squash, ⁴ peppers, eggplants, peas, ⁴ corn, and other pod crops	90-120	120-160	60-80	800-1,000	4-16-8	60-80	N
Cabbage, lettuce, collards, mustard, kale, and other leafy crops	120-140	160-200	80-100	1,000-1,200 ¹	4-16-8	80-100	N
Gardens without manure	-----	-----	-----	800-1,000 ¹	8-8-8	600-800	8-8-8
Gardens with 8-10 tons per acre stable manure	-----	-----	-----	800-1,000 ¹	8-8-8	400-600	8-8-8

¹ N refers to nitrogen, P₂O₅ to phosphoric acid, and K₂O to potash. On light soils, it is advisable to apply complete fertilizer in 2 equal applications.

² For potatoes growing on soils deficient in magnesium, add equivalent of 40 pounds per acre of magnesium oxide. For turnips, beets, and broccoli growing on light soils, add 10 to 15 pounds of borax per acre.

³ For sweetpotatoes growing on heavy soil, omit the side application.

⁴ Use one-half the side application of N.

Small Fruits

Grapes

Apply one-half pound of 8-8-8 fertilizer per vine for each year of its age up to a maximum of 4 to 6 pounds per vine—one-half applied 10 to 14 days before spring growth begins and the other half after fruit has set.

Brambles—Dewberries and Blackberries

Apply 600 to 800 pounds of 8-8-8 fertilizer per acre in the spring 10 to 14 days before growth begins; apply 32 pounds of nitrogen just as blooming begins; and apply 600 to 800 pounds of 8-8-8 per acre after vines are removed.

Strawberries

Apply 500 to 600 pounds of 8-8-8 fertilizer per acre 2 weeks before setting the plants, again in September or October, and 90 days before the normal ripening period. After harvest, when matted rows are barred off and thinned, apply 400 pounds per acre and work the soil to the plants.

Tree Fruits and Nuts

Pecans

YOUNG TREES: Apply 2 to 3 pounds of 8-8-8 per tree per year of the tree's age—one-half in February and the other half in April.

BEARING TREES: Without winter legume, apply 1,200 to 2,000 pounds of 8-8-8 per acre—one-half in February and the other half in April.

With winter legume, apply 500 to 600 pounds of 0-14-14 or 0-16-8 to the legume in the fall and 500 to 700 pounds of 8-8-8 per acre to the trees in February.

With Bermudagrass or small grain, apply an additional 50 pounds of N per acre not later than June 1, especially if the orchard is grazed.

LIME: Do not lime a pecan orchard until the lime requirement has been determined by soil test. If lime is applied, each tree should receive 10 pounds of zinc sulfate (36% Zn) every 5 years to prevent or correct rosette.

MINOR ELEMENTS: Apply 2 to 3 pounds of zinc sulfate per tree per year to prevent rosette. To correct rosette, apply $\frac{1}{2}$ to 1

pound zinc sulfate per tree per year of the tree's age, using a maximum of 10 to 15 pounds per tree.

Peaches and Plums

YOUNG TREES: For the first 3 years, apply 1 to 1½ pounds of 8-8-8 in February or March and ¼ pound of nitrate of soda or its equivalent in April per tree per year of its age.

BEARING TREES: Without cover crop, apply in early spring (not later than at full bloom) 1 to 1½ pounds of 8-8-8 for each year of the tree's age.

With cover crop, apply 400 pounds of 0-14-14 or 0-16-8 in the fall and again in early spring if legumes are turned under or mowed. If rye is used, apply in early spring (not later than at full bloom) an additional ¼ pound of nitrate of soda or its equivalent per tree for each year of the tree's age.

Apples

Apply 1½ pounds of 8-8-8 per tree for each year of the tree's age, using not more than 30 pounds per mature tree. If the orchard is in permanent sod, apply an additional 30 pounds of N per acre for bearing trees or add 5 pounds of urea (45% N) per 100 gallons to the first, second, and third cover sprays.

Fertilize cover crops with 500 to 600 pounds of 0-14-14 or 0-16-8 per acre in the fall.

Pears

Apply 1 pound of 4-12-12 per tree for each year of the tree's age, using a maximum of 12 pounds per mature tree.

FERTILIZER RECOMMENDATIONS *for* FISH PONDS

The following amounts of fertilizer per surface acre of pond are recommended for each application:

- (1) 100 pounds of 8-8-2, or
- (2) 50 pounds of 4-16-8 plus 6 pounds of N, or
- (3) 50 pounds of 0-16-8 plus 8 pounds of N.

The average pond will require 10 to 12 applications per year. Ponds receiving water from fertile lands require fewer applications than those receiving water from poor lands. Also, ponds having small amounts of overflow water require fewer applications than those with heavy overflow.

The first application of fertilizer should be made in early February; however, if the pond received heavy amounts of flood-

water, the first application may be delayed until early April. The first three applications should be made at 2-week intervals. Subsequent applications should be made every 3 to 4 weeks or whenever the water begins to lose its green color and becomes clear enough for the pond bottom to be seen in 16 to 18 inches of water. The last application should be made in October.

FERTILIZER RECOMMENDATIONS *for* LAWNS

Lawn fertilization should begin in the spring with an application of a complete fertilizer high in nitrogen such as 8-8-8 at the rate of 10 pounds per 1,000 square feet. Repeat the application at intervals of 4 to 8 weeks. A nitrogen material applied at a rate to give 1 pound of N per 1,000 square feet may be substituted for the mixed fertilizer for some of the applications. The last application of fertilizer should be made about 3 or 4 weeks before the first killing frost in the fall. If a winter grass such as ryegrass is sown on the lawn, the fertilizer application should be repeated as soon as the winter grass is well established.

Centipede grass lawns should not be fertilized with nitrogen as highly as is recommended above. One application of the complete fertilizer in the spring is sufficient for centipede grass under most conditions. If the soil is fertile, no fertilizer is needed for centipede grass.

