Fertilization For Lawns

Cooperative Extension Service/The University of Georgia College of Agricultural and Environmental Sciences

Table of Contents

Fertilization for Lawns

Gil Landry, Clint Waltz and C. Owen Plank
Extension Agronomists

A good fertilizer program is necessary for a healthy, attractive lawn, but it must be combined with correct mowing, irrigation and pest control practices for best results. Such a program includes the correct type and amount of fertilizer applied at the right time.

The first step in establishing a quality lawn is to determine the fertility level of the soil you're working with. A soil test is the best way to do this. The results of a soil test include recommendations for the fertilizer type, amount and application timing for your lawn. You can contact your local county extension office for more information about soil testing. Use the "general" fertilizer recommendations in this publication only as a substitute for such as analysis.

Plant Nutrients

Plants such as turfgrasses require a number of nutrients for growth. Three of these — carbon, hydrogen and oxygen — are rarely lacking because plants get these from carbon dioxide in the atmosphere and from soil water. The other elements essential to turfgrass growth and that come from the soil are nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, boron, manganese, molybdenum, copper, zinc and iron.

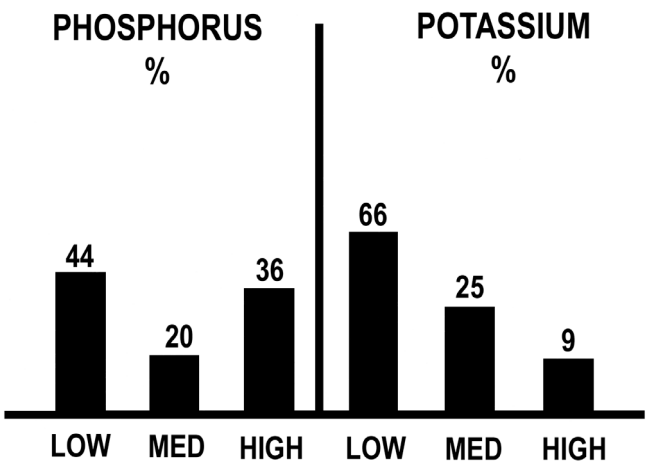
Those nutrients needed by plants in large quantities are called *macronutrients.* The macronutrients, usually supplied by fertilizers and called *fertilizer elements,* are nitrogen, phosphorus and potassium. Nitrogen helps give plants good green color and stimulates leaf and stem growth. Excessive nitrogen, however, will increase mowing and water demand, thatch buildup and plant susceptibility to insects and diseases. Phosphorus is needed for root growth and is very important for turfgrass establishment. Potassium is second to nitrogen in the amount necessary for growth. It may promote disease resistance, winter hardiness, and drought and traffic tolerance.

Table 1 illustrates the soil fertility levels of lawns and other turfgrass areas in Georgia. This data show that most lawns in Georgia are lower in potassium than phosphorus, thus indicating the need for fertilizers containing higher amounts of potassium than phosphorus.

Other macronutrients, called *secondary nutrients,* are calcium, magnesium and sulfur. The amount of calcium and magnesium in the soil usually is adequate if a good liming program using dolomitic lime is followed. Sulfur is generally present in most commercial fertilizers; however, it may be low in high analysis and liquid fertilizers.

Table 1

Fertility of Lawns in Georgia
Soil Test Summary Results (1984)



The remaining nutrients are required in very small amounts and are called *micronutrients* or *trace elements.* They are boron, copper, iron, manganese, molybdenum zinc and others.

Generally, plants use micronutrients in such small amounts that the soil provides a sufficient amount. A deficiency of one or more of these elements can limit plant growth just as any nutrient deficiency can. Micronutrient defici-

encies are most likely to occur in sandy soils when the grass is heavily fertilized and the clippings have been removed.

Turfgrasses differ in their requirements for these elements. For instance, centipedegrass has a relatively high iron requirement. If a soil on which centipedegrass is grown is over-limed, iron deficiency may occur. Iron deficiency, however, is seldom a problem with other turfgrasses.

The Georgia fertilizer law does not require fertilizer companies to guarantee the micronutient content unless it is claimed in their advertisements. In order to determine whether micronutrients are contained in lawn fertilizer, check the analysis tag. If the micronutrients are in the fertilizer, the tag will generally show the percentage of each element.

Soil Acidity

Soil acidity is another factor that affects grass growth. It is measured in terms of a pH scale that is graduated from 0 to 14. The midpoint (7) separates acid from alkaline soils. Any number below 7 represents an acid soil — the lower the number the more acid the soil. Numbers above 7 denote an alkaline soil condition. The pH scale is logarithmic; thus, a soil with a pH of 5 is 10 times more acid that one with a pH of 6.

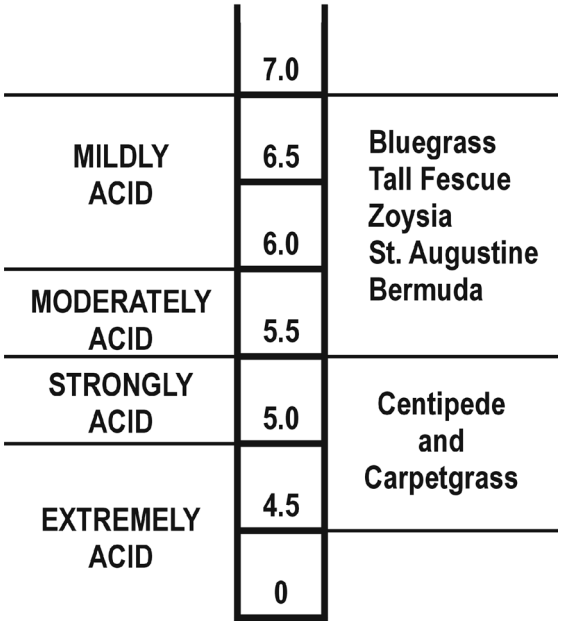


Figure 1. Soil pH and lawn grasses

Most turfgrasses grow best in soils with a pH between 6.0 and 6.5. (Figure 1) Most soils in Georgia, however, are more acid than this, and lime is often needed to obtain good grass growth (Table 2). A soil test is the best way to find your soil's lime requirements. The recommendations in Table 3 can be used in the absence of soil test information.

Table 2

Acidity of Lawns in Georgia (1984)
Soil pH Levels - %

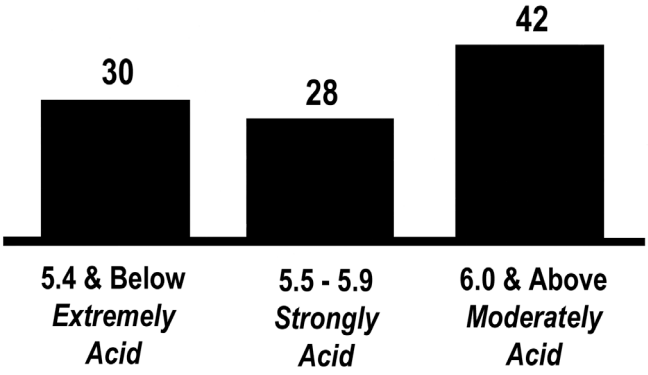


Table 3

General Lime Recommendations for Lawns[1]

Soil Type	Lbs. per 1,000 sq. ft.[2]
Sand	40
Sandy Loam	50
Clay	70
Clay Loam	70
Sandy Clay Loam	70

[1] Do not apply lime to centipedegrass lawns unless soil test results specify.
[2] Apply no more than 50 lbs. in a single application.

Soil Physical Properties

The physical condition of a soil plays an extremely important role in turfgrass growth. Soils in good physical condition contain the approximate ratio of water, air, mineral content and organic matter shown in Figure 2 (page 5). Such soils promote good, deep root development, which is needed for beginning and maintaining a healthy plant.

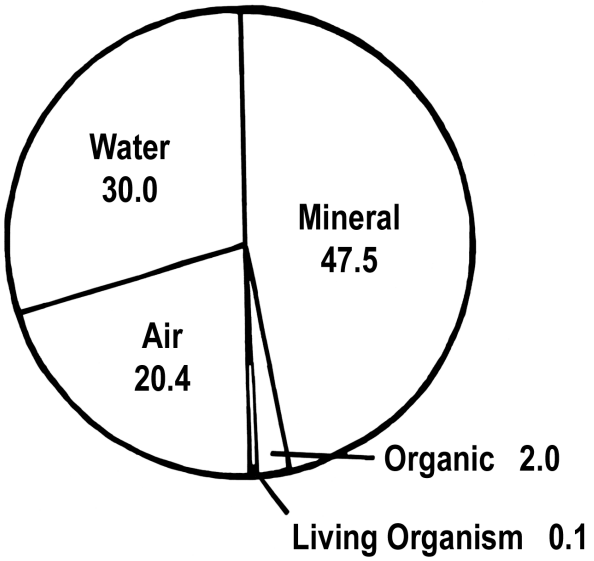


Figure 2. Average Composition of Soil

Often when a home site is graded, the topsoil is removed, leaving the clay subsoil exposed. This subsoil has a high clay content, lacks organic matter, and becomes hardened and compacted when it's dry. This is very common in the northern half of Georgia, and it is difficult to establish and maintain a lawn under these conditions. The best means of improving this problem is by cultivating the soil thoroughly to a 6-inch depth. The addition of organic matter in such soils is also beneficial.

Organic materials such as compost, well-rotted (10 years old) sawdust, decomposed leaves, grass clippings, shredded pine bark, manure or peat moss will improve a soil's physical condition and water-holding capacity. The information in Table 4 may be used as a guideline for application rates of some of these organic materials.

Table 4

Amount of Organic Matter to Add to Clay Soil

Material	Lbs. per 1,000 sq. ft.
Peat Moss	150
Rotted Sawdust	150*
Manure	200
Baled Hay	200*

* Add 2 lbs. nitrogen per 1,000 sq. ft.

It is important to remember that for a plant to use fertilizer efficiently, is must have a well-developed root system. Poor growth of lawns quite often is due to factors other than soil fertility. No amount of soil testing and fertilizer application will overcome physical problems related to the plant root system. This includes low areas in the lawn where there is excess soil moisture or compacted areas that do not allow adequate water and air movement in the soil. Soil testing and fertilizer application also cannot overcome problems associated with excess shade, thatch or improper management. Refer to Georgia Extension Service bulletin 773, *Lawns in Georgia,* and to your county extension agent for assistance with these types of problems.

Fertilizer Materials

A fertilizer is any material added to the soil that supplies elements needed for plant growth. Thus, a manure is considered a fertilizer.

A complete fertilizer is one that supplies nitrogen (N), phosphorus (P_2O_5) and potassium (K_2O). A fertilizer ratio is the ratio of the percentages of N, P_2O_5 and K_2O in a fertilizer. Examples of a 1-1-1 ratio fertilizer would be 10-10-10 and 8-8-8. An example of fertilizer with a 3-1-2 ratio would be 12-4-8. Fertilizers with the same ratio can be used interchangeably if the rate of application is altered so the correct amount is applied.

Georgia law requires fertilizer producers to display the guaranteed analysis (grade) on the fertilizer bag (Figure 3, page 6). For example, a lawn fertilizer may display a 10-10-10 analysis. The first number (10) guarantees that the fertilizer contains 10 percent nitrogen (N); the second number (10) guarantees 10 percent phosphate (P_2O_5); and the third number guarantees 10 percent potash (K_2O). The 50-pound bag of 10-10-10 lawn fertilizer contains (50 x 0.10 = 5) 5 pounds of nitrogen (N), 5 pounds of phosphate (P_2O_5) and 5 pounds of potash (K_2O) for a total of 15 pounds of nutrients. The remainder of the material in the bag — 35 pounds — is called *filler* or *carrier* or may be secondary nutrients.

For best savings, buy fertilizer for its weight of nutrients, not for its total weight. As with many other products, fertilizers generally cost more per pound in small packages than they do in large packages. To reduce fertilizer cost, determine the total amount of fertilizer needed for one season and buy this amount in the largest available package.

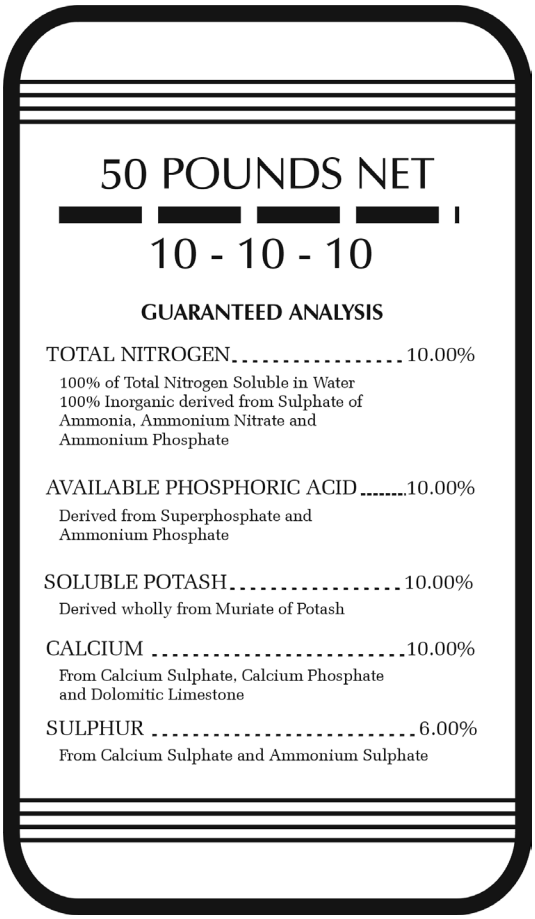


Figure 3. Fertilizer Label

Fertilizers are available in either solid or liquid, also called *fluid* or *suspension* form (Figure 4). Each form has advantages and disadvantages, but there are no major differences in the fertilizer elements in either type. One of the major considerations in fertilizer purchase should be the analysis or the content of nitrogen, phosphorus and potassium. Turfgrasses normally require nitrogen, phosphorus and potassium in a 4-1-2 or 3-1-2 ratio. This can be supplied by a 16-4-8 or 12-4-8 analysis fertilizer, but base specific needs on soil test results.

Organic fertilizers contain the element carbon and come from plant or animal material. Examples are processed sewage sludge (Milorganite), bone meal, cottonseed meal and manures.

Inorganic fertilizers are sometimes referred to as *chemical fertilizers.* They are derived primarily from chemical compounds such as ammonium nitrate, ammonium phosphates and potassium chloride. It should be understood that whether nutrients come from organic or inorganic sources, the nutrients are chemicals.

There are advantages and disadvantages to both organic and inorganic fertilizers. Plants absorb fertilizer elements primarily in the inorganic form. Elements in organic fertilizers must therefore be converted to the inorganic form before being absorbed.

Organic and inorganic fertilizers have the following advantages and disadvantages:

Organic Fertilizers

Advantages	Disadvantages
Slow release	More expensive
Small lawn burn potential	Slow response
Less subject to leaching	Low analysis

Inorganic Fertilizers

Advantages	Disadvantages
Rapid release	Greater burn potential
Less expensive	Easily leached
High analysis	

The primary advantage of organic over inorganic fertilizer is the slow release of fertilizer elements, especially nitrogen. Slow release of nitrogen results in even grass growth and reduces the possibility of leaching loss caused by heavy rains. Slow release of nitrogen also reduces the chance of foliage burn after application, but it can be a drawback when rapid growth is desired.

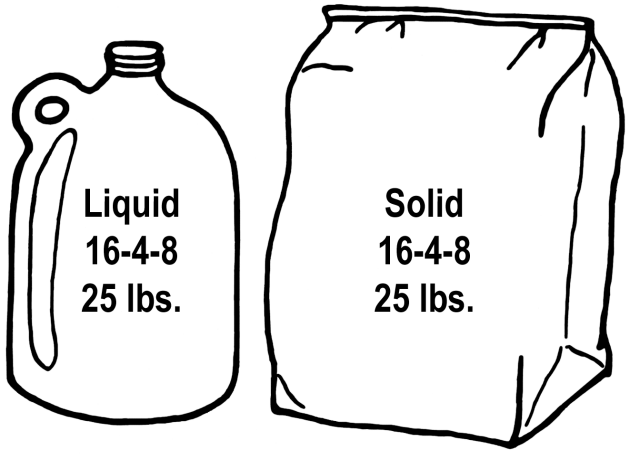


Figure 4. Liquid and Solid Fertilizers

One form of fertilizer is as good as another if both contain the same amount of plant nutrients.

Another disadvantage of organic fertilizers is that they generally cost more per unit of nutrients than inorganic forms. Most organic fertilizers are also lower in analysis than inorganic forms. In addition to increased cost per unit of nutrient, more labor and time are required to apply a given amount of nutrients using organic fertilizers. For these reasons, organic fertilizers make up a small portion of fertilizers.

Synthetic slow release nitrogen materials have the advantages of organic fertilizer's slow nitrogen release with the high nutrient content (30-38% N) of inorganic fertilizers. These materials are less subject to leaching, have low burn potential and can be applied at relatively high rates. Some disadvantages of these materials are that they are more expensive per unit of nitrogen, they have a slow response, and the rate of nitrogen release is dependent on water solubility or microbial breakdown.

Some of the more common slow release nitrogen materials are methylene ureas, isobutylidene diurea (IBDU), urea formaldehyde (UF) and sulphur coated urea (SCU). Generally, one slow release nitrogen material is as good as another for most lawn situations. For intensively managed turf, however, characteristics of the individual materials may make a difference and should be considered.

Calculating Lawn Areas

Lawn fertilizer recommendations are generally made in pounds per 1,000 square feet of lawn area.

The square footage of a lawn area can be easily calculated. Simply walk off the length and then the width of the yard, taking 3-foot steps. Multiply the total number of steps in each dimension by 3. Then multiply the length times the width of the yard. Remember to deduct areas such as driveways and home area (Figure 5).

Fertilizer Calculations

If a recommendation requires a complete fertilizer, any complete fertilizer of the same ratio can be used. *Example:*

(1) 10-10-10 (1-1-1 ratio) can be used for 8-8-8.

(2) 5-10-15 (1-2-3 ratio) can be used for 7-14-21.

A common recommendation for turfgrasses is to apply 1 pound of nitrogen (N) per 1,000 square feet. To determine how many pounds of fertilizer it would take to supply 1 pound of N, divide the percent nitrogen of the fertilizer into 100. (Note: This is only true when working on a 1,000 square foot basis.)

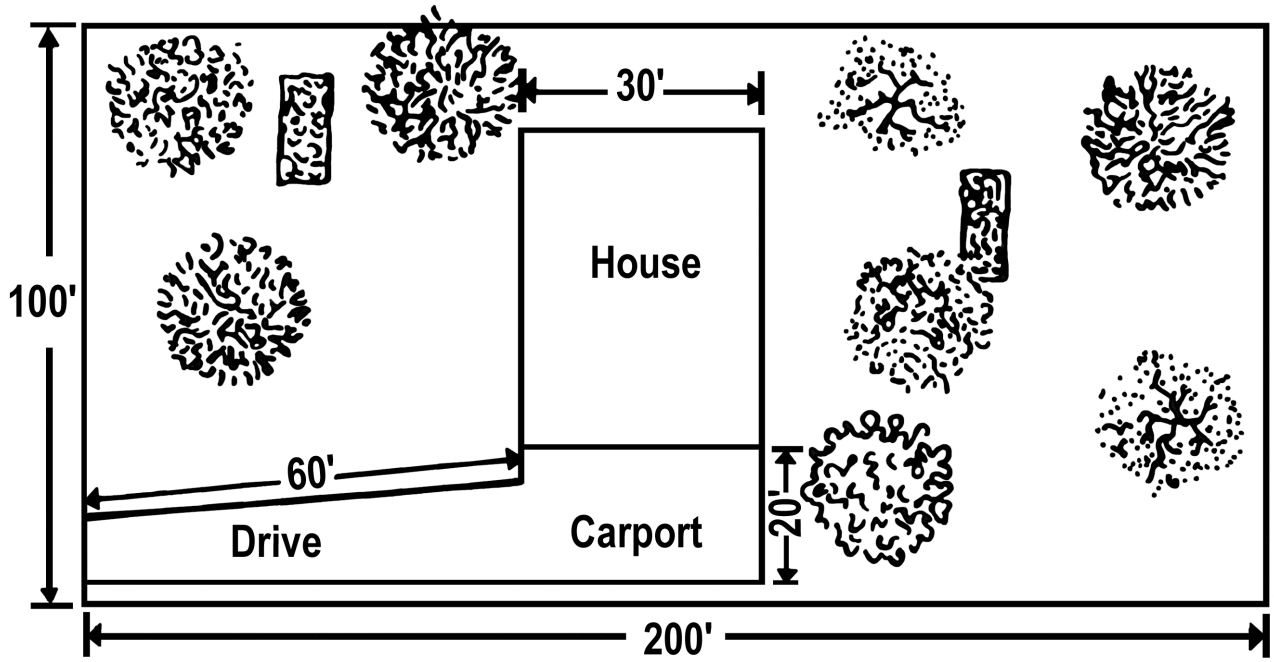


Figure 5. Determining lawn area

Total Area — 20,000 sq. ft. (100 x 200)
5,000 sq. ft. (house, trees, etc.)
15,000 sq. ft. lawn area

Examples: How many pounds of (1) 10-10-10; (2) 12-4-8; (3) 5-10-15; and (4) 16-4-8 are needed to apply 1 pound of N per 1,000 square feet.

(1) $\frac{100}{10}$ = 10 lbs. of 10-10-10

(2) $\frac{100}{12}$ = 8.3 lbs. of 12-4-8

(3) $\frac{100}{5}$ = 20 lbs. of 5-10-15

(4) $\frac{100}{16}$ = 6.3 lbs. of 16-4-8

In cases where you are substituting complete fertilizers of different ratios, the application rate should be based on the amount of that fertilizer needed to supply the recommended amount of nitrogen. Thus, all of the above fertilizers would supply 1 pound of nitrogen at those calculated rates.

This same calculation can be applied to other fertilizer materials.

Examples:

(1) Ammonium nitrate (33% N)
$\frac{100}{33}$ = 3 lbs. of ammonium nitrate will supply 1 lb. N

(2) 20% superphosphate (P_2O_5)
$\frac{100}{20}$ = 5 lbs. of superphosphate will supply 1 lb. P_2O_5.

These rates can be converted to a per-acre basis by multiplying by 43.5. Per-acre rates can likewise be converted to per-1,000 square feet by dividing by 43.5.

Examples:

(1) 10 pounds of 10-10-10 per 1,000 square feet equals 10 x 43.5 = 435 pounds per acre.

(2) 435 pounds of 10-10-10 per acre equals 435 divided by 43.5 = 10 pounds per 1,000 square feet.

Specialty Products

Specialty fertilizers are produced for particular situations. These products are usually good if used according to directions on their labels. Generally, they cost more than ordinary commercial fertilizers of the same grade.

Many fertilizer-pesticide combinations, especially those containing herbicides, are available to homeowners. Some problems associated with fertilizer-herbicide materials include:

(1) Chemicals are often applied that would normally be used less frequently or not at all. One example is applying a material with spring weed killer in the fall.
(2) Often application is made based on pesticide needs and not nutrient needs.
(3) The material is limited to a specific use.

There are potential problems when applying these materials. They are convenient and may be effective, but proper handling is very important.

Lawn Requirements and Recommendations

Proper material for your lawn must be applied at the correct rate and at the right time. This treatment depends on soil test results, grass species, environmental conditions and mowing practices. Soil tests provide information on the pH and nutrient status of soils as well as recommendations for fertilizer and lime applications.

The grass species differ in fertilizer needs. Generally, in Georgia, turfgrasses need the following amounts of nitrogen.

Grass	**Total Nitrogen** (lbs/1,000 sq. ft.)
Hybrid bermuda	2-5
Centipede	0-2
Common bermuda	2-5
St. Augustine	2-4
Seashore paspalum	2-4
Zoysia	1-2
Tall Fescue	2-5

Excess nitrogen will increase stem and leaf growth, which means more mowing. It also increases water requirements, thatch formation, and possibly insect and disease problems.

Environmental conditions such as rainfall, soil type and shade also affect fertilization practices. Lawns receiving high rainfall or irrigation will need more nitrogen. Moderately to heavily shaded areas should receive only half as much fertilizer as areas in full sunlight.

An additional fertilizer application per year will be needed if grass clippings are removed during mowing. This is required because the clippings contain plant nutrients that would otherwise be recycled into the soil.

Remember the following points when applying fertilizer:

- Fertilize when the grass leaves are dry to reduce the possibility of leaf burn.
- Water the fertilizer in thoroughly after application (¼ inch of water).
- Use a mechanical spreader and apply the fertilizer evenly. Divide the fertilizer in two equal parts and spread in two directions at right angles to each other.

The following lawn fertilizer recommendations are expressed as pounds per 1,000 square feet of lawn. Other fertilizer analyses may be substituted for the one suggested. As previously explained, however, the amount per 1,000 square feet should be increased or decreased depending on the fertilizer analysis. The recommendations in Table 5 are for newly established lawns.

Minimum and optimum rates of fertilizer and lime for established lawns are shown in Table 6 (page 10). Use the high rates when a lush green lawn is desired and the low rates when minimal maintenance, particularly less mowing of the lawn, is desired. Fertilizers with slow release nitrogen should be used according to label recommendations.

Table 5

Fertilizer and Lime Suggestions for New Lawns

Grass	Fertilization			Lime	
	Analysis**	Rate - lbs. per 1,000 sq. ft.	Time of Application	Rate - lbs. per 1,000 sq. ft.	Time of Application
Bermudas, Zoysia & St. Augustine	10-10-10	15	At planting.	50	At planting.
	16-4-8	5	Apply at monthly intervals*		
Tall Fescue	10-10-10	15	At planting.	50	At planting.
Centipede	10-10-10	10	At planting or one month after. Apply one application in mid-summer		
	10-10-10	5			

* Make these applications until the turf completely covers, with the last application being made 30 to 45 days before the normal first killing frost.

** Example fertilizer grades.

Table 6

Fertilizer and Lime Suggestions for Established Lawns

Grass Species	Fertilization						Lime Requirements	
	Optimum Maintenance			Low Maintenance				
	Analysis***	Rate - lbs. per 1,000 sq. ft.	Time of Application	Analysis	Rate - lbs. per 1,000 sq. ft.	Time of Application	Rate - lbs. per 1,000 sq. ft.	Time of Application
Hybrid Bermudas	16-4-8	6	Early spring* and at monthly intervals**	16-4-8	6	Early spring* and every 8 weeks**	30-50	Any time during growing season
Common Bermuda, St. Augustine & Zoysia	16-4-8	6	Early spring* and at 8-week intervals**	16-4-8	6	Early spring* and again in mid-summer	15-25	Any time during growing season
Fescue & Bluegrass	16-4-8	6	Early fall and Early spring*	16-4-8	10	Early fall and Early spring*	20-30	Any time during growing season
Centipede	12-4-8	5 5	After spring greenup and again in mid-summer	Fertilize every other year				

* "Early spring" refers to the time when the grass begins to turn green and grow again.

** These applications should be made during the growing season with the last application being applied 30 to 45 days before the normal first killing frost.

*** Example fertilizer grades.

When you have a question ...

Call or visit your local office of The University of Georgia's Cooperative Extension Service.

You'll find a friendly, well-trained staff ready to help you with information, advice and free publications covering agriculture and natural resources, family and consumer sciences, 4–H and youth development, and rural and community development.

The University of Georgia and Ft. Valley State University, the U.S. Department of Agriculture and counties of the state cooperating. The Cooperative Extension Service, the University of Georgia College of Agricultural and Environmental Sciences offers educational programs, assistance and materials to all people without regard to race, color, national origin, age, sex or disability.

An Equal Opportunity Employer/Affirmative Action Organization
Committed to a Diverse Work Force

Bulletin 710 Reprinted May, 2002

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, The University of Georgia College of Agricultural and Environmental Sciences and the U.S. Department of Agriculture cooperating.

Gale A. Buchanan, Dean and Director