

Connecticut Agricultural Experiment Station  
New Haven

LAWN FERTILIZATION  
Principles and Practice

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FIGURE 6. No home is complete without a well-fed lawn.

During the past few years numerous new fertilizer materials and formulas have appeared on the market, and there is much interest as to their proper place and correct use in lawn building and maintenance. This circular presents a few helpful suggestions in regard to the various types of fertilizers and manures.

**Lawn Turf Types**

First, it is necessary to consider the character of turf upon which the fertilizer is to be used.

If the sod is very sparse, and is badly infested with weeds or crab grass, good results cannot be expected. Applying

fertilizer under such conditions merely feeds the weeds and makes them grow faster. The renovation of a badly-run-out, weed-infested lawn is slow, expensive and frequently disappointing. Undoubtedly the best thing in almost all such cases is to spade or plow the soil in early summer, rake it frequently for several weeks to destroy germinating weed seeds, then fertilize liberally, and re-seed with a high-grade grass mixture about the first of September.

If the sod is composed largely of blue grass and white clover, and if dandelions, chickweed and plantain are the chief weeds to be observed in the lawn, the soil is apt to be sweet (not noticeably acid in reaction). Many people prefer a blue-grass-white clover lawn. In order to keep it at its best, lime should be applied every four or five years at the rate of 50 to 100 pounds per 1,000 square feet, and good results are obtained from all fertilizers that have an alkaline tendency.

If the sod is made up of slender and pointed leaved grasses with white clover practically absent and with crab grass and moss the most serious pests, the soil is probably acid. Under such conditions, it is not desirable to lime, since these grasses are tolerant of soil acidity, and liming would encourage weeds and coarsen the quality of the turf. Fertilizers with an acid tendency, particularly sulfate of ammonia, find their greatest usefulness on such a lawn.

#### Measurement of the Lawn Area

The quantity of fertilizer, manure or other soil amendment to be used must be based on an accurate measurement of the actual lawn area. In most cases this is not difficult, since the average lawn is usually laid out in two or more rectangular sections for which the area, in square feet, is the product of length and breadth, in feet. *Unless otherwise specified all recommendations in this circular are based upon a unit area of 1,000 square feet.* This is the equivalent of a strip of lawn 50 feet long and 20 feet wide.

#### Keeping up the Humus Supply

Lawn soils must contain a good amount of organic matter. Many sandy soils in this region need more humus to increase their water-holding capacity. Frequently the top soil is very thin, especially where much grading was done before building the lawn. Chemical fertilizers nourish the grass but do not add organic matter directly to the soil. However, by stimulating plant growth, they add larger organic residues to the soil in the form of clippings, winter-killed leaves and slough-

ings from the roots. This is adequate to maintain a good humus supply in the soil, if conditions are already favorable, but it fails on humus-poor soils because the fertilizers never have a chance to develop a thick turf.

**Manures** are chiefly valuable for their humus contributions to the soil. Stable manure is excellent if it has been well rotted for at least two years and if it is mellow and free from lumps or undecomposed straw. Fresh stable manure should never be used on a lawn, since it is full of weed seeds, and disagreeable to handle, and the lumps smother the grass, which makes a "patchy" lawn. Well-rotted stable manure at the rate of about one cubic yard (about 1,000 pounds) per 5,000 square feet, is best applied in the late fall or very early in the spring.

**Pulverized sheep manure** is a material of excellent mechanical condition and is free from weed seeds. It contains a considerable amount of available nitrogen and potash, but it is too expensive to use as a fertilizer unless the soil is especially lacking in humus. It can be safely applied in the early spring at the rate of 100 pounds followed by a midsummer application of 50 pounds. Poultry manure may be similarly used, although it is apt to contain weed seeds unless it has been thoroughly sterilized. Special poultry manure preparations that are satisfactory in this respect are on the market. Dried cow manure is now being sold, and may be used instead of poultry manure.

**Dried and granulated peat moss** is excellent for improving the humus conditions of the soil, especially during lawn building. It is also valuable as a top dressing. One bale, containing about eight bushels, is sufficient for about 400 square feet, and should be applied in the late fall. When one considers that this amount of peat moss will absorb nearly 200 gallons of water, its value for this purpose is readily perceived.

**Commercial humus soil**, reclaimed from muck deposits and forest leaf mold, are now being marketed extensively. They are in excellent mechanical condition for immediate application at any time as a top dressing in the renovation of old lawns that are low in humus. It should be used at the rate of one-half ton per unit area. However, these materials may contain high percentages of water, and their use is quite expensive, especially when one has to pay the freight for long distances.

**Compost** is almost invaluable for maintaining lawns of the highest quality. A compost heap is prepared by piling alternate layers of four inches of the best garden soil obtainable and two inches of well-rotted stable manure, peat-moss, commercial humus, muck, or other organic material. The heap should be flat-topped and about three feet high. It should

be permitted to rot for at least six months, and should be kept moist at all times. After passing the material through a coarse screen, it may be mixed with the chemical fertilizers that are to be used. One cubic yard of the compost is sufficient for about 5,000 square feet of lawn, and should be used in early spring and at least once during the summer. After spreading it should be brushed into the grass to settle it around the roots. A simple substitute for compost is furnished by mixing two parts of moist garden loam with one part of peat-moss. This can be used at once, in the same quantity as for regular compost, and may be supplemented with fertilizer if desired.

**Artificial manure** that is an excellent substitute for well-rotted stable manure can be prepared from straw, leaves or other plant refuse, by the use of a commercial reagent which hastens the decomposition of the organic materials by furnishing favorable conditions for the organisms that effect the rotting process. The success of this method depends upon one's ability to keep the pile of material thoroughly moist for from four to six months' time. The resulting product may be used on lawns in the place of well-rotted stable manure, or may be mixed with soil and used as a compost top dressing.

### Fertilizer Principles

Fertilizers are useful primarily for the plant nutrients which they contain. The three essential ingredients which must be supplied in well-balanced fertilization are nitrogen, phosphoric acid and potash, since all three of these essentials are often lacking in most soils of this region.

**Nitrogen** is the most important element in lawn fertilization, since its use produces the most marked growth response and the dark green color so necessary to a well-kept lawn. Nitrogen is supplied in fertilizers in three different forms: organic compounds, ammonia, and nitrates. The first of these is not immediately available to the plant, but becomes so as a result of the activities of microscopic organisms contained in the soil. Ammonia nitrogen is more or less available to the plant as such, but is chiefly transformed into the nitrate form by nitrifying bacteria before it is actually taken up by the plant. Ammonia nitrogen is not readily leached from the soil until this transformation takes place. Nitrates are immediately available to the plant, undergo no change in the soil, and are readily leached down below the zone of root action when heavy rains occur.

**Phosphoric acid** is not an acid in the true sense, but is a widely used term to designate the phosphorus-supplying

ingredients in the fertilizer. Phosphoric acid is quite deficient in most soils which have not been heavily fertilized in the past. It is essential to good root development and for the normal maturity of the plant. It is retained in the soil against leaching, and if applied in liberal quantities it produces a marked cumulative effect.

**Potash** is essential to normal health and vigor in the plant. Many of our soils, although they contain immense quanti-



FIGURE 7. Fine-textured bent-grass turf, on acid soil (right) and coarse-textured blue-grass turf on limed soil (left).

ties of potash in the soil minerals, are unable to supply a sufficient available amount of this nutrient. Potash is particularly stimulating to the growth of white clover.

### Organic Fertilizer Materials

Natural organic fertilizers have always found favor in lawn fertilization, since they may be applied in liberal amounts without burning the grass. The nitrogen that they contain is not readily leached from the soil and becomes available more gradually than is the case with many chemical fertilizers. All of the following materials are used at the rate of 25 to 35 pounds per unit area.

**Bone meal** is a great favorite among gardeners. It contains about 3 per cent of nitrogen and 22 per cent of phosphoric acid. When used on the lawn, it should be considered primarily as a source of phosphoric acid, and should be supplemented with fertilizer materials containing nitrogen and potash. If it has been used liberally in the past, it may not be needed more than once every three or four years, since phosphoric acid applied in the fertilizer does not leach from the soil.

**Cottonseed meal** and **castor pomace** have been used successfully on lawns, and are valuable primarily as sources of nitrogen, of which the former contains about 6.5 per cent and the latter 4.5 per cent. They should be spread carefully, since lumps of the material may cause some injury to the foliage under them.

**Animal tankage** contains from 5 to 7 per cent nitrogen and from 10 to 20 per cent phosphoric acid. It is a fairly well-balanced fertilizer in respect to these two nutrients, but it should be supplemented with some potash carrier. Tankage is used at the rate of about 30 pounds per 1,000 square feet.

**Milorganite** is the commercial name for the product of a special process in reclaiming sewage wastes. It contains 5 per cent of nitrogen and 2 per cent of available phosphoric acid, is in ideal physical condition for safe application to lawns, and is a popular golf course fertilizer.

**Ground tobacco stems** contain about 1.2 per cent nitrogen, 0.6 per cent phosphoric acid and 5 per cent potash. This material is an excellent source of potash.

#### Chemical Fertilizer Materials

**Sulfate of ammonia**, containing about 20 per cent nitrogen, is an extremely valuable source of this element, especially on acid-soil types of lawn sods. Its use has been shown to discourage the growth of many troublesome weeds, it does not readily leach from the soil, and it promotes a rapid growth of grass in a short time after application. This material is a fairly concentrated fertilizer, and it should never be applied at a rate exceeding four pounds per 1,000 square feet. In the early spring this amount may be used, but for summer use to maintain vigorous growth, the application should not exceed two pounds. It is best to mix it with compost or soil before spreading. On small areas sulfate of ammonia may be dissolved in water and applied from a sprinkling can. Heavy watering after the application of sulfate of ammonia is a good precaution.

**Nitrate of soda** contains about 15 per cent nitrogen, all of

which is immediately available to the plant. Its use has an alkaline tendency, and is best made on blue-grass-white clover lawns. It may be applied in the early spring at the rate of five pounds per 1,000 square feet and in the summer about half this amount should be used at one time. The same precautions in method of application as for sulfate of ammonia should be taken.

**Nitrate of lime** (calcium nitrate) is similar in properties to nitrate of soda, and contains the same amount of nitrogen. It furnishes nitrate to the plant in the form that is most commonly produced by normal soil processes. However, it absorbs moisture readily and may become unfit for future use if not applied soon after purchase.

**Urea** (floraid) is a highly concentrated and rapidly available synthetic organic compound containing 46 per cent of nitrogen. One should never use more than two pounds per 1,000 square feet, and only half this amount may be safely used after the grass is well started. Consequently it must always be mixed with soil, sand, compost or water before applying.

**Calurea** is a mixture of nitrate of lime and urea, containing 34 per cent of nitrogen. The maximum safe rate of application is about three pounds per 1,000 square feet.

**Cal-nitro** is a synthetic compound containing nitrate and ammonia nitrogen in equal proportions, and is of the same degree of concentration as sulfate of ammonia. It may be safely used in the same manner. Freshly opened bags contain the material in ideal mechanical condition for spreading and it may be "sown" over the surface like grass seed. Unless stored in a very dry place it rapidly loses this property.

**Ammophos** is supplied in two different formulas: "A", containing 11 per cent nitrogen and 46 per cent phosphoric acid, and "B" with 16.5 per cent nitrogen and 20 per cent phosphoric acid. In both materials all the nitrogen is in the form of ammonia. Properly supplementing them with a fertilizer that furnishes potash results in a fairly well-balanced fertilization program. The former is to be preferred on very poor soils, while the latter is more useful on soils in a good state of fertility. They result in a somewhat increased acidity in the soil. The safe rate of application is from 4 to 5 pounds. They are supplied in an ideal mechanical condition for "sowing" over the lawn.

**Superphosphate**, usually containing about 16 per cent of available phosphoric acid, is one of the cheapest and most satisfactory sources of this plant nutrient. It may be used alone at the rate of from 7 to 10 pounds every two or three years, or may be used annually at the rate of two to five pounds in mixtures with sources of nitrogen and potash.

Superphosphate is to be preferred to bone meal as a source of phosphoric acid on acid-soil types of lawns.

**Muriate of potash** is the most common material that supplies potash, and contains about 50 per cent of that nutrient. It is rarely used alone, but is best applied in mixtures with materials supplying nitrogen and phosphoric acid. The use of two pounds per unit area is ample for most soils in this region. **Sulfate of potash** is of similar concentration and may be used in the same manner.

**Wood ashes** are an excellent source of potash for blue-grass-white clover lawns, since they contain much lime. The potash content ranges from two to eight per cent. The ashes may be applied at rates up to 10 pounds per unit area.

### Complete Fertilizers

Many persons prefer to use a single material that supplies all the nutrient requirements of the plant. At the present time there are complete fertilizers on the market especially designed for use on lawns, or widely advertised for this purpose. These vary widely in concentration and in the proportions of the various nutrients. Table 1 gives the guaranteed analyses of a list of such fertilizers sampled in 1930 and reported in Bulletin 321 of this Station. Since these vary widely in concentration, the safe rates of spring application per unit area for established lawns are also presented in the table.

TABLE 1. ANALYSES AND RATES OF APPLICATION OF COMPLETE COMMERCIAL FERTILIZERS FOR LAWNS

| Station sample number              | Nitrogen<br>%     | Phosphoric<br>acid<br>% | Potash<br>% | Safe limit<br>for top dress-<br>ing—pounds<br>per 1,000 sq. ft. |
|------------------------------------|-------------------|-------------------------|-------------|---|
| 3943 .....                         | 4                 | 12                      | 4           | 25  |
| 3991 .....                         | 5                 | 8                       | 5           | 25  |
| 3908, 4174 .....                   | 6 <sup>1</sup>    | 6                       | 4           | 25  |
| 4405 .....                         | 5                 | 10                      | 4           | 20  |
| 3965 .....                         | 5                 | 13                      | 4           | 20  |
| 4066, 4094, 4250, 4401, 4641, 4739 | 7 <sup>1</sup>    | 6                       | 5           | 18  |
| 3951 .....                         | 7.5 <sup>1</sup>  | 2                       | 4.5         | 18  |
| 4228, 4335, 4473, 4488, 4506, 4570 | 8 <sup>1</sup>    | 6                       | 6           | 15  |
| 3496 .....                         | 10 <sup>1</sup>   | 3                       | 8           | 12  |
| 4031 .....                         | 10 <sup>1</sup>   | 3.5                     | 8           | 12  |
| 3958 .....                         | 16 <sup>1</sup>   | 5                       | 5           | 6   |
| 3978 .....                         | 18.2 <sup>1</sup> | 30                      | 15          | 5   |

Many other lawn fertilizers are constantly appearing on the market, hence the above list rapidly ceases to be complete. It must be kept in mind that every 1,000 square feet of lawn should be fed

<sup>1</sup> Percentage of ammonia, equivalent to 1.2 times percentage of nitrogen.

an average annual dose of from one and one-half to two and a half pounds of nitrogen, from one to three pounds of phosphoric acid, and from one to two pounds of potash. If the complete fertilizer is so concentrated that these amounts cannot be safely applied in one application, subsequent smaller treatments should be made.

### A Simple Program for Lawn Fertilization

As a consequence of the wide variety of fertilizers now offered on the market many persons are confused as to a proper choice. All of the above materials are good if they are properly used in suitable amounts and proportions and we are not in a position to assign a superior merit to any one of them. But we have many requests for some simple, cheap and comparatively safe method of treatment. The following plan is one that meets these requirements.

As soon as the frost is out of the ground (usually early in April) mix the fertilizer thoroughly and apply it in these amounts per unit area:

|                          |          |
|--------------------------|----------|
| Sulfate of ammonia ..... | 4 pounds |
| Superphosphate .....     | 4 pounds |
| Muriate of potash .....  | 2 pounds |

The materials can be obtained at almost any seed or farm supply store. If possible mix them with five to six cubic feet of compost. Otherwise use dry sand or loam in five times the weight of the fertilizer. Scatter this uniformly over the lawn. If an especially vigorous growth is desired, apply with a sprinkling can two pounds of sulfate of ammonia dissolved in 10 gallons of water twice during the summer after the foliage has lost its dark green color. Exercise special care to spread these applications evenly, for fertilizer is apt to burn grass in this stage of growth.