

CHAPTER IV

MANURES, COMPOSTS, AND OTHER HUMOUS MATERIALS

A VERY important factor in maintaining the fertility of a soil is the upkeep of its humus content. Organic matter in the soil has many functions that cannot be performed by other fertilizing substances. It improves the texture of the soil and betters aëration, water-holding capacity, and drainage. In addition, it furnishes material by means of which beneficial soil organisms may promote nitrification and produce other important biological changes.

By the proper use of suitable organic matter, a high degree of fertility can be maintained indefinitely. This cannot be said of mineral fertilizers, no matter how liberally or wisely they may be used. First-class permanent turf can be had only on soils that are well supplied with humus, or decayed vegetable matter. There are many forms of organic matter that can be used advantageously

on putting-greens if properly prepared. Barnyard manure, good compost of various kinds, and peats or mucks are all suitable, and one or more of these substances is available to every club in the country.

Barnyard manure.

Barnyard manure is the most commonly used humous dressing; not that it is ideal, but because it possesses qualities that are not found in other humous materials. The chief objections to its use as a top-dressing for putting-greens are that it ordinarily is too coarse, and that it is a carrier of weed seeds. These objections can be obviated, but unless they are overcome they are decidedly serious. While manure offers the most value as a fertilizer in a fresh condition, it should be thoroughly rotted when used as a dressing for greens. If well-rotted, most of the weed seeds are killed and the material is much more easily comminuted. The practice of applying coarse manure to fine turf in the fall and winter, and raking off the coarse material in the spring, cannot be recommended, but a liberal dressing of well-rotted and pulverized manure in the fall, winter, or early spring can result only in benefiting the grass.

The question is commonly asked, When may

manure be said to be well-rotted, and how long must it remain in a pile or pit before the weed seeds in it are killed? As concerns its texture, manure is well-rotted when it breaks up readily upon being worked over with a fork or mixer, and when so handled is reduced to a quite uniform consistency. The quantity of straw or litter in the manure, and the conditions under which it is composted, have much to do with the period required for decomposition.

As for the length of time required to destroy weed seeds, the evidence is not very definite. Some critical investigations that have been conducted recently indicate that one year is sufficient to kill all common weed seeds, and only half a year to devitalize a large percentage of them. Experience, however, indicates that it is neither safe nor desirable to use manure that has been composted for less than one year, and composting for two years is preferable. With proper planning, a supply of thoroughly rotted manure can be had at all times.

Powdered sheep manure.

When sheep are fed for some time in small inclosures, large quantities of manure—which is composed almost exclusively of the solid excre-

ment from the animals — accumulate. This material is sometimes dried, pulverized, and placed on the market in bags, and is subject to the same regulations as other commercial fertilizers. Powdered sheep manure has some advantages over ordinary barnyard manure, since it appears in a good mechanical condition and is free from weed seeds. However, it seems to lack the strength or substance necessary to make it always effective, and it is too expensive for the results which it produces to be used economically on putting-greens.

Mushroom soil.

Mushrooms for market are usually grown in cellars or caves, upon soils that are composed very largely of manure from horse stables. After the soil has been in use for one year it is no longer suitable for mushroom-culture, and is consequently replaced by a fresh supply. This partially exhausted material makes a very satisfactory humous dressing for turf. It is sufficiently decomposed to break up into the proper degree of fineness, and contains few, if any, viable weed seeds. While it varies considerably in quality, it can be purchased cheaply, and is highly recommended for use on putting-greens when properly comminuted.

Compost and composting.

The term compost has at times been applied to all mixtures used as fertilizers. At the present time, however, it is restricted by common usage to mixtures of sod, manure, leaf-mold, peat, lime, and various other substances that have been placed in piles or pits to promote decomposition. Compost is used extensively by gardeners and florists, and is their most common form of humus. As prepared by them, sod is its principal constituent, leaves, leaf-mold, and manure making up varying proportions as their needs may require, or as these materials are available. As a dressing for turf, a good compost can be prepared by piling sod in alternate layers with manure, leaves, and leaf-mold. To this mixture, or any similar mixture, lime in some form, preferably pulverized limestone, should be added. Regardless of the kind of grass to which the compost is to be applied, lime is very necessary in the preparation of compost. It has an important function in reducing the raw vegetable matter to a suitable form of humus by neutralizing the organic acids that develop and by promoting bacterial activity. In making compost, 100 pounds of pulverized lime should be used to each ton of

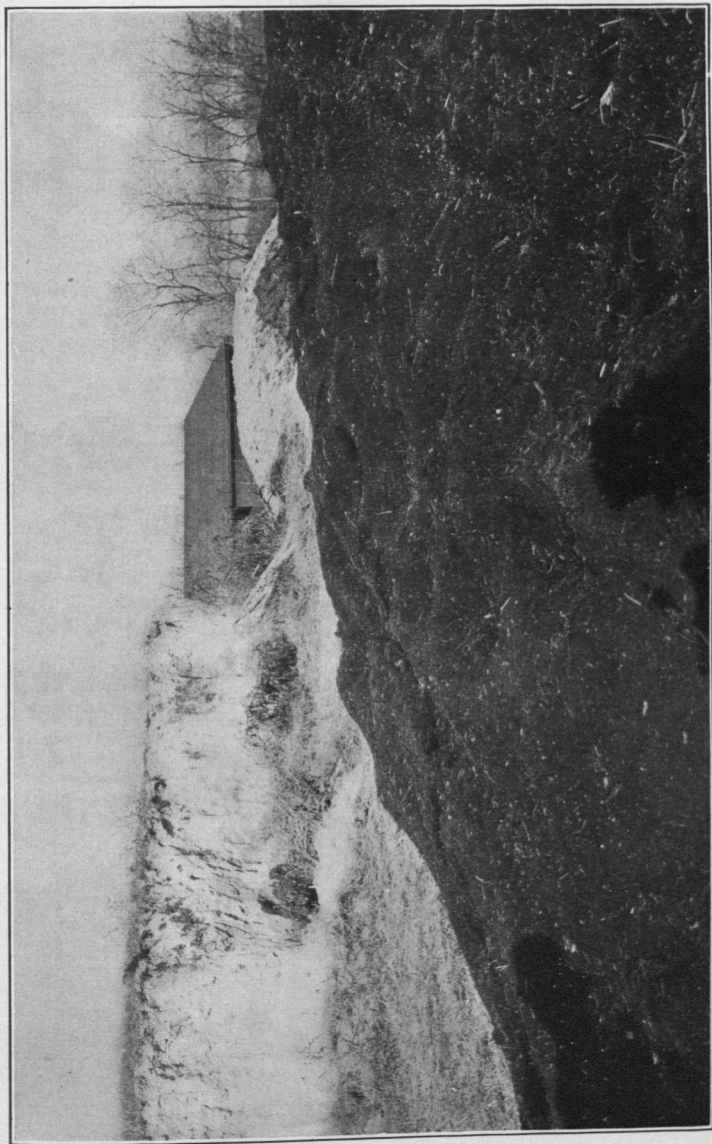


PLATE III. — Compost. The pile on the left is sod and manure in alternate layers 1 year old; the dark pile on the right is New Jersey muck. By the use of the machine shown in Plate IV, these two may be intimately mixed.

vegetable matter. If a considerable quantity of green vegetable matter is present, hydrated lime is preferable to pulverized limestone. There should be at least some manure in every compost pile, if for no other reason than because of the bacteria and other beneficial organisms which it introduces.

How long compost should remain in the pile before being used depends, to a very large degree, on the nature of the materials entering into it. Sod, leaf-mold, and manure will reach a very satisfactory degree of decomposition in one year if properly mixed. Six months' time is frequently sufficient to bring about the decomposition of green vegetable matter. There are no accurate data on the length of time required, and, therefore, the only safe course is to provide favorable conditions for decomposition and to allow as much time as possible. Even well-rotted compost should be screened to remove the coarse material and thoroughly mixed and comminuted before being used. Compost prepared in this way is so valuable, and at the same time relatively so cheap, that every club should see to it that an adequate supply is available at all times for use on its course. With a little attention, a good quality of manure

can be obtained, and it is entirely practicable to produce sod on unused portions of the club's grounds for composting purposes. (Plates III and IV.)

Leaf-mold.

In its untreated state leaf-mold, which is usually composed of leaves, twigs, roots, and similar vegetable matter in various stages of decomposition, is not a suitable form of humus for putting-greens. In fact, such material should be used only in the making of composts, or at least should be treated with lime before being used. Although leaves contain considerable quantities of lime, their partial decomposition produces an acid condition in the soil, and it is not until they are almost completely decomposed that they produce an alkaline reaction. When composted with lime, and also preferably with manure and sod, leaves and leaf-mold can be converted into a very useful form of humus.

Peat.

Peat is the remains of plants that have been decomposed, or at least partially so, in water. The consistency of peat varies from scums or slime to solid substances, in which the texture of the plants has almost, if not quite, disappeared. When peat

occurs naturally in a granular condition, it is usually called muck (Plate II), and all so-called muck soils are of peat origin. Peat is found in large deposits in many parts of the country, and its various forms have been the subject of investigations from an agricultural standpoint for centuries. Peat in the form of muck is a very valuable form of humus if properly utilized. It has a high water-holding capacity, and when incorporated with the soil it improves the texture and performs other important functions. Furthermore, it is of the proper consistency for application as a top-dressing, and is free from weed seeds. In its natural condition, however, it is seldom that muck is suitable either as a top-dressing for turf, or for mixing with the soil, since in some cases it contains a high percentage of salts that are injurious to grass, while in other cases it is highly acid in its reaction.

Recently in this country, muck, both in a treated and untreated form, has been placed on the market as humus under various trade names. Some of these commercial products are very crude, and it is doubtful whether their use can be recommended, especially from the standpoint of economy. Investigations show quite clearly that muck should

be thoroughly aërated by frequent stirring for a long period prior to use, and thoroughly leached by exposure to the weather under conditions of good drainage. This treatment greatly improves its value. It frequently has been recommended that muck be composted with lime and manure in order to hasten fermentation, since it is almost devoid of organisms that promote decay.

As a result of the work of an English investigator, there has been placed on the market recently a form of peat or muck inoculated with active cultures of nitrogen-fixing bacteria. It is claimed that this greatly increases its value by adding active nitrogen-fixing organisms to the soil under suitable conditions for nitrogen fixation, and in stimulating the nitrogen fixers already in the soil. Peat, treated according to this method, has not been tested extensively in this country, but it is reasonable to believe that almost equally good results can be obtained by composting it with a good quality of manure. Some American firms farm their peat beds for a year or two, then dry the muck, and mix it with other fertilizing ingredients, so that when placed on the market it is a standardized product. This treatment doubtless improves its

quality, but adds greatly to the cost. While properly prepared peat has many advantages for use on putting-greens, it frequently is so expensive that it cannot be applied economically. It is, therefore, always well to consider it in comparison with barnyard manure, which is a standard humous material. On the basis of a large number of analyses, it is estimated that in fertilizing constituents one cord or three tons of manure is equal to three and a half cords of muck, while on the basis of organic matter one cord of manure is equal to one and one-half cords of muck. A comparison of manure with air or kiln-dried muck would appear more favorably for the latter. From the above figures, it appears perfectly evident that a golf club is not justified in paying a high price for raw, wet muck when a better grade of humus can be had from properly composted manure, or mushroom soil. If a deposit of peat or muck is available to the club, it can be used very profitably. No matter in what form, or from what source obtained, muck should be mixed with sand or loam before being applied as a top-dressing to turf, and afterwards wetted thoroughly; otherwise, it will blow away upon becoming dry.

Street sweepings.

The conflicting results that have been obtained from the use of street sweepings as a fertilizer are probably due to the nature of the streets from which they were obtained. In times past street sweepings were recommended highly on account of their quick action, but of recent years sweepings from asphalt and other modern pavements have been considered even harmful to vegetation. Actual experiments have shown them to have a toxic effect on turf, and it therefore seems advisable to warn against their use on putting-greens.

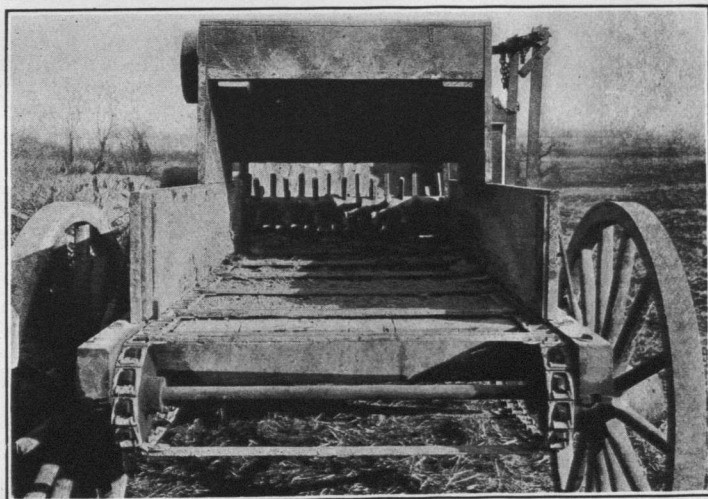


PLATE IV. — Upper. Compost pile. This is made up of alternate layers of sod and manure each about 6 inches thick; a small amount of lime is scattered on top of each layer of sod. The pile should be allowed to stand for at least 12 months before using. The horse-drawn machine is for mixing and pulverizing the material.

Lower. Rear view of the machine for pulverizing and thoroughly mixing compost materials.