Farm Manures

By H. L. Westover

Farm manure consists of a mixture of the dung or feces and urine of domestic animals, with the material used for bedding, including straw, peat, muck, leaves, sawdust, shavings, and other vegetable refuse. It is known under a variety of names, such as manure, barn manure, stable manure, farmyard manure, barnyard manure. It was one of the earliest materials to be used for soil improvement, and no other fertilizer used by the farmer for this purpose is so thoroughly appreciated as farm manure. In addition to furnishing a small amount of plant food, it supplies humus, which increases the water-holding capacity of the soil, improves its physical character, and makes the soil a more favorable medium for the growth of bacteria so essential to soil improvement.

Value of Farm Manure on the Golf Course

Farm manure is one of the best fertilizers for turf grasses. In fact, it is very difficult to grow these grasses satisfactorily on certain soils without a liberal application of farm manure. The value of the manure is due not so much to the nitrogen, phosphorus, potassium, and organic matter furnished, all of which may be supplied in other forms, as to the numerous beneficial organisms and their products which the manure carries. It is also probable that there are in the manure other beneficial agents whose value can not be measured.

While fresh manure ordinarily contains more readily available plant food, well-rotted manure is preferable for the golf course. When rotted in a well-compacted and moistened pile, the manure loses little in fertilizer value, weed seeds are destroyed, coarse material is broken down so that it may be evenly distributed, and the bacterial flora is increased. At least six months is required to bring about this condition, though a longer time is preferable provided the pile is properly protected.

Where the quantity is limited, its value may be greatly increased by composting it with loam, sod, or similar material. It is highly desirable that the pile be worked over two or three times before it is used, in order that the material may be thoroughly mixed.

In sowing fairways, particularly if the soil is low in fertility or deficient in humus, a liberal application of well-rotted farm manure worked into the top two inches of soil will be found highly beneficial. It also gives excellent results as a topdressing for fairways, though it is objectionable where it interferes with play. Where courses are closed during the winter, a light application of fine manure in the fall after play ceases will improve the turf. It should be evenly distributed, otherwise the grass will be smothered out in spots. In the spring any coarse material remaining should be raked off.

In preparing soil for putting greens, fine well-rotted manure worked into the soil before sowing the seed will be beneficial, particularly if the soil is low in fertility or of a very light sandy texture. On soils of average productivity, however, better results will be obtained where the manure is used with loam or sand in making compost to be employed as a topdressing. Frequent topdressings of farm manure alone have a tendency to encourage the weedy growth in the greens. Furthermore, too liberal use of barnyard manure is

almost certain to increase the number of earthworms and other pests.

Composition of Farm Manures and Factors Influencing It

The composition of farm manure is extremely variable, but a ton of average material contains about 1,500 pounds of water, 10 pounds of nitrogen, 5 pounds of phosphorus, and 10 pounds of potash, or a total of 25 pounds of actual plant food constituents not including lime.

Factors influencing the composition of the manure are (1) the kind of animal producing it, (2) the food the animals consume, (3) the kind and quantity of litter used in the stable or yard, and (4) the manner in which the litter is cared for.

There is considerable variation in the manure of different animals, due in part to the amount of water carried in the excrements. Cow and hog manures carry much more water than the manure from sheep and poultry, and are therefore less concentrated, or, in other words, carry a smaller percentage of nitrogen, phosphorus, and potassium.

The composition of farm manure is also greatly influenced by the character of the food consumed. The nitrogen, phosphorus, and potassium taken into the body pass through largely in the form of excrements. It is therefore obvious that the amount of these elements in the excrements is more or less dependent on the food eaten. There can be no more in the excrements than is taken in the food, but they are usually in a more readily available form as plant food. The solid material consists largely of the undigested portions that were not acted on in the digestive process and likewise are not readily made available in the soil by bacterial action as food for plants. As a result of having passed through the digestive tract, the material is however in a finer and softer condition, and therefore more quickly available than the same constituents in the food before it was taken by the animals. It is evident that the larger the amount of indigestible material in the food the larger is the amount of slowly available plant food in the excrements. The constituents of the urine, on the other hand, are in a soluble form, and are either directly available as plant food or readily become so. The more digestible the food, the larger the proportion of plant-food constituents in the urine. Generally speaking, foods rich in nitrogen are more digestible than those low in nitrogen, which results in larger amounts of nitrogen in the urine.

The composition of the manure is influenced by the litter, the value of which from a fertilizing standpoint is (1) to absorb and retain urine, (2) to increase organic matter and plant food, (3) to prevent the escape of ammonia in the air, (4) to make the material easier to handle, and (5) to influence physical and chemical action. The materials most commonly used as litter are straw from the various cereal crops (such as oats, rye, barley, and wheat), muck, peat-moss, sawdust, shavings, and leaves. The straw and leaves add nitrogen, phosphoric acid, and potash to the manure. Muck and peat-moss add nitrogen, but in a form that is not readily available. The nitrogen, phosphoric acid, and potash in sawdust and shavings are very slowly available. Moreover, in fresh stable manure, shavings and sawdust from cone-bearing trees, like the pines, spruces, and firs, are apt to be

toxic to plants. This condition is overcome by allowing the manure to rot thoroughly before using.

The value of farm manure may be greatly affected by the method of caring for it. In spite of its many advantages, so little attention is given to the proper preservation of farm manure that enormous losses result. In the average farm manure, about one-half the value of the nitrogen and two-thirds the value of the potash, or a total of about 50 percent of the plant-food constituents, are in the urine. When no effort is made to save the urine, as is all too commonly the case, a large part of the most readily available portion is lost. The losses from leaching by exposure to rains are also enormous. It is a common practice to throw the manure in the yard, often under the eaves, where it remains unprotected for months. In the course of six months, from 60 to 70 percent of its plant-food constituents may be lost. Further losses occur through the escape of nitrogen as ammonia, where air has free access to a manure pile which is not properly compacted. These losses can be overcome to a large extent by having tight floors and gutters to hold the urine and then using sufficient litter to absorb the liquid portion, by keeping manure under cover to prevent leaching, and by keeping the piles well compacted and thoroughly moistened to check heating and consequent loss of nitrogen as ammonia. The greater value of the manure will abundantly repay this additional effort.

Horse Manure.—A ton of fresh horse manure contains on the average about 1,560 pounds of water, 14 pounds of nitrogen, 5 pounds of phosphoric acid, and 11 pounds of potash. On account of the less complete destruction in the process of digestion of the organic material in the food eaten, horse manure furnishes abundant food for the micro-organisms that promote decay, and as a result it is subject to various kinds of fermentation. The evolution of heat in the manure is due to a special type of fermentation, and unless care is taken to have the manure pile well compacted a condition known as "fire-fanged" develops, resulting in a loss of much of the fertilizing value of the manure. The impression that horse manure is of little value is due to the fact that it deteriorates rapidly when proper precautions are not taken to preserve it. For the golf course, good horse manure is about equal to cow manure, and preferable to either sheep or poultry manure, as the larger amounts used furnish more organic matter or humus, which is a most important factor in growing turf grasses. Any deficiency in food constituents is easily supplied through the use of chemical fertilizers.

Cow manure.—In composition, cow manure does not vary widely from horse manure. A ton of average fresh manure contains 1,720 pounds of water, 12 pounds of nitrogen, 3 pounds of phosphoric acid, and 9 pounds of potash. It represents material that is more completely digested than does horse manure, and is far more compact. Due to the compactness and also to the larger amount of water in cow manure, there is not the same danger of losses through heating as in horse manure. Cow manure is preferable to sheep or poultry manure for use on golf courses for the reasons given in the case of horse manure. Shredded cow manure is sometimes offered on the market, but when dried, shredded, or otherwise treated it loses much of its value. Its best form is as ordinary well-rotted manure.

Sheep manure.—A ton of average fresh sheep manure contains 1,360 pounds of water, 19 pounds of nitrogen, 7 pounds of phosphoric acid, and 20 pounds of potash. It is a quick-acting fertilizer, and because of the small amount of water contained it is concentrated in composition and therefore prized by florists. In amounts ordinarily used, it does not supply much organic matter, and is therefore not nearly as satisfactory for use on golf courses as well-rotted barnyard manure, though it is much more easily applied. Any sheep manure available should be used in the compost heap. The cost of the dried sheep manure on the market is all out of proportion to its actual value.

Hog manure.—A ton of average fresh hog manure contains 1,740 pounds of water, 10 pounds of nitrogen, 7 pounds of phosphoric acid, and 8 pounds of potash. On account of the varied character of food consumed, the composition of the manure is more variable than that of other farm animals. Since it contains a high percentage of water, losses by leaching readily occur. Hog manure has been placed on the market in dried form, but, like dried sheep manure, the cost is all out of proportion to its actual fertilizing value.

Poultry manure.—While variable in composition, a ton of average fresh poultry manure contains about 1,100 pounds of water, 20 pounds of nitrogen, 16 pounds of phosphoric acid, and 8 pounds of potash. As the nitrogen is usually in the form of an ammonium compound it is a quick-acting fertilizer. Poultry manure ferments readily, and without proper care much of the nitrogen is lost as ammonia. It is not advisable to mix poultry manure with wood ashes or ordinary lime, as the ammonia is readily liberated when it comes in contact with an alkaline compound. It is an excellent fertilizer if mixed in a compost heap or with rich soil at the rate of 10 pounds of manure to 100 pounds of soil. If applied alone it is apt to burn the grass. It does not supply nearly the amount of organic matter that well-rotted stable manure furnishes.

Mushroom soil.—Mushroom soil or spent mushroom soil is treated in this article, as it is really little more than well-rotted manure. It is what remains of a good quality of horse manure after it has been in the mushroom cellar for a year. In preparing the fresh manure for the mushroom bed it is placed in a pile for three weeks, being turned occasionally to prevent the temperature from reaching a point where the manure burns or becomes "fire-fanged." After having served its purpose in the mushroom bed, the manure has lost little of the fertilizer value and is highly desirable for use on the golf course as topdressing for putting greens. Mushroom soil should not be used alone. Much better results are obtained where it is composted with sand and loam.

Moisture-holding capacity of soils.—Tests have shown that while 100 pounds of sand can hold only 25 pounds of water, and 100 pounds of clay 50 pounds of water, the same weight of humus or decaying organic matter can retain 190 pounds of water. The addition of humus to sandy soils or others deficient in organic matter is therefore an effective means of increasing their moisture-holding capacity.