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PREPARATION OF PEAT COMPOSTS

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ADVANTAGES OF COMPOSTING WITH PEAT.

IN ITS NATURAL CONDITION peat is seldom satisfactory for use as a fertilizer. Without any preparation whatever raw peat is inferior in its effects to stable manure, and from the standpoint of economy the chemically treated peat and the "bacterized" peat product known commercially under various trade names can not as yet be recommended for fertilizer purposes. Much study and experimental work have been done to utilize peat for the inoculation of soils with bacteria, but the results have been disappointing in most cases, and some of them have been seriously questioned by investigators who have repeated the experiments. The best means of taking full advantage of the inert valuable qualities of peat is through composting.

Peat has several characteristics which are of value in preparing composts.

It has a great power of absorbing and retaining ammonia as well as water if properly dried, shredded, and used as litter for making compost manure. The more noteworthy data on the absorbing power of peat litter have been summarized on page 27 of United States Department of Agriculture Bulletin No. 802 (Table 2).¹

¹ Dachnowski, Alfred P. Quality and value of important types of peat material. U. S. Dept. Agr. Bul. 802, 40 p. 1919. Literature cited, p. 39-40.

It amends the physical condition when applied to cold, dry, and leachy soils as well-rotted compost; the manured soil is made warmer and more retentive of moisture than by means of mineral fertilizers. The meliorated soil follows less rapidly the extremes during rapid changes in the atmosphere, and the organic matter maintains more even conditions when the rainfall is light during the growing season.

It deodorizes and promotes the decay of animal refuse derived from stock-yards, slaughterhouses, fisheries, and sewage-disposal plants. With enough moisture and air, this causes changes that benefit not only bacteria but eventually the higher plants, including subsequent crops which utilize the available phosphorus and potassium derived from these animal substances.

It modifies the disintegration of plant wastes furnished by green-manure crops or derived from truck farming, beet and sugar-cane refineries, and canning industries. The condition of good tilth in the soil is facilitated by the presence in peat of decaying substances from green vegetable matter.

It is a great source of carbonic acid and to a less extent of other acids. Through the formation of these products during peat decomposition the solubility of mineral salts and fertilizers is effected indirectly. Moderate applications of lime promote decay in composts and produce conditions favorable to beneficial soil organisms.

It is a constant supply of a most indispensable form of gaseous plant-food material; carbon-dioxid gas produced in the process of compost decay in the soil is absorbed and utilized by the aerial portion of green plants in making starch and sugar when exposed to sunshine.

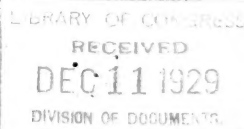
It yields a large volume of organic matter which is valuable not only as a soil amendment when properly composted but is serviceable also as a source of energy to bacteria which fix the nitrogen supplied by the air. Various other bacteria can utilize the organic nitrogen in composted peat. They make it over into a much-needed food material in an available form whenever temperature and moisture conditions are favorable.

It saves the roughage from cereal crops for feeding purposes when straw is replaced by peat litter as bedding material for live stock.

PEAT DEFINED.

Great differences are found in the rapidity with which decomposition in peat takes place. The decay of different types of plant remains presents some peculiarities, and hence a good degree of caution is advisable in choosing peat deposits. It is worthy of notice in this connection that peat is the name given to accumulated layers of plant material that vary greatly in texture and quality. Peat deposits should be investigated carefully, especially with reference to the kinds of material and the order in which the different layers of peat lie on one another, before the question of their utilization is considered.

Peat is the general name applied to the remains of plants which at one time formed an aquatic vegetation, or a marsh of coarse sedges or tall reeds, a bog of mosses and heaths, or a swamp of shrubs and trees. A peat deposit is therefore the result of the accumulation of many generations of plants from one or several groups of vegetation and in all cases contains at least one or more layers of different kinds of material. On that account the term "peat" is restricted in its meaning to a compact and well-shrunken mass of organic material which accumulated in water or under conditions of a rising water level and varies in thickness from about 8 to 10 inches upward. Muck, on the other hand, is the finely divided plant débris on any surface portion of peat land which has been cleared and cultivated for farming purposes. The term "muck" is applied correctly to disintegrated organic matter which contains more than 40 per cent of mineral material.



DIFFERENT KINDS OF PEAT.

Different types of peat and their physical and chemical peculiarities have been described in former publications,² and the localities near which layers of peat material are displayed in typical form at or somewhat below the surface of a peat deposit have also been specified.³

The litter and composting value of different kinds of peat may perhaps be better understood by making a fundamental distinction between heavy and light types of peat material, leaving gradations between them within an intermediate group.

As a rule the heavy types of peat are dark colored and dense; they consist of small fragments derived from various kinds of vegetation. The macerated material is often referred to as "well-decomposed peat or muck," but a close examination shows the presence of shells, diatoms, sponge spicules, and other débris in varying quantity. This indicates that the plant débris had accumulated in standing water or was formed under conditions of a high water level. When heavy peat soils containing large quantities of spicules are plowed or cultivated they are popularly known as "itchy muck," on account of the burning and itching sensation which is caused by the sharp-pointed siliceous material penetrating the skin of men and animals. The polishing and abrading effect on the tools and implements used also comes from these microscopic components. In the case of dense, blackish, coherent peat materials decay is nearly as rapid as in well-rotted stable manure, but under certain circumstances the use of these types of peat may become disadvantageous. The finely divided jellylike type of peat becomes very hard when dry, while the pulpy or macerated plant débris often contains resistant waxy and resinous substances, considerable quantities of soluble salts, or noxious substances, usually compounds of sulphur, which can become harmful to crops. The mineral soil, springs, seepage water, and the character of the geology of the locality are of considerable influence in this respect. The peat formed from the decay of waxy herbaceous and resinous woody evergreens does not appear to be injurious unless the substances resist decay and accumulate in large quantities.

Some of the heavy peats are noteworthy because of their relatively high organic nitrogen content, but this should not be looked upon necessarily as an important factor in judging their composting value. The nitrogenous compounds have a very slow disintegration capacity, and in this form they do not meet the agricultural requirements for soluble nitrogen.

The light, spongy, fibrous group of peat materials, which is more commonly red, brown, or gray in color, does not contain the aquatic admixture or any of its deleterious substances. Loose and fibrous types of peat from mosses and sedges were formed under conditions of low water level. They are but little advanced in decomposition,

² Dachnowski, Alfred P. Op. cit.

Peat deposits of Ohio. Geol. Surv. Ohio Bul. 16, 424 p., 29 fig., 8 pl., 1 folded map. 1912. Bibliographical footnotes.

³ Dachnowski, Alfred P. Peat deposits and their evidence of climatic changes. *In Bot. Gaz.*, v. 72, p. 57-89, 12 fig. 1921. Literature cited, p. 87-89.

The correlation of time units and climatic changes in peat deposits of the United States and Europe. *In Proc. Nat. Acad. Sci.*, v. 8, p. 225-231. 1922. Literature cited, p. 230-231.

and their decay proceeds at varying rates, depending upon their botanical composition and texture. During disintegration the softer cellulosic components usually disappear first. They are energetic and rapid in their action, and peat materials of that character should probably be used in smaller quantities to produce composts with the fertilizing effects of stable manure. The harder and more resistant portions of vegetable matter, known as the ligneous and chitinous material, disappear more gradually and seem to disintegrate slowly through a series of steps. Thus, this material has a more steady and lasting effect, but in comparison with the fertilizer value of standard stable manure it would need to be applied in larger quantities. It has not yet been shown conclusively that fibrous peat materials will produce nitrates on a large scale if composted with nodule legumes or if inoculated with nitrifying microorganisms, but these types would probably be preferable to the heavy peat materials. The practice has been to burn off the fibrous surface layers, since they are quite resistant to cutting, plowing, and weathering. They become brittle when overdrained, and the softer portion of the plant remains, such as rootlets, small leaves, and bits of plant tissue, break down into a dust or "mull." In many respects the light types are preferable to heavy peat if properly excavated and seasoned, and they are greatly to be recommended for litter and various composting purposes.

PEAT DEPOSITS AND THEIR STRUCTURE.

Deposits of peat are found in a number of States, generally occurring in basins which formerly were occupied by lakes or ponds. Deposits of this kind are known as "water-laid," since the bottom layers consist of the pulpy, compact, broken-down plant material which accumulates only in water and is derived from different kinds of vegetation. Above these layers the plant remains are more or less fibrous or woody and granular, and they are quite unlike those at the bottom in appearance and quality.

Occasionally peat may be found on flat but relatively moist land. This forms the "land-laid" group of deposits, as the mineral soil on which the deposit is resting still contains the roots of marsh or forest vegetation that at one time occupied the area. The light fibrous and the woody granular kinds of peat are in general to be found in deposits wherever the water level rose slowly and at about the same rate as the addition of plant remains to the deposit.

Along streams are peat deposits which often show distinct seams of shell marl, of sand or silt due to overflows, or an admixture of mineral matter washed in from the surrounding land. In this group of "overflow" deposits the light and the heavy compact layers of peat material are usually to be seen in an alternating order of position, due to the fluctuating condition of the water level. The salt marshes in bays and estuaries along the seashore which are overflowed by the tides of the ocean show a similar structure.

Saturation with water as well as the exclusion of air and the lower temperature which result from the lack of drainage have been among the principal causes of peat accumulation; they are also the factors which have prevented the processes of decay observed in the case of surface layers of cleared and cultivated peat land.

TIME OF EXCAVATING PEAT.

A clear understanding must, first of all, be obtained concerning the stratification and drainage capacity of the peat deposit selected for excavating. The character and quality of the mineral subsoil and of the different layers of peat should also be noted in some detail. The time for the various operations involved in excavating the peat should be decided upon with reference to season and available labor. In the case of the small farmer, working for his own needs, the time for excavation should fit in with the regular farm practice and be so arranged as to cause the least interference with the usual seasonal agricultural operations. Late autumn, winter, and early spring should be the period chosen for cutting and harvesting peat, not only because there is less other farm work to attend to at that season, labor is cheaper, and the peat can be more easily loaded and carted away, but mainly because freezing and thawing aid greatly the disintegration of the moist fibrous material that is dug out of a deposit. A dry summer is also appropriate, as the peat deposit then generally has a lower water level and is more accessible to men, teams, and machinery. The excavating operations should be extensive during favorable dry weather, so that in a rainy season composts may be made from the stock pile.

In order to prevent the wasteful use of peat deposits and to insure leaving the land area in a condition suitable for future agricultural use, the excavating of peat should not be carried on without proper plans and some organization. The necessity of draining a peat deposit effectively and of controlling water-level condition renders it essential that the whole area of peat land should be under one jurisdiction, so that it may be dealt with as a whole. The advantages of extensive platting and of transportation by the most convenient route also emphasize the advisability of having the area under proper supervision or cooperation.

METHODS OF EXCAVATING PEAT.

The operations for excavating peat are of several kinds. Briefly summarized, they are as follows:

Hand cutting.—This method, which is extensively used in Holland and other European countries, involves the use of specially constructed spades. The wing slane is a spade with a blade 12 inches long by 5 to 6 inches wide, having a wing or cutting lug projecting at right angles from the right-hand edge, the wing measuring about 6 inches in length. It cuts sods with the long axis in a vertical direction. The breast slane is a spade with a blade 14 inches long by 5 inches wide with sharp cutting edges. It is mounted on a short handle, the length over all being 3 feet 6 inches. The sods are cut with the long axis horizontal, the direction in which the fibrous plant remains lie. To excavate and collect the material economically a plan is devised whereby the peat deposit is sufficiently drained, cleared from its surface vegetation, and divided by a main roadway, through its center whenever possible. Running parallel to the road on each side is a main ditch, about 4 feet wide at the top, 5 feet deep, and 2 feet wide at the bottom. Provision is made by suitable means to control the water level. At distances of about 100 yards minor ditches are dug parallel to each other but at right angles to the direction of the main road and its ditches. Along these minor ditches strips are laid off as collecting and stacking ground, each about 12 yards wide. The field is again divided by running a series of small surface ditches, 2 feet wide and 3 feet deep, at distances of about 11 yards from each other, paralleling the main road. After the surface of the deposit has been cleared the peat is dug

in brick form with the slane spade. From the faces of the minor ditches, strips or trenches 3 feet wide and 2 feet deep, the peat is cut with the slane in the form of sods about 8 to 12 inches long and 4 by 4 inches in cross section. The excavated peat is placed on top of the cutting and without further handling is left to dry in the air. After a week or more, depending on the weather, it is "footed," i. e., built up so as to allow the free passage of air through the pile; later it is placed in larger stacks or on covered racks. At the end of a few weeks the peat blocks are removed and ground into "litter" as required. The best quality of litter should have a water content not to exceed 25 per cent, and its ash content should not be more than 5 per cent. In some localities the air-dry peat sods are put through a shredder combined with a rotary screen to separate the dust or mull. In other localities a silage cutter is used, and the pulverized material is blown into a storage bin. To prevent overheating and dust explosions the bin should be well ventilated. It is preferable to have the litter and the mull material separately baled in burlap or in a press and the bales made secure with laths of wood and bound with wire. The hand-cutting method entails much labor and requires a long season. This makes the product expensive except for large-scale requirements, and the process may not be profitable unless the use of litter and mull can be extended to other purposes, such as insulation, the packing of fragile goods, fruits, tubers, bulbs, and garden plants, and the storage of vegetables and ice.

Excavation by plowing.—In these operations the peat deposit is first cleared and drained in some advantageous manner by open ditches or tile. The surface peat is then prepared by plowing deep furrows and collecting the fibrous sod or harrowing and disking the material and leaving it in that state during the winter. The following spring the material is thoroughly harrowed into a finely divided condition, spread out in a thin, loose layer, and exposed to the air. The peat should be free from lumps in order that it may be mixed thoroughly with the ingredient to be composted with it. During a dry period it is scraped into heaps and hauled into a storage shed with sides opening for ventilation. The excavation and drying of peat by this method have been done at a comparatively small cost in time and labor, and considerable quantities of litter can be obtained in this manner.

Machine excavation.—For an output on a larger scale, which might follow logically as a step in the development of a composting industry, it would appear that economy suggests the use of machinery suitable for excavating and transporting raw materials. To replace the hand-slane method previously described, peat-cutting machines are used in deposits which are free from trunks, stumps, and roots of trees. Machines of the ladder-dredge type with continuously rotating excavating buckets fixed on a chain or the common dipper dredge may be used with success. Light excavators with large caterpillars are employed on drained peat land, and these in a modified form, supported on a floating scow, are used for water-logged peat deposits. After excavating, the moist peat should be piled and stored in mounds of considerable height and kept under some kind of cover, if possible. During storage the plant remains shrink considerably in volume and undergo a slow internal heating, granulating, and carbonizing process. The decomposition of resistant materials may be hastened by the use of exhaust steam or a live steam spray. By the piling method even the coarsest fibrous material in time will become reduced to a state of division which will admit of its profitable employment for various uses.

In forming an opinion on the relative merits of the various kinds of machines used in excavating, shredding, and pressing litter peat access should be had to technical journals, and the publications which deal with the manufacture of litter on a large scale should be consulted. A safe conclusion as to the type of machine best adapted can be arrived at only when the stratification of the peat deposit and the individual merits of the machines have been considered in relation to each other and tested in that connection.

DIRECTIONS FOR COMPOSTING WITH PEAT.

At the outset it should be restated that fibrous types of peat which may be cut in sods or blocks must be air dried and shredded to make a litter or else subjected to frost. Freezing breaks up the fibers, makes

them softer and more elastic, facilitates the subsequent drying, aids in reducing the material to the proper state of division, and brings about more active chemical and bacterial changes. To take advantage of the action of frost, fibrous types of peat should be exposed in a wet condition to winter weather. It is not advantageous to dry or char the material by means of high temperature or chemicals. The resistance of very fibrous peat to decomposition can be decreased by finely shredding the material or by using a live steam spray.

Another point to keep in mind is the possible presence of injurious substances, such as compounds of sulphur and iron. Such peat materials need the addition of lime in a finely divided condition. Dark, heavy types of peat on that account are less suitable for litter and composting purposes. The better types of fibrous peat are those derived from mosses and sedges. Their use has in late years increased very greatly in Europe and to some extent in this country. At the present time a considerable quantity of this sort of litter is imported.

It is obvious that composting with peat is a process which requires some practical experience. Among the most essential factors making for the production of a good compost are a proper proportion of materials, a favorable supply of air, and suitable temperature and moisture conditions. Notwithstanding the fact that many farmers have proved in a manner conclusive to themselves that the output of organic fertilizers can be increased and may approximately be more than doubled if a share of time and labor is devoted to this work, the question of their economic value must rest on the yield of crops resulting from the use of such composts.

A great variety of materials may, of course, be employed for making composts with peat, but there are comparatively few which allow of extensive and economical use. The following account will be confined to some of these.

COMPOSTING WITH STABLE MANURE.

The preparation of composts with stable manure is an old practice, published accounts of the use of such mixtures dating back to the eighteenth century. In the New England States composting stable manure with peat received considerable attention as early as 1850. A bushel basket of finely divided peat was placed every morning behind each animal or sprinkled in each stall. When removed in the operation of cleaning the stable, the material, including the excrement, was well mixed with the liquid portion, the most important fertilizer component, and placed in a composting pit or out of doors on a layer of weathered peat several inches in thickness. This was covered with another layer of peat, and the operation of piling in alternate layers was repeated until a heap 3 to 4 feet was built up. From time to time the pile was forked over and well mixed.

The proportions of stable manure and peat should vary somewhat, according to the quality of the manure and the texture and composition of the peat materials. Composts of equal parts of peat and stable manure are regarded by some as equal to the same quantity of stable manure. Others recommend 2 parts of peat and 1 part of manure, or a proportion of 3 of peat to 1 of manure. Experience is the best guide as to the relative quantities to be employed. With granular woody types of peat, or well-disintegrated material,

two to five times the quantity of peat to each portion of fresh manure may be used to advantage, while in the case of the light, fibrous, brown or reddish kinds of peat equal parts of manure and peat by bulk may give good results. In cold weather and in the Northern States a larger proportion of fresh manure is required. It is useful also to supplement the composts with clay, sod-loam, or mineral-fertilizer ingredients, notably ground rock phosphate or potash, in varying proportions, as may be required. The heap may be 6 to 8 feet wide and indefinitely long. Composts with coarse fibrous peat should remain in a compact pile out of doors at least six months. They should be located in a shady, cool, well-ventilated place, kept in a fairly moist condition, and should be shoveled or forked over at least twice at the heap. Weed seeds carried by the manure in the compost pile will be killed by the increasing heat, which results mainly from the action of molds and bacteria. If the pile gets too hot in summer, it should be turned over, and in doing this a little more of the fibrous peat should be added. Peat used in this manner in concentration camps for horses, cattle, poultry, and other live stock becomes transformed into a rich black manure and should make a valuable organic fertilizer.

COMPOSTING WITH SEWAGE.

The possibilities of the use of peat as a deodorizing absorbent and for conserving the fertilizer value of human excreta have been recognized in several European countries, notably in Sweden. Observations of tests extending over a number of years weighed in connection with the results of the practice from the point of view of profitable returns have convinced many that sewage composts have not received the attention they deserve. Local requirements frequently can not be met by flushing with running water, and the use of leaching cesspools, of abandoned wells, or of convenient streams can not be too strongly condemned, because they constitute a nuisance and are the source of transmission of disease germs through water, flies, or by other means.

The treatment of stable manure has already been discussed. The farmer can do no one thing so vital to his own welfare and that of the public as to use the same composting measures in treating the excretions in privies and closets, whether of the pit, vault, or pail type. To begin with, a thick layer of litter peat should be placed at the bottom of the receptacle. Dry, loose litter, or mull should be sprinkled on the night soil daily, as may be required, in the proportion of at least 3 to 10 parts of peat to 1 of solid matter by bulk. The process should be repeated until the accumulation must be removed. The receptacles when full should be cleaned out and the mass hauled to the composting field or pit and placed as a layer upon a bottom bed of peat several inches thick. A covering layer of litter will contribute greatly to the absorption of any strong, foul odors and aid in rapid and almost complete disintegration. Should signs of heating appear, the process of decay may attain a temperature in which disease germs, if present, are reduced in number and virulency. Rather than to drench the heap with water, additional peat should be forked into the pile and well mixed. If the precaution is taken to allow the time necessary for the decomposition of the peat and sewage mixture, there should be little danger of infectious ma-

terial passing from the compost heap to the ground water.⁴ In this manner fertilizer, and sanitation as well, can be provided effectively and at small expense for farm homes, for public dwellings, for small urban communities, and for labor and Army camps located in States which contain peat deposits.

The disposal by municipalities of the sludge produced at different sewage plants in large cities and the best method of recovering its fertilizer value are problems of no small economic possibilities. In a few cities sludge is sold to farmers and market gardeners in an air-dry condition. Sewage sludge promises to become a valuable manure when shredded fibrous peat in alternating layers is composted with the solid matter from settling tanks or when the jelly-like activated sludge is mixed and dewatered with dry mull peat. Layers of fibrous peat material may be used with advantage as filters or screens for the removal of finely suspended matter in the effluent and stored in heaps or composting pits. Any excess of oil or fatty material may be removed by solvents. By exposing the composted peat litter to the action of nitrogen-fixing organisms, which are usually present but will not function so long as ammonia remains unabsorbed, the quantity of available nitrogen may be increased. The addition of a neutralizing agent, such as is offered by crude salts of mineral fertilizers, will prove of advantage. This sort of composting should be done with mixing machinery and the mixture kept under cover in sheds or buildings attached to sewage plants. Sterilization with steam is readily effected where the necessity arises to eradicate disease germs. The manufacture of organic manure from sewage composted with peat may be vastly extended with the utmost advantage to all concerned if proper attention is given to the length of time necessary for the sewage compost to become well decomposed and sanitariously safe. Should this practice become established more generally, the centers of truck farming located near cities in the peat-land regions of this country would be able to obtain or produce their own organic fertilizer for early and late crops and for use during cool seasons in which a warm, manured seed bed is essential.

COMPOSTING WITH FISH SCRAPS.

The composting with the refuse from public markets or from other sources of easily decomposed animal waste, such as condemned storage eggs, should be carried on in a manner similar to that already described. Composting avoids the extremely disagreeable odor which is produced when wastes of this kind are allowed to putrefy. The content of various fertilizer constituents supplied by the animal matter and the peat as well, such as potash and phosphorus, become available to the roots of crop plants when a well-decomposed compost is applied in the field. Along the coast it has been the practice in a few places to compost any variety of fish scraps with peat or muck from the swamps and marshes near by. Accounts of these operations have been given by Johnson, from whose work⁵ (p. 70) the following extracts relating to methods of composting are taken:

During the present season (1858) we have composted about 2,000,000 white fish with about 700 loads (17,500 bushels) of muck. We vary the proportions

⁴ Vogel, J. H., et al. Die keimtötende Wirkung des Torfmülls. Aufl. 2. Arb. Deut. Landw. Gesell., Heft 1, 125 p. 1894.

⁵ Johnson, Samuel W. Peat and its uses. 168 p., 25 fig. New York. 1866.

somewhat according to the crop the compost is intended for. For rye we apply 20 to 25 loads per acre of a compost made with 4,500 fish (one load), and with this manuring, no matter how poor the soil, the rye will be as large as a man can cradle. Much of ours we have to reap. For oats we use less fish, as this crop is apt to lodge. For corn, 1 part fish to 10 to 12 muck is about right, while for grass or any top-dressing the proportion of fish may be increased.

We find it best to mix the fish in the summer and not use the compost until the next spring and summer. Yet we are obliged to use in September for our winter rye a great deal of the compost made in July. We usually compost the first arrivals of fish in June for our winter grain; after this pile has stood three or four weeks it is worked over thoroughly. In this space of time the fish become pretty well decomposed, though they still preserve their form and smell outrageously. As the pile is worked over a sprinkling of muck or plaster is given to retain any escaping ammonia. At the time of use in September the fish have completely disappeared, bones and fins excepted.

The effect on the muck is to blacken it and make it more loose and crumbly. As to the results of the use of this compost, we find them in the highest degree satisfactory. We have raised 30 to 35 bushels of rye per acre on land that without it could have yielded 6 to 8 bushels at the utmost. This year we have corn that will give 60 to 70 bushels per acre that otherwise would yield but 20 to 25 bushels. It makes large potatoes, excellent turnips and carrots.

Fish compost thus prepared is a uniform mass of fishy but not putrefactive odor, not disagreeable to handle. It retains perfectly all the fertilizing power of the fish. Lands manured with this compost will keep in heart and improve.

COMPOSTING WITH MOLASSES WASTE FROM SUGAR FACTORIES.

The growing of sugar beets on the northern peat deposits and of sugar cane on peat lands in the Southern States has assumed proportions of the highest importance in view of the fact that the sugar refinery is usually located near the fields and is an indispensable aid in handling and disposing of the crop. The possibilities of using the waste products of a sugar factory in connection with the production of organic manures from fibrous peat have hardly been recognized. Growers of truck crops have observed that leafy trimmings and green crops when plowed under in fibrous-peat soils promote disintegration and enrich the soil; they add starch and cellulose as a source of energy for the action of bacteria which fix the nitrogen gathered from the air. The pulp and trimmings from sugar beets when composted in a similar manner with alternating layers of peat and allowed to remain in a heap are converted into an effective manure. Carbon (charcoal) from peat used for clarifying and for decolorizing solutions of sugar and the molasses waste contain a large proportion of potash. A manure can be prepared by sprinkling discarded charcoal filters or diluted solutions of the molasses sludge upon thin layers of fibrous peat, part of which has been previously composted with fresh stable manure.

In order to retain its great absorbent capacity and composting value the peat material should not be dried artificially but by wind and sun only, and it should be free from lumps. The molasses-waste ingredients should be added, if possible, daily for about three weeks and thoroughly mixed by shoveling. Mineral fertilizers are added as required. The mass should be thrown up into flat heaps about 2 or 3 feet high, covered with a few inches of dry peat, so as to retain the moisture and heat, and allowed to stand. The time required will vary with the kind of peat used and the quality of the added material. Seasonal conditions and the degree of mixture also

will affect materially the rapidity of decomposition; hence the compost should be prepared and later air-dried and stored under cover. There is evidence to indicate that the fermentation of the mixture has a tendency to bring about the more ready action of beneficial bacteria. The use of this method should result in a very material contribution to the supply of organic fertilizers.

VALUE OF VARIOUS KINDS OF PEAT COMPOSTS.

It is evident that in connection with the use of sugar-factory wastes, as in the case of the disposal of city sewage, the lime sludge from sulphate paper mills, frosted crops, and deteriorated foods, including cereals, more extended investigations should be conducted. Tests should be made in the field and in the greenhouse to determine how much compost should be applied and when and the effect of each kind on the yield of crops. Various considerations will doubtless control the relative value of the different kinds of compost with reference to soil enrichment and crop returns. It will not be difficult, however, to determine the possibilities of the use of peat litter and of composting with peat in connection with a successful and economical method of supplying organic manure.



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