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ESSAY

ON THE MANUFACTURE OF MANURES, AND
THE APPLICATION OF THE SAME TO THE
DIFFERENT VARIETIES OF SOIL. BY
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Merits of this System.

It is not imagined that the system now indicated for the preservation of our barn-yard manures is a perfect one, securing all the advantages desirable to be secured. It does not wholly protect the manures from the wasting action of the atmosphere, nor from liability to loss by infiltration and drainage. But perhaps, considering the universality of its application, and the comparative ease and cheapness with which it may be adopted, it is the best that can be recommended for general practice. In situations where it is practicable, additional advantages may be unquestionably secured by the use of a *barn-cellar*, into which any or all of the manures of the establishment may be thrown, with suitable absorbents, and the whole wrought together into the richest of all composts, by the voluntary labors of the swine. No doubt farmers will find their account also in *housing* their manures as much as possible, since, by being thus protected, their most valuable portions (their juices and salts) will be preserved to a much greater extent than it is possible for them to be in the open air.

Comparative Value of Manures.

The barn-yard being the common receptacle of the excrements of the horse, the cow, and the sheep, and the great object having been, thus far, to point out the best mode of saving the *whole* of them, the comparative value of these different substances has passed unnoticed. In order, however, that the farmer may direct his labors for the preservation of his manures to the greatest profit, he should certainly have the benefit of all known facts on this point.

"The quantity of vegetable and animal matter in horse-dung is considerably larger than in cow-dung, it is as twenty-seven to fourteen, or nearly double; and of course the quantity of nitrogen which it is capable of yielding is nearly double that of cow-dung. Sheep-dung is similar to horse-dung, but contains a greater quantity of vegetable matter in a soluble state. It is also richer in salts; and the quantity of nitrogen which it is capable of yielding is greater than in either of the preceding substances. Hog-manure contains still larger quantities of soluble matter, and is capable of yielding a large quantity of nitrogen, in the form of ammonia. It ranks next in value to night-soil, which has ever been celebrated as the most valuable substance used for manure." [Gray's Agriculture, p. 286.]

"Experiments undertaken by order of the Saxon and Prussian authorities, varied in every form, and continued for a long period, prove that if a soil without manure yield a crop of three for one sown, then the same land dressed with cow-dung yields seven for one sown—with horse dung, ten for one sown—with human manure, fourteen for one sown." [Dana, p. 143.]

The Piggery.

Still greater care will here be requisite, to "see that the commonwealth receives no detriment," inasmuch as the treasures at stake are of higher value, and from two circumstances, more liable to liquid excrements, and the solid portions being more exposed, from the fact of their being constantly overturned by the rooting of the swine, and thus presenting, every hour in the day, fresh surface to the action of the sun and winds.

The former of these circumstances will be judiciously met by supplying the pens with an abundance of straw, leaves, sawdust, and the like; the latter by furnishing the yard with an occasional load of muck, and almost any quantity of weeds, pea and buckwheat straw, potato-vines, &c., all of which will be rapidly converted into

the most efficient supports of vegetable life.

It is suggested, whether it would not be an improvement on the present system, were the yard and pen but one enclosure, consisting of an open area under cover (with floors for eating only), where the same use might be made of muck and litter, as at present, and the whole completely shielded from the atmosphere.

The Privy Vault.

This, in proportion to the volume of its contents, should command a greater share of our solicitude than any other of the depositories of the farm manures. Considering simply the *nature of the food* from which the substances under consideration result, we might well suppose them to possess a superior efficacy in promoting the growth of the finer plants and grains—a supposition which agricultural chemistry unites with all experience in fully justifying. So far, therefore, as the simple preservation of manure is concerned, it is doubtless from this quarter that the farmer can derive the greatest profit at the least expense.

Let the vault, then, (constructed with a due regard to convenience, as well as to the exclusion of air and moisture,) be carefully supplied, at proper intervals, with powdered charcoal alone, or with dry powdered muck and gypsum, (the best of all substances for this purpose, but for which cut-straw, surface-soil, ashes, and old lime may be substituted,) and the object will be fully accomplished. The liquid portions will be absorbed, and the volatile products converted into fixed salts; the whole mass will become inodorous and inoffensive, (no small advantage to the family as well as to the farm,) and a goodly quantity of the richest of all manures will be prepared for convenient application to the cultivated crops.

Value of Human Excrements.

Deeply impressed, ourselves, with the value of these excrements, and deeming it of no small importance that a general interest should be awakened in relation to them, we cannot forbear from presenting our farmers with one or two pertinent quotations.

"In respect to the quantity of nitrogen contained in excrements, one hundred parts of the urine of a healthy man are equal to thirteen hundred parts of the fresh dung of a horse, and to six hundred parts of those of a cow. Hence, it is evident, that it would be of much importance to agriculture, if none of the human urine were lost. The powerful effects of urine, as a manure, are well known in Flanders, but they are considered invaluable by the Chinese, who are the oldest agricultural people we know. Indeed, so much value is attached to the influence of human excrements, by these people, that laws of the state forbid that any of them should be thrown away, and reservoirs are placed in every house, in which they are collected with the greatest care. No other kind of manure is used in their corn-fields. The agriculture of that country is the most perfect in the world."

"If we admit that the liquid and solid excrements of a man amount, on an average, to one and a half pounds daily, (five-fourths of a pound of urine, and one-fourth of a pound of feces,) and that both taken together yield three per cent. of nitrogen, then, in one year, they will amount to five-hundred and forty-seven pounds, which contain sixteen and a half pounds of nitrogen, a quantity sufficient to yield the nitrogen of eight hundred pounds of wheat, rye, or oats, or of nine hundred pounds of barley. This is much more than is necessary to add to an acre of land, in order to obtain, with the assistance of the nitrogen absorbed from the atmosphere, the richest possible crop every year. Every town and farm might thus supply itself with the manure, which, besides containing the most nitrogen, contains also the most phosphates; and if an alteration of the crops were adopted, they would be most abundant. By using, at the same time, bones and the lixiviated ashes of wood, the excrements of animals

might be completely dispensed with.— [Liebig, p. 185.]

"In Belgium, which has been the cradle of enlightened agriculture, and where good modes of cultivation are continued and constantly improved, they make astonishing use of this kind of manure. So great a value do the Flemings attach to it, that the cities set a high rate upon the privilege of disposing of the cleansing of their privies, and there are, in each one of them, sworn officers for the assistance of those who wish to make purchases.

"We shall find great difficulty in bringing this branch of industry to the same degree of perfection amongst us, that it has arrived at in Belgium, because our farmers do not realize its importance; and have a repugnance to employing this kind of manure. But could they not collect carefully all these matters, mix them with lime, plaster, or gravel, till the odour was dispelled, and then carry the whole upon the fields?

"Already, in most of our great cities, the contents of the privies are used for forming *poudrette*; this pulverulent product is sought for by our agriculturists, who acknowledge its good effects; let us hope that, becoming more enlightened, they will employ the faecal matter itself, as being more rich in nutritive principles, and abounding equally in salts; they can easily govern and moderate the too powerful action of this, by fermentation, or what is still better, by mixing it with plaster, earth, and other absorbents, to correct the odour."—[Chaptal, p. 62.]

Pure Animal Matter.

All animal substances, such as the carcasses of dead animals, unmerchantable fish, the refuse of the slaughter-house, the relics of the kitchen, and the waste of the tan-yard, the shoe-shop, the carding-mill, the comb, glue, soap, and woollen cloth manufactories, &c., by being seasonably gathered up, and either incorporated with the barn-yard manures, combined with compost materials, or buried directly in the soil, will prove the most efficient aids in promoting fertility. "The carcass of a dead horse," says Lord Meadowbank, "which is suffered to pollute the air with its effluvia, has been happily employed in decomposing twenty tons of peat, earth, and transforming it into the most valuable manure."

In illustration of the value of numerous refuse matters, commonly accounted "good for nothing," and thrown away, it may here be stated that the finest crop of eight-rowed corn inspected by the Agricultural Committee of Berkshire, the present year, owed its superiority, in their opinion, to the employment of a compost manure, in which the principal ingredient was *woolen flocks*. The soil was thin, consisting of exceedingly coarse gravel; yet the growth was luxuriant, and the ears well filled, perhaps beyond comparison for the present season.

Pure Vegetable Matter.

This may include straw, leaves, vines, &c., and green or ripen crops ploughed under, to improve the soil; but the consideration of this topic being unnecessary in the present connection, it will be reserved for a future paragraph, under the second branch of our general subject, namely:—

THE APPLICATION OF MANURES.

In order to the most judicious application of our manures, it is obviously necessary that we have regarded to certain characters and conditions of soil; as the proportions of its organic materials, and its relations to temperature and to moisture.

Inorganic Constituents of Soil.

By the inorganic constituents of soil, are meant those purely *earthly* substances which form the *basis*, and chiefly determine the *texture* of all soils, but which, of themselves, whether in a combined or separate step, are wholly incapable of supporting vegetation. Such are gravel, sand, and clay, (as also lime,) which constitute the basis of the great majority of all our soils.

Constitutional Character of Soil.

When either gravel or sand predomi-

nates in the constitution of a soil, it is termed siliceous, from silica, the common name of gravel and sand. When clay preponderates, it is denominated argillaceous or aluminous, from argil and alumina, both which signify clay in a pure state. If lime be a principal constituent, it is called calcareous, from calx, signifying chalk, which is only a certain modification of lime.

Physical Condition of Soil.

The different proportions in which the inorganic constituents enter into the composition of any soil, will also chiefly determine its physical condition; that is, it will be light or heavy, (more properly, loose or compact,) wet or dry, warm or cold, in proportion as it consists chiefly of gravel and sand, or mostly of clay.

Organic Constituents of Soil.

By the organic constituents of soil, are meant those vegetable and animal substances which help to compose the soil to a certain depth, which exert a considerable influence, also, upon its texture, and upon which vegetation is entirely dependant for its subsistence. In scientific works on agriculture this portion of the soil is usually treated of under the name of *geine*, *humus*, or *vegetable mould*; and embraces everything in the soil capable of undergoing decomposition, and thus becoming the food of plants.

Object of the Application of Manures.

To increase this organic portion of the soil, is the great object of the application of manures. It should not, however, for a moment be imagined, that the simple augmentation of the proportion of organic matter will insure fertility, since very much depends upon the state, as well as the quantity of this matter in the soil. It is upon these two circumstances, taken in connection, that the farmer is wholly dependant for success in all of his agricultural operations.

Certain Conditions of the Soil Prerequisite.

In illustration of what is meant by the dependence of fertility on the state of the *geine* in the soil, it may be observed, that manure, applied to either gravel or clay in a pure state, might as well be applied to the surface of an equatorial desert, a pool of water, or an island of ice; the former (gravel) being destitute of that quality of compactness which is necessary to prevent the salts and juices of the manure from escaping at once into the earth or air, and to retain a sufficient degree of moisture for the purposes of vegetable life; and the latter wanting that opposite quality of porosity, which is requisite for the escape of that superabundance of moisture, which, by its own presence, and the exclusion from the soil of the other atmospheric agents, would prove equally fatal to all the processes of vegetation.

The proposition, therefore, must approve itself to every intelligent farmer, that the fertility of a soil depends not only on the *quantity* of *geine* it contains, but also on the *state* of that *geine*, as affected by its relation to the inorganic constituents. Hence the importance to the agriculturist of making himself acquainted with the nature of soil in general, and of his own soil in particular, that he may husband to advantage his means of fertilization, and not expend his strength in labours that will, in the end, prove fruitless.

Constitution of the best Arable Soils.

The proportion in which chemical analysis has ascertained the different constituents of the most productive soils to exist, are about as follows: silica (gravel or sand), sixty parts in one hundred; alumina (clay), sixteen parts; lime, three parts; oxide of iron and manganese, seven parts; *geine* (organic matter capable of becoming the food of plants), nine parts; potash, three parts; soda, one part; magnesia, one part.

Says Chaptal: "From the results of analysis we find that in the best earths there is a large proportion of gravel, which renders the soil light and easily worked, and facilitates the passing off of superabundant rains. In consulting the analysis of less fertile soils, we find that their fertility diminishes in proportion as