FERTILIZERS: THEIR NATURE AND USE.—III.

By B. Leslie Emslie.

FERTILIZERS USED AS SOURCES OF PHOSPHORIC ACID.

Bones.—The virtue of bones for manurial purposes was known to the Romans, so that they are one of the very oldest phosphatic fertilizers. Though no loner the only source of phosphoric acid, bones are still a very important factor in the fertilizer trade. They are sold chiefly in three forms: (1) After treatment with acid; (2) in the raw, ground-up condition, only the fat having been removed, as bone meal; and (3) after they have been deglatinized and the greater part of the nitrogen removed, as steamed bone flour.

Bone meal contains about 22 per cent. of phosphoric acid and 4 per cent. of nitrogen. This is a rather slow-acting form of phosphatic fertilizer, especially if the particles are large. Being an organic substance, its decomposition is facilitated by bacteria, but the process is necessarily slow.

Steamed bone flour contains 28 to 30 per cent. phosphoric acid, and 1½ to 1¾ per cent. nitrogen. This is a more useful form of phosphatic fertilizer than pure raw bone, since, in the steaming process, besides losing the fat (which is detrimental), it is reduced to a fine state of division, thus presenting a larger surface to bacteria and other agents of decomposition in the soil.

Bone Black.—Contains 32 to 36 per cent. phosphoric acid.

Bone Ash.—Contains 27 to 36 per cent. phosphoric acid.

The two latter are only produced to a limited extent. Bone Black is the residue of bones which have been used in clarifying sugar; it decays slowly in the soil. Bone Ash results from burning bone, in order to reduce its bulk and thus facilitate transportation. It is more variable in composition than Bone Black.

MINERAL SOURCES OF PHOSPHORIC ACID.

In England, in 1845, the attention of agriculturists and fertilizer manufacturers was called to the coprolites which occurred over a considerable area of the eastern counties. These coprolites, which resemble pebbles in form and appearance, containing 50 to 60 per cent. calcium phosphate, consist of concretions of phosphate of lime deposited around excreta fragments of bone and shell, sharks' teeth, etc., and were for many years mined in Bedfordshire, Cambridge, Suffolk, etc., though now it has entirely ceased, owing to the richer deposits which have been discovered in Florida, Tennessee, and South Carolina.

Canadian Apatite.—Contains about 40 per cent. phosphoric acid. This is mined to some extent in the Provinces of Quebec and Ontario, but, as it occurs in varying proportions with other materials, it is not uniform in character, and is very expensive to mine.

Superphosphate or Acid Phosphate.—Contains 13 to 18 per cent. available phosphoric acid.

Natural phosphate of lime is insoluble in water, and only slightly soluble in dilute acid, so that in this condition it would be very slowly available to plants. By treating the ground mineral phosphate with sulphuric acid, part of the lime is displaced and substituted by water, which renders a great part of the phosphate soluble in water, and therefore readily available to plants. The change may be illustrated thus:

Ordinary tri-calcic phosphate..... (lime) (lime) (lime) phosphoric acid.

Treated with sulphuric acid, produces:

Superphosphate or mono-calcic phosphate... (lime) (water) (water) phosphoric acid.

When applied to the soil, superphosphate tends to revert again to the tri-calcic phosphate, but first of all to the di-calcic phosphate, which may be illustrated thus:

(Lime)
(Lime) Phosphoric acid, lime having displaced
(Water) one part of the water. In this form it is still available to plants, being soluble in dilute acid.

Superphosphate, or acid phosphate, is deservedly one of the most popular sources of phosphoric acid for plants, its quick action giving immediate returns in the season of its application; this naturally recommends it to the farmer.

Thomas' Phosphate Powder or Basic Slag (High-grade).—Contains 18 to 24 per cent. available phosphoric acid. This material is a by-product in the manufacture of steel. Its peculiarity is that it contains its phosphoric acid in the form of a tetra-calcic phosphate, or in the proportions of four parts of lime to one of phosphoric acid, thus:

(Lime)
(Lime) Phosphoric acid
(Lime)
(Lime)

This peculiar form of phosphate of lime is easily broken up, rendering the phosphoric-acid part assimilable to plants, but it is not so quickly available as that in acid phosphate, so that, to secure the best results, basic slag ought to be applied in the fall or early in spring.

The chief value of basic slag depends on fineness of grinding, and a good sample ought to be so finely divided that not less than 80 per cent. will pass through a sieve having 10,000 meshes to the square inch.

CHEMICAL ANALYSES OF SOILS.

At one time it was thought that a chemical analysis of the soil ought to indicate exactly the manurial requirements of that particular soil, but this theory was very soon upset when it was observed that certain rich clay soils, which on analysis showed a very high total potash content, were still benefited by an artificial application of potash, as proved by the increase in crop production.

Some soils, also, which analyzed high in phosphoric acid, were found to respond readily to an artificial application of an available phosphatic fertilizer.

Now, while a general chemical analysis will show the total amounts of plant food in the soil, it does not indicate what proportions are available to the plant, so that the quickest way to find out the manurial requirements of a soil is to conduct fertilizer tests right on the farm.

PLAN FOR A FERTILIZER EXPERIMENT.

The following plan of experiment would show whether any ingredient may be profitably dispensed with in the case of the particular crop on that particular soil:

Plot 1.—Unfertilized.

Plot 2.—Complete fertilizer (phosphoric acid, potash, nitrogen).

Plot 3.—Without potash (phosphoric acid, nitrogen.

Plot 4.—Without nitrogen (potash, phosphoric acid).

Plot 5.—Without phosphoric acid (potash, nitrogen).

The sources of phosphoric acid, potash and nitrogen used in the experiments may be any of those previously enumerated; for example, acid phosphate, muriate of potash, and nitrate of soda.

This plan of experiment may be extended or curtailed, as desired. If the farmer simply wishes to study the general effect of a complete fertilizer on his soil, then plots 1 and 2 will be sufficient; but should he desire to observe the effect of omitting any ingredient, he must have a third plot in which that ingredient is left out. To extend the plan, plots could be added to which each ingredient would be separately applied, but the average farmer will be content with the more simple tests, necessitating only two or three plots.

ADVANTAGES OF HOME MIXING OF FERTILIZERS.

When the Canadian farmer becomes sufficiently interested in the fertilizer question to want to make his own mixtures at home, it will be a good thing for the farmer and for the country in general. Then, fertilizers will be more largely and, at the same time, more economically used, for the farmer will be able to adjust the various fertilizer ingredients to suit not only the nature of the soil, but also of the crop to which they are to be applied.

He will be able to supplement his farmyard manure with some phosphate and potash without applying at the same time a wasteful excess of nitrogen, and, besides all this saving, the separate fertilizer ingredients will cost much less than when combined in a ready-mixed fertilizer.

A BEGINNER'S EXPERIENCE WITH ALFALFA.

Editor "The Farmer's Advocate":

As you have asked for people to write their experience on growing alfalfa, I will give you mine. I sowed it with a very light seeding of barley in 1906, not quite a bushel to the acre. Part of it had been root ground the year before, and part had been in mixed grain. That which was on the root ground when the barley was being cut was very thin and delicate-looking—I think, because the barley grew rank and heavy. What was sown on the stubble ground was well up to the bands in the barley sheaves. I had to leave them on their sides for a while to let the butts dry. But in the fall you could see very little difference in the patch, as the stubble was soon covered out of sight with it. It was quite rank, so I let the pigs and sheep on it a little, and they both were very fond of it.

I cut it twice in 1907. The first cutting was very heavy; the second cutting was not so heavy, but was a fair crop. It grew up quite big in the fall again, and I cut the rankest places with the scythe, a little every day, and carried it to the pigs and calves, and sometimes to the horses; and I believe this third cutting paid me for the seed, as the pigs seemed to do so well on it. I am sure they were fat much sooner, and on a great deal less grain, than they would have been without the alfalfa. The second cutting we kept by itself, and fed it once a day to the sheep this winter, and they are doing splendidly. The hens run in the sheep pen in the day time, and I see them quite busy picking and eating it. Everything seems to like it. I intend sowing it this spring without any nurse-crop.

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PAINT INSURANCE FOR THE FARMER.

By H. M. Tandy.

There are a great many farmers who, though they thoroughly believe in the theory and practice of fire insurance for their houses and barns, and life insurance for themselves and families, cannot or will not appreciate the protection which paint affords to their buildings and chattels. This condition is not the result of carelessness entirely, for the farmer is, all things considered, as wide-awake as anyone when a money-saving proposition is brought to his attention. It is because the facts of the case are not generally known.

Stupendous as it may appear, it is calculated, the computation based on a conservative and reliable estimate of conditions elsewhere, that Canadians could actually save from waste $10,000,000 worth of property each year by the intelligent use of paint. It requires no very great head for figures to estimate what this amount of money would accomplish yearly if spent on roadmaking say, or agricultural education.

What proportion of this vast amount of money is slipping away from the farmer, and how can it be prevented?

It is hard to think of another vocation that is so dependent as the farmer's upon wood and things made of wood, and it is for protection to wood that paint was first intended, and still is mostly used. As a general thing, a farmer's house, and generally his barns and outhouses, his implements, reapers, binders, all the way down to the humble spade, are composed of wood more or less, and so are his fences, and wagons, and buggies.

The need of paint for this wood is very great, in view of the fact that it is exposed to continuous and extreme effects of the destructive agents in the atmosphere, namely: heat, cold, and moisture. It is no exaggeration to state that in the case where a house or barn is painted within reasonable time, say two or three months after erection, ten years is added to the life of it. The reason is evident, and quite logical. Wood, in the natural state, is porous and absorbent. All the moisture that comes in contact with it is readily absorbed. Frost strikes it while in this state, the moisture congeals, and the lumber splits and cracks. Intense heat of summer will act on the moisture in a different but, also, quite destructive a manner. A few yearly repetitions of this, and the barn is in constant need of repair and hastening to an early decline. The judicious use of paint would have prolonged the life of that barn from ten to fifteen years. This is a larger item than appears on the face of it too, for if that barn cost $1,000 to build ten years ago, it would, in all probability, cost nearly $2,000 to-day, so rapidly has the value of lumber and labor increased in most localities.

Next in importance to the actual protection which paint gives to wood, there is another feature which also has a financial interest for the farmer. If, for any reason, it should be necessary or desirable to place the farm upon the market, the additional price which well-painted buildings will command over a run-down farm with unpainted ones will be out of all proportion to the time and money which it would take to keep it in good condition.

The labor which is necessary to spread paint is generally considered to be about two-thirds of the total cost of the job. That is to say, if regular painters were hired for a job of painting which cost $75, $25 would be for the cost of the paint, and $50 for wages. The farmer is in a position to avoid the cost of hiring painters by doing the work himself. Painting is not a difficult or an unpleasant undertaking. If the few simple rules that are given below are closely followed, the result will be entirely satisfactory.

1. Do not paint during very cold or very warm weather.

2. See that the lumber is free from moisture.

3. Work the paint into the grain of the wood thoroughly, do not simply spread it over the surface—use "elbow grease."

4. Two coats are sufficient; the first should be thinner than the second. Let the first coat dry thoroughly before applying the second, but do not wait too long, four to seven days will be sufficient.

There are two ways in which paint is sold: first, in prepared form ready to use second, in the form of lead and oil, the user mixing them together himself. There are many arguments advanced for and against each method, all well grounded and worthy of consideration. Lead and oil are procured, lead in the form of paste, and linseed oil in cans. Lead is sold in kegs, ranging in weight all the way from 12½ lbs. up. With a wooden paddle, the lead is then mixed with the oil by hand, in the proportion of 100 lbs. lead to 5 gallons oil. To this is added 1 pint of drier and 1 gallon of turpentine, which produces about 7¼ gallons of liquid paint. The proportions vary slightly for second and