

The Uses of Lime in Agriculture.

Lime itself is not usually valued as a direct fertilizer. Its action is indirect. What it does is more, perhaps, in the nature of stimulating the soil than of furnishing fertilizing materials. It has, however, a not important place in practical agriculture, and could be used to excellent advantage on many farms in this Province. In Lambton we have not a few acres of low-lying, swampy soils—soils which are called sour, and on which the ordinary farm crops do not thrive. Then, too, we have, in common with other parts of the Province, considerable areas of rather heavy clay land that is heavy to work, that bakes and is difficult to manage. On each of these kinds of soil lime has a beneficial effect. It corrects the sourness of the one, and relieves the tough, tenacious nature of the other. It makes the swampy soil sweet and fertile, and fit for the growth of plants, by acting chemically upon the vegetable acids whose presence induces the sourness, while it relieves the tenacity of the clays by a physical action in which the soil granules are caused to coagulate together into grains of larger dimensions, forming a soil that is more readily cultivated, more friable, more easily drained, and less likely to bake if worked when wet. We wish to consider briefly these two uses to which lime may be applied.

Swampy soils are soils formed in low-lying areas from the seepage drained into them from the surrounding higher land and from the growth and decay of water plants, mosses, etc., which finally produce a soil sufficiently fertile to sustain certain of the higher plants, but which are seldom capable of producing to the best advantage any of the ordinary agricultural crops. These soils may not occur in very large areas—in fact, in most cases their extent is quite limited—but wherever they do exist, their occurrence is due to the same cause, and the same remedy may be applied in correcting them. By the farmer they are termed "acid" or "sour," and their acidity or sourness is due to the fact that in their formation, through the fermentation or breaking down of the vast quantities of organic matter, mosses, sphagnum, etc., of which they are composed, a great amount of humic acid is liberated, and this, finding in the soil no base, such as lime or potash, with which it may unite, forming in the process the neutral, harmless salts, as are formed in all soils under suitable conditions, is forced to remain in the acid form—a form in which it cannot act as a plant food, nor, if present in any appreciable quantities, permit even of plant growth. Drainage may have some effect in correcting this acid condition, but its action is not rapid enough. We must employ something that will produce a more immediate result, and in this instance that something is lime. If the souring of the soil is due, as we have shown, to the presence of free acid, and if this acid is present for the reason that no base-forming element, such as calcium, is in the soil with which it may unite to form a salt, then the addition of this basic element—and lime is the cheapest form in which it may be procured—has the effect of acting chemically on the acid, changing it into the harmless form, sweetening the soil and fitting it for agricultural purposes.

Such is the action of lime on peaty soils. The effect it produces is chemical. On clays, however, its action is of a somewhat different nature, being largely physical. To understand this action clearly, it is necessary for us to know something of soil physics. Most farmers have a more or less hazy knowledge of the physical properties of the soils they are working, but few there are who know definitely the nature and constitution of the material whose cultivation and management is their vocation. It might not, therefore, be entirely without the subject to discuss it briefly here.

Soils are graded physically, according to the size of the particles of which they are composed, and, under this classification, fall naturally into the three great groups—gravels, sands and clays. Mixtures of these in different proportions with the vegetable mould, organic matter or humus, form the various types of loams. The distinguishing and peculiar characteristic of a clay is the extreme minuteness of its soil particles. It is this fineness of grain structure, together with the presence of the sticky, adhesive kaolin common to all clays, that renders these soils so compact in texture and so tenacious and stiff if cultivated when not in proper condition. The purpose of any remedy is to increase the size of the grains, to render them less adhesive, to increase the open spaces between them, and make the whole soil more open and porous. Underdrainage, the plowing down of green crops, or frequent manuring, accomplishes this result to some extent, but, as in the case of swamp soils, the most immediate result will follow the application of something that is, by its very nature, adapted to produce quickly the desired effect, and again that something is lime.

It is a well-known fact that standing water in a clay soil will usually appear muddy or discolored. Dissolve a piece of clay in a beaker of water, and the solution requires from a few hours to several days to become clear. Add to the mix-

ture, however, a small quantity of lime water, and the matter in suspension settles almost immediately. The lime acts upon the minute clay particles very quickly. They gather together into grains, getting larger and larger, until their weight is such that the water can sustain them no longer, and they sink. The lime has induced a flocculation or coagulation of the particles. Their adhesiveness is materially lessened. They will not pack together so closely, and the porosity and friability of the mass becomes correspondingly greater. Practically the same result follows the application of lime to the soil in the field. The minute granules coalesce into larger-sized grains, and these, from their very nature, must produce more pore space, a free circulation of air, greater root range, and a soil that is generally more easily cultivated and less likely to "bake," if by chance it should be worked when wet.

Ordinary farm soils contain, under most conditions, sufficient quantities of lime for their present and future needs, hence it would be an economic mistake to apply it for any purpose whatever. In the circumstances cited, however, it may be very profitably and advantageously employed. We have noted some very marked results following its application to clays, while its use on sour, acid soils invariably results in a very noticeable improvement in the quantity and quality of the crop produced. Its use, however, is hardly indicated under any other conditions ordinary in Ontario. About fifty bushels per acre is the usual dressing applied in any convenient way and at any reasonable season, after being allowed to thoroughly air-slake. It is better to apply lime often and lightly than to use in larger quantities at longer intervals.

Lambton Co., Ont.

Berlin's Beet-sugar Factory.

The beet-sugar industry in Ontario has now given us four years' experience, during which time ample opportunity has been afforded for careful observations of its relation to agriculture in particular, and to other industrial lines in general. To agriculture the industry has proved itself to be of almost essential importance where its benefits have once been felt. Each year the acreage under the cultivation of beets has increased, and each succeeding year the farmers have more readily made contracts with the company, proving the incorrectness of the impression that some persons held at first, namely, that the farmer would not grow beets. The reason of the increased interest taken by farmers in this industry rests, in the first place, on the fact that it pays them to cultivate the beet, but in addition to this fact all are recognizing an improvement in the soil's condition through the cultivation of the beet, and many hundreds of stockmen are now feeding beet pulp to their animals, with much better results than the most sanguine anticipated.

To the beet-growers of the Berlin factory there have been distributed for the 1905 crop of beets \$289,547.77, showing an average return per acre of \$53.78, based on an exact measured acreage under crop. There is no other crop in the farmer's rotation that gives such high average cash returns. The 1905 beet crop measured nearly fifty per cent. greater than that of 1904, yielded an average of 10.7 tons of net clean beets per acre, and produced a total tonnage fifty per cent. greater than in 1904. Each year the output of sugar has increased, reaching in 1905-6 a quantity sixty per cent. greater than in 1902-3, and thirty-two per cent. greater than in any former year.

Few actually realize the enormous amount of business done during the short period of the factory's campaign. This, however, may be judged of to some extent by the quantity of freight and number of carloads of beets, pulp, sugar, coal and other material conveyed to and from the factory. Berlin received no less than 1,570

carloads of beets, 223 of coal, 62 of stone, 10 of coke, while it has or will send out no less than 267 cars of beet pulp and 300 cars of sugar, composing a total of not less than 51,000 tons of freight carried by no less than 2,435 cars.

As to the future of the industry in Ontario, one important fact, at least, past experience has demonstrated, namely, that factories properly located and managed will, in the course of a few years, be warmly appreciated by its farmers. Each year our acreage prospects have improved in a manner causing us to believe that the time is near at hand when we shall be enabled to make up our required acreage by selecting the most careful and successful growers. At the time of writing the factory has a much larger acreage than upon the same date in any previous year, and we fully anticipate, if the flow of contract acreage coming in continues, the possibility of having to close our acreage books before the time of seeding.

There have been besides the above, 10,775 wagon loads of beets delivered, and several thousand loads of beet pulp teamed back to the farms to feed stock.

WATERLOO.

Experience in Bean Culture.

To the Editor "The Farmer's Advocate":

Some time ago you asked me to write our experience on bean culture. I have felt rather timid in writing to a paper that is so generally taken as an authority on farm topics, many farmers scarcely ever questioning anything that comes from "The Farmer's Advocate." This is a poor policy, as no one method will be successful in all localities and under all circumstances. I am sending you the method we have followed for the last few years with fairly good success, not that this is the best method, but hoping it may start a discussion on the subject, and the best method be found, as the best is none too good. At one time the raising of beans was one of the main industries of this section. But the prices went so low farmers thought it was too hard on the land for the profit derived, and therefore went into stock-raising or some other line; but as prices have again advanced, farmers are going back to beans. In considering this question under present conditions, the scarcity of help is one of the main problems, and how to raise them with the least amount of labor must be the aim. In the first place, I would say get a good serviceable team of horses; then make your fields as long as convenient, so as to save time in turning, and also the horses from trampling out so much of the crop in cultivating. In manuring the ground, we haul out of the box stalls in the winter and spread as evenly as possible, letting it lie over summer, and pasturing the field. In the fall we plow it under, and the manure gives no trouble and better results than if plowed under directly after being hauled out, besides making the pasture a good deal better. We have tried both ways, and find that letting the manure lie on the ground over summer makes a great difference on the crop, and has a tendency to destroy any weed seeds that may be in the manure. The next spring after the ground has been plowed, and the winter's frosts have had a chance of mellowing it, as soon as the ground is sufficiently dry to work properly, we go on with the cultivator or disk harrow and work up a nice seed-bed, then leave the ground for a week or so. This gives the foul seed a chance to germinate. A few days before it is time to plant we go over it again and work the ground up. This will be liable to destroy any weed seeds that may be near enough to the surface to grow throughout the summer. Then, about the 24th of May or the 1st of June, according to the season, we plant. Some use the bean planter, and others the ordinary 11-hoe drill. If it is a wet



At the Berlin, Ont., Sugar-beet Factory.

Hauling in several thousand tons of beets; piled outside during the rush of delivery.