

being converted into new material, into humus, and is adding to the available plant food in the soil. The available plant food is thus being constantly increased. It is quite a different thing with our orchards. You do not allow those apples or other fruit to rot on the ground, neither are the leaves, as a rule, returned to the orchard soil. Every time we sell a barrel of apples we are selling so much plant food. It is quite right to sell it. No man gets a profit unless he parts with something. The farmer is the skilled agent using Nature's instruments, taking the crude, raw material of low price and turning it into produce of greater value. It is the farmer's business to convert this plant food of the soil into material which he can send off and obtain money to buy the other necessities and luxuries of life. But the point I wish to emphasise is this: that every time he does that he is lowering the amount of plant food, and more particularly the amount of available plant food. Now, then, if he is going to keep up his soil bank account, if he wishes to reserve a margin for future crop growth, he has got to put that back in some form or other. He cannot go on drawing for ever unless he does so. And I only hope he may not live to see the time when it is too late to recover that soil economically. We must wake up to a realisation of this fact before it is too late. I use that word economically in its broadest sense; I do not mean sparingly, I mean with profit. A man does not act economically if he refuses to buy five dollars worth of fertilizers when he can get ten dollars of product from the application.

I want, then, to impress upon you that it is altogether an erroneous idea that the conditions which prevail in a forest are the same which prevail in an orchard; and, further, that every time you sell a barrel of apples you are selling so much of your plant food. By all means sell your apples, as it is the man who employs his capital and keeps it busy all the time that is going to make the most profit; but replace, in some form, the plant food so parted with.

Let me make a comparison with regard to the amount of plant food which is taken out and parted with in growing apples as compared, say, with wheat. We have always known there were certain amounts of potash, phosphoric acid, and nitrogen in apples; but we wished to determine what those amounts were. We made the necessary analyses. We also made a similar estimation of the plant food in the leaves of our orchard trees. Let me give you some figures to show you the extent of the exhaustion that takes place in orchard soils as compared with soil cropped with wheat.

Supposing we take thirty-five apple trees to the acre, and the orchard is in full crop. In twenty crops, say fifteen bushels to the tree, there will be—in the fruit and leaves of the twenty crops—extracted from that acre of soil over 1,300 lbs. of nitrogen, somewhat more than 300 lbs. of phosphoric acid, and nearly 1,900 lbs. of potash. There is very little plant food in a single apple, but when we come to measure the fertilizing ingredients in fifteen bushels to the tree over twenty years, together with that in the leaves over that period, you will see the amount is quite large. That has been a draft upon the total plant food in that soil, but, more than that, it has been more particularly an exhaustion of the portion of it which is immediately available. For the sake of comparison, let us take twenty years of wheat growing over the same area, one acre. During twenty years of continuous cropping of wheat, in the grain and straw of those twenty crops, reckoning fifteen bushels to the acre and the straw that accompanies it, we would withdraw from the soil: nitrogen, 660 lbs.; phosphoric acid, 210 lbs.; and potash, 325 lbs. This comparison furnishes startling figures. It means, by orcharding, we have taken out twice as much nitrogen as we should have done by the continuous cropping of wheat, half as much again in phosphoric acid, and three times as much potash. Besides these quantities, there are the amounts stored up in the branches and stems of trees, for there is a continual storing up there. This will show you better than any argument I can put forward the absolute necessity of attending to the fertilization of orchards.

I should like to say something, leaving out the consideration of the special application of commercial fertilizers, regarding the economic improvement of soils which have been badly treated in the past, or which are by nature pure in character. We are constantly receiving in our laboratories samples of soil more or less exhausted, soils partially exhausted or worn, for examination. From their examination I have gained a considerable amount of experience. These soils come from all parts of the Dominion.

We may say that they fall into two great classes, not that there is any strong line of demarcation between them: they are the heavy clay loams and the light sandy loams. They are, perhaps, accompanied by a letter, in which the man says the yield has been gradually lessening year by year, and he no longer thinks it profitable to till that soil—say, to sow wheat upon it. I look at a sample and do not wonder. It is hard, it is in clots or lumps, it is

refractory, it altogether poor of drainage and above all this

Now, well Does it always question of fertilization

Firstly, in the soil.

Secondly,

Thirdly, to take into

I have been on the other improvement

Plants may find a and forage food is taken from hold this soil improved. deficient in you can always appearance of cloddy and Humus, though nitrogen; it temperature sets free place we have not, continuous the amount of constituent.

What a return vegetables of the other. probabilities supply. Suppose I answer, then in nitrogen, will supply a the soil with clover. In the crops, we find the clover as can see the very necessarily and personal good orchard during the day. The keeping clover during at Ottawa. advise you all

There is what we call generations contain any amount of