By the bye, do you think that you can exhaust the soil—when I say exhaust, I mean totally exhaust the soil—by a continuous cropping and one-sided system of farming? No, not at all. Nature will see to that. No matter how profligate your use of the soil is, there will always be some material for plant food there, though locked up. We can ruin the soil for our successors down to the fourth generation, but it will come back again to fertility some time. How is this? It is because there is a wise provision of Nature that the greater part (90 per cent.) of the plant food in the soil is locked up, or insoluble, available for plant use only by the judicious culture of the field and by intelligent farming. It is thus that plant food may be rendered assimilable. We cannot entirely exhaust the soil, because it is no longer profitable to grow crops after they reach a certain minimum yield. If we do not get, say, 15 bushels of wheat, we abandon wheat growing. What we have done has been to use up the store of available plant food.

The continuous one-sided method of farming, taking all off and putting nothing back, is like a man drawing on his account and never making a deposit. Our soil may be regarded as our bank, and the plant food in it our capital. If we are to keep on making withdrawals we must make deposits.

We must return to the soil, especially, three constituents, namely: nitrogen, phosphoric acid and potash. It is essential that we should know something of these.

First of all let us consider nitrogen. Four-fifths of the atmosphere consists of nitrogen. It is present there as a gas, colourless, odorless and tasteless. You might say that if it is there in such abundant supply, what necessity is there for us to see to its application to our fields? Well, simply because our crops cannot utilize this free nitrogen as food. It is not as a gas available plant food.

Nitrogen must be converted into a certain compound, or class of compounds, known as nitrates, before it is utilizable by plants. The process whereby nitrogen contained in the vegetable matter of the soil is converted into nitrates is known as nitrification. It is the result of germ life in the soil. There must be certain favourable conditions, such as warmth, moisture, an open mellow soil or this useful work cannot proceed. We are to consider, therefore, the humus or vegetable matter of the soil as holding nitrogen required by our crops, but that before such nitrogen is available to them it must be converted into nitrates. In a few moments I shall tell you of a class of plants that can, by certain aids, avail themselves of the nitrogen of the air (exceptions to the general rule); but in the meantime we will consider briefly the source and supply of the mineral elements, phosphoric acid and potash. These are always present in the mineral matter or ash of plants, which may contain five to fifty per cent. potash and two to twenty per cent. phosphoric acid. Where have the potash, the phosphoric acid and the lime come from that are now in the soil? A knowledge of the origin or source of things is frequently very useful. That leads us to think of the origin of the soil.

We need not go into any learned argument as to the origin of this earth, but we may assume the theory as correct that this globe was once a mass of molten rock, and that this rock matter consisted of various elements, such as we find make up our rocks to-day. The molten matter gradually cooled off and solidified, and subsequently, by a series of atmospheric changes and weatherings, a very interesting set of phenomena, the surface of this rock was gradually disintegrated and broken down and partially decomposed, the result being the formation of sand, clay and gravel. After a time these particles became so reduced that the humblest forms of plant life could find a foothold. They, as it were, ate into this rock matter and made it part of their tissues or substance. As successive generations of plants grew and died, their remains, mixed with the result of the disintegration of the rock, formed what we know as soil. Consequently a soil is a mixture of rock material and organic matter, the latter consisting of plant remains.

We see, therefore, there are two classes of constituents which must be present in due proportions in order to obtain an arable or fertile soil. We must have the mineral food there, the source of which originally was rock, which covered and formed the crust of the earth, and also the remains of former plant life, which we call vegetable or organic matter, in the soil.

With regard to this question of nitrogen. I have told you that our ordinary farm crops cannot in the least avail themselves of atmospheric nitrogen, which is quite true; but there has been a discovery made recently, and which will be handed down as the greatest discovery of the century in connection with agricultural science, that there is a class of plants, all of which belong to one botanical family, which has the ability to utilize this free nitrogen gas of the atmosphere.