land, which was, agriculturally speaking, in a somewhat exhausted condition, was much more that of available phosphoric acid than of potash, or the other bases. In reference to this increase of potato tubers by mineral manures alone, it may be observed that the result is quite consistent with that obtained with root crops, having comparatively shallow root development; and in such cases the source of the nitrogen is chiefly the store of it in the surface soil. The beneficial effects of mineral manures, and especially of phosphates, are, indeed, observed generally with ripened, as well as with suc culent, crops, which are spring sown, and which have, with a short period of growth, comparatively superficial rooting, and which rely, therefore, much on the stores of the surface soil.

It is remarkable that there is much less increase of produce of potatoes by nitrogenous manures alone than by mineral manures alone. Thus, by ammonium salts alone there is an average produce of 5 124 pounds, or only 672 pounds more than without manure; and with nitrate of soda alone there is an average of only 5,880 pounds per acre. The better result by nitrate of soda than by ammonium salts is doubtless due to the nitrogenous supply being more immediately available, and more rapidly distributed within the soil, and so inducing, a more extended development of feeding root. These negative results, by the nitrogenous manures alone, confirm the conclusion that by the continuous growth of the crop on this lend it was the available supply of mineral constituents within the root range of the plant, more than that of nitrogen, that became deficient.

The amount of produce obtained by the mixture of both mineral and nitrogenous manures are sufficient to show that, although the land is by no means specially a lapted for potatoes, the results may be taken as normal and trustworthy; and as fairly indicating the characteristic manurial requirements of the crop; and the conclusion is that, in an agriculturally exhausted soil, both mineral and nitrogenous manures are required to give full crops of tubers.

With an annual application of sixteen tone of barnyard manure per acre, supplying about 200 pounds of nitrogen per acre per annum, there was an average produce of only 11,760 pounds; the addition of superphosphate of lime raised the produce to 12,540 pounds. But by the further addition of nitrate of soda, supplying eighty-six pounds of nitrogen per acre per annum in a much more readily available condition that most of that in the barnyard manure, the average annual produce of tubers was raised to 16,904 pounds, or by 3,360 pounds more.

Comparing these results with those obtained by artificial manures alone, we find that barnyard manure, which, besides an abundance of mineral matters and a large amount of organic substance, rich in carbon, supplied annually about 200 pounds of nitrogen, gave considerable less produce than an artificial mixture of mineral manures and ammonium salts, or nitrate of soda, supplying only eighty-six pounds of nitrogen per acre per annum. The fact is, that it is only the comparatively small proportion of the nitrogen of barnyard ma nure which is due to the liquid dejections of the animals, that is in a readily and rapidly available condition ; while that due to the more or less digested matter passing in the fæces, is more slowly available, and that in the litter remains a very long time inactive. Hence, the addition of nitrogen as nitrate of zoda to the barnyard manure bad a very marked effect.

The last column in the table shows the average percentage of diseased tubers under each condition of manuring. It is seen that without minure, and with purely mineral manures, the proportion of diseased tubers is much less than where nitrogenous manures were applied : and again, that it was less where the nitrogenous ingredients were applied alone, than when in conjunction with mineral manures; and where, than when in conjunction with mineral manures; and where, than when in conjunction with mineral manures; and where, than when in conjunction with mineral manures; and where, than when in conjunction with mineral manures; and where, than when in conjunction with mineral manures; and where, than when in conjunction with mineral manures; and where, the second discussion of the table shows the average percentage information of the table shows th

consequently, the luxuriance of growth, and the amounts of produce, were the greatest. The experiments further show that the potato disease, though largely dependent on season, developed much more in tubers grown by highly nitrogenous manures, and containing a juice rich in nitrogen, than under ordinary conditions. It is also shown that a result of the disease is a destruction of starch, the formation of sugar, the loss of organic substance, and the growth of the fungus at the expense of the maternal of the tuber.

RESULTS OF ROTHAMSTED POTATO EXPERIMENTS. -1. The amount of disease was not enhanced by the continuous growth of potatoes on the same ground. 2. The disease was increased by fertilisers rich in available nitrogen. 3. The disease changed much potato starch into sugar, and the fungus fed at the expense of the tuber. 4. The continuous growth of potatoes on the same land did not so much exhaust the available nitrogen, as it did the supply of mineral constituents within the reach of the roots. 5. In a wornout soil, both mineral and nitrogenous fertilizers are required to give full erops of potatoes.

ARTIFICIAL FERTILISERS

A general meeting of the members of the Noriolk Chamber of Agriculture was held on Saturday at the Agricultural Hall, Norwich, to hear a paper read by Mr. Thomas Brown, of Lynn, on "Artificial Fertilisers." The President (Mr. C. S. Read) was in the chair, and, in directing attention to the subject for consideration, reminded the meeting that a Commission was sitting to consider whether artificial manures and feeding stuffs should not be placed under some restrictions as to their purity.

Mr. Brown, in the introductory part of his paper, said Sprengel was the first to investigate the properties of soils, and to demonstrate in 1839 the importance of the mineral constituents therein. It was in 1840 that Liebig, in his great work ('Organic Chemistry in its Application to Agriculture and Physiology ") built up the science of agriculture, demon-strating that ' humus' is priceless to build up plant life, that plants derive their acid from the carbonic acid of the atmosphere, that their hydrogen comes from water, their nitrogen from ammonia in the air and the soil, their sulphur from the sulphates which abound in all soils, and that the mineral matter constituting the ash of plants is supplied from the soil, that this mineral matter is absolutely essential to vegetable life, and that the fertility of a soil cannot be maintained unless the mineral substances which are withdraw by cropping are restored. He demonstrated and established by experiment his four laws of husbandry :--(1) A soil can be termed fertile only when it contains all the materials requisite for the nutrition of plants in the required quantity and in the proper form. (2) With every crop a portion of these ingre-dients is removed. A portion of this portion is again added from the inexhaustible store of the atmosphere. Another part, however, is lost for ever if not replaced by man. (3) The fertily of the soil remains unenanged if all the ingredients of a crop are given back to the land. Such a restitution is effected by manure. (1) The manure produced in the course of husbandry is not sufficient to permanently maintain the fertility of a farm; it lacks the constituents, which are annually reported in the shape of grain, hay, milk, and live stock. These laws formed the basis of modern and scientific agriculture. Liebig my have unduly exalted his "mineral theory," but the world-samed labours of Messrs. Lawes and Gilbert had demonstrated that a soil well supplied with minerals, but devoid of aitrogen (nitrogenous plant food), is as infertile as one containing an abundance of nitrogenous mat-