

the following fact, which only came to my ears yesterday, or not : Mr. Tuck, Messrs. Dawes' farm-bailiff, who has been actively engaged in agricultural operations at Lachine for the last sixteen years, had never heard that there was such a publication as *The Illustrated Journal of Agriculture*.

Lawes on Manures for the Turnip.

Judging from the analysis of the turnip, the specific manure for this crop should be an alkali of some sort rather than phosphoric acid for the root and top contain a proportion of alkalies to phosphoric acid of five to one. Is it so in common practice? By no means, and here is another case in which practice deviated theory. The striking influence of all kinds of phosphates on the swede or the turnip was well known to farmers long before Baron von Liebig wrote on the subject. It is true that, in many parts of England, wood-ashes were used for catch-crops of turnips, but the produce from the ashes was really due to the phosphoric acid contained by all incinerated wood, particularly beech, rather than to their potash. I myself have shown that lixiviated ashes produce quite as many tons of turnips to the acre as ashes undeprived of their potash, but this series of experiments was tried on land which had been regularly manured with dung for many previous rotations, and where, therefore there was present an abundance of potash.

Still, as Professor Liebig, in his *Letters on Agriculture*, persisted that the Rothamsted experiments were wrongly conducted, and that the deductions drawn from them were erroneous in the highest degree, Lawes and Gilbert were induced to repeat the experiments on a larger scale, with a view to the refutation of Liebig's assertion that : "It is certain that this incessant removal of the phosphates (by the sale of flour, cattle, &c.) must tend to exhaust the land and diminish its capability of producing grain. The fields of Great Britain are in a state of progressive exhaustion from this cause, as is proved by the rapid extension of the cultivation of turnips and mangels, plants which contain the least amount of the phosphates, and therefore require the smallest quantity for their development." And, as a commencement of the proof that the professor was as utterly mistaken in his theory of the manure for turnips as we have seen he was in his theory of the manure for wheat, let us look at the following table, in which is given the amounts of bulb grown on the experimental plots at Rothamsted from 1843 to 1850, both years inclusive. They are divided into :

First, the continuously unmanured plot ;

Secondly, that with a large amount of superphosphate of lime each year ;

Thirdly, that with a very liberal dose of potash, with some soda and magnesia (alkalies), in addition to superphosphate

Years.	Plot continuously unmanured.	Plot with superphosphate alone every year.	Plot with superphosphate and mixed alkalies.
	Tons. cwt. qrs. lbs.	Tons cwt. qrs lbs	Tons. cwt. qrs. lbs.
1843	4 3 3 2	12 3 2 8	11 17 2 0
1844	2 4 1 0	7 14 3 0	5 13 2 0
1845	13 2 14	12 13 3 12	12 12 2 8
1846		1 18 0 0	3 10 1 20
1847		5 11 0 1	5 16 0 0
1848		10 11 0 8	9 14 2 0
1849		3 15 0 0	3 13 2 8
1850		11 9 0 0	9 7 1 12
Totals.		65 16 1 1	62 5 1 20
Means.		8 4 2 4	7 15 2 20

of lime. The superphosphate was entirely free from nitrogen, being made by the action of sulphuric acid on burnt bone-dust.

After three years consecutive growing of the same plant on the same land, the crop became not worth weighing. Eight successive crops of turnips manured with superphosphate of lime alone yielded an average of $8\frac{1}{2}$ tons of bulb. The addition of a large dose of alkalies—much greater than could be removed by the crop—to the superphosphate had no effect at all on the average yield ; for the diminution of the crop by a mean of about half a ton = $\frac{1}{8}$ of the whole may be disregarded.

The deduction I should make from the above series of experiments is this : as the value of the swede or the turnip in feeding cattle is due—as I have often insisted in this publication—not alone to the contents of the bulb, as determined by chemical analysis, being converted by the animal into its own flesh, fat, &c., but to some, as yet unknown, special agency which they exert in developing the assimilative processes of the animal ; so, I believe the effect of the phosphoric acid on the swede or turnip is due to some special agency which develops the assimilative processes of the plant. And this is the more likely, because in the case where the superphosphate is immediately neutralised by the large dose of alkalies, we see that the efficacy of the manure is thereby reduced. And again, the effects of the phosphoric acid, as such, cannot be due merely to the liberation of the alkalies of the soil ; for in that case we should expect that the artificial dose of these would at least have increased the crop.

Hence, we must conclude that phosphoric acid, though it forms so small a proportion of the ash of the turnip, has a very striking effect upon its growth, when applied as manure ; and it is equally certain that the extended cultivation of root-crops in Great Britain cannot be due to the deficiency of this substance for the growth of grain and to the less dependence upon it of the root-crops, as supposed by Liebig.

And what, now, are the conclusions we draw from what we have seen of the effects of nitrogen as a manure for wheat, and of phosphoric acid as a manure for swedes and turnips? First, that, taking into careful consideration the tendency of all experience in practical farming, as well as the collective results of the Rothamsted investigations, it is pretty certain that the analysis of a crop that is sold off a farm affords no direct guide to the nature of the manure required to be provided for its increased growth from sources extraneous to the home manures of the farm, that is to say, artificial manures ; or, in other words, if land is well and regularly farmed, nitrogen for the grain-crops, and phosphoric acid for the root-crops, will be the only imported plant-food required. (1)

Silage experiments at Woburn.

(Continued from p. 186, vol. IX.)

In the trials between *sweet* and *sour* silage, Dr. Voelcker does not seem to have reached any definite conclusion ; whether this failure was due to bad management of the harvesting, or to some other cause connected with, perhaps, the quality or the over-ripeness of the grass, I cannot say positively, but my impression is that as the content of the silo No. 2, which was the one intended for *sweet* silage, never attained a

(1) The use of nitrogenous manures for mangels, even where the dressings of farmyard dung are superabundant, is, and always has been, a puzzle to me as far as regards the theoretical reasons for their adoption. As to their practical use, I have no hesitation in saying that any farmer who sows mangels without adding to the ordinary coat of dung a supply of at least 30 pounds of nitrogen, either in the form of nitrate of soda, sulphate of ammonia, or guano, is throwing away at least eight tons of his potential crop.—A. R. J. F.