

amount of mineral matters or ash in a crop of turnips is very much larger than that in a crop of wheat, the amount of phosphoric acid which is removed from the soil by the one is very much more considerable than that taken up by the other.

"Taking the average composition of the ash of turnips, bulbs and tops, deduced from the recorded results of numerous experimenters, we have in 100 parts

	Bulbs.	Tops.
Potash	42.0	20.0
Soda	2.0	3.0
Magnesia	2.0	1.0
Lime	11.5	30.0
Phosphoric acid	9.0	5.0
Sulphuric acid	11.5	11.0
Silica	1.0	1.0
Chloride of sodium	6.0	8.0
Chloride of potassium	—	5.0
Carbonic acid	15.0	16.0
	100.0	100.0

"The average composition of the ash of the grain and straw of wheat is as follows :

	Wheat.	Straw.
Phosphoric acid	50.0	5.0
Sulphuric acid	.5	2.7
Silica	2.5	67.0
Lime	3.5	5.5
Magnesia	11.5	2.0
Potash	30.0	13.0
Soda	2.0	4.8
Chlorides of potassium and soda }		
	100.0	100.0

"If we suppose the crop of bulbs of the turnips to weigh 20 tons per acre and the tops 6 tons, and take the average percentage of ash in the bulbs at .70, and that in the tops at 1.7, we remove from each acre, in round numbers—

	lbs.	
the bulbs	314	mineral matter.
the tops	228	"
	542	

An average crop of turnips in fact removes from the soil 28½lbs. of phosphoric acid in the bulbs and 11½lbs. in the tops—39½lbs., or, in round numbers, 40lbs. in all.

"The grain of wheat, on an average, contains 5 per cent. of ash, and wheat straw 5 per cent. The mean produce of wheat per acre, taken at quarters—32 bushels at 60lbs. the bushel, is 1920lbs. of wheat; and as straw, being generally twice the weight of grain, would weigh 3840lbs.,

	lbs.	
1,920 of wheat there are	32½	mineral matter.
3,840 of straw there are	192	"
	223½	
total mineral matter per acre	223½	

A fair average crop of wheat indeed removes from the soil 16½lbs. of phosphoric acid in the grain, and 9½lbs. in the straw—together 25½lbs., or, in round numbers, 26lbs. Therefore a turnip crop weighing 20 tons per acre takes 14lbs. more phosphoric acid out of the soil than 32 bushels of wheat and the straw belonging to it."

Next let us travel with the Professor, while he farther inquires on the important question, for although the amount of phosphate of lime in the turnip crop is considerably more than in that of wheat, yet there are other reasons why the application of soluble phosphate of lime is so much more beneficial to the root than to the cereal. Here, again, to use the words of the Professor: "If we suppose the turnips to have been grown with 3cwt of superphosphate, containing 20 per cent. of soluble, and an inappreciable amount of available insoluble phosphate; the manure will supply 31lbs. of phosphoric acid and the remaining 9lbs. must be derived from the soil. Yet although the larger amount of phosphoric acid contained in a crop of turnips accounts to some extent for this crop being more benefited by phosphatic manures than wheat, I believe the principal cause of the more energetic and striking effect which such manures produce on root crops than on cereals, will be found in the different mode in which green and white crops take up food from the soil, and the different duration of their period of growth. The roots of wheat, as is well known, penetrate the soil to a much greater depth than the more delicate feeding fibres of the roots of a turnip. Wheat, remaining on the ground two or three months longer than turnips, can avail itself of a longer period of the resources of the soil; therefore in most cases the phosphoric acid disseminated through the soil is amply sufficient to meet the requirements of the wheat crop; whilst turnips, depending on a thinner depth of soil during their shorter period of growth, cannot assimilate sufficient phosphoric acid to come to perfection. This is, I believe the main reason why the direct supply of readily-available phosphate is so beneficial to root crops, and not to wheat.

"This view of the matter, if I am not mistaken, gains strength by the fact that barley, a crop which in many parts of England is often sown late in the season, and generally later than any other white crop, is much more improved by the superphosphate of lime than oats or wheat. On late sown barley this fertilizer has a strikingly beneficial effect. When the land has not been well done before, or is naturally poor, and the barley backward, a top dressing of 3cwt. of superphosphate will be found most useful. In that case a still better manure will be a mixture of superphosphate and guano in equal proportion, applied at the rate of 3 to 4 cwt. as a top-dressing. A crop of barley does not contain more phosphoric acid than a wheat crop; and yet I have repeatedly noticed the