ROTHAMSTED RESEARCH

Yields of the Field Experiments 1901

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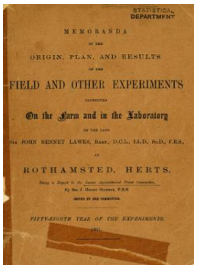

Potatoes; Hoos Field

Rothamsted Research

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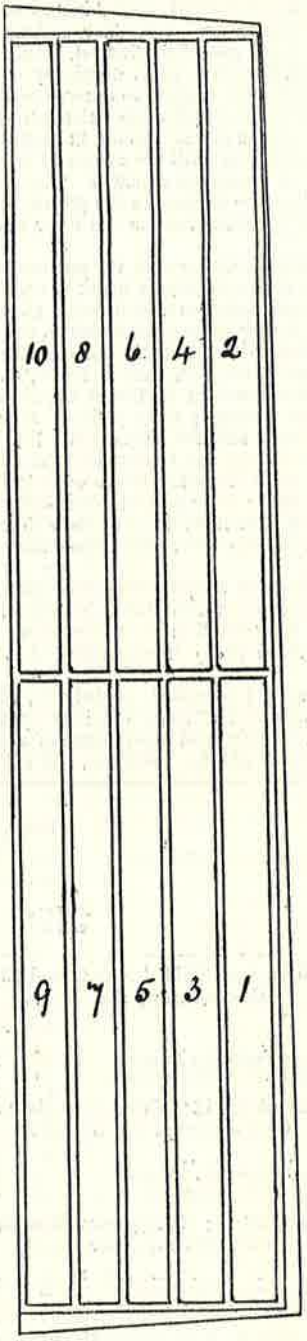
PLAN OF THE PLOTS IN HOOS FIELD, ON WHICH EXPERIMENTS HAVE BEEN MADE ON POTATOES, WITHOUT MANURE, AND WITH VARIOUS MANURES.

26 years, 1876–1901.

[For a brief summary of results and conclusions, see opposite page.]



Total area of ploughed land about $2\frac{1}{10}$ acre.
Area of each plot $\frac{1}{6}$ acre.
The double lines indicate division paths between plot and plot.

[For details of the manuring and produce, see pp. 88–109.]

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RESULTS OF EXPERIMENTS MADE IN HOOS FIELD, ON THE GROWTH OF POTATOES.

These experiments were commenced in 1876, so that 1901 is the 26th year of their continuance. The descriptions grown were "Rock," 4 years, "Champion," 11 years, "Sutton's Abundance," 5 years, "Bruce," 1 year, and "White Beauty of Hebron," 1897, and since. The question was not as to the comparative merits of different descriptions, and different sorts were selected on the supposition that in growing the crop year after year change was desirable, especially with a view to the avoidance or lessening of disease. The special object was to ascertain the manurial requirements of the crop, and the comparative characters and composition of the produce.

The crop was grown continuously without manure, with various artificial manures, and also with farmyard manure, both alone and with some artificial manures. There were 10 differently manured plots, and under each of the 10 conditions the crop more or less declined over the later compared with the earlier years. The average produce per acre of total tubers over the 20 years was—without manure, only 1 ton, 11½ cwt.; with ammonium-salts alone, 1 ton, 18½ cwt.; with nitrate of soda alone, 2 tons, 8 cwt.; with superphosphate alone, 3 tons, 2¼ cwt.; with mixed mineral manure, including potash, 3 tons, 6¾ cwt. Thus, purely nitrogenous manures yielded less than purely mineral manures, indicating that there was a deficiency of ash-constituents rather than of available nitrogen within the soil. With the mixed mineral manure and ammonium-salts together, the average produce of total tubers was nearly 6 tons, and with the mixed mineral manure and nitrate of soda rather over 6 tons per acre. The better result by the nitrate of soda is doubtless due to its nitrogen being more immediately available, and more rapidly distributed within the soil, and so inducing a more extended development of feeding root. The average produce by the mineral and nitrogenous manures together, over 20 years of continuous growth, was very nearly that of the estimated average produce of Great Britain under ordinary cultivation, and much more than that of Ireland. It was also more than the average of any other country in Europe, much more than many of them, and about 3 times as much as that of the United States.

The plots receiving farmyard manure, containing about 200 lb. of nitrogen, gave less produce than the mixture of mineral manure and ammonium-salts, or nitrate of soda, supplying only 86 lb. of nitrogen. In fact, only a small proportion of the nitrogen of farmyard manure is rapidly available, that due to undigested matter being more slowly available, and that in the litter remaining a long time inactive. Farmyard manure is, however, often applied in very large quantities for potatoes, the process being to a great extent one of forcing, and there remains a great amount of unexhausted manure-residue within the soil.

The percentage of nitrogen in potato tubers is much increased by the application of nitrogenous manures, but the less so the riper the crop. Without manure there is a comparatively low percentage of mineral matter and a medium percentage of nitrogen. With mineral manure alone there is the highest percentage of mineral matter, and the lowest of nitrogen. With purely nitrogenous manures there is the lowest percentage of mineral matter, and the highest of nitrogen. Lastly, with mineral and nitrogenous manures together, there are intermediate percentages, both of mineral matter and of nitrogen, in the tubers. More than 80 per cent. of the total nitrogen of the tubers exists in the juice. A comparatively small but variable proportion of the nitrogen of the tubers exists as albuminoids in the solid portion; perhaps on the average only about 15 per cent.; whilst from 40 to 50 per cent. of the total nitrogen may exist as soluble albuminoids in the juice, so that about or nearly two-thirds of the total nitrogen may exist as albuminoids, by far the larger proportion being, however, in the juice. The non-albuminoid nitrogenous matter exists chiefly as amides.

The characteristic effect of nitrogenous manures, provided there be a sufficient available supply of ash-constituents, and especially of potash, is to increase the amount of the non-nitrogenous substance—starch, in the tubers. Thus, the produce of starch per acre was about 1100 lb. without manure, nearly 2000 lb. with purely mineral manure, and with nitrogenous and mineral manures together about 3400 lb., or about 1½ ton. In other words, the increased produce of starch by the use of the mineral and nitrogenous manures together was more than 1 ton per acre. That is, there was a great increase in the production of the *non*-nitrogenous constituent—*starch*, by the use of nitrogen in manure, just as there is an increase in the produce of the non-nitrogenous constituent—sugar, by the use of nitrogenous manures to root crops. The increased production of non-nitrogenous substances by nitrogenous manures, is equally striking in cereal crops; the result in their case being an increased production of starch in the grain, and of cellulose in the straw. Indeed, it is for the production of the non-nitrogenous substances—starch, sugar, and cellulose—that our direct nitrogenous manures are chiefly used.

It is well known that season has much to do with the development of the potato disease; and there was on the average much more disease in the wetter seasons. As regards the influence of manure, the proportion of diseased tubers was the least where there was no supply of nitrogen; that is, where there was the least luxuriance, the most restricted growth, and where the ripening was early developed. On the other hand, with liberal supply of nitrogen, and luxuriant growth, there was the greatest proportion of diseased tubers; these being the conditions in which the juice is relatively rich in nitrogenous and mineral matters. Indeed, when the unsuitable weather comes, those tubers suffer the most which have the richest juice, that is, the least fixity of composition. It was found that there was always a higher, and sometimes a much higher, percentage of nitrogen in the dry substance of the diseased than in that of the sound tubers, indicating a loss of non-nitrogenous constituents. In many cases the still white, and also the separated discoloured portion of the diseased tubers, were analysed. Whilst the juice of the white portion contained approximately the normal amount of nitrogen, that of the discoloured portion contained very much less. On the other hand, the washed "Marc" of the white portion contained very little nitrogen, whilst that of the discoloured portion contained very much more. The distribution of the mineral matter to a great extent followed that of the nitrogen. The juice had obviously suffered exhaustion of much of both its nitrogen and its mineral matter in the development of the fungus. Further, there was more sugar (partly cane and partly glucose) in the diseased potatoes, which probably contributed to the development of the fungus. Apparently the first material change in the development of the disease is the destruction of starch and the formation of sugar. There is also a considerable loss of organic, and chiefly *non*-nitrogenous substance, due in part to the decomposition of the produced sugar, but probably in part to the evolution of carbonic acid, as a coincident of the growth of the fungus at the expense of ready-formed organic substance, this being a characteristic of the growth of such non-chlorophyllous plants. Thus the results adduced as to the course of the disease are quite consistent with the fact that it develops the more in tubers grown by highly nitrogenous manures, and having a highly nitrogenous juice.

A full available supply of ash-constituents is essential for the successful growth of the potato, but these being provided, the amount of produce is largely dependent on the available supply of nitrogen. In ordinary practice, farmyard manure is mainly relied upon. It is used in very large quantities, and it is sometimes supplemented by liberal dressings of artificial manures, both mineral and nitrogenous. The potato removes, however, a less proportion of the nitrogen supplied than any other farm crop.

For particulars of the manuring and produce, and to some extent of the composition of the differently grown tubers, see pages 88–109.

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EXPERIMENTS ON **POTATOES**.—HOOS FIELD; commencing 1876.

Below are given the particulars of the Manures and Produce of each of the first 5 Seasons, 1876–1880; also the *average* Produce of those first 5 Seasons. For continuation, 1881 and since, see pp. 92–3, 96–7, 100–1, 104–5, and 108–9.

The Land had been under experiments with Wheat, differently manured, from 1856 to 1874; and was fallowed in 1875.

Plots 1, 2, 3, and 4 had been unmanured for the Wheat. Plots 5 and 6 had received the same quantity of Ammonium-salts alone every year for the Wheat, as Plot 5 now receives for potatoes: Plot 6 now receiving the same amount of nitrogen, but as Nitrate of Soda, instead of Ammonium-salts. Plots 7 and 8 received the same amount of complex mineral manure, and Ammonium-salts, for the Wheat, as Plot 7 now receives for potatoes; and Plot 8 now receives the same complex mineral manures, and the same amount of nitrogen, but as Nitrate of Soda instead of Ammonium-salts. Plots 9 and 10 received the same complex mineral manures alone for the Wheat as Plot 10 now receives for potatoes; Plot 9 now receives superphosphate only. (3) Description of Potatoes, in 1876, 1877, 1878, and 1879, the "Rock" (White); and in those years the rows were 25 inches apart; with 12 inches from plant to plant in the rows. In 1880, the description was the "Champion" (White); and the rows were 25 inches apart, with 14 inches from plant to plant in the rows.

(Area under experiment, 2 acres.)

Plots.	Manures per Acre per Annum.	Produce per Acre. Tubers. Good.	Small.	Diseased.	Total.	Tops.
	First Season, 1876. Potatoes planted, June 10–13; Crop taken up, Oct. 30–31.					
1	Unmanured	3 6¼	0 5¼	0 5¾	3 17¼	Withered, not weighed, each lot spread on its own Plot and ploughed in.
2	Farmyard Manure (14 tons)	3 18¼	0 4	0 3⅛	4 5¼	
3	Farmyard Manure (14 tons), and 3½ cwts. Superphosphate (1)	4 14¾	0 6¾	0 5¼	5 6¾	
4	Farmyard Manure (14 tons), 3½ cwts. Superphosphate, and 550 lbs. Nitrate of Soda	5 9¼	0 5¾	0 19½	6 14½	
5	400 lbs. Ammonium-salts (2)	2 5¼	0 6¾	0 6	2 18	
6	550 lbs. Nitrate of Soda	3 2	0 5¾	0 9⅞	3 17⅝	
(3) 7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	6 12½	0 9½	1 0	8 2	
(3) 8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	6 17¾	0 10	1 8⅛	8 15⅞	
(3) 9	3½ cwts. Superphosphate	4 18¾	0 8½	0 13¾	6 1	
(3) 10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	5 3¾	0 6¾	0 13⅛	6 3⅝	
	Second Season, 1877. Potatoes planted, April 27–28; Crop taken up, Oct. 8–10.					
1	Unmanured	2 11¼	0 6¾	0 2½	3 0½	Withered, not weighed, each lot spread on its own Plot, but high wind (Oct. 14th) blew all off, before ploughing.
2	Farmyard Manure (14 tons)	5 0¾	0 11¼	0 6	5 18	
3	Farmyard Manure (14 tons), and 3½ cwts. Superphosphate (1)	4 13½	0 7¼	0 4	5 4¾	
4	Farmyard Manure (14 tons), 3½ cwts. Superphosphate, and 550 lbs. Nitrate of Soda	6 18¾	0 7	0 17½	8 3¼	
5	400 lbs. Ammonium-salts (2)	3 9¾	0 7¼	0 4	4 1	
6	550 lbs. Nitrate of Soda	4 14¾	0 6¾	0 5¾	5 7¼	
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	6 12	0 11¼	0 14¼	7 17½	
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	7 8¼	0 8¾	0 16¾	8 13¾	
9	3½ cwts. Superphosphate	2 12¾	0 11¾	0 1½	3 6	
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	3 6¾	0 7½	0 1¼	3 15½	

THIRD SEASON, 1878. Potatoes planted, April 29. Crop taken up, Sept. 18-21; Tops weighed, and spread on the Plots.

1	Unmanured	2	6¾	0	8¾	0	2	2	17½	0	3¾
2	Farmyard Manure (14 tons)	4	11	0	12¼	0	8½	5	11¾	0	6¾
3	Farmyard Manure (14 tons), and 3½ cwts. Superphosphate (1)	5	18¼	0	14½	0	13¼	7	6	0	11
4	Farmyard Manure (14 tons), 3½ cwts. Superphosphate, and 550 lbs. Nitrate of Soda	6	11¾	0	11¼	1	6¼	8	9¼	1	6
5	400 lbs. Ammonium-salts (2)	2	16¼	0	8½	0	5¾	3	10½	0	7
6	550 lbs. Nitrate of Soda	3	16¾	0	7	0	9½	4	13¼	0	11
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	7	6¾	0	9½	1	1	8	17¼	0	13¾
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	7	11½	0	9	1	3¾	9	4¼	1	0½
9	3½ cwts. Superphosphate	3	5¾	0	9½	0	3½	3	18¾	0	4¾
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	3	8	0	9	0	4¾	4	1¾	0	4¾

FOURTH SEASON, 1879. Potatoes planted, May 2; Crop taken up, Oct. 13-16.

1	Unmanured	0	11½	0	4	0	0¾	0	16¼	Withered, not weighed, each lot spread on its own Plot and ploughed in.
2	Farmyard Manure (14 tons)	1	13½	0	4½	0	10½	2	8½	
3	Farmyard Manure (14 tons), and 3½ cwts. Superphosphate (1)	1	14	0	6	0	10¼	2	10¼	
4	Farmyard Manure (14 tons), 3½ cwts. Superphosphate, and 550 lbs. Nitrate of Soda	2	16	0	5¾	0	12¾	3	14½	
5	400 lbs. Ammonium-salts (2)	0	17½	0	4	0	1½	1	3	
6	550 lbs. Nitrate of Soda	0	14¼	0	4½	0	2	1	0¾	
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	2	4½	0	5	0	6	2	15½	
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1	18¼	0	4½	0	6¼	2	9	
9	3½ cwts. Superphosphate	0	17¼	0	3½	0	1¼	1	2	
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	0	16¾	0	3	0	1¾	1	1½	

FIFTH SEASON, 1880. Potatoes planted, April 13; Crop taken up, Plots 5 and 6, Sept. 9th; other Plots, Sept. 28-30.

1	Unmanured	0	14½	0	6¼	0	0½	1	1¼	Withered, not weighed, each lot spread on its own Plot and ploughed in.
2	Farmyard Manure (14 tons)	4	13¼	0	6	0	5	5	4¼	
3	Farmyard Manure (14 tons), and 3½ cwts. Superphosphate (1)	5	6¾	0	5¼	0	10¾	6	2¾	
4	Farmyard Manure (14 tons), 3½ cwts. Superphosphate, and 550 lbs Nitrate of Soda	5	4	0	5¼	1	1¾	6	10¼	
5	400 lbs. Ammonium-salts (2)	0	8½	0	9¼	0	0	0	17¾	
6	550 lbs. Nitrate of Soda	0	11¼	0	10	0	0	1	1¼	
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	5	15½	0	5½	0	13	6	14	
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	6	3½	0	6¾	1	1	7	11¼	
9	3½ cwts. Superphosphate	3	9	0	6¾	0	3¼	3	19	
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	3	7¼	0	6	0	3¼	3	16½	

AVERAGE OF 5 SEASONS, 1876, '77, '78, '79, and 1880.

1	Unmanured	1	18	0	6¼	0	2¼	2	6½	In each year the Tops were spread on the respective Plots. For particulars see above.
2	Farmyard Manure (14 tons)	3	19⅜	0	7⅝	0	6⅞	4	13⅜	
3	Farmyard Manure (14 tons), and 3½ cwts. Superphosphate (1)	4	9½	0	8	0	8¾	5	6¼	
4	Farmyard Manure (14 tons), 3½ cwts. Superphosphate, and 550 lbs. Nitrate of Soda	5	8	0	7	0	19½	6	14½	
5	400 lbs. Ammonium-salts (2)	1	19½	0	7⅛	0	3½	2	10⅝	
6	550 lbs. Nitrate of Soda	2	11⅞	0	6⅞	0	5¼	3	4	
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	5	14⅞	0	8¼	0	14¾	6	17¼	
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	5	19⅞	0	7⅞	0	19⅛	7	6⅞	
9	3½ cwts. Superphosphate	3	0¾	0	8	0	4⅜	3	13⅜	
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	3	4½	0	6½	0	4⅞	3	15⅞	

(1) "Superphosphate of Lime"—in all cases made from 200 lbs. Bone-ash, 150 lbs. Sulphuric acid, sp. gr. 1·7 (and water).
(2) "Ammonium-salts"—in each case equal parts Sulphate and Muriate Ammonia of Commerce.
(3) The complex mineral manure having been sown in October 1874, but the Wheat not put in, and therefore no crop taken in 1875, no mineral manures are sown afresh on Plots 7, 8, 9, and 10, for the first crop of potatoes, 1876.

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EXPERIMENTS ON **POTATOES**.—HOOS FIELD—*continued*.—SUMMARY OF THE COMPOSITION OF THE "GOOD" TUBERS, in each of the first 5 Seasons, 1876–1880; also the average composition over those first 5 Seasons. For the composition in 1881 and since, see pp. 94–5, 98–9, 102–3, and 106–7.

An abstract of the analytical results obtained, illustrating the influence of different manures, and of different seasons, on the composition of Potatoes, is given below. The specific gravity of the tubers is also given. In the tubers the dry matter, nitrogen, and ash have been determined; and in some cases complete analyses of the ash have been made. Besides the results obtained relating to the composition of the tubers themselves, the dry matter, the sugar, the nitrogen, and the ash, in the expressed juice have in many cases been determined; in some cases the amount of the nitrogen existing as albuminoids has been determined; and in some, complete analyses of the ash of the juice have been made. It may be remarked, that by far the larger proportion of both the mineral matter, and the nitrogen, is found to exist in the juice; and of the nitrogen in the juice, as a rule, not much more than half exists as albuminoids. In the majority of cases, the small potatoes have been submitted to the same methods of analysis as the good potatoes. And in a large number of cases, similar methods of examination have been applied to the still white, and also to the separated discoloured portions of the diseased potatoes. With regard to these latter results, it may be observed, that whilst the juice of the white portion of the diseased potatoes contained approximately the normal amount of nitrogen, that of the discoloured portion contained very much less. On the other hand, the washed, or exhausted "marc" of the white portion, contained very little nitrogen, whilst that of the discoloured portion contained very much more. The distribution of the mineral matter was much in the same order as that of the nitrogen. It was obvious that the juice had suffered exhaustion of much of both its nitrogen and its mineral matter, in the development of the fungus. There was an increased amount of sugar found in the diseased potatoes, the result of diseased action, and it probably also contributed to the development of the fungus.

The results given in the Table relate to the "good" potatoes only. In interpreting the figures it must be borne in mind that in each year, the seed was planted on all the plots at the same time, and that all the crops were taken up at the same time; and as there was several times as much produce in some cases as in others, it is obvious that the crops would not each be at its best, and all in the same condition of maturity, when taken up. Then, again, the analyses were not performed immediately after taking up the crops, but some time afterwards, in weighed samples which had been kept in a cool place for some weeks or months; and in the following only preliminary statement of results, no correction is made for any change from the original weight of the samples, the results being calculated upon the fresh weights as finally taken for analysis.

Plots.	Manures per Acre, per Annum. (For Produce, see pp. 88–9.)	Specific Gravity of the Tubers.	Composition of the "Good" Tubers.				
			Dry Matter.	Mineral Matter (Ash).		Nitrogen.	
				In Fresh Tubers.	In Dry Matter.	In Fresh Tubers.	In Dry Matter.
	First Season, 1876.		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
1	Unmanured	1·097	23·9	0·84	3·53	0·269	1·13
2	Farmyard Manure (14 tons)	1·091	23·4	0·96	4·11	0·223	0·95
3	Farmyard Manure (14 tons), and 3½ cwts. Superphosphate (1)	1·097	23·5	1·00	4·27	0·191	0·81
4	Farmyard Manure (14 tons), 3½ cwts. Superphosphate, and 550 lbs. Nitrate of Soda	1·085	21·2	0·83	3·92	0·295	1·39
5	400 lbs. Ammonium-salts (2)	1·087	22·1	0·81	3·67	0·332	1·50
6	550 lbs. Nitrate of Soda	1·091	22·0	0·79	3·59	0·327	1·49
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·090	20·9	0·98	4·71	0·266	1·27
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·088	21·9	0·98	4·46	0·292	1·33
9	3½ cwts. Superphosphate	1·103	23·5	1·10	4·72	0·199	0·84
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	1·102	22·9	1·06	4·64	0·171	0·74
	Second Season, 1877.						
1	Unmanured	1·119	33·0	1·05	3·17	0·302	0·91
2	Farmyard Manure (14 tons)	1·109	26·5	1·06	4·00	0·212	0·80
3	Farmyard Manure (14 tons), and 3½ cwts. Superphosphate (1)	1·103	26·0	1·11	4·26	0·207	0·80
4	Farmyard Manure (14 tons), 3½ cwts. Superphosphate, and 550 lbs. Nitrate of Soda	1·112	27·2	1·06	3·90	0·301	1·11
5	400 lbs. Ammonium-salts (2)	1·107	22·0	0·67	3·07	0·281	1·28
6	550 lbs. Nitrate of Soda	1·116	25·9	0·74	2·85	0·301	1·16
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·103	28·4	1·23	4·33	0·270	0·95
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·112	27·3	1·16	4·26	0·268	0·98
9	3½ cwts. Superphosphate	1·109	26·5	1·18	4·44	0·203	0·76
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	1·109	26·8	1·21	4·52	0·208	0·78

Third Season, 1878.

1	Unmanured	1·107	26·0	0·85	3·26	0·228	0·88
2	Farmyard Manure (14 tons)	1·100	24·4	1·02	4·20	0·209	0·86
3	Farmyard Manure (14 tons), and 3½ cwts. Superphosphate (1)	1·090	23·8	1·03	4·35	0·205	0·86
4	Farmyard Manure (14 tons), 3½ cwts. Superphosphate, and 550 lbs. Nitrate of Soda	1·078	21 9	0·97	4·45	0·269	1·23
5	400 lbs. Ammonium-salts (2)	1·099	24 9	0·78	3·12	0·310	1·25
6	550 lbs. Nitrate of Soda	1·105	25·5	0·67	2·64	0·326	1·28
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·093	23·6	1·08	4·57	0·223	0·95
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·097	24·4	1·08	4·41	0·228	0·94
9	3½ cwts. Superphosphate	1·097	24·1	1·14	4·74	0·165	0·68
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	1·098	23·7	1·16	4·90	0·167	0·71

Fourth Season, 1879.

1	Unmanured	1·103	24·3	0·96	3·95	0·242	1·00
2	Farmyard Manure (14 tons)	1·103	23·7	0·99	4·16	0·220	0·93
3	Farmyard Manure (14 tons), and 3½ cwts. Superphosphate (1)	1·099	24·0	1·02	4·26	0·218	0·91
4	Farmyard Manure (14 tons), 3½ cwts. Superphosphate, and 550 lbs. Nitrate of Soda	1·102	24·6	0·91	3·69	0·254	1·04
5	400 lbs. Ammonium-salts (2)	1·103	24·6	0·76	3·06	0·270	1·10
6	550 lbs. Nitrate of Soda	1·104	25·0	0·76	3·05	0·300	1·20
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·098	23·1	0·95	4·13	0·241	1·05
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·102	23·9	1·04	4·36	0·272	1·14
9	3½ cwts. Superphosphate	1·099	23·6	1·10	4·65	0·219	0·93
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	1·099	23·5	1·15	4·89	0·211	0·90

Fifth Season, 1880.

1	Unmanured	1·123	28·8	0·77	2·66	0·382	1·33
2	Farmyard Manure (14 tons)	1·114	27·6	0·98	3·56	0·287	1·04
3	Farmyard Manure (14 tons), and 3½ cwts. Superphosphate (1)	1·117	27·8	0·98	3·52	0·275	0·99
4	Farmyard Manure (14 tons), 3½ cwts. Superphosphate, and 550 lbs. Nitrate of Soda	1·102	25·2	0·88	3·48	0·357	1·41
5	400 lbs. Ammonium-salts (2)	1·114	28·5	0·84	2·95	0·430	1·51
6	550 lbs. Nitrate of Soda	1·117	28·8	0·88	3·06	0·415	1·44
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·097	25·9	0·97	3·73	0·327	1·26
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·118	26·7	0·96	3·59	0·318	1·19
9	3½ cwts. Superphosphate	1·114	27·2	1·03	3·81	0·247	0·91
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	1·116	27·3	1·06	3·86	0·236	0·87

Average of 5 Seasons, 1876 '77, '78, '79, and 1880.

1	Unmanured	1·110	27·2	0·89	3·31	0·285	1·05
2	Farmyard Manure (14 tons)	1·103	25·1	1·00	4·01	0·231	0·92
3	Farmyard Manure (14 tons), and 3½ cwts. Superphosphate (1)	1·101	25·0	1·03	4·13	0·220	0·88
4	Farmyard Manure (14 tons), 3½ cwts. Superphosphate, and 550 lbs. Nitrate of Soda	1·096	24·0	0·93	3·89	0·296	1·24
5	400 lbs. Ammonium-salts (2)	1·102	24·4	0·77	3·17	0·326	1·33
6	550 lbs. Nitrate of Soda	1·107	25·4	0·77	3·04	0·335	1·32
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·096	24·4	1·04	4·29	0·266	1·10
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·103	24·8	1·04	4·22	0·276	1·12
9	3½ cwts. Superphosphate	1·104	25·0	1·11	4·47	0·207	0·83
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	1·105	24·8	1·13	4·56	0·199	0·80

(1) "Superphosphate of Lime"—in all cases made from 200 lbs. Bone-ash, 150 lbs. Sulphuric acid, sp. gr. 1·7 (and water).
(2) "Ammonium-salts"—in each case equal parts Sulphate and Muriate Ammonia of Commerce.

EXPERIMENTS ON **POTATOES**.—HOOS FIELD—*continued.*

Below are given the particulars of the Manures and Produce of the Sixth, Seventh, Eighth, Ninth, and Tenth Seasons, 1881, 1882, 1883, 1884, and 1885. For the Manures and Produce of the 5 preceding years, see pp. 88–9, and of succeeding years, 1886 and since, see pp. 96–7, 100–1, 104–5, and 108–9.

The Land had been under experiments with Wheat, differently manured, from 1856 to 1874; and was fallowed in 1875.

Plots 1, 2, 3, and 4 had been unmanured for the Wheat. Plots 5 and 6 had received the same quantity of Ammonium-salts alone every year for the Wheat, as Plot 5 now receives for potatoes: Plot 6 now receiving the same amount of nitrogen, but as Nitrate of Soda, instead of Ammonium-salts. Plots 7 and 8 received the same amount of complex mineral manure, and Ammonium-salts, for the Wheat, as Plot 7 now receives for potatoes; and Plot 8 now receives the same complex mineral manures, and the same amount of nitrogen, but as Nitrate of Soda instead of Ammonium-salts. Plots 9 and 10 received the same complex mineral manures alone for the Wheat as Plot 10 now receives for potatoes; Plot 9 now receives superphosphate only. Description of Potatoes, in 1876, 1877, 1878, and 1879, the "Rock" (White); and in those years the rows were 25 inches apart, with 12 inches from plant to plant in the rows. In 1881, 1882, 1883, 1884, and 1885, the description was the "Champion" (White); and the rows were 25 inches apart, with 14 inches from plant to plant in the rows.

(Area under experiment, 2 acres.)

Plots.	Manures per Acre per Annum.	Produce per Acre. Tubers. Good.	Small.	Diseased.	Total.	Tops.
	Sixth Season, 1881. Potatoes planted, March 31; Crop taken up, October 5, 6 and 7.					
		Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	
1	Unmanured, in 1876, and each year since	1 17¼	0 3¼	0 0¼	2 0¾	Withered, not weighed each lot spread on its own Plot and ploughed in.
2	Farmyard Manure (14 tons)	7 14½	0 3¾	0 1¾	8 0	
3	Farmyard Manure (14 tons), and 3½ cwts. Superphosphate (1)	6 14¼	0 4	0 1¼	6 19½	
4	Farmyard Manure (14 tons), 3½ cwts. Superphosphate, and 550 lbs. Nitrate of Soda	8 6¾	0 5¼	0 9½	9 1½	
5	400 lbs. Ammonium-salts (2)	2 6	0 4½	0 0	2 10½	
6	550 lbs. Nitrate of Soda	2 19¾	0 3¼	0 0¾	3 3¾	
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	10 10⅞	0 3½	0 1⅝	10 16	
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	9 12½	0 4	0 3½	10 0	
9	3½ cwts. Superphosphate	5 7¾	0 3¼	0 0½	5 11½	
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	5 14¾	0 2¾	0 1	5 18½	
	Seventh Season, 1882. Potatoes planted, March 21. Crop taken up, September 25–27.					
1	Unmanured, in 1876, and each year since	1 15¼	0 3½	0 0¼	1 19	Withered, not weighed, each lot spread on its own Plot and ploughed in.
2	Unmanured in 1882. Previously Farmyard Manure (14 tons)	3 15¾	0 2¼	0 2	4 0	
3	Farmyard Manure (14 tons), and 3½ cwts. Superphosphate (1)	5 8	0 4¼	0 3½	5 15¾	
4	Farmyard Manure (14 tons), 3½ cwts. Superphosphate. In 1881, and previously, 550 lbs. Nitrate of Soda also	4 7¼	0 3¾	0 1¼	4 12¼	
5	400 lbs. Ammonium-salts (2)	1 18¼	0 3¾	0 0¼	2 2¼	
6	550 lbs. Nitrate of Soda	1 18½	0 3	0 0¼	2 1¾	
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	7 15½	0 3½	0 11¾	8 10¾	
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	6 16½	0 3½	0 2¾	7 2¾	
9	3½ cwts. Superphosphate	4 12	0 2¾	0 1½	4 15¾	
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	4 7½	0 2¼	0 0¼	4 10	

Eighth Season, 1883. Potatoes planted, March 22. Crop taken up October 22–25.											
1	Unmanured, in 1876, and each year since	2	4¼	0	6½	0	1¼	2	12	Withered, not weighed, each lot spread on its own Plot and ploughed in.	
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	4	5¼	1	0½	0	4	5	9¾		
3	Farmyard Manure (14 tons) alone 1883; previously 3½ cwts. Superphosphate also (1)	5	6½	0	9½	0	4¾	6	0¾		
4	Farmyard Manure (14 tons) alone 1883. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	4	0¾	0	11¼	0	1¾	4	13¾		
5	400 lbs. Ammonium-salts (2)	2	13¼	0	8½	0	2¾	3	4½		
6	550 lbs. Nitrate of Soda	2	13½	0	7¾	0	1¼	3	2½		
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	7	16¾	0	14	0	8¼	8	19		
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	7	9½	0	9¾	0	3½	8	2¾		
9	3½ cwts. Superphosphate	4	8½	0	7¾	0	3¼	4	19½		
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	4	9½	0	7½	0	1¾	4	18¾		
Ninth Season, 1884. Potatoes planted, March 21. Crop taken up, September 24–26.											
1	Unmanured, in 1876, and each year since	2	0¼	0	4¾	0	1	2	6	Withered, not weighed, each lot spread on its own Plot and ploughed in.	
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	2	5¼	0	4¼	0	2	2	11½		
3	Farmyard Manure (14 tons), alone 1883–4, previously 3½ cwts. Superphosphate also (1)	3	10¾	0	5¾	0	2¼	3	18¾		
4	Farmyard Manure (14 tons) alone 1883–4. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	3	12½	0	6¼	0	2½	4	1¼		
5	400 lbs. Ammonium-salts (2)	2	0½	0	7½	0	0¾	2	8¾		
6	550 lbs. Nitrate of Soda	1	16¼	0	3¼	0	0½	2	0		
7	400 lbs. Ammonium-salts. 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	4	19¼	0	10½	0	2¼	5	12		
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	4	10¼	0	7	0	2½	4	19¾		
9	3½ cwts. Superphosphate	3	13¼	0	5	0	1¼	3	19½		
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	3	13	0	5	0	1¾	3	19¾		
Tenth Season, 1885. Potatoes planted, March 17 and 18. Crop taken up, September 24–26.											
1	Unmanured in 1876, and each year since	0	16¾	0	4¼	0	0	1	1	Withered, not weighed, each lot spread on its own Plot and ploughed in.	
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1	13	0	3¾	0	1	1	17¾		
3	Farmyard Manure (14 tons) alone 1883 and since; previously 3½ cwts. Superphosphate also (1)	2	6⅝	0	5⅛	0	0⅝	2	12⅜		
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	2	11	0	4⅛	0	0⅝	2	15¾		
5	400 lbs. Ammonium-salts (2)	1	6½	0	5½	0	0	1	12		
6	550 lbs. Nitrate of Soda	1	7¼	0	5	0	0¼	1	12½		
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	4	2	0	6½	0	1⅝	4	9⅞		
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	3	16½	0	4⅞	0	1⅛	4	2½		
9	3½ cwts. Superphosphate	2	1⅝	0	3¼	0	0⅞	2	5¼		
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	2	0	0	2¾	0	0½	2	3¼		
Average of 5 Seasons, 1881, '82, '83, '84, and 1885.											
1	Unmanured in 1876, and each year since	1	14⅜	0	4⅜	0	0⅝	1	19¾	Withered, not weighed, each lot spread on its own Plot and ploughed in.	
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	3	18¾	0	6⅞	0	2⅛	4	7¾		
3	Farmyard Manure (14 tons) alone 1883 and since; previously 3½ cwts. Superphosphate also (1)	4	13⅛	0	5¾	0	2½	5	1⅜		
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	4	11⅝	0	6⅛	0	3⅛	5	0⅞		
5	400 lbs. Ammonium-salts (2)	2	0⅞	0	6	0	0¾	2	7⅝		
6	550 lbs. Nitrate of Soda	2	3	0	4½	0	0⅝	2	8⅛		
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	7	0⅞	0	7⅝	0	5	7	13½		
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	6	9	0	5⅞	0	2⅝	6	17½		
9	3½ cwts. Superphosphate	4	0½	0	4¼	0	1½	4	6¼		
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	4	0⅞	0	4⅛	0	1	4	6		

(1) "Superphosphate of Lime"—in all cases made from 200 lbs. Bone-ash, 150 lbs. Sulphuric acid, sp. gr. 1·7 (and water).
(2) "Ammonium-salts"—in each case equal parts Sulphate and Muriate Ammonia of Commerce.

EXPERIMENTS ON POTATOES.—HOOS FIELD—*continued.*—SUMMARY OF THE COMPOSITION OF THE "GOOD" TUBERS, in the Sixth, Seventh, Eighth, Ninth, and Tenth Seasons, 1881, 1882, 1883, 1884, and 1885. For the particulars of the composition in the first 5 years, 1876–1880, see pp. 90–1, and for those in succeeding years, 1886 and since, see pp. 98–9, 102–3, and 106–7.

An abstract of the analytical results obtained, illustrating the influence of different manures, and of different seasons, on the composition of Potatoes, is given below. The specific gravity of the tubers is also given. In the tubers the dry matter, nitrogen, and ash have been determined; and in some cases complete analyses of the ash have been made. Besides the results obtained relating to the composition of the tubers themselves, the dry matter, the sugar, the nitrogen, and the ash, in the expressed juice have in many cases been determined; in some cases the amount of the nitrogen existing as albuminoids has been determined; and in some, complete analyses of the ash of the juice have been made. It may be remarked, that by far the larger proportion of both the mineral matter, and the nitrogen, is found to exist in the juice; and of the nitrogen in the juice, as a rule, not much more than half exists as albuminoids. In many cases, the small potatoes have been submitted to the same methods of analysis as the good potatoes. And in some cases, similar methods of examination have been applied to the still white, and also to the separated discoloured portions of the diseased potatoes. With regard to these latter results, it may be observed, that whilst the juice of the white portion of the diseased potatoes contained approximately the normal amount of nitrogen, that of the discoloured portion contained very much less. On the other hand, the washed, or exhausted "marc" of the white portion, contained very little nitrogen, whilst that of the discoloured portion contained very much more. The distribution of the mineral matter was much in the same order as that of the nitrogen. It was obvious that the juice had suffered exhaustion of much of both its nitrogen and its mineral matter, in the development of the fungus. There was an increased amount of sugar found in the diseased potatoes, the result of diseased action, and it probably also contributed to the development of the fungus.

The results given in the Table relate to the "good" potatoes only. In interpreting the figures it must be borne in mind that in each year, the seed was planted on all the plots at the same time, and that all the crops were taken up at the same time; and as there was several times as much produce in some cases as in others, it is obvious that the crops would not each be at its best, and all in the same condition of maturity when taken up. Then, again, the analyses were not performed immediately after taking up the crops, but sometime afterwards, in weighed samples which had been kept in a cool place for some weeks or months; and in the following only preliminary statement of results, no correction is made for any change from the original weight of the samples, the results being calculated upon the fresh weights as finally taken for analysis.

PLOTS.	MANURES PER ACRE, PER ANNUM. (For Produce, see pp. 92–3.)	Specific Gravity of the Tubers.	Composition of the "Good" Tubers.				
			Dry Matter.	Mineral Matter (Ash).		Nitrogen.	
				In Fresh Tubers.	In Dry Matter.	In Fresh Tubers.	In Dry Matter.
	SIXTH SEASON, 1881.		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
1	Unmanured, in 1876, and each year since	1·125	30·5	0·86	2·82	0·389	1·28
2	Farmyard Manure (14 tons)	1·116	29·1	0·99	3·41	0·294	1·01
3	Farmyard Manure (14 tons), and 3½ cwts. Superphosphate (1)	1·113	28·1	1·07	3·81	0·295	1·05
4	Farmyard Manure (14 tons), 3½ cwts. Superphosphate, and 550 lbs. Nitrate of Soda	1·107	26·0	0·91	3·51	0·359	1·39
5	400 lbs. Ammonium-salts (2)	1·115	27·9	0·84	3·03	0·375	1·35
6	550 lbs. Nitrate of Soda	1·114	28·0	0·76	2·70	0·379	1·36
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·110	26·7	1·06	3·97	0·306	1·15
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·107	25·3	0·98	3·89	0·341	1·35
9	3½ cwts. Superphosphate	1·123	29·0	1·14	3·92	0·242	0·83
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	1·122	28·3	1·17	4·13	0·225	0·80
	SEVENTH SEASON, 1882.						
1	Unmanured, in 1876, and each year since	1·127	29·5	0·83	2·82	0·296	1·00
2	Unmanured in 1882. Previously Farmyard Manure (14 tons)	1·131	30·3	0·91	3·01	0·260	0·86
3	Farmyard Manure (14 tons), and 3½ cwts. Superphosphate (1)	1·122	28·7	0·97	3·39	0·261	0·91
4	Farmyard Manure (14 tons), 3½ cwts. Superphosphate. In 1881, and previously, 550 lbs. Nitrate of Soda also	1·116	26·6	0·93	3·48	0·313	1·18
5	400 lbs. Ammonium-salts (2)	1·119	27·9	0·77	2·78	0·372	1·34
6	550 lbs. Nitrate of Soda	1·119	27·9	0·79	2·82	0·408	1·46
7	400 lbs. Ammonium salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·120	27·5	0·96	3·49	0·305	1·11
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·123	28·2	0·98	3·46	0·336	1·19
9	3½ cwts. Superphosphate	1·128	29·3	1·03	3·53	0·209	0·71
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	1·125	29·1	1·08	3·71	0·229	0·79

Eighth Season, 1883.

1	Unmanured, in 1876, and each year since	1·123	28·5	0·79	2·78	0·312	1·10
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1·128	28·3	0·88	3·10	0·276	0·97
3	Farmyard Manure (14 tons) alone 1883; previously 3½ cwts. Superphosphate also (1)	1·117	26·6	0·95	3·56	0·289	1·09
4	Farmyard Manure (14 tons) alone 1883. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	1·109	26·2	0·93	3·53	0·320	1·22
5	400 lbs. Ammonium-salts (2)	1·117	26·8	0·75	2·81	0·368	1·37
6	550 lbs. Nitrate of Soda	1·118	26 8	0·71	2·64	0·393	1·47
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·113	26·2	0·96	3·67	0·282	1·08
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·111	26·2	0·97	3·86	0·359	1·37
9	3½ cwts. Superphosphate	1·123	27·2	1·02	3·76	0·208	0·77
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	1·122	27·2	1·05	3·86	0·197	0·73

Ninth Season, 1884.

1	Unmanured, in 1876, and each year since	1·117	27·0	0·75	2·78	0·360	1·33
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1·115	26·9	0·80	2·99	0·361	1·34
3	Farmyard Manure (14 tons) alone 1883–4; previously 3½ cwts. Superphosphate also (1)	1·102	24·6	0·91	3·69	0·390	1·59
4	Farmyard Manure (14 tons) alone 1883–4. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	1·099	23·8	0·92	3·88	0·382	1·61
5	400 lbs. Ammonium-salts (2)	1·107	25·8	0·67	2·58	0·456	1·77
6	550 lbs. Nitrate of Soda	1·105	25·2	0·66	2·61	0·443	1·76
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·099	24·3	0·95	3·89	0·387	1·59
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·098	23·8	0·89	3·72	0·440	1·85
9	3½ cwts. Superphosphate	1·117	26·6	1·01	3·78	0·260	0·98
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	1·118	26·8	1·07	3·98	0·238	0·88

Tenth Season, 1885.

1	Unmanured, in 1876, and each year since	1·123	28·7	0·82	2·85	0·390	1·36
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1·124	27·9	0·83	2·99	0·388	1·39
3	Farmyard Manure (14 tons) alone 1883 and since; previously 3½ cwts. Superphosphate also (1)	1·114	26·5	0·96	3·63	0·394	1·49
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	1·113	26·9	0·97	3·61	0·418	1·56
5	400 lbs. Ammonium-salts (2)	1·115	27·5	0·83	3·01	0·474	1·73
6	550 lbs. Nitrate of Soda	1·119	27·4	0·74	2·70	0·482	1·76
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda. 100 lbs. Sulph. Mag.	1·111	26·6	0·96	3·59	0·408	1·53
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·116	27·7	0·93	3·37	0·408	1·47
9	3½ cwts. Superphosphate	1·127	28·6	1·02	3·56	0·340	1·19
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	1·119	27·6	1·10	3·97	0·299	1·08

Average of 5 Seasons, 1881, '82, '83, '84, and 1885.

1	Unmanured in 1876, and each year since	1·123	28·8	0·81	2·81	0·349	1·21
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1·123	28·5	0·88	3·10	0·316	1·11
3	Farmyard Manure (14 tons) alone 1883 and since; previously 3½ cwts. Superphosphate also (1)	1·114	26·9	0·97	3·62	0·326	1·23
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	1·109	25·9	0·93	3·60	0·358	1·39
5	400 lbs. Ammonium-salts (2)	1·115	27·2	0 77	2·84	0·409	1·51
6	550 lbs. Nitrate of Soda	1·115	27·1	0·73	2·69	0·421	1.56
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·111	26·3	0·98	3·72	0·338	1·29
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·111	26·2	0·95	3·66	0·377	1·45
9	3½ cwts. Superphosphate	1·124	28·1	1·04	3·71	0 252	0·90
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	1·121	27·8	1·09	3·93	0·238	0·86

(1) "Superphosphate of Lime"—in all cases made from 200 lbs. Bone-ash, 150 lbs. Sulphuric acid, sp. gr. 1·7 (and water).
(2) "Ammonium-salts"—in each case equal parts Sulphate and Muriate Ammonia of Commerce.

EXPERIMENTS ON POTATOES.—HOOS FIELD—*continued.*

Below are given the particulars of the Manures and Produce, of the Eleventh, Twelfth, Thirteenth, Fourteenth, and Fifteenth Seasons, 1886, 1887, 1888, 1889, and 1890. For the Manures, description of Potatoes grown, and the Produce, in the 10 preceding years, see pp. 88–9, and 92–3, and in succeeding years, pp. 100–1, 104–5, and 108–9.

The arrangement of the plots is precisely the same as for the 10 preceding potato crops. The manures are the same as for the crops of 1883, 1884 and 1885, excepting that for the crop of 1887 Sulphate Ammonia was applied instead of equal parts of Sulphate and Muriate Ammonia, as in former years and since (see foot-note No. 2). Description of Potato, "The Champion" (White). Rows 25 inches apart; 14 inches from plant to plant in the rows.

(Area under experiment, 2 acres.)

Plots.	Manures per Acre per Annum.	Produce per Acre. Tubers. Good.	Small.	Diseased.	Total.	Tops.
	Eleventh Season, 1886. Potatoes planted, April 10. Crop taken up, September 30, and October 1 and 2.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	
1	Unmanured in 1876, and each year since	0 13¾	0 4	0 0¼	0 18	Withered, not weighed, each lot spread on its own Plot and ploughed in.
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1 17	0 3	0 1	2 1	
3	Farmyard Manure (14 tons) alone 1883 and since; previously 3½ cwts. Superphosphate also (1)	2 15	0 3¼	0 1	2 19¼	
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	2 12¼	0 3	0 1½	2 16¾	
5	400 lbs. Ammonium-salts (2)	1 2½	0 4½	0 1	1 8	
6	550 lbs. Nitrate of Soda	1 2½	0 3¾	0 0¼	1 6½	
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	3 10	0 3¼	0 1	3 14¼	
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	3 6¼	0 3½	0 0½	3 10¼	
9	3½ cwts. Superphosphate	1 17¾	0 2½	0 0¾	2 1	
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	2 2½	0 2¾	0 0½	2 5¾	
	Twelfth Season, 1887. Potatoes planted, March 24. Crop taken up, October 17–19.					
1	Unmanured in 1876, and each year since	1 3¾	0 3	0 0½	1 7¼	Withered, not weighed, each lot spread on its own Plot and ploughed in.
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	2 2¼	0 3¼	0 0½	2 6	
3	Farmyard Manure (14 tons) alone 1883 and since; previously 3½ cwts. Superphosphate also (1)	3 18	0 4¾	0 1	4 3¾	
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	4 14	0 4¾	0 3	5 1¾	
5	450 lbs. Sulphate Ammonia (3)	1 9¾	0 3½	0 0¼	1 13½	
6	550 lbs. Nitrate of Soda	1 18¼	0 3¼	0 0½	2 2	
7	450 lbs. Sulph. Ammonia, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	4 1¼	0 4¾	0 0¾	4 6¾	
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	4 18	0 4¼	0 2	5 4¼	
9	3½ cwts. Superphosphate	1 16½	0 4	0 1	2 1½	
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	2 3¾	0 3¾	0 1½	2 9	

THIRTEENTH SEASON, 1888. Potatoes planted, April 17. Crop taken up, October 11–17.

1	Unmanured in 1876, and each year since	0	12¾	0	2¼	0	0½	0	15¼	Withered, not weighed, each lot spread on its own Plot and ploughed in.
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1	10¾	0	2¼	0	1	1	14	
3	Farmyard Manure (14 tons) alone 1883 and since; previously 3½ cwts. Superphosphate also (1)	2	3	0	2¼	0	6	2	11¼	
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	2	3½	0	1¾	0	6	2	11¼	
5	400 lbs. Ammonium-salts (2)	0	19¾	0	2	0	0½	1	2¼	
6	550 lbs. Nitrate of Soda	1	7	0	2½	0	1¼	1	10¾	
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	2	8½	0	1½	0	8½	2	18¾	
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	3	2¾	0	1¾	0	13¼	3	17¾	
9	3½ cwts. Superphosphate	1	11½	0	1½	0	0¾	1	13¾	
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	1	12¾	0	1½	0	1¼	1	15½	

FOURTEENTH SEASON, 1889. Potatoes planted, March 28 and 29. Crop taken up, September 16–18.

1	Unmanured in 1876, and each year since	0	13¾	0	2¼	0	0½	0	16½	Withered, not weighed, each lot spread on its own Plot and ploughed in.
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1	9¾	0	2½	0	0¾	1	13	
3	Farmyard Manure (14 tons) alone 1883 and since; previously 3½ cwts. Superphosphate also (1)	1	9½	0	3	0	7¼	1	19¾	
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	2	10¾	0	3	0	5	2	18¾	
5	400 lbs. Ammonium-salts (2)	1	1¼	0	2½	0	0¾	1	4½	
6	550 lbs. Nitrate of Soda	1	7	0	2½	0	2½	1	12	
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	3	2¾	0	2¾	0	3½	3	9	
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	3	6¾	0	2	0	2½	3	11¼	
9	3½ cwts. Superphosphate	1	15½	0	2	0	1	1	18½	
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	2	2¾	0	1¾	0	1	2	5½	

FIFTEENTH SEASON, 1890. Potatoes planted, April 3. Crop taken up, September 9–11.

1	Unmanured in 1876, and each year since	0	18¾	0	6	0	0½	1	5	Withered, not weighed, each lot spread on its own Plot and ploughed in.
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	2	4	0	7	0	1¼	2	12¼	
3	Farmyard Manure (14 tons) alone 1883 and since; previously 3½ cwts. Superphosphate also (1)	6	1	0	8¼	0	6	6	15¼	
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	6	2½	0	8¾	0	5¾	6	17	
5	400 lbs. Ammonium-salts (2)	1	9¼	0	10¾	0	0½	2	0½	
6	550 lbs. Nitrate of Soda	2	2	0	6¾	0	0¾	2	9½	
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	5	13¾	0	6¾	0	7¼	6	7¾	
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	5	14	0	6¼	0	3½	6	3¾	
9	3½ cwts. Superphosphate	2	6	0	5¾	0	0¾	2	12½	
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	2	16¼	0	6¼	0	0½	3	3	

AVERAGE OF 5 SEASONS, 1886, '87, '88, '89, and 1890.

1	Unmanured in 1876, and each year since	0	16½	0	3½	0	0¼	1	0¼	Withered, not weighed, each lot spread on its own Plot and ploughed in.
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1	16¾	0	3¾	0	0¾	2	1¼	
3	Farmyard Manure (14 tons) alone 1883 and since; previously 3½ cwts. Superphosphate also (1)	3	5¼	0	4¼	0	4¼	3	13¾	
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	3	12½	0	4¼	0	4¼	4	1	
5	400 lbs. Ammonium-salts (2)	1	4½	0	4¾	0	0½	1	9¾	
6	550 lbs. Nitrate of Soda	1	11¼	0	3¾	0	1	1	16	
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	3	15¼	0	3¾	0	4¼	4	3¼	
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	4	1½	0	3¾	0	4¼	4	9½	
9	3½ cwts. Superphosphate	1	17½	0	3	0	0¾	2	1¼	
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	2	3½	0	3¼	0	1	2	7¾	

(1) "Superphosphate of Lime," 1886 and 1887, made from 200 lbs. Bone-ash, 150 lbs. Sulphuric acid, sp. gr. 1·7 (and water); 1888, and since, made from high percentage mineral phosphates, and Containing 37 per cent., or more, of soluble phosphate.
(2) "Ammonium-salts"—in each case equal parts Sulphate and Muriate Ammonia of Commerce.
(3) 450 lbs. Sulphate Ammonia is estimated to contain the same amount of Nitrogen as the 200 lbs. Sulphate and 200 lbs. Muriate of Ammonia applied in former years, and since.

EXPERIMENTS ON **POTATOES.**—HOOS FIELD—*continuea.*—SUMMARY OF THE COMPOSITION OF THE "GOOD" TUBERS, in the Eleventh, Twelfth, Thirteenth, Fourteenth, and Fifteenth Seasons, 1886, 1887, 1888, 1889, and 1890. For particulars of the composition in the first 10 years, 1876–1885, see pp. 90–1, and 94–5, and for those in succeeding years, 1891 and since, see pp. 102–3, and 106–7.

An abstract of the analytical results obtained, illustrating the influence of different manures, and of different seasons, on the composition of Potatoes, is given below. The specific gravity of the tubers is also given. In the tubers the dry matter, nitrogen, and ash have been determined; and in some cases complete analyses of the ash have been made. Besides the results obtained relating to the composition of the tubers themselves, the dry matter, the sugar, the nitrogen, and the ash, in the expressed juice have in many cases been determined; in some cases the amount of the nitrogen existing as albuminoids has been determined; and in some, complete analyses of the ash of the juice have been made. It may be remarked, that by far the larger proportion of both the mineral matter, and the nitrogen, is found to exist in the juice; and of the nitrogen in the juice, as a rule, not much more than half exists as albuminoids. In many cases, the small potatoes have been submitted to the same methods of analysis as the good potatoes. And in some cases, similar methods of examination have been applied to the still white, and also to the separated discoloured portions of the diseased potatoes. With regard to these latter results, it may be observed, that whilst the juice of the white portion of the diseased potatoes contained approximately the normal amount of nitrogen, that of the discoloured portion contained very much less. On the other hand, the washed, or exhausted "marc" of the white portion, contained very little nitrogen, whilst that of the discoloured portion contained very much more. The distribution of the mineral matter was much in the same order as that of the nitrogen. It was obvious that the juice had suffered exhaustion of much of both its nitrogen and its mineral matter, in the development of the fungus. There was an increased amount of sugar found in the diseased potatoes, the result of diseased action, and it probably also contributed to the development of the fungus.

The results given in the Table relate to the "good" potatoes only. In interpreting the figures it must be borne in mind that in each year, the seed was planted on all the plots at the same time, and that all the crops were taken up at the same time; and as there was several times as much produce in some cases as in others, it is obvious that the crops would not each be at its best, and all in the same condition of maturity when taken up. Then, again, the analyses were not performed immediately after taking up the crops, but sometime afterwards, in weighed samples which had been kept in a cool place for some weeks or months; and in the following only preliminary statement of results, no correction is made for any change from the original weight of the samples, the results being calculated upon the fresh weights as finally taken for analysis.

Plots.	Manures per Acre, per Annum. (For Produce, see pp. 96–7.)	Specific Gravity of the Tubers.	Composition of the "Good" Tubers.				
			Dry Matter.	Mineral Matter (Ash).		Nitrogen.	
				In Fresh Tubers.	In Dry Matter.	In Fresh Tubers.	In Dry Matter.
	Eleventh Season, 1886.		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
1	Unmanured in 1876, and each year since	1·125	28·9	0 77	2·68	0·403	1·39
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1·125	29·1	0·87	3·00	0·420	1·44
3	Farmyard Manure (14 tons) alone 1883 and since; previously 3½ cwts. Superphosphate also (1)	1·112	26·7	0·98	3·69	0·385	1·44
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	1·115	26·7	0·93	3·47	0·423	1·59
5	400 lbs. Ammonium-salts (2)	1·118	28·7	0·75	2·62	0·468	1·63
6	550 lbs. Nitrate of Soda	1·119	28·6	0·77	2·68	0·468	1·64
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·111	27·4	1·01	3·67	0·401	1·46
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·116	28·2	0·98	3·48	0·395	1·40
9	3½ cwts. Superphosphate	1·123	28·4	0·97	3·41	0·328	1·16
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	1·122	28·5	1·08	3·79	0·299	1·05
	Twelfth Season, 1887.						
1	Unmanured in 1876, and each year since	1·121	28·0	0·83	2·97	0·434	1·55
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1·121	28·2	0·87	3·07	0·424	1·50
3	Farmyard Manure (14 tons) alone 1883 and since; previously 3½ cwts. Superphosphate also (1)	1·106	25·1	1·00	3·98	0·396	1·58
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881 and previously, 550 lbs. Nitrate of Soda also	1·107	25·2	0·97	3·85	0·374	1·48
5	450 lbs. Sulphate Ammonia (3)	1·115	27·3	0·78	2·85	0·475	1,74
6	550 lbs. Nitrate of Soda	1·115	27·4	0·77	2·80	0·460	1·68
7	450 lbs. Sulph. Ammonia, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·106	26·3	1·12	4·23	0·409	1·55
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·108	25·5	0·99	3·90	0·431	1·69
9	3½ cwts. Superphosphate	1·118	27·6	1·08	3·92	0·370	1·34
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	1·111	26·3	1·12	4·27	0·353	1·35

Thirteenth Season, 1888.

1	Unmanured in 1876, and each year since	1·114	27·6	0·84	3·02	0·360	1·30
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1·119	27·9	0·85	3·04	0·345	1·24
3	Farmyard Manure (14 tons) alone 1883 and since; previously 3½ cwts. Superphosphate also (1)	1·105	25·3	1·03	4·09	0·390	1·54
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	1·104	25·4	1·04	4·10	0·362	1·43
5	400 lbs. Ammonium-salts (2)	1·110	26·8	0·78	2·92	0·440	1·64
6	550 lbs. Nitrate of Soda	1·114	26·6	0·83	3·13	0·431	1·63
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·106	25·5	1·00	3·90	0·340	1·33
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·109	25·6	0·97	3·79	0·332	1·29
9	3½ cwts. Superphosphate	1·116	27·0	1·09	4·02	0·321	1·19
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	1·112	26·8	1·11	4·14	0·313	1·17

Fourteenth Season, 1889.

1	Unmanured in 1876, and each year since	1·119	28·4	0·81	2·84	0·423	1·49
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1·119	27·9	0·82	2·94	0·394	1·41
3	Farmyard Manure (14 tons) alone 1883 and since; previously 3½ cwts. Superphosphate also (1)	1·109	26·0	1·05	4·05	0·391	1·50
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	1·114	26·5	1·05	3·98	0·387	1·46
5	400 lbs. Ammonium-salts (2)	1·120	28·1	0·84	3·00	0·392	1·40
6	550 lbs. Nitrate of Soda	1·121	27·7	0·76	2·74	0 405	1·46
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·112	26·1	0·99	3·78	0·364	1 40
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·114	26·5	0·99	3 74	0·382	1·44
9	3½ cwts. Superphosphate	1·118	27·5	1·05	3·83	0·360	1·31
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	1·115	26·9	1·10	4·08	0·303	1·13

Fifteenth Season, 1890.

1	Unmanured in 1876, and each year since	1·125	28·9	0·81	2·80	0·381	1·32
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1·125	30·0	0·82	2·75	0·380	1·27
3	Farmyard Manure (14 tons) alone 1883 and since; previously 3½ cwts. Superphosphate also (1)	1·117	26·8	1·00	3·75	0·293	1·09
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	1·116	27·5	1·06	3·84	0·284	1·03
5	400 lbs. Ammonium-salts (2)	1·118	28·5	0·81	2·84	0·405	1·42
6	550 lbs. Nitrate of Soda	1·119	28·4	0·82	2·88	0·430	1·51
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·100	25·6	0·97	3·78	0·369	1·44
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·115	27·3	0·98	3·59	0·348	1·27
9	3½ cwts. Superphosphate	1·122	28·7	1·01	3·53	0·298	1·04
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	1·121	28·2	1·13	4·00	0·245	0·87

Average of 5 Seasons, 1886, '87, 88', '89, and 1890.

1	Unmanured in 1876, and each year since	1·121	28·4	0·81	2·86	0·400	1·41
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1·122	28·6	0·85	2·96	0·393	1·37
3	Farmyard Manure (14 tons) alone 1883 and since; previously 3½ cwts. Superphosphate also (1)	1·110	26·0	1·01	3·91	0·371	1·43
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	1·111	26·3	1·01	3·85	0·366	1·40
5	400 lbs. Ammonium-salts (2)	1·116	27·9	0·79	2·85	0·436	1·57
6	550 lbs. Nitrate of Soda	1·118	27·8	0·79	2·85	0·439	1·58
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·107	26·2	1·01	3·87	0·377	1·44
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·112	26·6	0·98	3·70	0·378	1·42
9	3½ cwts. Superphosphate	1·119	27·8	1·04	3·74	0·335	1·20
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	1·116	27·3	1·11	4·06	0·303	1·11

(1) "Superphosphate of Lime," 1886 and 1887, made from 200 lbs. Bone-ash, 150 lbs. Sulphuric acid, sp. gr. 1·7 (and water); 1888, and since, made from high percentage mineral phosphates, and containing 37 per cent., or more, of soluble phosphate.

(2) "Ammonium-salts"—in each case equal parts Sulphate and Muriate Ammonia of Commerce.

(3) 450 lbs. Sulphate Ammonia is estimated to contain the same amount of Nitrogen as the 200 lbs. Sulphate and 200 lbs. Muriate of Ammonia applied in former years, and since.

EXPERIMENTS ON POTATOES.—HOOS FIELD—*continued.*

Below are given the particulars of the Manures and Produce, for the Sixteenth, Seventeenth, Eighteenth, Nineteenth, and Twentieth Seasons, 1891, 1892, 1893, 1894, and 1895. For the Manures, description of Potatoes grown, and the Produce, of the 15 preceding years, see pp. 88–9, 92–3, and 96–7, and of the succeeding years, pp. 104–5, and 108–9.

The arrangement of the plots is precisely the same as for the 15 preceding potato crops. The manures are the same as for the crops of 1883, and since. Description of Potato, "Sutton's Abundance" (White). Rows 25 inches apart; 14 inches from plant to plant in the rows.

In the spring of 1894 permanent division paths were laid out between plot and plot.

(Area under experiment, 2 acres.)

Plots.	Manures per Acre per Annum.	Produce per Acre.				
		Tubers.				Tops.
		Good.	Small.	Diseased.	Total.	
	Sixteenth Season, 1891. Potatoes planted, April 1. Crop taken up, September 28–30.					
1	Unmanured in 1876, and each year since	Tons. cwts. 0 13	Tons. cwts. 0 0⅞	Tons. cwts. 0 0⅛	Tons. cwts. 0 14	Withered, not weighed, each lot spread on its own Plot and ploughed in.
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1 14¼	0 1	0 1	1 16¼	
3	Farmyard Manure (14 tons) alone 1883 and since; previously 3½ cwts. Superphosphate also (¹)	5 16¼	0 1	0 10¾	6 8	
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	5 11¾	0 1¼	0 13	6 6	
5	400 lbs. Ammonium-salts (²)	1 2¼	0 1	0 0½	1 3¾	
6	550 lbs. Nitrate of Soda	2 3	0 1¼	0 1¼	2 5½	
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	4 17¾	0 1¼	0 3	5 2	
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	5 3½	0 1¼	0 4½	5 9¼	
9	3½ cwts. Superphosphate	2 10¼	0 1	0 0¾	2 12	
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	2 12¼	0 1¼	0 1¼	2 14¾	
	Seventeenth Season, 1892. Potatoes planted, April 4 and 5. Crop taken up, September 29, October 7 and 8.					
1	Unmanured in 1876, and each year since	0 15¾	0 2¾	0 0¼	0 18¾	Withered, not weighed, each lot spread on its own Plot and ploughed in.
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1 18½	0 2¾	0 8¼	2 9½	
3	Farmyard Manure (14 tons) alone 1883 and since; previously 3½ cwts. Superphosphate also (¹)	4 11	0 2	0 9¼	5 2¼	
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	5 0¾	0 2	0 6¾	5 9½	
5	400 lbs. Ammonium-salts (²)	1 3	0 2½	0 0¾	1 6¼	
6	550 lbs. Nitrate of Soda	1 19	0 2¼	0 0¾	2 2	
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	5 3¾	0 2¾	0 5½	5 12	
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	6 15¼	0 2	0 5½	7 2¾	
9	3½ cwts. Superphosphate	2 13¾	0 2½	0 0¾	2 17	
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	3 12½	0 2	0 3	3 17½	

Eighteenth Season, 1893. Potatoes planted, March 28. Crop taken up, September 12–14.

1	Unmanured in 1876, and each year since	0	18½	0	1½	0	1	1	1	Withered, not weighed, each lot spread on its own Plot and ploughed in.
2	Unmanured in 18-2, and since. Previously Farmyard Manure (14 tons)	1	8¼	0	1¾	0	2¾	1	12¾	
3	Farmyard Manure (14 tons) alone 1883 and since; previously 3½ cwts. Superphosphate also (1)	5	16	0	2¼	0	8½	6	6¾	
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	6	2	0	2	0	9	6	13	
5	400 lbs. Ammonium-salts (2)	1	2½	0	1¾	0	1½	1	5¾	
6	550 lbs. Nitrate of Soda	1	12¼	0	1½	0	3	1	16¾	
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	4	4	0	2	0	3	4	9	
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	4	7½	0	1¾	0	4¼	4	13½	
9	3½ cwts. Superphosphate	1	19	0	2	0	3½	2	4½	
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	2	4¾	0	1¾	0	3	2	9½	

Nineteenth Season, 1894. Potatoes planted, April 9. Crop taken up, September 21–28.

1	Unmanured in 1876, and each year since	0	18¼	0	1½	0	4½	1	4	Withered, not weighed, each lot spread on its own Plot and ploughed in.
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1	12¼	0	1½	0	4½	1	18¼	
3	Farmyard Manure (14 tons) alone 1883 and since; previously 3½ cwts. Superphosphate also (1)	6	3¾	0	1½	2	6	8	11¼	
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	6	6¾	0	2	2	0	8	8¾	
5	400 lbs. Ammonium-salts (2)	1	8½	0	1½	0	4½	1	14¼	
6	550 lbs. Nitrate of Soda	2	16½	0	1	0	5¾	3	3	
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	5	3¼	0	1½	1	10¾	6	15½	
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	5	7½	0	1	1	0½	6	9	
9	3½ cwts. Superphosphate	2	4¼	0	1¼	0	4½	2	10	
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	2	4½	0	1¼	0	5¾	2	11¼	

Twentieth Season, 1895. Potatoes planted, April 6. Crop taken up, September 10–12.

1	Unmanured in 1876, and each year since	0	16¾	0	2¾	0	0¼	0	19¾	Withered, not weighed, each lot spread on its own Plot and ploughed in.
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1	5	0	3½	0	1½	1	10	
3	Farmyard Manure (14 tons) alone 1883 and since; previously 3½ cwts. Superphosphate also (1)	4	9¼	0	4	0	14¼	5	7½	
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	5	5	0	4½	1	1¼	6	10¾	
5	400 lbs. Ammonium-salts (2)	1	1¾	0	3	0	0¾	1	5½	
6	550 lbs. Nitrate of Soda	1	4½	0	3¾	0	2½	1	10¾	
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	3	6¼	0	2¾	0	5	3	14	
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	3	16	0	3¼	0	10½	4	9¾	
9	3½ cwts. Superphosphate	1	11½	0	2¾	0	1¾	1	16	
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	2	7½	0	3¼	0	2	2	12¾	

Average of 5 Seasons, 1891, '92, '93, '94, and 1895.

1	Unmanured in 1876, and each year since	0	16½	0	2	0	1⅛	0	19⅝	Withered, not weighed, each lot spread on its own Plot and ploughed in.
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1	11⅝	0	2⅛	0	3⅝	1	17⅞	
3	Farmyard Manure (14 tons) alone 1883 and since; previously 3½ cwts. Superphosphate also (1)	5	7¼	0	2⅛	0	17¾	6	7⅛	
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	5	13¼	0	2⅜	0	18	6	13⅝	
5	400 lbs. Ammonium-salts (2)	1	3⅝	0	2	0	1⅛	1	7⅛	
6	550 lbs. Nitrate of Soda	1	19	0	2	0	2⅝	2	3⅝	
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	4	11	0	2	0	9½	5	2½	
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	5	2	0	1⅞	0	9⅛	5	13	
9	3½ cwts. Superphosphate	2	3¾	0	2	0	2¼	2	8	
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	2	12¼	0	1⅞	0	3	2	17⅛	

(1) "Superphosphate of Lime," made from high percentage mineral phosphates, and containing 37 per cent., or more, of soluble phosphate.
(2) "Ammonium-salts"—in each case equal parts Sulphate and Muriate Ammonia of Commerce.

EXPERIMENTS ON POTATOES.—HOOS FIELD—*continued.*—SUMMARY OF THE COMPOSITION OF THE "GOOD" TUBERS in the Sixteenth, Seventeenth, Eighteenth, Nineteenth, and Twentieth Seasons, 1891, 1892, 1893, 1894, and 1895. For particulars of the composition in the first 15 years, 1876–1890, see pp. 90–1, 94–5, and 98–9, and for those in succeeding seasons, see pp. 106–7.

An abstract of the analytical results obtained, illustrating the influence of different manures, and of different seasons, on the composition of Potatoes, is given below. The specific gravity of the tubers is also given. In the tubers the dry matter, nitrogen, and ash have been determined; and in some cases complete analyses of the ash have been made. Besides the results obtained relating to the composition of the tubers themselves, the dry matter, the sugar, the nitrogen, and the ash, in the expressed juice have in many cases been determined; in some cases the amount of the nitrogen existing as albuminoids has been determined; and in some, complete analyses of the ash of the juice have been made. It may be remarked, that by far the larger proportion of both the mineral matter, and the nitrogen, is found to exist in the juice; and of the nitrogen in the juice, as a rule, not much more than half exists as albuminoids. In many cases, the small potatoes have been submitted to the same methods of analysis as the good potatoes. And in some cases, similar methods of examination have been applied to the still white, and also to the separated discoloured portions of the diseased potatoes. With regard to these latter results, it may be observed, that whilst the juice of the white portion of the diseased potatoes contained approximately the normal amount of nitrogen, that of the discoloured portion contained very much less. On the other hand, the washed or exhausted "marc" of the white portion, contained very little nitrogen, whilst that of the discoloured portion contained very much more. The distribution of the mineral matter was much in the same order as that of the nitrogen. It was obvious that the juice had suffered exhaustion of much of both its nitrogen and its mineral matter, in the development of the fungus. There was an increased amount of sugar found in the diseased potatoes, the result of diseased action, and it probably also contributed to the development of the fungus.

The results given in the Table relate to the "good" potatoes only. In interpreting the figures it must be borne in mind that in each year, the seed was planted on all the plots at the same time, and that all the crops were taken up at the same time; and as there was several times as much produce in some cases as in others, it is obvious that the crops would not each be at its best, and all in the same condition of maturity when taken up. Then, again, the analyses were not performed immediately after taking up the crops, but some time afterwards, in weighed samples which had been kept in a cool place for some weeks or months; and in the following only preliminary statement of results, no correction is made for any change from the original weight of the samples, the results being calculated upon the fresh weights as finally taken for analysis.

PLOTS.	MANURES PER ACRE, PER ANNUM. (For Produce, see pp. 100–1.)	Specific Gravity of the Tubers.	Composition of the "Good" Tubers.				
			Dry Matter.	Mineral Matter (Ash).		Nitrogen.	
				In Fresh Tubers.	In Dry Matter.	In Fresh Tubers.	In Dry Matter.
	SIXTEENTH SEASON, 1891.		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
1	Unmanured in 1876, and each year since	1·107	25·5	0·79	3·11	0·379	1·49
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1·111	26·6	0·80	3·02	0·356	1·34
3	Farmyard Manure (14 tons) alone 1883 and since: previously 3½ cwts. Superphosphate also (1)	1·097	22·6	1·01	4·46	0·311	1·38
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	1·099	23·4	0·95	4·08	0·286	1·22
5	400 lbs. Ammonium-salts (2)	1·095	25·7	0·80	3·10	0·434	1·69
6	550 lbs. Nitrate of Soda	1·102	24·5	0·73	2·96	0·417	1·70
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·092	22·7	0·95	4·15	0·365	1·61
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·095	23·0	0·93	4·05	0·345	1·50
9	3½ cwts. Superphosphate	1·110	26·2	0·99	3·78	0·300	1·15
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	1·100	25·4	1·14	4·48	0·252	0·99
	SEVENTEENTH SEASON, 1892.						
1	Unmanured in 1876, and each year since	1·104	25·9	0·83	3·22	0·385	1·48
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1·108	26·5	0·75	2·83	0·361	1·36
3	Farmyard Manure (14 tons) alone 1883 and since: previously 3½ cwts. Superphospate also (1)	1·101	23·8	1·05	4·37	0·279	1·17
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	1·100	23·5	1·05	4·47	0·352	1·49
5	400 lbs. Ammonium-salts (2)	1·103	25·2	0·84	3·33	0·419	1·66
6	550 lbs. Nitrate of Soda	1·101	25·0	0·71	2·84	0·437	1·75
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·096	23·2	0·93	4·02	0 346	1·49
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·097	23·0	0·96	4·17	0·363	1·58
9	3½ cwts. Superphosphate	1·111	26·6	0·95	3·58	0·301	1·13
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	1·110	25·6	1·09	4·26	0·253	0·98

Eighteenth Season, 1893.

1	Unmanured in 1876, and each year since	1·117	28·0	0·81	2·91	0·396	1·41
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1·116	27·9	0·80	2·86	0·394	1·41
3	Farmyard Manure (14 tons) alone 1883 and since: previously 3½ cwts. Superphosphate also (1)	1·097	23·7	1·09	4·59	0 358	1·51
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	1·096	23·5	1·05	4·48	0·366	1·56
5	400 lbs. Ammonium-salts (2)	1·115	28·3	0·81	2·88	0·438	1·55
6	550 lbs. Nitrate of Soda	1·108	26·8	0·80	2·99	0·443	1·65
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·104	25·7	1·07	4·18	0·360	1·40
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·099	24·6	1·10	4·47	0·403	1·63
9	3½ cwts. Superphosphate	1·115	28·1	1·02	3·62	0·338	1·20
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	1·110	26·9	1·19	4·42	0·304	1·13

Nineteenth Season, 1894.

1	Unmanured in 1876, and each year since	1·110	26·3	0·82	3·13	0·343	1·31
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1·115	27·2	0·79	2·90	0·342	1·26
3	Farmyard Manure (14 tons) alone 1883 and since: previously 3½ cwts. Superphosphate also (1)	1·100	24·2	1·08	4·46	0·279	1·15
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	1·101	24·8	1·07	4·33	0·290	1·17
5	400 lbs. Ammonium-salts (2)	1·109	27·0	0·74	2·75	0·433	1·60
6	550 lbs. Nitrate of Soda	1·106	25·9	0·75	2·91	0·437	1·68
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·103	24·9	0·99	3·98	0·338	1·35
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·100	24·1	0·96	3·99	0·331	1·37
9	3½ cwts. Superphosphate	1·113	27·0	0·99	3·66	0·263	0·98
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	1·108	25·3	1·13	4·49	0·247	0·98

Twentieth Season, 1895.

1	Unmanured in 1876, and each year since	1·121	29·0	0·87	3·00	0·375	1·30
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1·124	29·4	0·89	3·01	0·387	1·32
3	Farmyard Manure (14 tons) alone 1883 and since: previously 3½ cwts. Superphosphate also (1)	1·099	23·9	1·08	4·53	0·344	1·44
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	1·101	23·3	1·05	4·50	0·336	1·44
5	400 lbs. Ammonium-salts (2)	1·126	28·9	0·86	2·97	0·424	1·46
6	550 lbs. Nitrate of Soda	1·113	27·2	0·81	2·98	0·435	1·60
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·106	25·1	1·07	4·27	0·366	1·45
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·104	24·3	1·06	4·36	0·380	1·56
9	3½ cwts. Superphosphate	1·117	28·1	1·08	3·85	0·333	1·19
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	1·111	26·0	1·19	4·60	0·286	1·10

Average of 5 Seasons, 1891, '92, '93, '94, and 1895.

1	Unmanured in 1876, and each year since	1·112	26·9	0·83	3·07	0·376	1·40
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1·115	27·5	0·80	2·92	0·368	1·34
3	Farmyard Manure (14 tons) alone 1883 and since: previously 3½ cwts. Superphosphate also (1)	1·099	23·6	1·06	4·48	0 314	1·33
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	1·099	23·7	1·04	4·37	0·326	1·38
5	400 lbs. Ammonium-salts (2)	1·110	27·0	0·81	3·01	0·430	1·59
6	550 lbs. Nitrate of Soda	1·106	25·9	0·76	2·94	0·434	1·68
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·100	24 3	1·00	4·12	0·355	1·46
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs Sulph. Soda, 100 lbs. Sulph. Mag.	1·099	23·8	1·00	4·21	0·364	1·53
9	3½ cwts. Superphosphate	1·113	27·2	1·01	3·70	0·307	1·13
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	1·108	25·8	1·15	4·45	0·268	1·04

(1) "Superphosphate of Lime," made from high percentage mineral phosphates, and containing 37 per cent., or more, of soluble phosphate.
(2) "Ammonium-salts"—in each case equal parts Sulphate and Muriate Ammonia of Commerce.

EXPERIMENTS ON **POTATOES**.—HOOS FIELD—*continued.*

Below are given the particulars of the Manures and Produce, for the Twenty-first, Twenty-second, Twenty-third, Twenty-fourth, and Twenty-fifth Seasons, 1896, 1897, 1898, 1899 and 1900. For the Manures, description of Potatoes grown, and the Produce, of the 20 preceding years, see pp. 88–9, 92–3, 96–7, and 100–1, and of the succeeding years, pp. 108–9.

The arrangement of the plots is precisely the same as for the 20 preceding potato crops.

The manures are the same as for the crops of 1883, and since; excepting that for the crops of 1897, and since, Basic Slag has been used instead of Superphosphate. Description of Potato, in 1896, "Bruce" (White); in 1897, and since, "Beauty of Hebron" (White). Rows 25 inches apart; 14 inches from plant to plant in the rows.

In the spring of 1894 permanent division paths were laid out between plot and plot.

(Area under experiment, 2 acres.)

Plots.	Manures per Acre per Annum.	Produce per Acre. Tubers. Good.	Small.	Diseased.	Total.	Tops.
	Twenty-first Season, 1896. Potatoes planted, April 10. Crop taken up, October 23–30.					
1	Unmanured in 1876, and each year since	Tons. cwts. 1 1¼	Tons. cwts. 0 2¾	Tons. cwts. 0 0¾	Tons. cwts. 1 4¾	Withered, not weighed, each lot spread on its own Plot and ploughed in.
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1 11¾	0 2¼	0 1½	1 15½	
3	Farmyard Manure (14 tons) alone 1883 and since; previously 3½ cwts. Superphosphate also (1)	5 6⅛	0 1⅝	1 12¼	7 0	
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	4 11¾	0 2¼	1 14½	6 8½	
5	400 lbs. Ammonium-salts (2)	1 17⅛	0 1⅝	0 2⅜	2 1¼	
6	550 lbs. Nitrate of Soda	2 1⅛	0 1¾	0 3⅛	2 6	
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	5 6½	0 2	0 15⅝	6 4⅛	
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	5 6½	0 1⅞	0 14⅞	6 3¼	
9	3½ cwts. Superphosphate	2 10⅛	0 1¾	0 3⅛	2 15	
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	2 14⅛	0 1½	0 3½	2 19⅛	
	Twenty-second Season, 1897. Potatoes planted, April 8. Crop taken up, September 13–15.					
1	Unmanured in 1876, and each year since	0 8¾	0 3	..	0 11¾	Withered, not weighed, each lot spread on its own Plot and ploughed in.
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1 2⅛	0 3⅝	0 0¼	1 6	
3	Farmyard Manure (14 tons) alone 1883 and since; previously 3½ cwts. Superphosphate also (1)	3 15⅛	0 3⅜	0 0½	3 19	
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 188 and previously, 550 lbs. Nitrate of Soda also	3 15	0 3⅝	0 0¾	3 19⅜	
5	400 lbs. Ammonium-salts (2)	0 11⅝	0 4⅜	0 0⅛	0 16⅛	
6	550 lbs. Nitrate of Soda	0 19½	0 4	0 0¼	1 3¾	
7	400 lbs. Ammonium-salts. 400 lbs. Basic Slag, 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	3 2¾	0 4¼	0 0¼	3 7¼	
8	550 lbs. Nitrate of Soda, 400 lbs. Basic Slag, 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	3 11¼	0 5¼	0 0¼	3 16¾	
9	400 lbs. Basic Slag	1 8½	0 4¼	0 0½	1 13¼	
10	400 lbs. Basic Slag, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	1 11½	0 4¼	0 0¼	1 16	

TWENTY-THIRD SEASON, 1898. Potatoes planted, March 21 and 22. Crop taken up, September 9–13.

1	Unmanured in 1876, and each year since	0	7	0	6⅞	0	0⅛	0	14	Withered, not weighed, each lot spread on its own Plot and ploughed in.
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	0	15⅞	0	9¼	0	0¼	1	5¼	
3	Farmyard Manure (14 tons) alone 1883 and since; previously 3½ cwts. Superphosphate also (1)	3	1	0	7½	0	3⅛	3	11⅝	
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	3	4⅜	0	8⅝	0	3½	3	16½	
5	400 lbs. Ammonium-salts (2)	0	6¾	0	8¼	0	0¼	0	15⅜	
6	550 lbs. Nitrate of Soda	0	11⅞	0	10¼	0	0⅛	1	2¼	
7	400 lbs. Ammonium-salts, 400 lbs. Basic Slag, 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	2	9	0	10½	0	1⅜	3	1¼	
8	550 lbs. Nitrate of Soda, 400 lbs. Basic Slag, 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	2	12	0	10⅝	0	1⅞	3	4½	
9	400 lbs. Basic Slag	0	15¾	0	8½	0	0¼	1	4½	
10	400 lbs. Basic Slag, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	0	9	0	8⅜	0	0⅛	0	17½	

TWENTY-FOURTH SEASON, 1899. Potatoes planted, March 28. Crop taken up, August 28 and 29.

1	Unmanured in 1876, and each year since	0	6	0	2	0	0¼	0	8¼	Withered, not weighed, each lot spread on its own Plot and ploughed in.
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	0	11⅜	0	2⅜	0	0⅝	0	14⅜	
3	Farmyard Manure (14 tons) alone 1883 and since; previously 3½ cwts. Superphosphate also (1)	2	1¾	0	3¼	0	1	2	6	
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	1	11⅝	0	3	0	0⅞	1	15½	
5	400 lbs. Ammonium-salts (2)	0	7	0	3⅜	0	0¼	0	10⅝	
6	550 lbs. Nitrate of Soda	0	15⅞	0	3½	0	0⅛	0	19¼	
7	400 lbs. Ammonium-salts, 400 lbs. Basic Slag, 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1	18⅛	0	3⅛	0	0⅛	2	1⅜	
8	550 lbs. Nitrate of Soda, 400 lbs. Basic Slag, 300 lbs. Sulph. Potash, 100 lbs Sulph. Soda, 100 lbs. Sulph. Mag.	2	4¼	0	2⅜	0	0⅛	2	7⅛	
9	400 lbs. Basic Slag	0	15½	0	3	0	0¼	0	18¾	
10	400 lbs. Basic Slag, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	0	15½	0	2¾	0	0¼	0	18½	

TWENTY-FIFTH SEASON, 1900. Potatoes planted, April 2. Crop taken up, September 14 and 15.

1	Unmanured in 1876, and each year since	0	7⅛	0	1½	0	0⅛	0	8¾	Withered, not weighed, each lot spread on its own Plot and ploughed in.
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	0	9⅜	0	3	0	0⅛	0	12⅝	
3	Farmyard Manure (14 tons) alone 1883 and since; previously 3½ cwts. Superphosphate also (1)	2	6⅛	0	2⅞	0	0⅛	2	10¼	
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	1	17	0	3½	0	0⅝	2	1⅛	
5	400 lbs. Ammonium-salts (2)	0	6⅜	0	3⅞	0	0⅛	0	10⅜	
6	550 lbs. Nitrate of Soda	0	7½	0	4⅜	0	0	0	12¼	
7	400 lbs. Ammonium-salts, 400 lbs. Basic Slag, 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1	9⅛	0	3⅝	0	0⅜	1	13⅛	
8	550 lbs. Nitrate of Soda, 400 lbs. Basic Slag, 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1	9	0	5⅜	0	0⅛	1	14⅜	
9	400 lbs. Basic Slag	0	12⅞	0	3½	0	0⅛	0	16½	
10	400 lbs. Basic Slag, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	0	13¼	0	3½	0	0	0	16¾	

AVERAGE OF 5 SEASONS, 1896, '97, '98, '99, and 1900.

1	Unmanured in 1876, and each year since	0	10	0	3¼	0	0¼	0	13½	Withered, not weighed, each lot spread on its own Plot and ploughed in.
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	0	18⅛	0	4⅛	0	0⅛	1	2⅝	
3	Farmyard Manure (14 tons) alone 1883 and since; previously 3½ cwts. Superphosphate also (1)	3	6⅛	0	3⅜	0	7½	3	17⅜	
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	3	0	0	4⅛	0	8⅛	3	12¼	
5	400 lbs. Ammonium-salts (2)	0	13⅞	0	4¼	0	0⅝	0	18¾	
6	550 lbs. Nitrate of Soda	0	19⅛	0	4⅜	0	0⅜	1	4⅝	
7	400 lbs. Ammonium-salts, 400 lbs. Basic Slag, 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	2	17⅛	0	4⅜	0	3⅜	3	5½	
8	550 lbs. Nitrate of Soda, 400 lbs. Basic Slag, 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	3	0½	0	5¼	0	3½	3	9¼	
9	400 lbs. Basic Slag	1	4½	0	4¼	0	0¾	1	9½	
10	400 lbs. Basic Slag, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	1	4⅝	0	4⅛	0	0¾	1	9½	

(1) "Superphosphate of Lime," made from high percentage mineral phosphates, and containing 37 per cent., or more, of soluble phosphate.
(2) "Ammonium-salts"—in each case equal parts Sulphate and Muriate Ammonia of Commerce.

EXPERIMENTS ON POTATOES.—HOOS FIELD—*continued.*—SUMMARY OF THE COMPOSITION OF THE "GOOD" TUBERS in the Twenty-first, Twenty-second, Twenty-third, Twenty-fourth, and Twenty-fifth Seasons, 1896, 1897, 1898, 1899, and 1900. For particulars of the composition in the first 20 years, 1876–1895. see pp. 90–1, 94–5, 98–9, and 102–3.

An abstract of the analytical results obtained, illustrating the influence of different manures, and of different seasons, on the composition of Potatoes, is given below. The specific gravity of the tubers is also given. In the tubers the dry matter, nitrogen, and ash have been determined; and in some cases complete analyses of the ash have been made. Besides the results obtained relating to the composition of the tubers themselves, the dry matter, the sugar, the nitrogen, and the ash, in the expressed juice have in many cases been determined; in some cases the amount of the nitrogen existing as albuminoids has been determined; and in some, complete analyses of the ash of the juice have been made. It may be remarked, that by far the larger proportion of both the mineral matter, and the nitrogen, is found to exist in the juice; and of the nitrogen in the juice, as a rule, not much more than half exists as albuminoids. In many cases, the small potatoes have been submitted to the same methods of analysis as the good potatoes. And in some cases, similar methods of examination have been applied to the still white, and also to the separated discoloured portions of the diseased potatoes. With regard to these latter results, it may be observed, that whilst the juice of the white portion of the diseased potatoes contained approximately the normal amount of nitrogen, that of the discoloured portion contained very much less. On the other hand, the wasted or exhausted "marc" of the white portion, contained very little nitrogen, whilst that of the discoloured portion contained very much more. The distribution of the mineral matter was much in the same order as that of the nitrogen. It was obvious that the juice had suffered exhaustion of much of both its nitrogen and its mineral matter, in the development of the fungus. There was an increased amount of sugar found in the diseased potatoes, the result of diseased action, and it probably also contributed to the development of the fungus.

The results given in the Table relate to the "good" potatoes only. In interpreting the figures it must be borne in mind that in each year, the seed was planted on all the plots at the same time, and that all the crops were taken up at the same time; and as there was several times as much produce in some cases as in others, it is obvious that the crops would not each be at its best, and all in the same condition of maturity when taken up. Then, again, the analyses were not performed immediately after taking up the crops, but some time afterwards, in weighed samples which had been kept in a cool place for some weeks or months; and in the following only preliminary statement of results, no correction is made for any change from the original weight of the samples, the results being calculated upon the fresh weights as finally taken for analysis.

PLOTS.	MANURES PER ACRE, PER ANNUM. (For Produce, see pp. 104–5.)	Specific Gravity of the Tubers.	Composition of the "Good" Tubers.				
			Dry Matter.	Mineral Matter (Ash).		Nitrogen.	
				In Fresh Tubers.	In Dry Matter.	In Fresh Tubers.	In Dry Matter.
	TWENTY-FIRST SEASON, 1896.		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
1	Unmanured in 1876, and each year since	1·109	25·7	0·76	2 98	0·380	1·48
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1·109	25·5	0·76	2·96	0·376	1·47
3	Farmyard Manure (14 tons) alone 1883 and since: previously 3½ cwts. Superphosphate also (1)	1·096	22·0	0·99	4·49	0·339	1·54
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	1·090	21·6	0·98	4·53	0·322	1·49
5	400 lbs. Ammonium-salts (2)	1·102	24·8	0·74	2·99	0·405	1·63
6	550 lbs. Nitrate of Soda	1·085	23·2	0·78	3·36	0 416	1·79
7	400 lbs. Ammonium-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·092	22·0	0·99	4·51	0·372	1·69
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·095	21·5	0·96	4·46	0·356	1·65
9	3½ cwts. Superphosphate	1·109	25·8	0·91	3·53	0·356	1·38
10	3½ cwts. Superphosphate, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	1·107	23·3	1·08	4·62	0·312	1·34
	TWENTY-SECOND SEASON, 1897.						
1	Unmanured in 1876, and each year since	1·100	23·7	0·74	3·13	0·344	1·45
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1·109	25·7	0·76	2·95	0·381	1·48
3	Farmyard Manure (14 tons) alone 1883 and since: previously 3½ cwts. Superphosphate also (1)	1·101	23·4	0·97	4·14	0·369	1·58
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	1·098	23·5	1·00	4·26	0·385	1·64
5	400 lbs. Ammonium-salts (2)	1·102	24·6	0·75	3·05	0·451	1·83
6	550 lbs. Nitrate of Soda	1·103	24·5	0·73	2·96	0·475	1·94
7	400 lbs. Ammonium-salts, 400 lbs. Basic Slag, 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·094	23·0	0·96	4·19	0·423	1·84
8	550 lbs. Nitrate of Soda, 400 lbs. Basic Slag, 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·098	23·0	0·95	4·12	0·441	1·91
9	400 lbs. Basic Slag	1·112	26·5	0·89	3·37	0·325	1·23
10	400 lbs. Basic Slag, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	1·108	25·2	1·06	4·21	0·294	1·17

Twenty-third Season, 1898.

1	Unmanured in 1876 and each year since	1·095	22·1	0·70	3·16	0·345	1·56
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1·103	24·6	0·70	2·84	0·354	1·44
3	Farmyard Manure (14 tons) alone 1883 and since: previously 3½ cwts. Superphosphate also (1)	1·095	22·0	0·92	4·20	0·368	1·67
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	1·101	22·2	0·98	4·43	0·381	1·71
5	400 lbs. Ammonium-salts (2)	1·093	22·7	0·73	3·23	0·408	1·79
6	550 lbs. Nitrate of Soda	1·099	23·6	0·72	3·06	0·453	1·92
7	400 lbs. Ammonium-salts, 400 lbs. Basic Slag, 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·094	22·3	0·96	4·28	0·396	1·77
8	550 lbs. Nitrate of Soda, 400 lbs. Basic Slag, 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·095	22·5	0·93	4·16	0·403	1·79
9	400 lbs. Basic Slag	1·104	24·0	0·78	3·24	0·326	1·35
10	400 lbs. Basic Slag, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	1·102	23·0	0·99	4·30	0·284	1·24

Twenty-fourth Season, 1899.

1	Unmanured in 1876, and each year since	1·096	23·8	0·76	3·20	0·349	1·47
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1·105	25·1	0·74	2·96	0·392	1·56
3	Farmyard Manure (14 tons) alone 1883 and since: previously 3½ cwts. Superphosphate also (1)	1·102	24·3	1·09	4·50	0·368	1·51
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	1·106	24·0	1·10	4·57	0·378	1·57
5	400 lbs. Ammonium-salts (2)	1·097	23·7	0·77	3·27	0·414	1·75
6	550 lbs. Nitrate of Soda	1·105	25·3	0·80	3·17	0·449	1·77
7	400 lbs. Ammonium-salts, 400 lbs. Basic Slag, 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·101	24·2	1·05	4·34	0·408	1·69
8	550 lbs. Nitrate of Soda, 400 lbs. Basic Slag, 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·103	24·4	1·06	4·36	0·426	1·75
9	400 lbs. Basic Slag	1·109	25·0	0·90	3·58	0·342	1·37
10	400 lbs. Basic Slag, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	1·109	25·8	1·15	4·47	0·308	1·19

Twenty-fifth Season, 1900.

1	Unmanured in 1876, and each year since	1·090	21·9	0·73	3·33	0·370	1·69
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1·099	23·6	0·71	3·01	0·384	1·63
3	Farmyard Manure (14 tons) alone 1883 and since: previously 3½ cwts. Superphosphate also (1)	1·089	20·2	0·93	4·63	0·369	1·83
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	1·088	20·3	0·96	4·75	0·361	1·78
5	400 lbs. Ammonium-salts (2)	1·090	22·3	0·80	3·57	0·404	1·81
6	550 lbs. Nitrate of Soda	1·091	23·0	0·79	3·44	0·435	1·89
7	400 lbs. Ammonium-salts, 400 lbs. Basic Slag, 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·089	20·5	1·00	4·86	0·375	1·83
8	550 lbs. Nitrate of Soda, 400 lbs. Basic Slag, 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·088	20·8	0·98	4·72	0·391	1·88
9	400 lbs. Basic Slag	1·098	22·6	0·84	3·73	0·347	1·53
10	400 lbs. Basic Slag, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	1·100	22·4	1·05	4·70	0·328	1·46

Average of 5 Seasons, 1896, '97, '98, '99, and 1900.

1	Unmanured in 1876, and each year since	1·098	23·4	0·74	3·16	0·358	1·53
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)	1·105	24·9	0·73	2·94	0·377	1·52
3	Farmyard Manure (14 tons) alone 1883 and since: previously 3½ cwts. Superphosphate also (1)	1·097	22·4	0·98	4·39	0·363	1·63
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also	1·097	22·3	1·00	4·51	0·365	1·64
5	400 lbs. Ammonium salts (2)	1·097	23·6	0·76	3·22	0·416	1·76
6	550 lbs. Nitrate of Soda	1·097	23·9	0·76	3·19	0·446	1·86
7	400 lbs. Ammonium-salts, 400 lbs. Basic Slag, 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·094	22·4	0·99	4·44	0·395	1·76
8	550 lbs. Nitrate of Soda, 400 lbs. Basic Slag, 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.	1·096	22·4	0·98	4·36	0·403	1·80
9	400 lbs. Basic Slag	1·106	24·8	0·86	3·49	0·339	1·37
10	400 lbs. Basic Slag, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia	1·105	23·9	1·07	4·46	0·305	1·28

(1) "Superphosphate of Lime," made from high percentage mineral phosphates, and containing 37 per cent., or more, of soluble phosphate.
(2) "Ammonium-salts,"—in each case equal parts Sulphate and Muriate Ammonia of Commerce.

EXPERIMENTS ON **POTATOES**.—HOOS FIELD—*continued*.

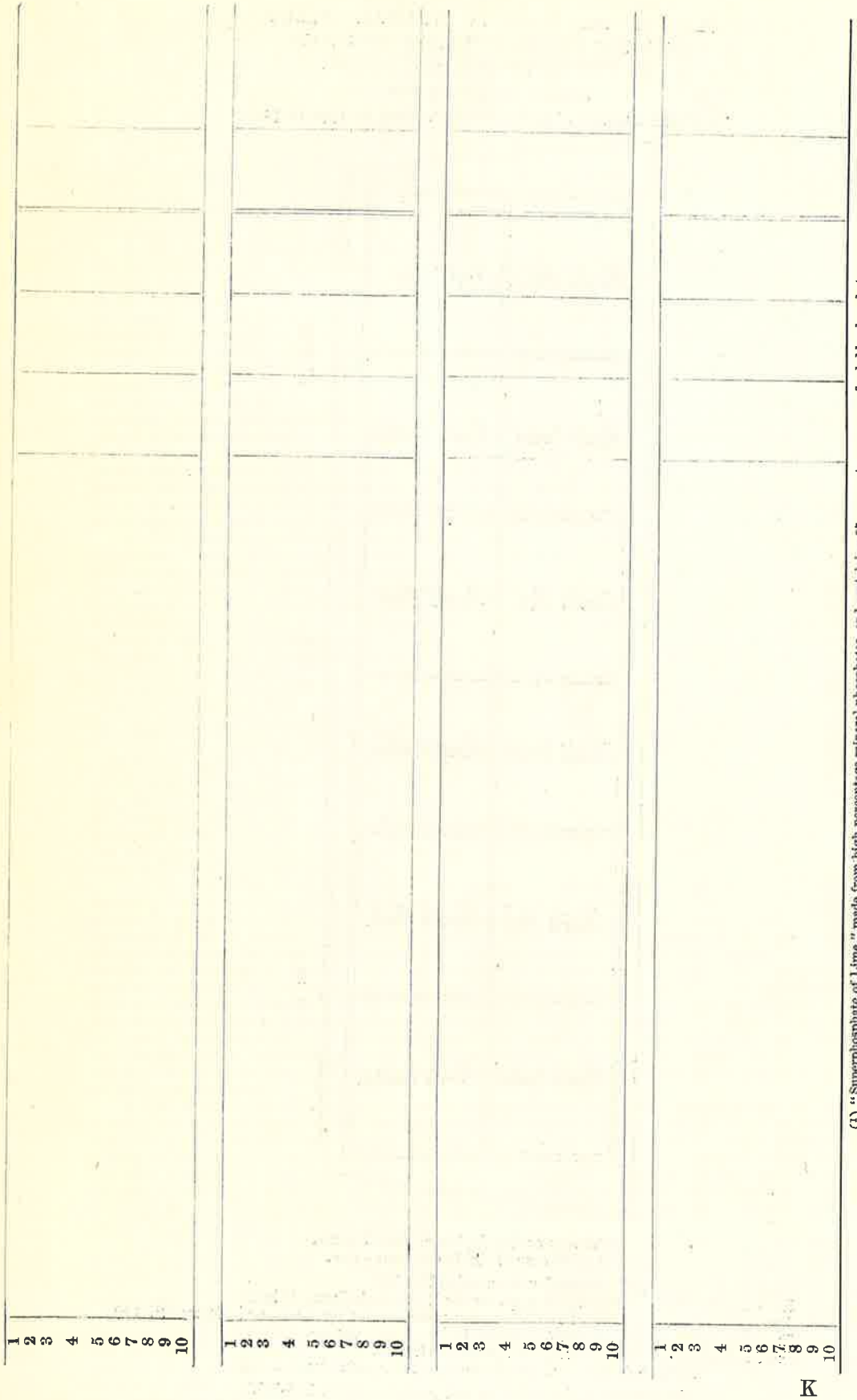
Below are given the particulars of the Manures for the Twenty-sixth Season, 1901. For the Manures, description of Potatoes grown, and the Produce, of the 25 preceding years, see pp. 88–9, 92–3, 96–7, 100–1, and 104–5.

The arrangement of the plots is precisely the same as for the 25 preceding potato crops. The manures are the same as for the crops of 1883, and since; excepting that for the crops of 1897, and since, Basic Slag has been used instead of Superphosphate. Description of Potato, "Beauty of Hebron" (White). Rows 25 inches apart; 14 inches from plant to plant in the rows.

In the spring of 1894 permanent division paths were laid out between plot and plot.

; (Area under experiment, 2 acres.)

Plots.	Manures per Acre per Annum.	Produce per Acre.				
		Tubers.				Tops.
		Good.	Small.	Diseased.	Total.	
	Twenty-sixth Season, 1901. Potatoes planted, April 23. Crop taken up,	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	
1	Unmanured in 1876, and each year since					
2	Unmanured in 1882, and since. Previously Farmyard Manure (14 tons)					
3	Farmyard Manure (14 tons) alone 1883 and since; previously 3½ cwts. Superphosphate also (1)					
4	Farmyard Manure (14 tons) alone 1883 and since. In 1882, and previously, 3½ cwts. Superphosphate, and in 1881, and previously, 550 lbs. Nitrate of Soda also					
5	400 lbs. Ammonium-salts (2)					
6	550 lbs. Nitrate of Soda					
7	400 lbs. Ammonium-salts, 400 lbs. Basic Slag, 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.					
8	550 lbs. Nitrate of Soda, 400 lbs. Basic Slag, 300 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.					
9	400 lbs. Basic Slag					
10	400 lbs. Basic Slag, 300 lbs. Sulphate Potash, 100 lbs. Sulphate Soda, and 100 lbs. Sulphate Magnesia					
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						



(1) "Superphosphate of Lime," made from high percentage mineral phosphates, and containing 37 per cent., or more, of soluble phosphate.
(2) "Ammonium-salts."—In each case equal parts Sulphate and Muriate Ammonia of Commerce.

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