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Yields of the Field Experiments 1876

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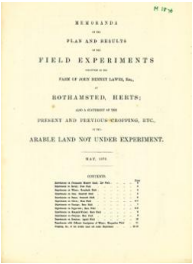

Experiments on Sugar Beet; Barn Field

Rothamsted Research

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Experiments on SUGAR BEET (Vilmorin's Green-top White Silesian)—BARN FIELD.

Grown year after year on the same Land, without Manure, and with different descriptions of Manure, commencing 1871.

Previous Cropping:—1843–'48 (6 Seasons), experiments on Norfolk White Turnips, with different descriptions of Manure.
1849–'52 (4 Seasons), experiments on Swede Turnips, with different descriptions of Manure.
1853–'55 (3 Seasons), Barley without Manure (with a view as far as possible to equalise the condition of the Plots).
1856–'70 (15 Seasons), experiments on Swede Turnips, with different descriptions of Manure, in which the arrangement of the Plots was the same, and that of the Manures very similar—in fact, exactly the same during the last 10 years—as in the first year of Sugar Beet, excepting that, during those 10 years, the Alkalies were omitted for the Swedes. For the second and subsequent years of Sugar Beet slight alterations in the Mineral Manures were made, and in the fourth and fifth years the Farmyard Manure, Nitrate of Soda, Ammonia-salts, and Rape-cake were omitted, as will be seen below. Seed dibbled on the flat; in rows 22 inches apart, and 11 inches apart in the rows; plants moulded up afterwards.

Area under experiment about 8 acres. The experiments are arranged as under, in 5 Series, each of which comprises 8 Plots.

Plots.	Manures, per Acre, per Annum.									
	Series 1.		Series 2. Each Plot as Series 1, and Cross-dressed with 550 lbs. Nitrate Soda.		Series 3. Each Plot as Series 1, and Cross-dressed with 400 lbs. "Ammonia-salts."		Series 4. Each Plot as Series 1, and Cross-dressed with 2000 lbs. Rape-cake, and 400 lbs. "Ammonia-salts."		Series 5. Each Plot as Series 1, and Cross-dressed with 2000 lbs. Rape-cake.	
First Season, 1871.	Produce per Acre (Roots trimmed as for feeding, not as for Sugar-making).									
	Roots.	Leaves.	Roots.	Leaves.	Roots.	Leaves.	Roots.	Leaves.	Roots.	Leaves.
	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.
1 Farmyard Manure (14 tons)	18 3	3 5	27 13	6 19	22 1	5 6	26 4	6 14	28 18	5 14
2 Farmyard Manure (14 tons), and 3½ cwts. Superphosphate (1)	14 13	2 14	25 16	5 15	21 15	4 6	25 2	6 7	25 4	5 5
3 Without Manure (1846, and since)	7 11	2 0	22 3	5 12	15 6	4 16	19 18	7 0	20 16	4 12
4 3½ cwts. Superphosphate, 300 lbs. Sulph. Pot., 200 lbs. Sulph. Soda, 100 lbs. Sulph. Magnesia	7 11	1 5	22 15	4 8	17 10	3 5	22 15	6 3	21 7	3 19
5 3½ cwts Superphosphate	5 12	1 8	20 19	3 14	15 4	3 19	19 18	7 12	18 19	4 5
6 3½ cwts. Superphos., 300 lbs. Sulph. Potass	5 1	1 4	21 5	3 13	17 4	3 4	23 11	6 11	21 0	3 11
7 3½ cwts. Superphos., 300 lbs. Sulph. Pot., 36½ lbs. Amm.-salts (2)	5 18	1 5	20 19	3 18	18 8	4 3	21 0	5 0	21 7	3 17
8 Unmanured, 1853, and since; previously part Unman., part Superphos.	7 10	1 14	21 13	3 16	16 2	4 15	17 19	7 11	20 7	4 9
Second Season, 1872.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.
1 Farmyard Manure (14 tons)	15 13	4 2	23 9	7 19	22 14	9 0	26 8	9 11	22 5	6 1
2 Farmyard Manure (14 tons), and 3½ cwts. Superphosphate (1)	16 0	3 18	24 6	8 16	22 0	7 16	25 9	9 14	20 15	5 11
3 Without Manure (1846, and since)	7 17	1 13	21 7	6 6	15 3	4 13	20 8	10 1	16 3	3 11
4 3½ cwts. Superphosphate, 500 lbs. Sulph. Pot., 200 lbs. Chloride Sodium (common salt), 200 lbs. Sulph. Magnesia	6 14	1 10	20 2	5 19	15 10	3 7	23 8	7 13	17 18	3 15
5 3½ cwts. Superphosphate	6 17	1 8	19 6	6 4	14 5	4 13	18 11	10 4	15 18	3 16
6 3½ cwts. Superphos., 500 lbs. Sulph. Potass	6 6	1 5	16 16	5 14	14 7	3 19	22 16	9 9	15 17	3 14
7 3½ cwts. Superphos., 500 lbs. Sulph. Pot., 36½ lbs. Amm.-salts (2)	6 15	1 8	17 0	6 1	15 9	3 19	23 9	9 10	15 10	3 15
8 Unmanured, 1853, and since; previously part Unman., part Superphos.	5 4	1 5	15 6	5 19	13 10	4 1	19 12	9 17	15 0	4 6
Third Season, 1873.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.
1 Farmyard Manure (14 tons)	15 2	5 12	20 5	10 9	22 2	9 18	22 15	12 10	23 10	7 8
2 Farmyard Manure (14 tons) and 3½ cwts. Superphosphate (1)	14 6	5 2	21 10	11 0	19 4	8 9	23 7	13 6	21 18	6 18
3 Without Manure (1846, and since)	5 1	1 11	14 5	6 11	9 3	3 16	15 12	9 11	14 13	4 1
4 3½ cwts. Superphosphate, 500 lbs. Sulph. Pot., 200 lbs. Chloride Sodium (common salt), 200 lbs. Sulph. Magnesia	5 2	1 13	16 9	6 11	12 10	3 10	20 3	8 0	16 1	3 8
5 3½ cwts. Superphosphate	5 5	1 11	18 8	5 13	10 19	5 0	14 15	9 8	13 19	4 9
6 3½ cwts. Superphos., 500 lbs. Sulph. Potass	4 12	1 5	15 17	4 4	12 18	3 12	20 2	9 5	14 14	3 11
7 3½ cwts. Superphos., 500 lbs. Sulph. Pot., 36½ lbs. Amm.-salts (2)	5 19	1 12	16 14	5 3	13 0	4 15	19 16	9 0	15 17	4 4
8 Unmanured, 1853, and since; previously part Unman., part Superphos.	4 11	1 7	12 9	5 18	8 8	2 19	15 2	9 8	12 2	3 16
Fourth Season, 1874 (3). Mineral Manures as in 1872 and 1873; but no Farmyard Manure, or cross-dressings of Nitrate Soda, Ammonia-salts, or Rape-cake.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.
1 Without Manure, 1874 and 1875 (Farmyard Manure in '71, '72, '73)	10 16	5 6	11 14	8 9	11 7	8 3	13 7	9 17	14 10	7 8
2 3½ cwts. Superphosphate (with Farmyard Manure, '71, '72, '73)	13 3	5 9	7 9	4 16	9 5	5 17	12 5	7 7	13 1	6 4
3 Without Manure (1846, and since)	5 2	1 5	3 2	2 6	3 7	2 2	2 11	2 10	3 19	2 9
4 3½ cwts. Superphosphate, 500 lbs. Sulph. Pot., 200 lbs. Chloride Sodium (common salt), 200 lbs. Sulphate Magnesia	6 10	1 8	8 16	3 6	7 10	2 0	10 12	4 16	8 2	3 11
5 3½ cwts. Superphosphate	5 19	1 7	7 10	3 6	7 6	2 8	7 15	5 4	5 17	3 6
6 3½ cwts. Superphos., 500 lbs. Sulph. Potass	5 11	1 5	8 1	2 14	8 1	1 18	9 10	4 13	7 13	3 2
7 3½ cwts. Superphos., 500 lbs. Sulph. Pot., and Amm.-salts, '71, '72, '73	6 14	1 3	9 5	2 11	8 15	1 14	11 14	4 11	8 4	3 9
8 Unmanured, 1853, and since; previously part Unman., part Superphos.	5 0	1 2	7 13	2 16	6 10	2 0	7 6	4 7	3 12	2 1
Fifth Season, 1875. Mineral Manures as in 1872, 1873, and 1874; but no Farmyard Manure, or cross-dressings of Nitrate Soda, Ammonia-salts, or Rape-cake.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.
1 Without Manure, 1874 and 1875 (Farmyard Manure in '71, '72, '73)	17 5	2 11	19 18	2 14	21 0	3 6	22 7	3 12	19 13	2 11
2 3½ cwts. Superphosphate (with Farmyard Manure, '71, '72, '73)	15 11	2 2	19 18	2 18	18 17	2 18	20 9	3 5	18 10	2 1
3 Without Manure (1846, and since)	5 9	1 1	9 5	1 12	8 0	1 3	14 1	2 13	11 17	1 10
4 3½ cwts. Superphosphate, 500 lbs. Sulph. Pot., 200 lbs. Chloride Sodium (common salt), 200 lbs. Sulph. Magnesia	5 9	1 0	9 8	1 7	7 16	1 1	12 14	1 14	10 3	1 7
5 3½ cwts. Superphosphate	5 11	1 2	9 19	1 10	7 16	1 4	13 17	2 8	11 2	1 14
6 3½ cwts. Superphos., 500 lbs. Sulph. Potass	5 4	1 0	8 4	1 4	7 1	1 2	12 8	2 3	10 2	1 9
7 3½ cwts. Superphos., 500 lbs. Sulph. Pot. and Amm.-salts '71, '72, '73	5 11	1 1	8 2	1 6	7 6	1 1	11 17	1 17	10 6	1 11
8 Unmanured, 1853, and since; previously part Unman., part Superphos.	4 15	1 0	7 4	1 2	6 1	1 4	12 2	2 11	11 12	2 13

(1) "Superphosphate of Lime"—in all cases made from 200 lbs. Bone-ash, 150 lbs. Sulphuric Acid sp. gr. 1·7 (and water).
(2) "Ammonia-salts"—in each case equal parts Sulphate and Muriate of Ammonia of Commerce.
(3) Owing to the deficiency of Rain for some time after sowing a large proportion of the plants failed. Some were transplanted on plots 1, but not on the other plots; and eventually the plant was (excepting on plots 1) upon the whole very deficient and irregular, the remaining plants being larger than usual.

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Experiments on **SUGAR BEET**—BARN FIELD—*continued.*

Abstract of Results illustrating the influence of the different Manures on the Amount of Produce, and on the Composition of the Roots. Average of the First Three Seasons, 1871, 1872, and 1873.

	Manures per Acre per Annum.				
	Series 1. Manures as below only, No Cross-dressing.	Series 2. As Series 1, and Cross-dressed with 550 lbs. Nitrate Soda.	Series 3. As Series 1, and Cross-dressed with 400 lbs. "Ammonia-salts."	Series 4. As Series 1, and Cross-dressed with 2000 lbs. Rape-cake, and 400 lbs. "Ammonia-salts."	Series 5. As Series 1, and Cross-dressed with 2000 lbs. Rape-cake.
Plot 1 (Series I.), Farmyard Manure (14 Tons).					
Average produce per Acre:—	Cwts.	Cwts.	Cwts.	Cwts.	Cwts.
Roots	326	476	446	502	498
Leaves	86	169	161	192	128
Total	412	645	607	694	626
Average Composition of the Roots:—	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Dry Matter	17·49	16·11	16·56	16·23	16·66
Mineral Matter (ash) in Dry Matter	5·00	6·11	5·83	6·55	5·61
Nitrogen in Dry Matter (1)	0·83	1·24	1·53	1·52	1·24
Sugar in Juice	13·14	11·58	12·05	11·10	12·01
Sugar in Roots, if 95, P. C. Juice	12·48	11·00	11·45	10·55	11·41
Means of Plots 4, 5, and 6 (Series I.), Superphosphate, with or without other Mineral Manures, every year.					
Average produce per Acre:—	Cwts.	Cwts.	Cwts.	Cwts.	Cwts.
Roots	118	382	290	413	346
Leaves	28	102	76	165	76
Total	146	484	366	578	422
Average Composition of the Roots:—	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Dry Matter	18·53	15·93	17·43	15·93	17·66
Mineral Matter (ash) in dry Matter	4·30	5·73	4·81	5·98	4·50
Nitrogen in Dry Matter (1)	0·54	1·20	0·87	1·52	0·83
Sugar in Juice	14·45	12·12	13·35	11·56	13·45
Sugar in Roots, if 95, P. C. Juice	13·73	11·51	12·68	10·98	12·78

(1) The percentages of Nitrogen relate to the first year only; but the percentage of Nitrogen has been determined in the Juice, in selected cases, each year; and the results confirm the indications of the nitrogen in the roots in the first year.

Experiments on **MANGOLD WURZEL**.—BARN FIELD (after Sugar-beet); commencing 1876.

The arrangement of the Plots is precisely the same as previously for Sugar-beet, excepting that Plot 9, which was unmanured for Sugar-beet, and also previously for Swedes, is now added as a manured Plot. With this exception the manures are also substantially the same as previously for Sugar-beet; in fact, precisely the same as for the Sugar-beet in 1872 and 1873. Seed, Yellow Globe; dibbled on ridges, rows 26 inches apart; plants 11 inches apart in the rows (3).

Plots.	Manures per Acre per Annum.										
	Series 1.			Series 2. As Series 1, and Cross-dressed with 550 lbs. Nitrate Soda.		Series 3. As Series 1, and Cross-dressed with 400 lbs. "Ammonia-salts."		Series 4. As Series 1, and Cross-dressed with 2000 lbs. Rape-cake and 400 lbs. "Ammonia-salts."		Series 5. As Series 1, and Cross-dressed with 2000 lbs. Rape-cake.	
		Produce per Acre.									
		Roots.	Leaves.	Roots.	Leaves.	Roots.	Leaves.	Roots.	Leaves.	Roots.	Leaves.
		Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.
1	Farmyard Manure (14 Tons)										
2	Farmyard Manure (14 tons), and 3½ cwts. Superphosphate (1)										
3	Without Manure (1846, and since)										
4	3½ cwts. Superphosphate, 500 lbs. Sulph. Pot., 200 lbs. Chloride Sodium (common salt), 200 lbs. Sulph Magnesia										
5	3½ cwts. Superphosphate										
6	3½ cwts. Superphosphate, 500 lbs. Sulph. Potass										
7	3½ cwts. Superphos., 500 lbs. Sulph. Pot., 36½ lbs. Amm.-salts (2)										
8	Unmanured, 1853, and since; previously part Unman.: part Superphos.										
9	Farmyard Manure (14 tons), 3½ cwts. Superphosphate, and 400 lbs. ammonia-salts, no cross-dressing (3)										

(1) "Superphosphate of Lime"—in all cases made from 200 lbs. Bone-ash, 150 lbs. Sulphuric acid, sp. gr.; 1·7 (and water).
(2) "Ammonia-salts"—in each case equal parts Sulphate and Muriate of Ammonia of Commerce.
(3) Plot 9 sown on the flat instead of on ridges; plants ridged up afterwards; rows 22 inches apart, plants 10 inches apart in the rows.

Experiments on **POTATOES**.—HOOS FIELD; commencing 1876.

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 Ammonia-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 Ammonia-salts. Plots 7 and 8 received the same amount of complex mineral manure and Ammonia-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 Ammonia-salts. Plots 9 and 10 received the same complex mineral manures alone for the Wheat as Plot 10 is to receive for potatoes; Plot 9 to receive superphosphate only (3).

Plots.	Manures per Acre per Annum.	Produce per Acre.					
		1876.		1877.		1878.	
		Tubers.	Tops.	Tubers.	Tops.	Tubers.	Tops.
		Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.
1	Unmanured						
2	Farmyard Manure (14 tons)						
3	Farmyard Manure (14 tons), and 3½ cwts. Superphosphate (1)						
4	Farmyard Manure (14 tons), 3½ cwts. Superphosphate, and 550 lbs. Nitrate of Soda						
5	400 lbs. Ammonia-salts (2)						
6	550 lbs. Nitrate of Soda						
7	400 lbs. Ammonia-salts, 3½ cwts. Superphos., 300 lbs. Sulph. Potass, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.						
8	550 lbs. Nitrate of Soda, 3½ cwts. Superphos., 300 lbs. Sulph. Potass, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag.						
9	3½ cwts. Superphosphate						
10	3½ cwts. Superphosphate, 300 lbs. Sulph. Potass, 100 lbs. Sulph. Soda, and 100 lbs. Sulph. Magn.						

(1) "Superphosphate of Lime"—in all cases made from 200 lbs. Bone-ash, 150 lbs. Sulphuric acid, sp. gr. 1·7 (and water).
(2) "Ammonia-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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