ROTHAMSTED RESEARCH

Yields of the Field Experiments 1875

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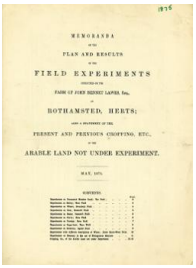

Memoranda of the Field Experiments at Rothamsted May 1875

Rothamsted Research

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1875

MEMORANDA

OF THE

PLAN AND RESULTS

OF THE

FIELD EXPERIMENTS

CONDUCTED ON THE

FARM OF JOHN BENNET LAWES, Esq.,

AT

ROTHAMSTED, HERTS;

ALSO A STATEMENT OF THE

PRESENT AND PREVIOUS CROPPING, ETC.,

OF THE

ARABLE LAND NOT UNDER EXPERIMENT.

MAY, 1875.

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https://doi.org/10.23637/ERADOC-1-239

THE PARK.

Experiments with different Manures on PERMANENT MEADOW LAND.

The Land has probably been laid down with Grass for some **centuries.** **No fresh** seed **has been artificially sown within** the last 40 years **certainly**; nor is there record of any having been sown since the Grass was first laid down. The **experiments commenced** in 1856, **at which time the character** of the herbage **appeared uniform** over all the Plots. Excepting as explained in the Table and in the foot-notes, the same **description of Manure** has **been applied year after year to the** same Plot.

(Area under experiment, about 7 acres.)

		Produce per Acre, weighed as Hay.							
Plots.	Manures, per acre, per Annum.	14th Season; 1869.	15th Season; 1870.	16th Season; 1871.	17th Season; 1872.	18th Season; 1873.	19th Season; 1874.	Average per Annum; 18 Years 1856-1873.	Plots.
		Cwts.	Cwts.	Cwts.	Cwts.	Cwts.	Cwts.	Cwts.	
1	{1856–63, 8 years, 14 tons Farmyard Manure, and 200 lbs. Ammonia-salts [1]; average produce 49½ cwts. / 1864 and since, 200 lbs. Ammonia-salts alone; average produce (10 years, 1864–73) 40⅝ cwts. .. ..}	61	16¼	43¾	31½	29¾	23½	44¾	1
2	{1856–63, 8 years, 14 tons Farmyard Manure; average produce 42⅜ cwts. .. / 1864 and since, unmanured; average produce (10 years, 1864–73) 35⅛ cwts.}	55¼	13⅞	33⅞	25¼	18⅞	16¼	38⅝	2
3	Unmanured, continuously	33	5¾	25⅜	14⅝	12¼	12⅝	21⅞	3
4 {1	3½ cwts. Superphosphate of Lime [2]	40¼	7¼	24⅞	15⅜	13½	13⅛	23½ [9]	1
4 {2	3½ cwts. Superphosphate of Lime, and 400 lbs. Ammonia-salts	45½	8¼	38¼	28½	26	19⅛	35⅛ [9]	2 4
5	400 lbs. Ammonia-salts	35⅝	5½	29⅝	22½	16⅝	6⅜	27½	5
[3] 6	{1856–68, 13 years, 400 lbs. Ammonia-salts; average produce 30½ cwts. .. .. / 1869 and since, 300 lbs. Sulph. Potass, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Magnesia, 3½ cwts. Superphos.; av. prod. (5 yrs., 1869–73) 32¼ cwts.}	56½	16¼	37½	25¼	26	21½	31⅛	6
7	300 lbs. Sulphate Potass, 100 lbs. [4] Sulphate Soda, 100 lbs. Sulphate Magnesia, and 3½ cwts. Superphosphate	54⅜	17½	39⅜	37⅜	34⅜	27½	35½	7
[3] 8	{1856–61, 6 years, 300 lbs. Sulph. Potass, 200 lbs. Sulph. Soda, 100 lbs. Sulph. Magnesia, and 3½ cwts. Superphosphate; average produce 36 cwts. / 1862 and since, 250 lbs. [5] Sulphate Soda, 100 lbs. Sulphate Magnesia, and 3½ cwts. Superphosphate; average produce (12 years, 1862–73) 28½ cwts.}	46⅜	12¾	30	22⅞	18⅜	17¼	31	8
9	300 lbs. Sulphate Potass, 100 lbs. [4] Sulphate Soda, 100 lbs. Sulphate Magnesia, 3½ cwts. Superphosphate, and 400 lbs. Ammonia-salts	68⅜	29½	58¾	50½	43¾	29⅜	52⅛	9
[3] 10	{1856–61, 6 yrs. 300 lbs. Sulph. Potass, 200 lbs. Sulph. Soda, 100 lbs. Sulph. Magnesia, 3½ cwts. Superphos., 400 lbs. Amm.-salts; av. prod. 55½ cwts. / 1862 and since, 250 lbs. [5] Sulph. Soda, 100 lbs. Sulph. Magnesia, 3½ cwts. Superphos., 400 lbs. Amm.-salts; av. prod. (12 yrs., 1862–73) 43¾ cwts.}	57¼	21¼	46½	38⅜	33	23	47⅝	10
11 {1	{300 lbs. Sulph. Potass, 100 lbs. [4] Sulph. Soda, 100 lbs. Sulph. Magnesia, 3½ cwts. Superphosph., 800 lbs. [6] Ammonia-salts	75½	42⅜	56⅝	63⅜	46⅜	23½	60¼	1
11 {2	300 lbs. Sulph. Potass, 100 lbs. [4] Sulph. Soda, 100 lbs. Sulph. Magnesia, 3½ cwts. Superphosph., 800 lbs. [6] Ammonia-salts, and 400 lbs. Silicate Soda [7]}	78½	49½	65¾	63⅞	56½	39⅜	65¼	2 11
12	Unmanured continuously	38¾	11½	26⅜	20⅛	16⅛	14⅝	24½	12
13	300 lbs. Sulph. Potass, 100 lbs. [4] Sulph. Soda, 100 lbs. Sulph. Magnesia, 3½ cwts. Superphosph., 400 lbs. Ammonia-salts, 2000 lbs. Cut Wheat-straw ..	77⅝	48	63	62⅝	57	46½	57⅝	13
14	550 lbs. Nitrate of Soda [8], 300 lbs. Sulphate Potass, 100 lbs. [4] Sulphate Soda, 100 lbs. Sulphate Magnesia, and 3½ cwts. Superphosphate	76⅛	56¼	61⅞	55½	51¾	49	57⅜	14
15	550 lbs. Nitrate of Soda	53¼	15½	38⅝	32⅜	33¾	26⅛	36⅜ [10]	15
16	275 lbs. Nitrate of Soda, 300 lbs. Sulphate Potass, 100 lbs. [4] Sulphate Soda, 100 lbs. Sulphate Magnesia, and 3½ cwts, Superphosphate	74¼	33⅛	57	40	41⅝	29⅜	47⅛ [10]	16
17	275 lbs. Nitrate of Soda	54⅜	19½	38½	29⅝	28½	22⅜	34⅜	17
18	Mixture supplying the quantity of Potass, Soda, Lime, Magnesia, Phosphoric acid, Silica, and Nitrogen, contained in 1 ton of Hay (commencing 1865)	55⅜	14⅜	37⅛	33⅜	26⅛	22½	33 [11]	18
19	275 lbs. Nitrate of Soda, 290 lbs. Sulphate of Potass, and 3½ cwts. Superphosphate (commencing 1872)	..	..	..	40	38⅝	34¼	39⅜	19
20	327 lbs. Nitrate of Potass, and 3½ cwts. Superphosphate (commencing 1872)	..	..	..	38½	36	29¼	37¼	20

1 acre .. .. = (about)	0·40 Hectare .. .. .. or 1·59 Prussian Morgen.
1 lb. (pound avoir.) .. = (about)	0·45 Kilogramme .. .. .. or 0·91 Zollverein Pfund.
1 cwt. (hundredweight) = (about)	51·0 Kilogrammes .. .. .. or 1·02 Centner.
1 ton .. .. = (about)	1016·0 Kilogrammes .. .. or 20·33 Centner.
1 lb. per acre .. .. = (about)	1·12 Kilogramme per Hectare or 0·57 Zollv. Pfd. per Pr. Morgen.
1 cwt. per acre .. .. = (about)	125·5 Kilogrammes per Hectare or 0·64 Centner per Pr. Morgen.
1 ton per acre .. .. = (about)	2510·0 Kilogrammes per Hectare or 12·82 Centner per Pr. Morgen.

(1) "Ammonia-salts"—in all cases equal parts Sulphate and Muriate of Ammonia of Commerce.
(2) The "Superphosphate of Lime" is, in all cases, made from 200 lbs. Bone-ash, 150 lbs. Sulphuric Acid Sp. gr. 1·7 (and water).
(3) Plots 6, 8, and 10, had, besides the Manures specified, 2000 lbs. Sawdust per acre per annum for the first 7 years, 1856–1862, but without effect.
(4) 200 lbs. 1856–63 inclusive.
(5) 500 lbs. in 1862 and 1863.
(6) Only 400 lbs. in 1859–60–61.
(7) The application of Silicates did not commence until 1862.
(8) 550 lbs. Nitrate of Soda is reckoned to contain the same amount of Nitrogen as 400 lbs. of "Ammonia-salts."
(9) Average of 15 years only, as the manures specified were first applied in 1859 (previously, 1856–7 and 8, Sawdust only).
(10) Average of 16 years only, as these experiments did not commence until 1858.
(11) Average of 9 years only, as the experiment only commenced in 1865.

HOOS FIELD.

EXPERIMENTS ON THE GROWTH OF **BARLEY** YEAR AFTER YEAR ON THE SAME LAND, WITHOUT MANURE, AND WITH DIFFERENT KINDS OF MANURE.

Previous Cropping—1847, Swedish Turnips, with Dung and Superphosphate of Lime, the Roots carted off; 1848, Barley; 1849, Clover; 1850, Wheat; 1851, Barley manured with Ammonia-salts.

First Experimental Barley Crop in 1852. Barley every year since; and, unless stated to the contrary in the Table, or in the foot-notes, the same Manure has been applied year after year to the same Plot.

(Area under experiment, about 4¼ acres.)

		Produce per Acre.						
		Average per Annum, over 20 Years, 1852–1871.			Twenty-third Season, 1874.			
		Dressed Corn.			Dressed Corn.			
Plots.	Manures, per acre, per annum.	Quantity.	Weight per Bushel.	Total Straw.	Quantity.	Weight per Bushel.	Total Straw.	Plots.
		Bushels.	lbs.	cwts.	Bushels.	lbs.	cwts.	
1 O.	Unmanured continuously	20	52¾	11¾	17⅜	54¾	8¾	1 O.
2 O.	3½ cwts. Superphosphate of Lime (1)	25½	53¼	13⅜	21½	55	9⅝	2 O.
3 O.	200 lbs. (2) Sulphate Potass, 100 lbs. (3) Sulphate Soda, 100 lbs. Sulphate Magnesia	22⅜	53	12¼	18	56½	7¾	3 O.
4 O.	200 lbs. (2) Sulphate Potass, 100 lbs. (3) Sulphate Soda, 100 lbs. Sulphate Magnesia, 3½ cwts. Superphosphate	27½	53⅜	14⅜	19¼	56⅜	8⅛	4 O.
1 A.	200 lbs. Ammonia-salts (4)	32⅔	52⅛	18½	23⅛	54⅝	12½	1 A.
2 A.	200 lbs. Ammonia-salts, and 3½ cwts. Superphosphate	47	53½	27⅜	42⅜	54¾	20⅜	2 A.
3 A.	200 lbs. Ammonia-salts, 200 lbs. (2) Sulph. Potass, 100 lbs. (3) Sulph. Soda, 100 lbs. Sulph. Magnesia	35	52¾	20¾	30⅜	55¾	15⅜	3 A.
4 A.	200 lbs. Ammonia-salts, 200 lbs. (2) Sulph. Potass, 100 lbs. (3) Sulph. Soda, 100 lbs. Sulph. Magnesia, 3½ cwts. Superphosphate	46¼	54	28½	45¼	57⅜	28⅞	4 A.
(5) 1 AA.	275 lbs. Nitrate Soda	37	52	22⅛	30¼	55	15	1 AA.
(5) 2 AA.	275 lbs. Nitrate Soda, and 3½ cwts. Superphosphate	49¼	53⅜	30½	53½	54	27⅜	2 AA.
(5) 3 AA.	275 lbs. Nitrate Soda, 200 lbs. (2) Sulph. Potass, 100 lbs. (3) Sulph. Soda, 100 lbs. Sulph. Magnesia	37⅜	52½	24⅜	32	55¾	18½	3 AA.
(5) 4 AA.	275 lbs. Nitrate Soda, 200 lbs. (2) Sulph. Potass, 100 lbs. (3) Sulph. Soda, 100 lbs. Sulph. Magnesia, 3½ cwts. Superphosphate	49¾	53⅜	32⅜	51⅜	57	27⅞	4 AA.
(6) 1 AAS.	275 lbs. Nitrate Soda, 400 lbs. Silicate Soda (6)	38¾	52½	23⅛	37½	55¾	20⅞	1 AAS.
(6) 2 AAS.	275 lbs. Nitrate Soda, 400 lbs. Silicate Soda, and 3½ cwts Superphosphate (1)	48⅜	53⅜	30⅜	51¾	56⅜	28¼	2 AAS.
(6) 3 AAS.	275 lbs. Nitrate Soda, 400 lbs. Silicate Soda, 200 lbs. (2) Sulph. Potass, 100 lbs. (3) Sulph. Soda, and 100 lbs. Sulph. Magnesia	41¼	52⅜	25⅞	41⅝	55¼	25⅜	3 AAS.
(6) 4 AAS.	275 lbs. Nitrate Soda, 400 lbs. Silicate Soda, 200 lbs. (2) Sulph. Potass, 100 lbs. (3) Sulph. Soda, 100 lbs. Sulph. Magnesia, and 3½ cwts. Superphosphate	50⅜	53⅜	33⅜	54¼	56¾	33¾	4 AAS.
(7) 1 C.	1000 lbs. Rape-cake	45½	53¾	26⅝	47⅛	57¼	24⅛	1 C.
(7) 2 C.	1000 lbs. Rape-cake, and 3½ cwts. Superphosphate	46¾	53⅞	28⅜	49⅝	57⅞	24⅞	2 C.
(7) 3 C.	1000 lbs. Rape-cake, 200 lbs. (2) Sulph. Potass, 100 lbs. (3) Sulph. Soda, 100 lbs. Sulph. Magnesia	43⅝	53¾	27⅛	45⅝	57¼	23¾	3 C.
(7) 4 C.	1000 lbs. Rape-cake, 200 lbs. (2) Sulph. Potass, 100 lbs. (3) Sulph. Soda, 100 lbs. Sulph. Magnesia, 3½ cwts. Superphosphate	47⅜	53⅜	29¼	49¼	57	24¾	4 C.
(8) 1 N.	275 lbs. Nitrate of Soda	37⅜ (11)	52⅝ (11)	22⅞ (11)	35⅜	55½	19	1 N.
(8) 2 N.	275 lbs. (9) Nitrate of Soda	41⅜ (11)	52⅝ (11)	26⅛ (11)	42⅝	56¾	23¼	2 N.
5 O.	200 lbs. (2) Sulphate of Potass, 3½ cwts. Superphosphate (10)	22¾ (11)	53½ (11)	12⅜ (11)	17	56½	8⅜	5 O.
5 A.	200 lbs. (2) Sulphate of Potass, 3½ cwts. Superphosphate, and 200 lbs. Ammonia-salts	44⅛ (11)	53¾ (11)	28 (11)	42⅛	57¾	25⅜	5 A.
M.	100 lbs. Sulphate of Soda, 100 lbs. Sulphate of Magnesia, and 3½ cwts. Superphosphate	21½ (12)	53¼ (12)	12⅜ (12)	18¼	55	9¼	M.
6 1	Unmanured continuously	22	52½	12⅜	16½	54¾	8¾	1
6 2	Ashes (burnt soil and turf)	21⅞	52⅜	12⅛	20	56	9½	2 } 6
7 1	Farmyard Manure 14 tons, 20 years, 1852–1871; unmanured since	48¼	54⅜	28¼	46½	57⅝	26⅛	7
7 2	Farmyard Manure 14 tons, every year				64½	57½	37¼	

1 acre	= (about) 0·40 Hectare or 1·59 Prussian Morgen.
1 bushel	= (about) 0·36 Hectolitre or 0·66 Prussian Scheffel.
1 lb. (pound avoir.)	= (about) 0·45 Kilogramme or 0·91 Zollverein Pfund.
1 cwt. (hundredweight)	= (about) 51·0 Kilogrammes or 1·02 Centner.
1 bushel per acre	= (about) 0·9 Hectolitre per Hectare or 0·42 Pr. Scheffel per Pr. Morgen.
1 lb. per acre	= (about) 1·12 Kilogramme per Hectare or 0·57 Zollv. Pfd. per Pr. Morgen.
1 cwt. per acre	= (about) 125·5 Kilogrammes per Hectare or 0·64 Centner per Pr. Morgen.

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

(2) 300 lbs. per annum for the first six years, 1852–7.

(3) 200 lbs. per annum for the first six years, 1852–7.

(4) The "Ammonia-salts"—in all cases equal parts Sulphate and Muriate of Ammonia of Commerce.

(5) First 6 years, 1852–7, instead of Nitrate of Soda, 400 lbs. Ammonia-salts per annum; next 10 years, 1858–67, 200 lbs. Ammonia-salts per annum; 1868, and since, 275 lbs. Nitrate of Soda per annum. 275 lbs. Nitrate of Soda is reckoned to contain the same amount of Nitrogen as 200 lbs. "Ammonia-salts."

(6) The application of Silicates did not commence until 1864; in 1864-5-6 and 7, 200 lbs. Silicate of Soda and 200 lbs. Silicate of Lime were applied per acre, but in 1868, and since, 400 lbs. Silicate of Soda, and no Silicate of Lime. These plots ("AAS") comprise, respectively, one half of the original "AA" plots, and, excepting the addition of the Silicates, have been, and are, in other respects, manured in the same way as the "AA" plots; and, for the sake of comparison with the latter, the *average produce* is given for the whole period of 20 years, 1852–1871.

(7) 2000 lbs. Rape-cake per annum for the first six years, and 1000 lbs. only, each year since.

(8) 300 lbs. Sulphate of Potass, and 3½ cwts. Superphosphate of Lime, without Nitrate of Soda, the first year (1852); Nitrate alone each year since.

(9) 550 lbs. Nitrate of Soda for 1853-4-5-6, and 7; and 275 lbs. only, each year since.

(10) Ammonia-salts also the first year, but not since.

(11) Average of 19 years only.

(12) Average of 14 years only.

BROADBALK FIELD.

EXPERIMENTS ON THE GROWTH OF **WHEAT** YEAR AFTER YEAR ON THE SAME LAND; WITHOUT MANURE, AND WITH DIFFERENT KINDS OF MANURE.

Previous Cropping—1839, Turnips, with Farmyard Manure; 1840, Barley; 1841, Peas; 1842, Wheat; 1843, Oats; the last four Crops Unmanured.

First Experimental Wheat Crop in 1844. Wheat every year since; and, with some exceptions, nearly the same description of Manure on the same Plots each year—especially during the last 23 years (1852 and since). Unless otherwise stated, the Manures are sown in the Autumn before the seed.

(Area under experiment, about 13 acres.)

		Produce per Acre.						
		Average per Annum, 20 Years, 1852–1871.			Thirty-first Season, 1874.			
		Dressed Corn.			Dressed Corn.			
Plots.	Manures, per acre, per annum.	Quantity.	Weight per Bushel.	Total Straw.	Quantity.	Weight per Bushel.	Total Straw.	Plots.
		Bushels.	lbs.	cwts.	Bushels.	lbs.	cwts.	
0	Superphosphate of Lime (three times as much as on No. 5 and succeeding Plots)	17 3/8	58 3/8	15 1/4	16 7/8	59	11 7/8	0
1	Sulphates of Potass, Soda, and Magnesia (twice as much as on No. 5 and succeeding Plots)	15 1/8	58 1/8	13 7/8	11 3/8	59 3/8	8 5/8	1
2	Farmyard Manure (14 tons every year)	35 7/8	60	33 7/8	39 1/4	60 1/4	39 5/8	2
3	Unmanured continuously	14 3/8	57 1/2	13	11 1/2	58 1/4	8 7/8	3
4	Unmanured for Crop of 1852, and since; previously Superphosphate (made with Muriatic Acid), and Sulphate Ammonia	15 3/4	58 3/8	13 3/4	12 1/4	58 3/4	8 7/8	4
5 (*a* and *b*)	200 lbs. [1] Sulphate Potass, 100 lbs. [2] Sulphate Soda, 100 lbs. Sulphate Magnesia, 3½ cwts. Superphosphate of Lime [3]	17	58 7/8	15 1/4	13	59	7 7/8	5 (*a* and *b*)
6 (*a* and *b*)	200 lbs. [1] Sulphate Potass, 100 lbs. [2] Sulphate Soda, 100 lbs. Sulphate Magnesia, 3½ cwts. Superphos., and 200 lbs. Ammonia-salts [4]	26 3/8	59 3/8	24 1/2	25 3/4	59 5/8	19 7/8	6 (*a* and *b*)
7 (*a* and *b*)	200 lbs. [1] Sulphate Potass, 100 lbs. [2] Sulphate Soda, 100 lbs. Sulphate Magnesia, 3½ cwts. Superphos., and 400 lbs. Ammonia-salts	35 1/4	59 1/4	35 3/8	39 1/2	59 3/4	41 1/2	7 (*a* and *b*)
8 (*a* and *b*)	200 lbs. [1] Sulphate Potass, 100 lbs. [2] Sulphate Soda, 100 lbs. Sulphate Magnesia, 3½ cwts. Superphos., and 600 lbs. Ammonia-salts	38 1/4	59	41 3/8	40 1/2	60	54 1/2	8 (*a* and *b*)
9 (*a*)	200 lbs. [1] Sulphate Potass, 100 lbs. [2] Sulphate Soda, 100 lbs. Sulphate Magnesia, 3½ cwts. Superphos., and 550 lbs. Nitrate Soda [5]	36 3/4	58 3/8	41 1/4	38 1/4	60 3/8	44 3/4	9 (*a*)
9 (*b*)	550 lbs. Nitrate of Soda [5]. (The Nitrate for both 9*a* and 9*b* always sown in the Spring.)	26	56 5/8	28 1/4	21 1/2	57 1/2	19 3/8	9 (*b*)
10 (*a*)	400 lbs. Ammonia-salts alone, for 1845, and each year since; Mineral Manure in 1844	22 1/2	57 1/8	21 5/8	25 1/4	56 1/2	17 5/8	10 (*a*)
10 (*b*)	400 lbs. Ammonia-salts alone, for 1845, and each year since (excepting 1846 and 1850); Mineral Manure in 1844, '48, and '50	25 7/8	58	24 3/4	27 1/4	57	21 1/4	10 (*b*)
11 (*a* and *b*)	400 lbs. Ammonia-salts, 3½ cwts. Superphosphate	28	57 3/8	26 3/8	32 7/8	58	27 5/8	11 (*a* and *b*)
12 (*a* and *b*)	400 lbs. Ammonia-salts, 3½ cwts. Superphosphate, and 366½ lbs. [6] Sulphate of Soda	33 7/8	59 1/8	32 3/8	39 1/2	59 1/2	34 3/4	12 (*a* and *b*)
13 (*a* and *b*)	400 lbs. Ammonia-salts, 3½ cwts. Superphosphate, and 200 lbs. [6] Sulphate of Potass	33 7/8	59 5/8	33 7/8	37	60 1/2	35 1/4	13 (*a* and *b*)
14 (*a* and *b*)	400 lbs. Ammonia-salts, 3½ cwts. Superphosphate, and 280 lbs. [6] Sulphate of Magnesia	33 7/8	59 1/4	32 7/8	36 1/2	59 1/2	32 1/8	14 (*a* and *b*)
15 (*a*)	200 lbs. [1] Sulph. Pot., 100 lbs. [2] Sulph. Sod., 100 lbs. Sulph. Mag., 3½ cwts. Superphos. [7]; 400 lbs. Amm.-salts, sown in Spring [8]	32 7/8	59 5/8	32 1/2	27 3/4	61 1/4	23 1/4	15 (*a*)
15 (*b*)	200 lbs. [1] Sulph. Pot., 100 lbs. [2] Sulph. Sod., 100 lbs. Sulph. Mag., 3½ cwts. Superphos. [7]; 400 lbs. Amm.-salts, sown in Spring [9]	34	59 3/4	33 7/8	30 5/8	61	26 3/4	15 (*b*)
16 (*a* and *b*)	1852–64, 13 years, 200 lbs. Sulph. Potass, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag., 3½ cwts. Superphos., and 800 lbs. Ammonia-salts; average produce 39½ bush. Corn, 46⅜ cwts. Straw. 1865 and since, unmanured; average produce (9 years, 1865–73) 17⅞ bushels Corn, 15⅝ cwts. Straw	32 3/8	59	36 1/8	11 3/4	60	10 1/4	16 (*a* and *b*)
17 (*a* and *b*)	400 lbs. Ammonia-salts	31 5/8 [12]	59 1/2 [12]	31 1/4 [12]	33 1/4 [14]	60 3/4 [14]	31 1/8 [14]	17 (*a* and *b*)
18 (*a* and *b*)	200 lbs. [1] Sulphate Potass, 100 lbs. [2] Sulphate Soda, 100 lbs. Sulphate Magnesia, and 3½ cwts. Superphosphate	17 5/8 [13]	58 5/8 [13]	16 1/8 [13]	14 [15]	58 3/4 [15]	9 1/4 [15]	18 (*a* and *b*)
19	3½ cwts. Superphosphate of Lime [11], 300 lbs. Sulphate of Ammonia, and 500 lbs. Rape-cake	30 3/4	58 5/8	29 1/8	37 3/8	59	28	19
20	Unmanured continuously	15 1/4 [10]	58 [10]	14 3/8 [10]	13 3/4	59 1/4	11 3/8	20
21	200 lbs. [1] Sulph. Potass, 100 lbs. [2] Sulph. Soda, 100 lbs. Sulph. Magnesia, 3½ cwts. Superphos., and 100 lbs. Muriate Ammonia	21 3/8	58 3/4	19 1/2	22 7/8	59 1/2	14 7/8	21
22	200 lbs. [1] Sulph. Potass, 100 lbs. [2] Sulph. Soda, 100 lbs. Sulph. Magnesia, 3½ cwts. Superphos., and 100 lbs. Sulphate Ammonia	21	58 5/8	19	21 3/8	59 1/4	13 3/4	22

1 acre = (about)	0·40 Hectare = or 1·59 Prussian Morgen.
1 bushel = (about)	0·36 Hectolitre = or 0·66 Prussian Scheffel.
1 lb. (pound avoir.) = (about)	0·45 Kilogramme = or 0·91 Zollverein Pfund.
1 cwt. (hundredweight) = (about)	51·0 Kilogrammes = or 1·02 Centner.
1 bushel per acre = (about)	0·9 Hectolitre per Hectare = or 0·42 Pr. Scheffel per Pr. Morgen.
1 lb. per acre = (about)	1·12 Kilogramme per Hectare = or 0·57 Zollv. Pfd. per Pr. Morgen.
1 cwt. per acre = (about)	125·5 Kilogrammes per Hectare = or 0·64 Centner per Pr. Morgen.

(1) 300 lbs. per annum for Crop of 1858, and previously.
(2) 200 lbs. per annum for Crop of 1858, and previously.
(3) "Superphosphate of Lime"—in all cases, excepting for Plot 19, made from 200 lbs. Bone-ash, 150 lbs. Sulphuric acid sp. gr. 1·7 (and water).
(4) The "Ammonia-salts," in all cases, equal parts Sulphate and Muriate of Ammonia of Commerce.
(5) 9*a* 475 lbs. Nitrate Soda in 1852, 275 lbs. in 1853 and 1854, 550 lbs. each year since; 9*b* 475 lbs. in 1852, 550 lbs. each year since; 550 lbs. is reckoned to contain the same amount of Nitrogen as 400 lbs. "Ammonia-salts."
(6) For 1858, and previously—1½ time as much.
(7) For 1872 and previously, made with Muriatic instead of Sulphuric Acid.
(8) For 1872 and previously, 400 lbs. Sulphate Ammonia, sown in the Autumn.
(9) For 1872 and previously, 300 lbs. Sulphate Ammonia and 500 lbs. Rape-cake, sown in the Autumn.
(10) The Manures of Plots 17 and 18 are, year by year, transposed.
(11) Made with Muriatic instead of Sulphuric Acid.
(12) Average of 20 years' Ammonia-salts, alternated with Mineral Manures.
(13) Average of 20 years' Mineral Manures, alternated with Ammonia-salts.
(14) Plots 17 had the Ammonia-salts for the Crop of 1874.
(15) Plots 18 had the Mineral Manures for the Crop of 1874.
(16) Average of 19 years only; as, in 1868, owing to a mistake in carting, the produce could not be ascertained.

The Plots marked "(*a* and *b*)" are divided into duplicate portions, "*a*" and "*b*," respectively, which are manured alike; excepting that, for the crops of 1864-5-6 and 7, the "*a*" portions of plots 5, 6, 7, 8, 9, 16, and 17 (or 18), received a mixture of soluble Silicates in addition to the other Manures, but, hitherto, without any material effect; and for the crops of 1868, and since, cut straw (that produced in the previous season) has been applied (instead of Silicates) on the "*a*" portions of plots 5, 6, 7, 8, 11, 12, 13, 14, and 17 (or 18); also for the crop of 1874, and since, the straw of the previous season has been cut up and applied to the "*a*" portion of plot 15.

GEESCROFT FIELD.

EXPERIMENTS ON THE GROWTH OF **OATS** YEAR AFTER YEAR ON THE SAME LAND; WITHOUT MANURE, AND WITH DIFFERENT KINDS OF MANURE.

Previous Cropping—1847 and 1848, Clover, Experimental Manures; 1849—1859, Beans, Experimental Manures; 1860, Fallow; 1861 and 1862, Wheat, Unmanured; 1863, Fallow; 1864, Beans, Dunged; 1865, Wheat, Unmanured; 1866, Beans, Unmanured; 1867 and 1868, Wheat, Unmanured.

First Experimental Oat Crop in 1869.

(Area under Experiment, $\frac{3}{4}$ acre.)

PLOTS.	MANURES, PER ACRE, PER ANNUM.	PRODUCE PER ACRE.																	
		1ST SEASON, 1869.			2ND SEASON, 1870.			3RD SEASON, 1871.			4TH SEASON, 1872.			5TH SEASON, 1873.			AVERAGE PER ANNUM 5 YEARS, 1869–1873.		
		Dressed Corn.		Total Straw.	Dressed Corn.		Total Straw.	Dressed Corn.		Total Straw.	Dressed Corn.		Total Straw.	Dressed Corn.		Total Straw.	Dressed Corn.		Total Straw.
		Quantity.	Weight per Bushel.		Quantity.	Weight per Bushel.		Quantity.	Weight per Bushel.		Quantity.	Weight per Bushel.		Quantity.	Weight per Bushel.		Quantity.	Weight per Bushel.	
		Bushels.	lbs.	cwts.	Bushels.	lbs.	cwts.	Bushels.	lbs.	cwts.	Bushels.	lbs.	cwts.	Bushels.	lbs.	cwts.	Bushels.	lbs.	cwts.
1	Unmanured	36⅜	36¾	19¼	16⅜	35	9⅛	20½	33½	11¼	15	36¼	7⅛	10¾	27⅛	5⅜	19⅛	33¾	10⅜
2	200 lbs. Sulphate Potass, 100 lbs. Sulphate Soda, 100 lbs. Sulphate Magnesia, and 3½ cwts. Superphosphate of Lime (1)	45	38½	24½	19⅛	35⅛	9⅝	22	35¼	13½	19½	37¾	10⅜	17	28⅝	8⅝	24½	35	13⅜
3	400 lbs. Ammonia-salts (2)	56⅛	37½	36⅞	30	34⅞	17¼	57⅛	36⅜	40⅝	55¾	37½	30⅝	36½	32⅝	16¾	47	35⅞	28½
4	400 lbs. Ammonia-salts, 200 lbs. Sulphate Potass, 100 lbs. Sulphate Soda, 100 lbs. Sulphate Magnesia, and 3½ cwts. Superphosphate	75¼	39¼	54	50⅝	36	28⅝	58⅝	35⅜	50	62⅜	39½	45⅛	48¼	34¾	27⅝	59	37	41⅛
5	550 lbs. Nitrate of Soda (3)	62¼	38½	42¾	36½	35¼	23	55	36⅝	34¾	42⅛	36⅜	20⅝	39¾	30¼	16½	47⅛	35½	27½
6	550 lbs. Nitrate of Soda, 200 lbs. Sulphate Potass, 100 lbs. Sulphate Soda, 100 lbs. Sulphate Magnesia, and 3½ cwts. Superphosphate	69⅜	38½	49⅞	50	35¾	28¾	60¼	33¾	48⅜	44⅝	37¼	24	63⅝	33⅝	24	57½	35⅜	35

SECOND 5 YEARS; MINERAL MANURES AS BEFORE, AMMONIA-SALTS AND NITRATE OF SODA ONLY HALF AS MUCH AS PREVIOUSLY.

		6TH SEASON, 1874.			7TH SEASON, 1875.			8TH SEASON, 1876.			9TH SEASON, 1877.			10TH SEASON, 1878.			AVERAGE PER ANNUM 5 YEARS, 1874–1878.		
		Bushels.	lbs.	cwts.	Bushels.	lbs.	cwts.	Bushels.	lbs.	cwts.	Bushels.	lbs.	cwts.	Bushels.	lbs.	cwts.	Bushels.	lbs.	cwts.
1	Unmanured	12	31½	7															
2	200 lbs. Sulphate Potass, 100 lbs. Sulphate Soda, 100 lbs. Sulphate Magnesia, and 3½ cwts. Superphosphate of Lime (1)	13⅜	31¼	6½															
3	200 lbs. Ammonia-salts (2)	37¼	33¼	22⅞															
4	200 lbs. Ammonia-salts, 200 lbs. Sulphate Potass, 100 lbs. Sulphate Soda, 100 lbs. Sulphate Magnesia, and 3½ cwts. Superphosphate	46¾	34⅝	24⅜															
5	275 lbs. Nitrate of Soda (3)	35⅛ (4)	30 (4)	16½ (4)															
6	275 lbs. Nitrate of Soda, 200 lbs. Sulphate Potass, 100 lbs. Sulphate Soda, 100 lbs. Sulphate Magnesia, and 3½ cwts. Superphosphate	28¼ (4)	33½ (4)	16⅜ (4)															

(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) 550 lbs. Nitrate of Soda is reckoned to contain the same amount of Nitrogen as 400 lbs. "Ammonia-salts."

(4) On these plots, where large quantities of Nitrate of Soda had been applied year after year, the land, though more worked, was so wet that it could not be got into favourable condition for sowing, and the plant was very irregular.

EXPERIMENTS ON THE GROWTH OF LEGUMINOUS CROPS.

I.—Beans, Peas, and Tares—Geescroft Field.

Experiments on the growth of Leguminous corn-crops (beans, peas, and tares), with different descriptions of manure, were commenced in 1847, about nine acres being devoted to the purpose.

Experiments with Beans were continued for thirteen consecutive seasons, to 1859 inclusive; but, during the later years, the crop fell off very much, and the land became very foul.

In 1860 the land was fallowed.

In 1861 a crop of wheat, without manure, was taken.

In 1862 beans were again sown, but with some variation in the manuring.

In 1863 the land was fallowed.

In 1864, 5, 6, 7, 8, and 9, beans were grown, with much the same manures on the same plots, each year, as in 1862.

In the winter of 1869-70, 5000 lbs. of fresh burnt lime were applied per acre, over all the plots.

In 1870 beans were grown with the same manures on the respective plots as in 1864-69.

In October 1870 winter beans were sown (without manure), but the plants were to so great an extent destroyed by the severe weather which followed, that, in April 1871, the crop was ploughed up, and the land left fallow.

During the winter and early spring of 1871-2, the land was so wet that it could not be prepared in time for sowing. It was therefore left fallow for 1872, at the end of May subsoiled to a depth of about 12 inches, and re-ploughed in July. The winter and early spring of 1872-3 were also so extremely wet, that it was again impossible to prepare the land in time for sowing; it was, however, ploughed up towards the end of March, again left fallow, and re-ploughed in July and October (1873). On February 2, 1874, the land was again set with Beans, but without manure. In 1875 Beans were again sown, with the same manures on the respective plots as in 1864-1870; but owing to the wetness of the land in the first instance, and the subsequent hindrance by other spring sowing, they were not put in until April 1 and 2.

The general result of the experiments with Beans has been, that mineral constituents used as manure (more particularly potass), increased the produce very much during the early years; and, to a certain extent, afterwards, whenever the season was favourable for the crop. Ammonia-salts, on the other hand, produced very little effect; notwithstanding that a Leguminous crop contains two, three, or more times as much nitrogen as a Graminaceous one grown under similar conditions as to soil, &c. Nitrate of soda has, however, produced marked effects. But Leguminous crops grown too frequently on the same land seem to be peculiarly subject to disease, which no conditions of manuring that we have hitherto tried seem to obviate.

Experiments with Peas were soon abandoned, owing to the difficulty of keeping the land free from weeds, and an alternation of Beans and Wheat was substituted; the beans being manured much as in the experiments with the same crop grown continuously as above described. But the wetness of the winter of 1871-72 prevented the sowing of the Beans for the season of 1872; and again the wetness of the autumn and winter of 1872-3 prevented the sowing of the wheat until April 4, 1873, when Nursery wheat was put in, which, however, did not come to maturity, but was cut in the middle of September, yielding about 27 cwts. of gross produce per acre, containing too little corn to be worth thrashing. The land was ploughed in October 1873, and sown with beans February 3, 1874. On October 23, 1874, wheat was sown without manure.

In alternating Wheat with Beans, the remarkable result had been obtained, that nearly as much wheat, and nearly as much nitrogen, were yielded in eight crops of wheat in alternation with the highly nitrogenous beans, as in sixteen crops of wheat grown consecutively without manure in another field, and also nearly as much as were obtained in a third field in eight crops alternated with bare fallow.

Experiments with Tares, like those with Peas, were soon abandoned, and for the same reasons. Beans were at first substituted, with some variation in the description of the manures employed; but this experiment has likewise been abandoned for some years.

II.—Red Clover (*Trifolium pratense*)—Hoos Field.

Experiments on the growth of Clover, with many different descriptions of manure, were commenced in 1849, and, with the occasional interposition of a corn-crop, or fallow, have been continued up to the present time.

As with other *Leguminous* crops, the result was, that mineral constituents applied as manure (particularly potass) considerably increased the early crops; whereas ammonia-salts had little or no beneficial effect, and were sometimes injurious. It may be added that, even up to the present time, the beneficial effects of long previous applications of potass are apparent whenever there is any growth at all. To go a little more into detail:—

In the first year, 1849, the crops were throughout very heavy; especially with mineral, and without nitrogenous manure.

In autumn 1849 wheat was sown, and in spring 1850 Red Clover. In 1851 small cuttings were taken; and in 1852, though the crops were not heavy, there was by no means a failure. Since that time, however, all attempts to grow clover year after year on the same land have failed to give anything like a full crop, or a plant which would stand the usual time on the ground. Small cuttings were obtained in the autumns of 1855 and 1859 from seed sown in the spring of those years, and small but rather heavier cuttings in June and August 1865, from seed sown in 1864.

On two occasions (1851 and 1854) heavy dressings of Farmyard dung were applied to some of the plots; and in 1854 some received a dressing of 20 tons of dung, and 5000 lbs. of lime, per acre.

On some portions of the land Clover-seed was sown 10 times during the 23 years, 1848–1870 inclusive, and more frequently alone than with a corn-crop; but in 7 out of the last 8 trials the plant died off in the winter and spring succeeding the sowing the seed.

In view of these failures in the field, it is a fact of much interest, that in 1854 Red Clover was sown in a garden, only a few hundred yards distant from the experimental field, on soil which has been under ordinary garden cultivation for probably two or three centuries, and it has every year since shown very luxuriant growth; and, after re-sowing 4 times during the period, namely, in 1860, 1865, 1868, and 1871, a small cutting was taken in the autumn of 1871, two cuttings in 1872, and two in 1873. Notwithstanding some injury from dodder in 1873, there still remained too much plant to break up; and, accordingly, fresh seed was sown between the rows on May 4, and this failing, again on July 7, 1874. Small cuttings were taken June 11, July 22, and September 30, 1874. This (1875) is, therefore, the 22nd season of the growth of Clover, year after year, on this plot of garden ground.

In reference to the field experiments, it may be added that, in 1864, a portion of the land was trenched 2 feet deep, and one-third of the manure was mixed with the layer from 24 to 16 inches, one-third from 16 to 8 inches, and the remainder from 8 inches upwards. Owing to the characters of the season, the mechanical condition of the land was at first very unfavourable after this treatment; but, although many years have now elapsed, and the excess of constituents supplied was in some cases considerable, the plant has died off as completely on these plots as elsewhere.

Again, in the winter of 1867-8 small portions of the experimental land were dug, some to the depth of 9 inches, some to the depth of 18, some to the depth of 27, and some to the depth of 36 inches, and sown to the respective depths with different mixtures; supplying in some cases very large amounts of potass, soda, lime, magnesia, phosphoric acid, sulphuric acid, nitrate of soda, &c. From other similar sized plots, the soil was removed to the depths of 9, 18, and 27 inches respectively, and replaced by soil taken at the same depths from

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the garden border, on a portion of which clover had been grown successfully since 1854, as above referred to. In April 1868 clover was sown over the whole of these small plots, and on some other portions of the land not so treated; but the plant for the most part died off during the following winter.

In April 1869 the same portions were re-sown, small quantities of clover were cut in September of that year, but the plant again died off in the winter.

In April 1870 Clover was sown over the whole of the experimental land, this time in conjunction with Barley; but on those portions which had also been sown in 1868 and 1869 the plant again died off during the winter and early spring; whilst from those which had not been sown in 1868 and 1869 two small cuttings were taken in 1871. In the spring of 1872, the plant being then almost entirely gone, the land was ploughed up. It was again ploughed in July 1872, and in March 1873; the intention being to sow some other Leguminous crop; but owing to the wetness and lateness of the season this was not done; the land was again left fallow, and re-ploughed in the beginning of June and the end of July (1873). On May 4, 1874, the land was again ploughed, prepared for sowing, and sown with Red Clover seed, May 5, without manure. The plant came up well, and was very forward in September, when the flowering stems were cut down but left on the land. During the winter and early spring the plant on those portions from which cuttings had been taken in 1871 almost entirely failed; whilst on those from which none had been taken since 1869, a fair plant remains.

In the spring of 1871 the *small* plots in the field were again re-sown, and those of the garden-soil were entirely enclosed, both around and above, by galvanised wire netting. Small cuttings were taken from these small beds in July 1872, and (excepting from the garden-soil plots, which had yielded considerably more than the others in 1872) larger cuttings were taken in July 1873. The produce was the largest where potass and nitrate of soda were employed, and where they were applied in the largest quantity, and at the greatest depths. In April 1874 there was still some healthy plant on all the plots, but it was considered to be too irregular to preserve. It was, therefore, dug in. The artificially-manured plots were remanured as before, but only to the depth of 9 inches, and seed was sown on May 4th, July 6th, and October 22nd; each time the plant coming up well, but subsequently dying off. On the Garden soil plots, the plant from the first sowing (May 4), for the most part stood; requiring only to be made good here and there on July 6; and in September small cuttings were taken. In May, 1875, the plant was entirely gone on the artificially-manured plots, which were then dug up, and prepared for resowing. On the garden soil plots, though the rows were imperfect, some healthy plants still remain, which are therefore left. More small plots were arranged in the spring of 1874; on which the manures were dug in, at the various depths, on May 11th to 14th, and the seed sown on May 16th. On these new plots, with one or two exceptions, a good plant still remains (May 1875).

The general result of the experiments in the field has been—that neither organic matter rich in carbon as well as other constituents, nor ammonia-salts, nor nitrate of soda, nor mineral constituents, nor a complex mixture, supplied as manure, availed to restore the clover-yielding capabilities of the land; though, where some of these were applied in large quantity, and at considerable depths, the result was better than when they were used in only moderate quantities and applied only on the surface.

On the other hand, it is clear that the garden-soil has supplied the conditions under which clover can be grown year after year on the same land for many years in succession.

The results obtained on the garden-soil seem to show that what is called "clover-sickness," cannot be due to the injurious influence of excreted matters upon the immediately succeeding crop.

That Clover frequently fails coincidently with injury from parasitic plants, or insects, cannot be disputed; but it may be doubted whether such injury should be reckoned as the cause, or merely the concomitant and an aggravation, of the failing condition.

The results of the experiments seem, therefore, to exclude the supposition that the primary cause of failure is either destruction by parasitic plants or insects, injury from excreted matters, or the shade of a corn-crop, and to indicate that it must be looked for in exhaustion of the soil. Still there remain several open questions. Is it exhaustion of certain organic matters rich in carbon, of nitrogenous food, or of mineral constituents? Again: is there an absolute deficiency in the soil of some of the substances in question, or only an unfavourable condition of combination, or, so to speak, of *soil-digestion* of them, for the requirements of Leguminous plants? Or, is there only an unfavourable distribution of them within the soil, considered in relation to the extent and character of the root-range of the crop?

These various suggestions cannot be further considered within the limits of this brief notice, which may be concluded by the following quotation from Rothamsted papers on the subject ('Journal Royal Agricultural Society of England,' vol. xxi. Part I. p. 178; and 'Journal Royal Horticultural Society of London,' vol. iii. p. 86, 1872).

"When land is not what is called 'clover-sick,' the crop of clover may frequently be increased by top-dressings of manure containing potass and superphosphate of lime; but the high price of salts of potass, and the uncertainty of the action of manures upon the crop, render the application of artificial manures for clover a practice of doubtful economy.

"When the land is what is called 'clover-sick,' none of the ordinary manures, whether 'artificial' or natural, can be relied upon to secure a crop.

"So far as our present knowledge goes, the only means of insuring a good crop of Red Clover is to allow some years to elapse before repeating the crop upon the same land."

BARN FIELD.

EXPERIMENTS ON THE GROWTH OF ROOT-CROPS.

Experiments with Turnips were commenced in 1843. Eight acres, divided into numerous plots, were set apart for the purpose; and the crop was grown for ten consecutive years on the same land ("Norfolk Whites" 1843-1848, and "Swedes" 1849-1852); on some plots without manure, and on others with different descriptions of manure. Barley was then grown for three consecutive seasons (1853-1855) without manure, in order to test the comparative corn-growing condition of the different plots, and also to equalize their condition, as far as possible, by the exhaustion of some of the most active and immediately available constituents supplied by the previous manuring. A new series of experiments with Swedes was then arranged, having regard to the character of the manures previously applied on the different plots, and to the results previously obtained. This second series was commenced in 1856, and continued for 15 years—namely, to 1870 inclusive.

It is impossible adequately to state the bearing of the results in a few words, but the following are some of the most characteristic indications:—

1. Without manure of any kind, the produce of roots was reduced in a few years to a few cwts. per acre; but the diminutive plants (both root and leaf) contained a very unusually high percentage of nitrogen.

2. Of "mineral" constituents, phosphoric acid (in the form of superphosphate of lime) was by far the most effective manure; but, when this manure is used alone, the immediately available nitrogen of the soil is rapidly exhausted.

3. Really large crops of turnips can only be obtained when the soil supplies a liberal amount of nitrogenous (and carbonaceous?) matter, as well as mineral constituents; and when they are already available within the soil, or are supplied in the form of farmyard manure, rape-cake, Peruvian guano, ammonia-salts, &c., the rapidity of growth, and the amount of the crop, are greatly increased by the use of superphosphate of lime applied near to the seed.

The land is now devoted to experiments with sugar-beet; for particulars of which see next page.

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Experiments on SUGAR BEET—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.

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. 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)										
2	3½ cwts. Superphosphate (with Farmyard Manure, '71, '72, '73)										
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. Superphos., 500 lbs. Sulph. Potass										
7	3½ cwts. Superphos., 500 lbs. Sulph. Pot. and Amm.-salts '71, '72, '73										
8	Unmanured, 1853, and since; previously part Unman., part Superphos.										

(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.

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AGDELL FIELD.

Experiments on an actual Course of Rotation—Turnips, Barley, Leguminous Crop (or Fallow), and Wheat.

These Experiments were commenced in 1848; so that the present crop (1875) is the 28th experimental one, or the fourth crop of the Seventh Course.
One-third of the land has been continuously unmanured; one-third manured with Superphosphate of Lime alone once every four years, that is for the turnip-crop commencing each course; and one-third manured (also for the turnip-crop only) with a complex manure, as described in the foot-note, No. 2.
In the Second, Third, and Fourth Courses, clover was sown, but failed; and in them, and in the Fifth and Sixth Courses, beans were taken instead, on half of each plot, and the other half left fallow; for the third crop of the Seventh Course clover was again sown (spring 1873), on half of each plot, the other half being left fallow.
From half of each of the three plots the whole turnip-crop (roots and leaves) was removed; and on the other half the roots were eaten on the land by sheep, and the uneaten leaves spread and ploughed in. In the case of all the other crops, the total produce was removed from the land.
The abstract of the results given below relates to the portions of each plot from which the turnip-crops were entirely removed; and on which, in the second, third, fourth, fifth, and sixth courses, beans (not fallow) replaced the clover.

(Area under experiment, about 2½ acres.)

1 lb. (pound avoir.) per acre .. = (about) 1·12 Kilogramme per Hectare, or 0·57 Zollverein Pfund. per Prussian Morgen.
1 cwt. (hundredweight) per acre = (about) 125·5 Kilogrammes per Hectare, or 0·64 Centner per Pr. Morgen.

Years.	Description of Crop.	Produce per Acre. Plot 1. Unmanured continuously. Corn[3] (or Roots).	Straw (or Leaf).	Total Produce.[4]	Plot 2. Superphosphate of Lime,[1] alone, for the Turnip Crops only. Corn[3] (or Roots).	Straw (or Leaf).	Total Produce.[4]	Plot 3. Complex Manure,[2] for the Turnip Crops only. Corn[3] (or Roots).	Straw (or Leaf).	Total Produce.[4]
1st Course, 1848–51.										
1848	Norfolk White Turnips	65½ cwts.	45¾ cwts.	111¼ cwts.	225¾ cwts.	106¼ cwts.	**332 cwts.**	218 cwts.	151¼ cwts.	369¾ cwts.
1849	Barley	44⅝ bush.	2983 lbs.	5636 lbs.	29⅜ bush.	2111 lbs.	**3841 lbs.**	28⅝ bush.	2088 lbs.	3794 lbs.
1850	Clover (calc[d]. as hay)	..	..	54 cwts.	..	..	**57¾ cwts.**	..	..	63 cwts.
1851	Wheat	28½ bush.	3431 lbs.	5389 lbs.	28 bush.	3371 lbs.	**5253 lbs.**	28⅝ bush.	3552 lbs.	5500 lbs.
2nd Course, 1852–55.										
1852	Swedish Turnips	26 cwts.	4¼ cwts.	30½ cwts.	223½ cwts.	20½ cwts.	**243¾ cwts.**	396½ cwts.	36½ cwts.	433 cwts.
1853	Barley	34⅜ bush.	2430 lbs.	4465 lbs.	28⅜ bush.	1873 lbs.	**3560 lbs.**	38½ bush.	2604 lbs.	4873 lbs.
1854	Beans	5½ bush.	1055 lbs.	1445 lbs.	5⅞ bush.	1103 lbs.	**1534 lbs.**	9½ bush.	1355 lbs.	2065 lbs.
1855	Wheat	35½ bush.	3619 lbs.	5859 lbs.	35¼ bush.	3525 lbs.	**5789 lbs.**	37⅝ bush.	3942 lbs.	6371 lbs.
3rd Course, 1856–59.										
1856	Swedish Turnips	32 cwts.	2¼ cwts.	34½ cwts.	136 cwts.	7½ cwts.	**143¾ cwts.**	333¾ cwts.	12½ cwts.	346¼ cwts.
1857	Barley	48½ bush.	2600 lbs.	5337 lbs.	28½ bush.	1475 lbs.	**3076 lbs.**	48 bush.	2435 lbs.	5168 lbs.
1858	Beans	6¼ bush.	1100 lbs.	1515 lbs.	6⅛ bush.	1155 lbs.	**1605 lbs.**	12⅜ bush.	1520 lbs.	2357 lbs.
1859	Wheat	35¼ bush.	4030 lbs.	6262 lbs.	34⅛ bush.	3930 lbs.	**6120 lbs.**	39⅜ bush.	4610 lbs.	7154 lbs.
4th Course, 1860–63.										
1860	Swedish Turnips	1 cwt.	(6¼ lbs.)	1 cwt.	29¼ cwts.	1¼ cwt.	**30¾ cwts.**	87¼ cwts.	3¼ cwts.	90¾ cwts.
1861	Barley	38⅛ bush.	2522 lbs.	4718 lbs.	30⅛ bush.	2000 lbs.	**3775 lbs.**	60⅜ bush.	3990 lbs.	7391 lbs.
1862	Beans	29 bush.	1840 lbs.	3661 lbs.	29⅜ bush.	2150 lbs.	**4040 lbs.**	49⅜ bush.	3280 lbs.	5990 lbs.
1863	Wheat	44⅞ bush.	3467 lbs.	6350 lbs.	34⅝ bush.	3390 lbs.	**5619 lbs.**	46⅓ bush.	4697 lbs.	7636 lbs.
5th Course, 1864–67.										
1864	Swedish Turnips	8¾ cwts.	0¼ cwt.	9¼ cwts.	68 cwts.	4¾ cwts.	**72¾ cwts.**	176¼ cwts.	8¼ cwts.	185 cwts.
1865	Barley	39 bush.	2154 lbs.	4182 lbs.	33¼ bush.	1615 lbs.	**3394 lbs.**	47½ bush.	2595 lbs.	5148 lbs.
1866	Beans	10¼ bush.	1013 lbs.	1689 lbs.	7⅜ bush.	978 lbs.	**1463 lbs.**	20⅜ bush.	1990 lbs.	3343 lbs.
1867	Wheat	21 bush.	2143 lbs.	3473 lbs.	19⅞ bush.	1966 lbs.	**3222 lbs.**	23⅝ bush.	3003 lbs.	4567 lbs.
6th Course, 1868–71.										
1868	Swedish Turnips	Failed, and ploughed up.			Failed, and ploughed up.			Failed, and ploughed up.		
1869	Barley	24⅝ bush.	1948 lbs.	3358 lbs.	28¾ bush.	2025 lbs.	**3696 lbs.**	42⅞ bush.	3309 lbs.	5800 lbs.
1870	Beans	13⅜ bush.	738 lbs.	1591 lbs.	15⅜ bush.	768 lbs.	**1778 lbs.**	24⅛ bush.	1056 lbs.	2664 lbs.
1871	Wheat	20⅛ bush.	2799 lbs.	4092 lbs.	29⅜ bush.	3048 lbs.	**4521 lbs.**	23 bush.	3440 lbs.	4883 lbs.
7th Course, 1872–75.										
1872	Swedish Turnips	34½ cwts.	8¾ cwts.	42¾ cwts.	170⅛ cwts.	17⅜ cwts.	**188 cwts.**	339¾ cwts.	35¼ cwts.	375⅛ cwts.
1873	Barley	23¼ bush.	1343 lbs.	2717 lbs.	20⅜ bush	1565 lbs.	**2875 lbs.**	31¼ bush.	1723 lbs.	3573 lbs.
1874	Clover	..	..	31¼ cwts.	..	..	**52⅝ cwts.**	..	..	84¼ cwts.
1875	Wheat									
Summary—Average of the First 6 Courses, 1848-1871.										
1848, '52, '56, '60, '64	Swedish Turnips	26¾ cwts.	10¼ cwts.	37¼ cwts.	136¼ cwts.	28 cwts.	164¼ cwts.	242½ cwts.	42½ cwts.	285 cwts.
1849, '53, '57, '61, '65, '69	Barley	38⅜ bush.	2440 lbs.	4619 lbs.	30 bush.	1850 lbs.	3355 lbs.	44⅜ bush.	2829 lbs.	5362 lbs.
1850, '54 '58, '62, '66, '70	Clover, 1850 (calc[d]. as hay)	..	..	54 cwts.	..	..	57⅜ cwts.	..	..	63 cwts.
	Beans	12⅜ bush.	1149 lbs.	1980 lbs.	13 bush.	1231 lbs.	2084 lbs.	22½ bush.	1840 lbs.	3264 lbs.
1851, '55, '59, '63, '67, '71	Wheat	30⅛ bush.	3248 lbs.	5238 lbs.	29⅜ bush.	3205 lbs.	5087 lbs.	33⅜ bush.	3874 lbs.	6017 lbs.

(1) First Course—100 lbs. Bone-ash, and 100 lbs. Sulphuric Acid (sp. gr. 1·7); Second Course—160 lbs. Bone-ash, 120 lbs. Sulphuric Acid; Third, Fourth, Fifth, Sixth, and Seventh Courses—200 lbs. Bone-ash, and 150 lbs. Sulphuric Acid, *per acre*.

(2) First Course—100 lbs. Pearl-ash, 100 lbs. Bone-ash, 100 lbs. Sulphuric Acid, 100 lbs. Sulphate of Ammonia, 100 lbs. Muriate of Ammonia, and 1000 lbs. Rape-Cake; Second Course—300 lbs. Sulphate of Potass, 100 lbs. Sulphate of Soda, 100 lbs. Sulphate of Magnesia, 160 lbs. Bone-ash, 120 lbs. Sulphuric Acid, 100 lbs. Sulphate of Ammonia, 100 lbs. Muriate of Ammonia, and 2000 lbs. Rape-cake; Third, Fourth, Fifth, Sixth, and Seventh Courses—300 lbs. Sulphate of Potass, 200 lbs. Sulphate of Soda, 100 lbs. Sulphate of Magnesia, 200 lbs. Bone-ash, 150 lbs. Sulphuric Acid, 100 lbs. Sulphate of Ammonia, 100 lbs. Muriate of Ammonia, and 2000 lbs. Rape-cake, *per acre*.

(3) The quantities given in *Bushels* represent the *Dressed* Corn only.

(4) The "Total Produce" of the Corn-crops includes Dressed Corn, Offal Corn, and Total Straw.

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Experiments with Different Descriptions of WHEAT, in 1875; and Summary of Results obtained in previous Years.

Season 1875. Little Knott Wood Field. 1½ Cwt. Nitrate Soda; after Mangolds with Dung 1874, Carted off.	Dressed corn per acre. 1871; Sawpit Field; 3 cwts. Guano; after Mangolds, carted off.	1872; Foster's Field; 2 cwts. Superphosphate, 2 cwts. Nitrate Soda; after Roots, carted off.	1873; Long Hoos Field; 1½ cwt. Nitrate; after Mangolds (with Dung), carted off.	1874; Upper Harpenden Field; 2 cwts. Nitrate after Mangolds (with Dung) carted off.	1875;	1876;	Average.	Weight per bushel. 1871: Sawpit Field; 3 cwts. Guano; after Mangolds, carted off.	1872; Foster's Field; 2 cwts. Superphosphate; 2 cwts. Nitrate Soda, after Roots, carted off.	1873; Long Hoos Field; 1½ cwt. Nitrate; after Mangolds (with Dung), carted off.	1874; Upper Harpenden Field; 2 cwts. Nitrate after Mangolds (with Dung) carted off.	1875;	1876;	Average.
	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1. White-chaff (Red)	.. ..	.. ..	40⅝	55⅛			47⅞	.. ..	.. ..	58½	61⅝			60
2. Rivett's (Red)	.. ..	.. ..	48⅛	67			57½	.. ..	.. ..	57⅛	58⅛			57⅝
3. Chubb Wheat (Red)	28⅜	40	35⅜	50½			38⅝	60¼	61⅞	59⅛	61⅛			60⅜
4. Red-chaff (White)	32¾	37	35¼	48¾			38½	61⅝	62¼	60¾	61½			61⅛
5. Browick (Red)	35¼	40½	38⅜	51⅛			41⅜	60	61⅜	59½	61¼			60⅛
6. Red Wonder	31¼	43¾	37⅛	55⅛			42	59	60⅞	60	62¼			60½
7. Burwell (Old Red Lammas)	31⅛	41¼	35⅛	47¼			38¾	62	63	61½	63½			62½
8. Bristol Red	29⅜	44⅜	39½	53⅜			41⅝	60⅞	61½	60½	61⅝			61⅛
9. Red Nursery	34⅛	45¼	27⅛	41⅛			36⅞	63	65	62	65¼			63¾
10. Red Langham	30¾	43⅜	34⅛	53⅛			40½	60⅜	61¼	60½	63			61¼
11. Woolly Ear (White)	31¼	42¾	37	51¼			40½	61⅛	62⅛	61⅛	62¾			61¾
12. Hardcastle (White)	.. ..	46½	42	49⅝			46	.. ..	61⅞	59¾	63			61½
13. Golden Drop (Red), Hallett's	39½	49¾	44¼	51¾			46¼	61⅜	63	59¾	63			61¾
14. Victoria White, Hallett's	33¾	45¼	38¼	44½			40⅜	61	62⅜	59¾	62¼			61⅜
15. Hunter's White, Hallett's	26⅞	39¾	38⅝	45⅜			37⅝	59¼	61⅜	57¼	61⅛			59⅞
16. Original Red, Hallett's	30	35¼	36⅜	43⅜			36⅜	58⅝	60	56⅛	60⅜			58⅞
17. White Chiddam	26⅞	38½	31⅜	42			34⅞	62¼	63	59¼	62¾			61⅜
18. Red Rostock	37	.. ..	46¼	53¾			45⅝	60⅛	.. ..	56¾	59⅞			58⅝
19. Casey's White	29⅞	42⅛	37⅞	52⅛			40⅜	60⅜	61½	58¾	60¾			60⅜
20. Golden Rough-chaff (Red)	33	39¼	38½	52⅛			40⅝	61⅝	62½	59¾	62½			61⅜
21. Bole's Prolific (Red)	33⅝	42¾	45¼	48⅛			42½	61½	62⅜	57½	62			60⅞
22. Club Wheat (Red)	36	45¾	47½	59⅝			47¼	60⅜	61⅞	58¼	61⅞			60⅜
23. Stimson's White	.. ..	.. ..	.. ..	.. ..			..	.. ..	.. ..	.. ..	.. ..			..
24. Australian Wheat (White)	.. ..	.. ..	.. ..	.. ..			..	.. ..	.. ..	.. ..	.. ..			..
Mean	32¼	42¼	38⅞	50¾			41⅞	60¾	62⅛	59¼	61⅞			60⅞

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EXPERIMENTS WITH A VIEW TO ECONOMY IN THE USE OF EXPENSIVE NITROGENOUS MANURES.

It is found that generally less than half the nitrogen supplied in such manures as guano, ammonia-salts, or nitrate of soda, is recovered in the increase of the crop for which they are used; that a considerable quantity may remain in the soil in a comparatively inactive state, yielding increase very slowly; and that a considerable quantity may be carried away by drainage, and lost. It seemed desirable, therefore, to commence a series of experiments to determine whether any saving can be effected by applying comparatively small quantities near to the seed, instead of larger amounts in the usual mode of broadcast sowing and harrowing-in.

It is also intended to make experiments with a view to ascertain the best periods of the year for the application of such manures to different crops.

First Season, 1871.—Experiments upon Wheat. Little Hoos Field. Plots ¼ acre each.

Plot No.	Manures per Acre, &c.	Produce per Acre. Dressed Corn. Quantity.	Dressed Corn. Weight per Bushel.	Total Straw.
		Bushels.	lbs.	cwts.
1	Unmanured. Seed 1 bushel, dibbled 6 inches apart in the rows	23¾	59·3	24½
2	146 lbs. Sulphate Ammonia (containing Nitrogen = 15 bushels grain, and its straw). Seed 1 bushel; Holes dibbled 6 inches apart in the rows; manure (mixed with Ashes) put in, and seed above	31⅓	59·1	36¼
3	292 lbs. Sulphate Ammonia. Seed 1 bushel; Manure (mixed with Ashes) sown broadcast, seed dibbled 6 inches apart in the rows	28¾	58·3	35⅝

First Season, 1871.—Experiments upon Barley. Thirty-acres Field. Plots ½ acre each.

		Bushels.	lbs.	cwts.
1	Unmanured. Seed 3 bushels; drilled	40½	53·9	24⅝
2	1 cwt. Superphosphate, 1 cwt. Nitrate Soda. Seed 3 bushels; Manures mixed with Ashes and sown broadcast; seed drilled	49⅞	53·3	30½
3	1 cwt. Superphosphate, 1 cwt. Nitrate Soda. Seed 3 bushels; Manures mixed with Ashes and drilled; seed drilled above	49½	53·4	28½
4	1 cwt. Superphosphate, 1 cwt. Nitrate Soda. Seed 3 bushels; Manures, Ashes, and Seed mixed, and drilled together	51	53·0	30⅜
5	1 cwt. Superphosphate, 1 cwt. Nitrate Soda. Seed 1½ bushel; Holes dibbled, 6 inches apart in the rows; Manures (mixed with Ashes) put in, and Seed above	51¼	53·3	28¼
6	2 cwts. Superphosphate, 2 cwts. Nitrate Soda. Seed 3 bushels; Manures mixed with Ashes and sown broadcast; seed drilled	56¼	51·6	32⅝

Second Season, 1872.—Experiments upon Barley. Thirty-acres Field. Plots ½ acre each.

		Bushels.	lbs.	cwts.
1	Unmanured. Seed 2½ bushels, drilled	33⅛	54·4	19½
2	3 cwts. Superphosphate, 2 cwts. Nitrate Soda. Seed 2½ bushels; Manures made up to 15 bushels per acre with Ashes, and sown broadcast; seed drilled	46⅓	54·1	30⅛
3	3 cwts. Superphosphate, 2 cwts. Nitrate Soda. Seed 2½ bushels; The Superphosphate mixed with 40 lbs. slaked Lime to neutralize the acid, the Nitrate added, and the whole made up to 15 bushels per acre with Ashes, and sown broadcast; Seed drilled	47⅞	53·6	31⅛
4	1 cwt. Superphosphate, 1 cwt. Nitrate Soda. Seed 2½ bushels; Manures and Seed made up to 15 bushels per acre with Ashes, and the whole (Manure, Seed, and Ashes) drilled together	42⅝	54·1	26½
5	1 cwt. Superphosphate, 1 cwt. Nitrate Soda. Seed 2½ bushels; Manures and Seed made up to 15 bushels per acre with a mixture of half Lime and half Ashes, and the whole (Manure, Seed, Lime, and Ashes) drilled together	43⅓	53·1	27

Third Season, 1873.

Some experiments were conducted in which a given quantity of Nitrate of Soda (generally at the rate of 1 cwt. per acre) was, by means of plaster of Paris, and other substances, made to adhere to the seed, forming a coating upon it. Experiments in pots, well watered and kept in a greenhouse, showed that barley so coated germinated well, and gave strong and healthy plants; but owing to the wetness of the weather previously, to the consequent lateness of sowing, and to the scarcity of rain afterwards, the coated seeds sown in the field came up so irregularly, that it was considered not worth while to keep the crop separate at harvest. Even if it had not been so, there are practical difficulties in the way of so preparing the seed, which might render the method inapplicable in ordinary practice.

Fourth Season, 1874.—Experiments upon Barley. Barn Field. Plots ¼ acre each.

Plot. No.	Manures per Acre, &c.	Produce per Acre. Dressed Corn. Quantity.	Dressed Corn. Weight per Bushel.	Total Straw.
		Bushels.	lbs.	cwts.
1	Unmanured. Seed 2 bushels, dibbled 6 inches apart in the rows	39	55·2	18¼
2	1 cwt. Superphosphate, 1 cwt. Nitrate Soda, 2 cwts. Ashes; Seed 2 bushels; All mixed, made into a paste with water, and dibbled 6 inches apart in the rows	47	55·5	24⅝
3	1 cwt. Superphosphate, 1 cwt. Nitrate Soda, 80 lbs. slaked Lime; Seed 2 bushels All mixed, and dibbled 6 inches apart in the rows	47½	55·6	24¼
4	1 cwt. Superphosphate, 1 cwt. Nitrate Soda, 2 cwts. Ashes; Seed 2 bushels; Manures mixed and sown broadcast; Seed drilled	54¾	56·3	25¾

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ROTHAMSTED

MAY,

SUMMARY STATEMENT OF THE PRESENT AND PREVIOUS

(13 Years, 1863–1875,

Name of Field.	Acres.	PREVIOUS CROPPING						
		1863.	1864.	1865.	1866.	1867.	1868.	1869.
Thirty Acres	30	Wheat, Sheep-Folded, and 2 cwts. Guano.	Oats, 2 cwts. Guano, 1 cwt. Corn Manure.	Oats, 1 cwt. Guano, 3 cwts. Corn Manure.	Tares and Swedes, Dung and Artificial.	Oats, after Sheep-Folding.	Clover.	Wheat, 2 cwts. Guano.
Upper Harpenden	14	Red Clover, Unmanured.	Wheat, 1½ cwt. Guano, 1½ cwt. Corn Manure.	Oats, 1 cwt. Guano, 2 cwts. Corn Manure.	Oats, 2 cwts. Guano, 1 cwt. Sulph. Ammonia.	Tares, Dung. Swedes, Artificial.	Wheat, ¾ths. 2½ cwts. Guano, ¼th. Sheep-folded.	Oats, 2 cwts. Guano, 1 cwt. dried Blood, ½ cwt. Sulph. Ammonia.
Harpenden	22	Oats, 3 cwts. Guano.	Mangolds and Turnips, Dung and Artificial.	Wheat, Sheep-Folded.	Red Clover (peren.), Unmanured.	Wheat, 2½ cwts. Guano.	¾rds Oats, 2 cwts. Guano, & 1 cwt. Nitr. Soda. ¼rd 1 cwt. Nitr. Soda, and Sheep-folded.	Swedes, Dung and various Artificial Manures.
Little Hoos	9	Barley, 3 cwts. Guano, 1 cwt. superphos.	Red Clover.	Wheat, 1½ cwt. Guano, 1 cwt. Nitrate Soda, 1 cwt. Corn Manure.	Mangolds, Dung and Artificial.	Wheat, Unmanured.	Oats, 2 cwts. Guano, 1 cwt. Nitrate of Soda.	Barley, 1 cwt. dried Blood, ½ cwt. Sulph. Ammonia, 1 cwt. superphosphate.
Fosters' ..	18	Barley, 5½ cwts. Artificial Manure.	Swedes, Dung and Artificial.	Oats, 1 cwt. Guano, 1 cwt. Corn Manure.	Red Clover, Unmanured.	Wheat, 2 cwts. Guano, ½ cwt. Corn Manure.	Oats, 2 cwts. Guano, 1 cwt. Nitrate of Soda.	Barley, 1 cwt. dried Blood, ½ cwt. Sulph. Ammonia, 1 cwt. superphosphate.
Knott Wood	30	Oats, Sheep-Folded.	Red Clover (peren.).	Wheat, Sheep-Folded, 1 cwt. Guano.	Oats, 2 cwts. Guano, 1 cwt. Sulph. Ammonia.	Oats, 2 cwts. Guano, 1 cwt. Sulph. Ammonia.	Swedes, 2 cwts. Guano, 2½ cwts. superphosphate and Dung.	Wheat, 3 cwts. Guano (one-half), Unmanured (one-half), after Swedes ploughed up and Fallowed.
Little Knott Wood ..	14	Swedes, Dung and Artificial.	Wheat, Unmanured.	Red Clover (peren.), Unmanured.	Red Clover (peren.), Sheep-Folded.	Wheat, 1 cwt. Guano, ½ cwt. Corn Manure.	Oats, 2 cwts. Guano, 1 cwt. Nitrate Soda.	Mangolds, 12 tons Dung, 3 cwts. Guano.
Sawpit ..	14	Tares and Oats, Sheep-Folded, and 2 cwts. Guano.	Barley, 1½ cwt. Guano, ½ cwt. superphos., 1 cwt. Corn Manure.	Mangolds and Turnips, Dung and Artificial.	Wheat, Unmanured.	Red Clover, Unmanured.	Wheat, 1 cwt. Guano, 1 cwt. Wheat Manure.	Wheat, 3 cwts. Guano.
Rick-yard	8	Wheat, Unmanured.	Wheat, Sheep-Folded, and 3 cwts. Guano.	Barley, 2 cwts. Guano, 1½ cwt. Corn Manure.	Red Clover, Sheep-Folded.	Wheat, Guano.	Barley, 2 cwts. Wheat Manure.	Tares, Dung.
Six Acres ..	6	Mangolds, Dung and Artificial.	Wheat, Unmanured.	Red Clover, Unmanured.	Wheat, 2 cwts. Guano, 2 cwts. Corn Manure.	Oats, 3 cwts. Guano.	Beans, Dung.	Wheat, 2 cwts. Guano, 1 cwt. Nitrate of Soda.
Clay-Croft	12	Wheat, Dung.	Wheat, 2 cwts. Guano, 2 cwts. Corn Manure.	Oats, 2 cwts. Guano, 2 cwts. Corn Manure.	Oats, 2 cwts. Guano, 1 cwt. Sulph. Ammonia.	Beans, Dung.	Wheat, 2 cwts. Guano.	Oats, 2 cwts. Guano, 1 cwt. dried Blood, ½ cwt. Sulph. Ammonia.
Ten Acres ..	10	Oats, 3 cwts. Guano.	Oats, 2 cwts. Guano, 1 cwt. Dried Blood.	Tares, Dung.	Turnips, Artificial.	Wheat, Guano.	Red Clover.	Wheat, 2 cwts. Guano.
Agdell ..	9	Barley, Sheep-Folded.	Barley, 1½ cwt. Guano, ½ cwt. superphos., 1 cwt. Corn Manure.	Red Clover, Unmanured.	Wheat, 1½ cwt. Guano, 1½ cwt. Corn Manure.	Oats, 2 cwts. Guano.	Tares, Dung.	Barley, Unmanured.
Long Hoos	25	Fallow.	Swedes, Dung and Artificial.	Barley, 1 cwt. Guano, 1 cwt. Corn Manure.	Barley, 1½ cwt. Guano, 1 cwt. Corn Manure.	Mangolds and Swedes, 15 tons Dung, 3 cwts. Guano.	Wheat, 1 cwt. Guano.	Oats, 2 cwts. Guano, 1 cwt. dried Blood, ½ cwt. Sulph. Ammonia.
Sawyers' ..	25	Swedes and Fallow, Artificial.	Barley, 1 cwt. Guano, 1 cwt. Corn Manure.	Swedes, Dung and Artificial.	Wheat and Barley, Sheep-Folded.	Red Clover, Unmanured.	Wheat, 3 cwts. Guano.	Fallow.
West Barn	32	Swedes, Dung and Artificial.	Oats, 1½ cwt. Guano, 1½ cwt. Corn Manure.	Red Clover (peren.), Sheep-Folded.	Wheat, 1½ cwt. Guano, 1½ cwt. Corn Manure.	Barley, 1 cwt. Blood Manure, 1 cwt. superphosphate, 1 cwt. Sulph. Ammonia.	Fallow.	Wheat, 3 cwts. Guano.

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FARM.

1875.

CROPPING, &c., OF THE ARABLE LAND NOT UNDER EXPERIMENT.

inclusive.)

AND MANURING.

1870.	1871.	1872.	1873.	1874.	Crop, &c., Present Season, 1874-75.	Acres.	Name of Field.
Oats, 2 cwts. Guano.	Barley, 2 cwts. superphosphate, 2 cwts. Nitrate Soda.	Barley, 2½ cwts. superphosphate, 2½ cwts. Nitrate Soda, (2½ acres experiment).	Barley (¾ with Grass-seeds). 2 cwts. superphosphate, 2 cwts. Nitrate Soda.	Grass (¾), Folded, and 1 cwt. Nitrate. Barley (¼), 2 cwts. superphosphate, 2½ cwts. Nitrate Soda.	Grass (¾), Sheep-folded. Tares (¼) Dung.	30	Thirty Acres
Swedes, Dung and superphosphate.	Wheat, 2 cwts. Guano.	Oats, 2½ cwts. superphosphate, 2½ cwts. Nitrate Soda.	Mangolds, Dung. (Carted off.)	Wheat (10 acres Varieties). 2 cwts. Nitrate Soda.	Barley, (¾) 3 cwts. Guano, (¼) 2 cwts. superphosphate, 2¼ cwts. Nitrate Soda.	14	Upper Harpenden.
Wheat, 3 cwts. Guano.	Oats, 3 cwts. Guano, 1 cwt. Nitrate Soda. Tares, Dung.	Oats, 2½ cwts. superphosphate, 2½ cwts. Nitrate Soda. Tares, Dung.	Barley, After Oats—2 cwts. superphosphate; 2 cwts. Nitrate. After Tares—1 cwt. superphosphate; 1 cwt. Nitrate.	Barley, 2 cwts. superphosphate, 2 cwts. Nitrate Soda.	Mangolds, Dung, and 2 cwts. Guano.	22	Harpenden.
Barley, 2½ cwts. Guano.	Barley, 3 cwts. superphosphate, 2½ cwts. Nitrate Soda.	Barley (with Clover). 2½ cwts. superphosphate, 2½ cwts. Nitrate Soda.	Barley (½), Unmanured. Clover (½), Unmanured.	Barley, 2 cwts. superphosphate, 2 cwts. Nitrate Soda (1 acre Unmanured).	Barley, where Barley 1873, 2 cwts. superphosphate, 2 cwts. Nitrate of Soda. where Clover 1873, Half quantities.	9	Little Hoos.
Oats, 2 cwts. Guano, 3 cwts. Blood Manure.	Roots, Tares, and Rape, Dung and Artificial.	Wheat, ⅓ Varieties of Wheat, 2 cwts. superphosphate, 2 cwts. Nitrate Soda, ⅔ Sheep-folded.	Barley, 2 cwts. superphosphate, 2 cwts. Nitrate Soda (2 acres experiment).	Barley, 2 cwts. superphosphate, 2 cwts. Nitrate Soda.	Barley, (½) 3½ cwts. Guano, (¼) 2½ cwts. superphosphate, 2½ cwts. Nitrate Soda, (½) 1½ cwts. Guano, 1½ Nitrate.	18	Fosters'.
Oats, 3 cwts. Guano.	Oats, 3 cwts. Guano, 1 cwt. Nitrate Soda.	Oats, 2½ cwts. superphosphate, 2½ cwts. Nitrate Soda.	Tares (¼), Dung. Swedes (¾), Dung, 2 cwts. superphosph.; 2 cwts. Nitrate Soda.	Barley, After Roots and Tares carted. 2 cwts. superphosphate, 2 cwts. Nitrate Soda, After Tares fed, 1 cwt. each.	Barley, 2½ cwts. superphosphate, 2½ cwts. Nitrate Soda.	30	Knott Wood.
Wheat, 3 cwts. Guano.	Oats, 3 cwts. Guano, 1 cwt. Nitrate Soda.	Oats, ½ Sheep-folded. All, 2½ cwts. superphos., 2½ cwts. Nitrate Soda.	Barley, 2 cwts. superphosphate, 2 cwts. Nitrate Soda.	Mangolds, Dung. (Carted off.)	Wheat (Varieties). 1½ cwt. Nitrate Soda.	14	Little Knott Wood.
Mangolds, Dung and 3 cwts. Guano.	Wheat, 3 cwts. Guano.	Oats, 2½ cwts. superphosphate, 2½ cwts. Nitrate Soda.	Oats, 2 cwts. superphosphate, 2 cwts. Nitrate Soda.	Barley, 2 cwts. superphosphate, 2 cwts. Nitrate Soda.	Barley, 2½ cwts. superphosphate, 2½ cwts. Nitrate Soda.	14	Sawpit.
Barley, 1 cwt. Guano.	Mangolds, Dung and 4 cwts. Cotton Cake.	Wheat, Unmanured.	Barley, 2 cwts. superphosphate, 2 cwts. Nitrate Soda.	Tares, Dung. ½ followed by Turnips, 1 cwt. superphosphate, 1 cwt. Nitrate Soda.	Barley, 1 cwt. Nitrate Soda.	8	Rick-yard.
Barley, 2½ cwts. Guano.	Barley, 3 cwts. superphosphate, 2½ cwts. Nitrate Soda.	Barley, 2½ cwts. superphosphate, 2½ cwts. Nitrate Soda.	Barley, 2 cwts. superphosphate, 2 cwts. Nitrate Soda.	Barley, 2 cwts. superphosphate, 2½ cwts. Nitrate Soda.	Barley, 2 cwts. superphosphate, 2½ cwts. Nitrate Soda.	6	Six Acres.
Turnips, Dung and 3 cwts. superphosphate.	Wheat, Unmanured.	Oats, 2½ cwts. superphosphate, 2½ cwts. Nitrate Soda.	Clover, Unmanured.	Wheat, 2 cwts. Nitrate Soda.	Oats, 2½ cwts. superphosphate, 2½ cwts. Nitrate Soda.	12	Clay-Croft.
Oats, 3 cwts. Guano.	Mangolds, Dung and 4 cwts. Cotton Cake.	Wheat, Unmanured.	Barley, 2 cwts. superphosphate, 2 cwts. Nitrate Soda (5 acres experiment).	Oats, 2 cwts. superphosphate, 2½ cwts. Nitrate Soda.	Oats, 2½ cwts. superphosphate, 2½ cwts. Nitrate Soda.	10	Ten Acres.
Barley, 1½ cwt. Guano, 1½ cwt. superphosphate.	Mangolds, Dung and 4 cwts. Cotton Cake.	Wheat, Unmanured (and part Roots).	Clover, Unmanured. Barley, Experiment.	Wheat, 1 cwt. Nitrate Soda (3 acres Experiment, ½ Clover, ½ Fallow).	Barley, 2 cwts. superphosphate, 2 cwts. Nitrate Soda. Wheat, 3 acres, Experiment.	9	Agdell.
Sainfoin, Unmanured.	Sainfoin, Unmanured. (Steam cultivated, July.)	Mangolds, Dung. (Carted off.)	Wheat. (⅕ Varieties of Wheat), 1½ cwt. Nitrate Soda.	Oats, 2 cwts. superphosphate, 2 cwts, Nitrate Soda.	Oats, 2½ cwts. superphosphate, 2½ cwts. Nitrate Soda.	25	Long Hoos.
Wheat, 4 cwts. Guano.	Wheat, 4 cwts. Guano. 1 cwt. Nitrate Soda.	Barley, 2½ cwts. superphosphate, 2½ cwts. Nitrate Soda.	Oats, 2 cwts. superphosphate, 2 cwts. Nitrate Soda.	Mangolds and Swedes, Dung.	Barley after Swedes (¾) 2 cwts. superphosphate, 2 cwts. Nitrate Soda. Wheat after Mangolds (¼) 1½ cwt. Nitrate Soda.	25	Sawyers'.
Sainfoin, Unmanured.	Sainfoin, Unmanured.	Sainfoin, Unmanured.	Oats, 2 cwts. superphosphate, 2 cwts. Nitrate Soda.	Wheat (Oats fed off 1873), 1½ cwt. Nitrate Soda.	Oats, 2 cwts. superphosphate, 2 cwts. Nitrate Soda.	32	West Barn.

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