ROTHAMSTED RESEARCH

Yields of the Field Experiments 1878

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Experiments on Wheat; Broadbalk Field

Rothamsted Research

Rothamsted Research (1879) *Experiments on Wheat; Broadbalk Field ;* Yields Of The Field Experiments 1878, pp 10 - 10 **- DOI: https://doi.org/10.23637/ERADOC-1-242**

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 27 years (1852 and since). From the commencement of the experiments in 1843–4 up to 1876–7 inclusive, the mineral manures, the ammonia-salts, and rape-cake, &c., if any, were sown in the autumn, before the seed; excepting in 1845, when, owing to the wet autumn and winter, all the manures were spring-sown; and for the crops of 1873, 4, 5, 6, and 7, the ammonia-salts applied to Plot 15 were top-dressed in the spring. Nitrate of soda has, however, always been sown in the spring. But, in consequence of the ascertained great loss of the nitrogen of the manures by drainage, especially in wet winters, it has been decided to apply only the mineral manures (and Farmyard-manure) in the autumn, and the ammonia-salts, as well as the nitrate, in the spring; excepting on Plot 15, where, for comparison, the ammonia-salts are to be sown in the autumn; and on Plot 19, where the ammonia-salts are mixed in, when the superphosphate is made. This plan is adopted for the first time for the present crop, 1877–8.

(Area under experiment, about 13 acres.)

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.

Plots.	Manures, per acre, per annum.	Produce per Acre. Average per Annum. Dressed Corn. Quantity. 12 Years, 1852–63.	12 Years, 1864–75.	24 Years, 1852–75.	Weight per Bushel. 12 Years, 1852–63.	12 Years, 1864–75.	24 Years, 1852–75.	Total Straw. 12 Years, 1852–63.	12 Years, 1864–75.	24 Years, 1852–75.	Thirty-Fourth Season, 1877. Dressed Corn. Quantity.	Weight per Bushel.	Total Straw.	Plots.
		Bushels.	Bushels.	Bushels.	lbs.	lbs.	lbs.	Cwts.	Cwts.	Cwts.	Bushels.	lbs.	Cwts.	
0	Superphosphate of Lime (three times as much as on No. 5 and succeeding Plots)	18¼	16¼	17¼	57½	59¼	58½	16½	13	14¾	12	59	8⅛	0
1	Sulphates of Potass, Soda, and Magnesia (twice as much as on No. 5 and succeeding Plots)	16⅜	12⅛	14⅜	57½	59⅛	58¼	15⅜	10⅜	13	7⅛	59¼	4⅝	1
2	Farmyard Manure (14 tons every year)	35⅜	35	35¼	59¼	60⅝	60	34⅝	32⅝	33⅜	24⅛	59⅛	20¼	2
3	Unmanured continuously	15½	12⅜	14	56½	59	57¾	14⅞	9⅜	12⅜	8⅞	58⅞	6⅜	3
4	Unmanured for Crop of 1852, and since; previously Superphosphate (made with Muriatic Acid), and Sulphate Ammonia ..	17	13	15	57¼	59⅜	58¼	15½	10½	13	9⅞	57¼	7¼	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) ..	18½	13¾	16⅛	57⅞	59¾	58⅞	16⅞	11½	14⅛	11⅝	57½	7⅝	5 (*a* and *b*)
6 (*a* and *b*)	200 lbs. (1) Sulphate Potass, 100 lbs. (2) Sulphate Soda, 100 lbs. Sulphate Mag., 3½ cwts. Superphos., 200 lbs. Ammonia-salts (4)	28⅜	22⅜	25⅜	58⅝	60⅛	59½	26⅞	20¼	23½	14⅝	58⅛	10½	6 (*a* and *b*)
7 (*a* and *b*)	200 lbs. (1) Sulphate Potass, 100 lbs. (2) Sulphate Soda, 100 lbs. Sulphate Mag., 3½ cwts. Superphos., 400 lbs. Ammonia-salts ..	36⅜	32⅛	34¼	58½	60¼	59¼	37½	31⅝	34⅝	19⅞	59¼	16⅜	7 (*a* and *b*)
8 (*a* and *b*)	200 lbs. (1) Sulphate Potass, 100 lbs. (2) Sulphate Soda, 100 lbs. Sulphate Mag., 3½ cwts. Superphos., 600 lbs. Ammonia-salts ..	38	37	37½	57⅜	60¼	59	42⅛	40¼	41¼	24⅜	59¼	20	8 (*a* and *b*)
9 {*a*	200 lbs. (1) Sulphate Potass, 100 lbs. (2) Sulphate Soda, 100 lbs. Sulphate Mag., 3½ cwts. Superphos., 550 lbs. Nitrate Soda (5)	34⅜	39⅛	36⅞	57	59⅞	58⅓	39⅓	44⅜	42⅛	40⅛	57¾	34⅜	9 {*a*
9 *b*}	550 lbs. Nitrate of Soda (5). (The Nitrate for both 9*a* and 9*b* always sown in the Spring.)	25⅞	24½	25¼	55⅓	57⅜	56⅓	28⅓	26⅛	27¼	27⅜	58	22⅜	9 *b*}
10 {*a*	400 lbs. Ammonia-salts alone, for 1845, and each year since; Mineral Manure in 1844	22⅜	21⅛	21⅞	55⅞	58	56⅞	23½	18½	20⅞	17⅞	57½	11⅜	10 {*a*
10 *b*}	400 lbs. Ammonia-salts alone, for 1845, and each year since (except 1846 and 1850); Mineral Manure 1844, '48, '50 ..	27	23	25	57	58⅜	57⅜	27⅜	20⅛	23½	18¼	58⅜	13⅜	10 *b*}
11 (*a* and *b*)	400 lbs. Ammonia-salts, 3½ cwts. Superphosphate	29⅜	25⅜	27½	56½	58⅛	57⅜	28⅞	22⅜	25⅛	17⅞	59⅞	12½	11 (*a* and *b*)
12 (*a* and *b*)	400 lbs. Ammonia-salts, 3½ cwts. Superphosphate, and 366½ lbs. (6) Sulphate of Soda	35⅛	31⅛	33⅛	58¼	59¾	59⅛	35¼	28	31⅝	17⅜	60	13¼	12 (*a* and *b*)
13 (*a* and *b*)	400 lbs. Ammonia-salts, 3½ cwts. Superphosphate, and 200 lbs. (6) Sulphate of Potass	34⅝	32⅛	33⅜	58½	60⅜	59⅝	35⅝	30⅝	33⅛	18½	60⅛	14	13 (*a* and *b*)
14 (*a* and *b*)	400 lbs. Ammonia-salts, 3½ cwts. Superphosphate, and 280 lbs. (6) Sulphate of Magnesia	35	31¼	33⅛	58⅜	60⅛	59¼	35⅜	28⅜	32	18½	58⅜	14	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, in Autm. (8)	33¼	31¼	32¼	58½	60¾	59⅝	33⅞	29⅓	31⅜	32⅞	58⅞	25⅓	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, in Autm. (9)	34⅞	32⅛	33⅜	58⅜	60⅝	59¾	35⅞	30¾	33⅜	33⅛	59⅛	24⅝	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 (12 years, 1865–76) 16⅛ bushels Corn, 14⅛ cwts. Straw	38½	19½	29	57½	60¼	59	46	17⅞	31⅞	9⅞	58⅛	6¾	16 (*a* and *b*)
(10) 17 (*a* and *b*)	400 lbs. Ammonia-salts	32⅝	28⅞	30¾(12)	58⅝	60¼	59½(12)	33½	27⅝	30⅜(12)	10	58⅞	6⅞(14)	17 (*a* and *b*)
(10) 18 (*a* and *b*)	200 lbs. (1) Sulphate Potass, 100 lbs. (2) Sulphate Soda, 100 lbs. Sulphate Magnesia, and 3½ cwts. Superphosphate	18⅞	14⅞	16⅞(13)	58·	59⅜	58⅞(13)	17⅞	12⅞	15⅝(13)	12⅝	58⅜	9½(15)	18 (*a* and *b*)
19	3½ cwts. Superphosphate of Lime (11), 300 lbs. Sulphate of Ammonia, and 500 lbs. Rape-cake, in Autumn	31⅝	28⅝	30⅛	58⅛	58⅞	58½	31½	25⅛	28¼	19½	58	13	19
20	Unmanured continuously	15⅝	12	13⅞(16)	57	58½	57¾(16)	15⅜	11⅛	13¼(16)	11⅜	58⅛	8⅞	20
21	200 lbs. (1) Sulph. Potass, 100 lbs. (2) Sulph. Soda, 100 lbs. Sulph. Mag., 3½ cwts. Superphos., 100 lbs. Muriate Ammonia	22¾	19⅜	20⅝	57⅞	59⅝	58¾	20⅞	16⅜	18⅝	11⅝	58½	9⅜	21
22	200 lbs. (1) Sulph. Potass, 100 lbs. (2) Sulph. Soda, 100 lbs. Sulph. Mag., 3½ cwts. Superphos., 100 lbs. Sulphate Ammonia	21⅜	19⅜	20½	57¾	59⅝	58¾	20⅝	16	18⅜	21⅛	55	15⅜	22

(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. No Sulphate of Potass, Soda, or Magnesia, or Superphosphate, in 1852, 1853, or 1854. 9*b*, 475 lbs. Nitrate in 1852, 550 lbs. each year since. 550 lbs. Nitrate 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; for 1873, 4, 5, 6, and 7, 400 lbs. Ammonia-salts, sown in the Spring; for 1878, 400 lbs. Ammonia-salts, sown in the Autumn.
(9) For 1872 and previously, 300 lbs. Sulphate Ammonia and 500 lbs. Rape-cake, sown in the Autumn; for 1873, 4, 5, 6, and 7, 400 lbs. Ammonia-salts, sown in the Spring; for 1878, 400 lbs. Ammonia-salts, 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) Averages of Ammonia-salts, alternated with Mineral Manures.
(13) Averages of Mineral Manures, alternated with Ammonia-salts.
(14) Plots 17 had the Mineral Manures for the Crop of 1877.
(15) Plots 18 had the Ammonia-salts for the Crop of 1877.
(16) Averages of 12 years, 11 years, and 23 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.