Memoranda of the Field Experiments at Rothamsted, May 1873

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Experiments on Wheat; Broadbalk Field

Rothamsted Research

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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 21 years. Unless otherwise stated, the Manures are sown in the Autumn before the seed.

(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, 20 Years, 1852–1871. Dressed Corn. Quantity.	Dressed Corn. Weight per Bushel.	Total Straw.	Twenty-ninth Season, 1872. Dressed Corn. Quantity.	Dressed Corn. 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)	17¾	58⅜	15¼	17¼	58¾	16¾	0
1	Sulphates of Potass, Soda, and Magnesia (twice as much as on No 5 and succeeding Plots)	15⅛	58⅛	13⅞	10⅞	57⅞	11⅜	1
2	Farmyard Manure (14 tons every year)	35⅞	60	33⅞	32⅜	60¾	33⅜	2
3	Unmanured continuously	14½	57½	13	10¾	59	10¼	3
4	Unmanured for Crop of 1852, and since; previously Superphosphate (made with Muriatic Acid), and Sulphate Ammonia	15¾	58⅜	13¾	11⅜	57⅝	10⅞	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	58⅞	15¼	12⅜	60	11⅞	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)	26⅜	59⅜	24½	20½	60⅛	22⅞	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	35¼	59¼	35⅜	29¾	60¼	34⅛	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	38¼	59	41⅜	35⅝	60½	45½	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)	36¾	58⅜	41½	40⅝	60	58¼	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	56⅜	28¼	23⅜	55½	28⅝	9 (*b*)
10 (*a*)	400 lbs. Ammonia-salts alone, for 1845, and each year since; Mineral Manure in 1844	22½	57⅛	21⅝	18	56¾	21¾	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	25⅞	58	24¾	18¾	55⅞	21¾	10 (*b*)
11 (*a* and *b*)	400 lbs. Ammonia-salts, 3½ cwts. Superphosphate	28	57⅜	26⅜	27¼	59⅛	30½	11 (*a* and *b*)
12 (*a* and *b*)	400 lbs. Ammonia-salts, 3½ cwts. Superphosphate, and 366½ lbs. (6) Sulphate of Soda	33⅞	59⅛	32⅜	29¼	59¾	32¾	12 (*a* and *b*)
13 (*a* and *b*)	400 lbs. Ammonia-salts, 3½ cwts. Superphosphate, and 200 lbs. (6) Sulphate of Potass	33⅞	59⅜	33⅞	29⅞	60½	34¾	13 (*a* and *b*)
14 (*a* and *b*)	400 lbs. Ammonia-salts, 3½ cwts. Superphosphate, and 280 lbs. (6) Sulphate of Magnesia	33⅞	59¼	32⅞	30⅜	59⅝	33⅞	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)	32⅞	59⅝	32½	30½	60½	35⅞	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	59¾	33⅞	32⅜	60¾	36⅞	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 39⅜ bush. Corn, 46⅜ cwts. Straw .. .. 1865 and since, unmanured; average produce (7 years, 1865–71) 19¼ bushels Corn, 16⅝ cwts. Straw	32⅜	59	36⅛	13⅛	59⅜	13⅞	16 (*a* and *b*)
(10) 17 (*a* and *b*)	200 lbs. (1) Sulphate Potass, 100 lbs. (2) Sulphate Soda, 100 lbs. Sulphate Magnesia, and 3½ cwts. Superphosphate	17⅝ (12)	58⅞ (12)	16⅛ (12)	25⅞ (14)	60⅝ (14)	29½ (14)	17 (*a* and *b*)
(10) 18 (*a* and *b*)	400 lbs. Ammonia-salts	31⅜ (13)	59½ (13)	31¼ (11)	12⅞ (15)	59⅜ (15)	14⅞ (15)	18 (*a* and *b*)
19	3½ cwts. Superphosphate of Lime (11), 300 lbs. Sulphate of Ammonia, and 500 lbs. Rape-cake	30¾	58⅝	29⅛	27¾	59½	29½	19
20	Unmanured continuously	15½ (16)	58 (16)	14½ (16)	11⅜	57⅛	11⅛	20
21	200 lbs. (1) Sulph. Potass, 100 lbs. (2) Sulph. Soda, 100 lbs. Sulph. Magnesia, 3½ cwts. Superphos., and 100 lbs. Muriate Ammonia	21⅜	58¾	19½	20⅞	59⅜	19¾	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	58⅝	19	20⅛	59⅞	18⅛	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; 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' Mineral Manures, alternated with Ammonia-salts.
(13) Average of 20 years' Ammonia-salts, alternated with Mineral Manures.
(14) Plots 17 had the Ammonia-salts for the Crop of 1872.
(15) Plots 18 had the Mineral Manures for the Crop of 1872.
(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).