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Memoranda of the Field Experiments at Rothamsted: May 1880



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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 29 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 sown in the autumn. This plan was adopted for the first time for the crop of 1875.

(Area under experiment, about 13 acres.)

PLOTS.	Manures, per acre, per annum.	PRODUCE PER ACRE.												Plots.	
		Dressed Corn.						Total Straw.			Dressed Corn.				Total Straw.
		Average per Annum.									Thirty-Sixth Season, 1878.				
		Quantity.		Weight per Bushel.				Quantity.		Weight per Bushel.	Quantity.		Weight per Bushel.		
13 Years, 1862-74.		13 Years, 1862-74.		13 Years, 1862-74.		13 Years, 1862-74.		13 Years, 1862-74.	26 Years, 1852-77.		26 Years, 1852-77.	26 Years, 1852-77.			
0	Superphosphate of Lime (three times as much as on No. 5 and succeeding Plots)	18½	15½	16½	57½	58½	14½	12½	14½	4½	54	6½	0		
1	Sulphates of Potash, Soda, and Magnesia (twice as much as on No. 5 and succeeding Plots)	16½	11½	13½	57½	58½	13½	9½	12½	2½	54	3½	1		
2	Farmyard Manure (14 tons every year)	35	33	34½	59	60	34½	30½	32½	16	56½	20	2		
3	Unmanured continuously	15½	11½	13½	57	58½	14½	9	11½	4½	52½	6½	3		
4	Unmanured for Crop of 1852, and since; previously Superphosphate (made with Muriatic Acid), and Sulphate Ammonia	17	12½	14½	57½	59	15½	9½	12½	4½	51½	6½	4		
5 (a and b)	200 lbs. ♂ Sulphate Potash, 100 lbs. ♂ Sulphate Soda, 100 lbs. Sulphate Magnesia, 3½ cwt. Superphosph. of Lime ♂	18½	13½	15½	58½	59	16½	10½	13½	5½	53	7½	5 (a and b)		
6 (a and b)	200 lbs. ♂ Sulphate Potash, 100 lbs. ♂ Sulphate Soda, 100 lbs. Sulphate Mag., 3½ cwt. Superphosph., 200 lbs. Ammonia-salts ♂	28½	20½	24½	58½	60	27½	18	22½	10½	56½	14½	6 (a and b)		
7 (a and b)	200 lbs. ♂ Sulphate Potash, 100 lbs. ♂ Sulphate Soda, 100 lbs. Sulphate Mag., 3½ cwt. Superphosph., 400 lbs. Ammonia-salts	37½	28½	33½	58½	59½	36½	28½	33½	16½	56½	26½	7 (a and b)		
8 (a and b)	200 lbs. ♂ Sulphate Potash, 100 lbs. ♂ Sulphate Soda, 100 lbs. Sulphate Mag., 3½ cwt. Superphosph., 600 lbs. Ammonia-salts	38½	34½	36½	58½	60	42½	38½	39½	20½	56½	37½	8 (a and b)		
9 (a and b)	200 lbs. ♂ Sulphate Potash, 100 lbs. ♂ Sulphate Soda, 100 lbs. Sulphate Mag., 3½ cwt. Superphosph., 550 lbs. Nitrate Soda ♂	35½	37½	39½	57½	59	40½	43½	44½	21½	56½	38½	9 (a and b)		
10 (a and b)	550 lbs. Nitrate of Soda ♂. (The Nitrate for both 9a and 9b always sown in the Spring.)	24½	23½	24½	57½	57½	28½	26½	26½	4	49½	9½	10 (a and b)		
11 (a and b)	400 lbs. Ammonia-salts alone, for 1843, and each year since; Mineral Manure in 1844	27½	21	24½	57½	57½	27½	16½	22½	4	48½	8	11 (a and b)		
12 (a and b)	400 lbs. Ammonia-salts alone, for 1845, and each year since (except 1846 and 1850); Mineral Manure 1844, 48, 50	30½	23	26½	58½	57½	29½	20½	24½	11½	54½	18	12 (a and b)		
13 (a and b)	400 lbs. Ammonia-salts, 3½ cwt. Superphosphate and 366½ lbs. ♂ Sulphate of Soda	35½	28	32	58½	59½	35½	25½	30½	14	55½	22	13 (a and b)		
14 (a and b)	400 lbs. Ammonia-salts, 3½ cwt. Superphosphate, and 200 lbs. ♂ Sulphate of Potash	35½	29½	32½	59	60½	36	27½	32	16	57½	27½	14 (a and b)		
15 (a and b)	200 lbs. ♂ Sulph. Pot., 100 lbs. ♂ Sulph. Soda, 100 lbs. Sulph. Mag., 3½ cwt. Superphosph. ♂; 400 lbs. Amm.-salts, in Autm. ♂	33½	30½	31½	59	60½	35½	25½	30½	16½	57½	25½	15 (a and b)		
16 (a and b)	200 lbs. ♂ Sulph. Pot., 100 lbs. ♂ Sulph. Soda, 100 lbs. Sulph. Mag., 3½ cwt. Superphosph. ♂; 400 lbs. Amm.-salts, in Autm. ♂	35	31½	33½	59	60½	36	28½	32½	5	53½	27½	16 (a and b)		
17 (a and b)	1852-64, 13 years, 200 lbs. Sulph. Potash, 100 lbs. Sulph. Soda, 100 lbs. Sulph. Mag., 3½ cwt. Superphosph., and 800 lbs. Ammonia-salts; average produce 39½ bush. Corn, 46½ cwt. Straw	39½	15½	27½	58	59½	46½	13½	30½	4½	52½	7½	17 (a and b)		
18 (a and b)	1855 and since, unmanured; average produce (14 years, 1855-77) 15½ bushels Corn, 193 cwt. Straw	32½	26½	29½	59	60	35½	25	29½	8½	51	5½	18 (a and b)		
19	200 lbs. ♂ Sulphate Potash, 100 lbs. ♂ Sulphate Soda, 100 lbs. Sulphate Magnesia, and 3½ cwt. Superphosph.	18½	14	16½	58½	59	17½	12	14½	20½	58½	29½	19		
20	1878-9, and since, 1700 lbs. Rape-cake; 1852-78, 3½ cwt. Superphosph. ♂; 400 lbs. Sulph. Am., and 500 lbs. Rape-cake, in Autm.	32	26½	29½	58½	58½	31½	23	27½	8½	53½	11½	20		
21	Unmanured continuously	15½	11½	13½	57½	58	15	10½	13½	4½	53	6½	21		
22	200 lbs. ♂ Sulph. Potash, 100 lbs. ♂ Sulph. Soda, 100 lbs. Sulph. Mag., 3½ cwt. Superphosph., 100 lbs. Muriate Ammonia	22½	17½	20	58½	59	20½	14½	17½	8½	54	10½	22		

(1) 300 lbs. per annum for Crop of 1858, and previously.
 (2) 200 lbs. per annum for Crop of 1853, and previously.
 (3) Superphosphate of Lime—in all cases, excepting for Plot 19, made from 200 lbs. Bone-ash, 150 lbs. Sulphuric acid, gr. 1-7 (and water).
 (4) The "Ammonia-salts," in all cases, equal parts Sulphate and Muriate of Ammonia of Commerce.
 (5) 96, 475 lbs. Nitrate Soda in 1852, 275 lbs. in 1853 and 1854, 550 lbs. each year since. No Sulphate of Potash, Soda, or Magnesia, or Superphosphate, in 1852, 1853, or 1854. 96, 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 times 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 and since, 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 and since, 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 1879.
 (15) Plots 18 had the Ammonia-salts for the Crop of 1879.
 (16) Averages of 13 years, 12 years, and 25 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 and 7, the "a" portions of plots 5, 6, 7, 8, 9, 10, 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 to 1879 inclusive, cut straw (that produced in the previous season) was 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 each succeeding crop to 1879 inclusive, the straw of the previous season was cut up and applied to the "a" portion of Plot 15. For the crop of 1880, the straw is in no case returned to the land.