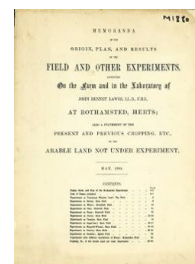


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Experiments on Wheat; Broadbalk Field

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.												Total Straw.	Plots.	
		Average per Annum.						Thirty-Sixth Season, 1878.								
		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.			
0	Superphosphate of Lime (three times as much as on No. 5 and succeeding Plots)	18½	16½	13½	12½	10½	14½	12½	10½	14½	12½	10½	14½	12½	10½	0
1	Sulphates of Potash, Soda, and Magnesia (twice as much as on No. 5 and succeeding Plots)	16½	14½	12½	11½	9½	13½	11½	9½	13½	11½	9½	13½	11½	9½	1
2	Farmyard Manure (14 tons every year)	35	33	31	29	27	33	31	29	33	31	29	33	31	29	2
3	Unmanured continuously	15½	14	12½	11½	10½	13½	12½	11½	13½	12½	11½	13½	12½	11½	3
4	Unmanured for Crop of 1852, and since; previously Superphosphate (made with Muriatic Acid), and Sulphate Ammonia	17	15½	14	13	11½	15½	14	13	15½	14	13	15½	14	13	4
5 (a and b)	200 lbs. ♂ Sulphate Potash, 100 lbs. ♂ Sulphate Soda, 100 lbs. Sulphate Magnesia, 3½ cwt. Superphosph. of Lime ♂	18½	17	15½	14½	13	17	15½	14½	17	15½	14½	17	15½	14½	5 (a and b)
6 (a and b)	200 lbs. ♂ Sulphate Potash, 100 lbs. ♂ Sulphate Soda, 100 lbs. Sulphate Mag., 3½ cwt. Superphos., 200 lbs. Ammonia-salts ♂	28½	27	25½	24½	23	27	25½	24½	27	25½	24½	27	25½	24½	6 (a and b)
7 (a and b)	200 lbs. ♂ Sulphate Potash, 100 lbs. ♂ Sulphate Soda, 100 lbs. Sulphate Mag., 3½ cwt. Superphos., 400 lbs. Ammonia-salts	37½	36	34½	33	31½	36	34½	33	36	34½	33	36	34½	33	7 (a and b)
8 (a and b)	200 lbs. ♂ Sulphate Potash, 100 lbs. ♂ Sulphate Soda, 100 lbs. Sulphate Mag., 3½ cwt. Superphos., 600 lbs. Ammonia-salts	38½	37	35½	34½	33	37	35½	34½	37	35½	34½	37	35½	34½	8 (a and b)
9 (a and b)	200 lbs. ♂ Sulphate Potash, 100 lbs. ♂ Sulphate Soda, 100 lbs. Sulphate Mag., 3½ cwt. Superphos., 550 lbs. Nitrate Soda ♂	29½	28	26½	25½	24	28	26½	25½	28	26½	25½	28	26½	25½	9 (a and b)
10 (a and b)	400 lbs. Ammonia-salts alone, for 1843, and each year since; Mineral Manure in 1844	23½	22	21	20	19	21	20	19	21	20	19	21	20	19	10 (a and b)
11 (a and b)	400 lbs. Ammonia-salts alone, for 1843, and each year since; Mineral Manure 1844, 48, 50	30½	29	27½	26½	25	29	27½	26½	29	27½	26½	29	27½	26½	11 (a and b)
12 (a and b)	400 lbs. Ammonia-salts, 3½ cwt. Superphosphate	37½	36	34½	33	31½	36	34½	33	36	34½	33	36	34½	33	12 (a and b)
13 (a and b)	400 lbs. Ammonia-salts, 3½ cwt. Superphosphate, and 200 lbs. ♂ Sulphate of Soda	35½	34	32½	31	29½	34	32½	31	34	32½	31	34	32½	31	13 (a and b)
14 (a and b)	400 lbs. Ammonia-salts, 3½ cwt. Superphosphate, and 280 lbs. ♂ Sulphate of Magnesia	35½	34	32½	31	29½	34	32½	31	34	32½	31	34	32½	31	14 (a and b)
15 (a and b)	200 lbs. ♂ Sulph. Pot., 100 lbs. ♂ Sulph. Sod., 100 lbs. Sulph. Mag., 3½ cwt. Superphos. ♂; 400 lbs. Amm.-salts, in Autm. ♂	33½	32	30½	29	27½	32	30½	29	32	30½	29	32	30½	29	15 (a and b)
16 (a and b)	200 lbs. ♂ Sulph. Pot., 100 lbs. ♂ Sulph. Sod., 100 lbs. Sulph. Mag., 3½ cwt. Superphos. ♂; 400 lbs. Amm.-salts, in Autm. ♂	35	34	32½	31	29½	34	32½	31	34	32½	31	34	32½	31	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. Superphos., and 800 lbs. Ammonia-salts; average produce 39½ bush. Corn, 46½ cwt. Straw	39½	38	36½	35	33½	38	36½	35	38	36½	35	38	36½	35	17 (a and b)
18 (a and b)	400 lbs. Ammonia-salts	32½	31	29½	28	26½	31	29½	28	31	29½	28	31	29½	28	18 (a and b)
19	200 lbs. ♂ Sulphate Potash, 100 lbs. ♂ Sulphate Soda, 100 lbs. Sulphate Mag., 3½ cwt. Superphos., 200 lbs. Ammonia-salts	18½	17	15½	14½	13	17	15½	14½	17	15½	14½	17	15½	14½	19
20	1878-9, and since, 1700 lbs. Rape-cake; 1852-78, 3½ cwt. Superph. Lime ♂, 300 lbs. Sulph. Am., and 500 lbs. Rape-cake, in Autm.	32	31	29½	28	26½	31	29½	28	31	29½	28	31	29½	28	20
21	Unmanured continuously	15½	14	12½	11½	10½	14	12½	11½	14	12½	11½	14	12½	11½	21
22	200 lbs. ♂ Sulph. Potash, 100 lbs. ♂ Sulph. Soda, 100 lbs. Sulph. Mag., 3½ cwt. Superphos., 100 lbs. Muriate Ammonia	22½	21	20	19	18	21	20	19	21	20	19	21	20	19	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 sp. 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 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 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 1864-5-6 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 13. For the crop of 1880, the straw is in no case returned to the land.