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Memoranda of the Plan and Results of the Field Experiments, May 1869

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Experiments on Wheat: Broadbalk

Rothamsted Research

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

BROADBALK FIELD.

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 17 years.

(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; twenty-sixth season—1868-9.	Produce per Acre. Average per Annum, over 17 Years, 1852–1868. Dressed Corn. Quantity.	Weight per Bushel.	Total Straw.	Twenty-fifth Season, 1868. Dressed Corn. Quantity.	Weight per Bushel.	Total Straw.
		Bushels.	lbs.	cwts.	Bushels.	lbs.	cwts.
0	Superphosphate of Lime (three times as much as on No. 5 and succeeding Plots)	17¾	58¼	15¾	22¼	61½	16½
1	Mixed Alkalies (twice as much as on No. 5 and succeeding Plots)	15½	58	14½	20½	60	14¼
2	Farm-yard dung (14 tons every year)	35½	60	34	41¾	61½	37½
3	Unmanured continuously	14¾	57½	13½	16¾	61	8¾
4	Unmanured for Crop of 1852, and since; previously Superphosphate (with Muriatic Acid) and Sulphate Ammonia ..	16¼	58¼	14¼	17½	61½	12
5 (*a* and *b*)	Mixed Alkalies [1] ; and Superphosphate of Lime[2]	17½	58¾	15½	17½	62¾	12
6 (*a* and *b*)	ditto ; ditto ; and 200 lbs. Ammonia-salts[3]	27¼	59½	25¼	28¼	62¾	23
7 (*a* and *b*)	ditto ; ditto ; and 400 lbs. **ditto**	36¼	59¾	36½	39¾	61	34½
8 (*a* and *b*)	ditto ; *ditto* ; and 600 lbs. **ditto**	38¾	59	42½	46½	62	43
9 (*a*)	ditto ; ditto ; and 550 lbs. Nitrate of Soda [4]	36½	58¼	41½	47¾	61¼	46¼
9 (*b*)	none ; *none* ; 550 lbs. ditto	26¾	56¾	29	27¼	62	24½
10 (*a*)	none since 1844 ; none since 1844 ; 400 lbs. "Ammonia-salts"	23½	57¼	22¾	24¾	62	19¼
10 (*b*)	none (except 1844, '48 and '50) ; none (except 1844, '48, & '50) ; 400 lbs. ditto	27½	58¼	26¼	27¾	62½	21
11 (*a* and *b*)	none ; "Superphosphate of Lime" ; and 400 lbs. ditto	29¾	57½	28	33¾	62¼	25¼
12 (*a* and *b*)	366½ lbs.[5] **Sulphate of Soda** ; ditto ; and 400 lbs. ditto	35	59¼	34	39¾	63½	31½
13 (*a* and *b*)	200 lbs.[3] **Sulphate of Potass** ; *ditto* ; and 400 lbs. ditto	34¼	59½	34¾	39¼	63¼	36
14 (*a* and *b*)	280 lbs.[3] **Sulphate of Magnesia** ; ditto ; and 400 lbs. ditto	34¾	59¾	34	41¾	64	32¾
15 (*a*)	"Mixed Alkalies" ; *ditto*[6] ; and 400 lbs. Sulphate Ammonia	33¼	59½	33	44¼	63¾	41½
15 (*b*)	ditto ; ditto[6] ; 300 lbs. ditto ; and 500 lbs. Rape-cake	34¼	59½	34¾	41½	63¾	37¾
16 (*a* and *b*)	Unmanured in 1865, and since; *previously*, 1852-64 Mixed Alkalies, Superphosphate, and 800 lbs. Ammonia-salts ..	39½ [8]	58 [8]	46½ [8]	22¾	62¾	18¼
[7] 17 (*a* and *b*)	"Mixed Alkalies" ; and "Superphosphate of Lime"	32¼ [9]	59½ [9]	32¼ [9]	37½ [11]	63¾ [11]	32½ [11]
[7] 18 (*a* and *b*)	none ; none ; and 400 lbs. "Ammonia-Salts"	17¾ [10]	58¾ [10]	16½ [10]	18¾ [12]	62¾ [12]	14¼ [12]
19	none ; Superphosphate of Lime [3] ; 300 lbs. Sulphate Ammonia; and 500 lbs. Rape-cake	31¾	58¾	30¼	37	63	28¼
20	Unmanured continuously	14¾ [13]	57¾ [13]	14½ [13]	..	..	..
21	"Mixed Alkalies" ; "Superphosphate of Lime" ; and 100 lbs. Muriate **Ammonia**	21½	58½	19¾	26¼	62½	20¼
22	ditto ; ditto ; and 100 lbs. Sulphate **Ammonia**	21¼	58½	19½	25	62¾	20½

(1) Since 1858, 200 lbs. Sulphate of Potass, 100 lbs. Sulphate of Soda, and 100 lbs. Sulphate of Magnesia; for Crop of 1857–8, and previously, 300 lbs., 200 lbs., and 100 lbs., respectively.

(2) 200 lbs. Bone-ash, 150 lbs. Sulphuric acid (sp. gr. 1·7).

(3) Equal parts Sulphate and *Muriate of Ammonia of Commerce.*

(4) 550 lbs. Nitrate of Soda is reckoned to contain the same amount of Nitrogen as 400 lbs. "Ammonia-salts."

(5) **For 1858, and previously 1½ time as much.**

(6) **With Muriatic instead of Sulphuric Acid.**

(7) **The Manures of Plots 17 and 18 are, respectively, year by year transposed.**

(8) **Average whilst manured, 13 years, 1852–1864.**

(9) **Average of 17 years' Ammonia-salts, alternated with Mineral Manures.**

(10) Average of 17 years' Mineral Manures, alternated with Ammonia-salts.

(11) Plots 17 had the *Ammonia-salts for the Crop of 1868.*

(12) Plots 18 had the Mineral Manures for the Crop of 1868.

(13) Average of 16 years, 1852–1867; in 1868, owing to a mistake at the time of 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).

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