

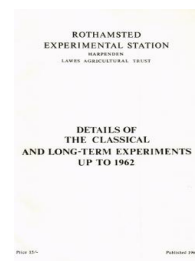
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Barnsfield- Formerly Mangolds Amd Sugar Beet

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BARNFIELD, MANGOLDS, 1876-1959
(WITH SUGAR BEET ALSO SINCE 1946)

The previous experimental crops on the Barnfield plots were:- white turnips 1843-1848, swedes 1849-1852, barley 1853-1855, swedes 1856-1870, sugar beet 1871-1875. The layout of the field and the manures applied for these crops were similar to those adopted for the mangolds, but there were some important changes. For details of dressings and yields obtained in these early years see Memoranda of the Field Experiments 1901, pp. 56-63. For the complete history of cropping and manuring 1843-1959 see Rep. Rothamst. exp. Sta. for 1961, p. 227.

The field is manured on a cross dressing system: the "mineral" manures P, K, Na, Mg are laid in various combinations on strips running North and South, the various nitrogenous manures are applied across these strips at right angles. The strips are (1) dung, (2) dung + PK, (4) PKNaMg, (5) P, (6) PK, (7) P Na Mg, (8) no minerals. The nitrogen cross dressings are 0: no nitrogen, N: nitrate of soda, A: sulphate of ammonia, AC: sulphate of ammonia and castor meal, C: castor meal. The actual rates of manuring are given in Table 8 below:

Table 8
Strip Manures applied annually since 1876 unless otherwise stated. Dung (D), superphosphate (P), sulphate of potash (K), agricultural salt (Na), sulphate of magnesia (Mg) per acre.

Strip	Treatment					Notes
	D tons	P P ₂ O ₅ lb. (1)	K K ₂ O lb.	Na lb.	Mg lb.	
1	14	-	-	-	-	
2	14	65	245	-	-	(2)
4	-	65	245	200	200	(4)
5	-	65	-	-	-	
6	-	65	245	-	-	
7	-	65	-	200	200	(3)
8	-	-	-	-	-	

Cross Dressings (nitrogenous) per acre

Series	Nitrate of soda N lb.	Sulphate of ammonia N lb.	Castor meal N lb.	Notes
O	-	-	-	
N	86	-	-	(4)
A	-	86	-	(5)
AC	-	86	86	(6)
C	-	-	86	(6)

Plot 9: There are no cross dressings. The manures given since 1903 are sulphate of potash 245 lb. K₂O; agricultural salt 200 lb.; sulphate of magnesia 200 lb.; nitrate of soda 86 lb. N. See note (7).

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The individual plots are defined by their strip number and their series letter. Thus plot 5N has superphosphate (65 lb. P_2O_5) and nitrate of soda (86 lb. N).

Notes:

- (1) Basic slag was used in place of superphosphate from 1896-1902.
- (2) Until 1894 dung and superphosphate.
- (3) Until 1902 the whole of strip 7 received 65 lb. P_2O_5 245 lb. K_2O and ammonium salts providing 8 lb. N. The present test of Na and Mg begun in 1903.
- (4) In 1903 plot 4N was halved. 4Na carried the original manures; 4Nb received superphosphate 392 lb., calcium chloride 190 lb., potassium nitrate 570 lb., calcium nitrate 100 lb. per acre.
- (5) Until 1916 equal parts of ammonium sulphate and chloride. (1887 ammonium sulphate only).
- (6) Until 1939 rape cake @ 2000 lb. per acre (none 1917-1920); 1940-1954 2000 lb. castor bean meal; since 1955 86 lb. N as castor bean meal.
- (7) 1876-1902 14 tons dung, 65 lb. P_2O_5 , 86 lb. N as ammonium salts per acre.

Application of manures: Dung is ploughed in in winter; P, K, Mg, salt and castor bean meal and one third of the sulphate of ammonia and nitrate of soda are applied after the first cultivation but before the seed is drilled. The remaining two-thirds of the nitrogenous fertilisers are applied as a top dressing about the time of singling.

Variety of mangolds: Yellow Globe. Leaves spread on their plots and ploughed in. In 1908 and 1927 swedes were grown when mangolds failed. In 1931 a crop of mixed mangolds and swedes was grown. In 1935 the mangolds failed and the field was bare fallowed.

Since 1946 four rows of sugar beet (Kleinwanzleben E) have been drilled on the East side of every strip except strip 8 which has the sugar beet on the West side. Top weights are estimated from one random row per plot and the tops are spread on their plots and ploughed in except on the 0-series (less dung plots).

Since 1954 a space equal to four rows of mangolds has been kept free from crop along the East side of strip 1. This area receives the same manure as the adjacent cropped area.

In 1955 certain plots badly infested with twitch (*Agropyron repens*) were divided into two parts, one part being sprayed with sodium trichloroacetate (TCA). In 1956 the other half of these plots was similarly treated.

Chalking: In spring 1956 a corrective dressing of 5 tons of ground chalk per acre was applied to the A and AC series. After the crop had been removed a maintenance dressing was applied to balance the sulphate of ammonia and castor meal given over a 5-year period on series A, AC, and C, the rate being 100 lb. calcium carbonate per 14 lb. N as sulphate of ammonia and 50 lb. calcium carbonate per 14 lb. N as castor meal.

Leaf yields: Since 1942 the leaf yields have been estimated from the produce of two random rows per plot. Since 1954 the yields on the 0 series (except the dung plots) have been calculated from the two sample rows chosen for leaf weights. In 1955 it was decided that owing to the small amount of organic matter contained in the leaves of these plots, these leaves should in future be carted off.

The experiment ended in 1959. The land was fallowed in 1960 in preparation for experiments to study the residues of the former treatments.

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For a summary of Barnfield results up to 1940 see Watson, D. J. & Russell, E. J. (1943-46). The Rothamsted experiments on mangolds 1872-1940.

- Part 1. Effect of manures on yield of roots. *Emp. J. exp. Agric.* 11, 49-64.
- Part 2. Effect of manures on the growth of the plant. *Ibid.* 11, 65-77.
- Part 3. Causes of variation of yield. *Ibid.* 13, 61-79.
- Part 4. The composition of the mangold grown on Barnfield (i) The **dry** matter content of leaves and roots. *Ibid.* 14, 49-56 (ii) The nitrogen content of leaves and roots. *Ibid.* 14, 57-70.

See also Kalamkar, R. J. (1933). A statistical examination of the yield of mangolds from Barnfield at Rothamsted. *J. agric. Sci.* 23, 161-175.

For an account of the yields of mangolds and sugar beet 1941-1959 and analyses of crops and soils from Barnfield see Warren, R. G. and Johnston, A. E. *Rep. Rothamst. exp. Sta. for 1961*, 227-247.

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Table 9

MANGOLDS, BARNFIELD 1876-1959

Roots: tons per acre, means over 19, 37 and 9 years

Series	O		A		N		C		AC		
	No nitrogen		Ammonium sulphate		Sodium nitrate		Rape cake		Rape cake + Ammonium sulphate		
	1876-94	1904-40	1876-94	1904-40	1876-94	1904-40	1876-94	1904-40	1876-94	1904-40	1941-59
Strip											
8 No P or K	3.8	3.0	6.0	5.6	10.2	10.6	10.2	8.3	10.1	7.5	8.1
5 P	5.0	4.0	8.3	6.8	15.7	16.1	12.0	9.4	11.2	8.8	9.3
6 P K	4.5	3.8	13.7	14.5	15.5	16.8	18.0	17.6	22.1	22.0	18.9
7 P Na Mg	(5.9)	4.0	(15.0)	16.1	(15.9)	18.4	(18.9)	19.2	(22.0)	21.5	17.0
4 P K Na Mg	5.3	4.2	15.5	15.5	18.3	19.0	20.7	20.7	25.0	26.4	19.1
1 D	16.8	17.4	22.1	22.0	23.2	28.0	23.6	23.0	24.5	23.2	19.9
2 D P K*	(17.0)	19.9	(21.4)	26.9	(24.2)	29.4	(23.3)	27.8	(23.5)	29.4	23.5

* The figures in brackets are means for the period, but the treatments differed from that given later.

Table 10
SUGAR BEET BARNFIELD
Roots and tops: tons per acre, means over 14 years 1946-59

Strip,	Series O		A		N		C		AC	
	No Nitrogen Tops	Roots	Ammonium sulphate Tops	Roots	Sodium nitrate Tops	Roots	Rape cake Tops	Roots	Rape cake + ammonium sulphate Tops	Roots
8 No P or K	2.0	1.5	4.9	4.2	6.1	5.0	7.5	5.6	9.0	6.4
5 P	2.1	1.9	4.8	5.0	7.4	6.7	6.6	6.9	9.3	7.2
6 PK	1.9	1.6	5.3	6.6	6.6	6.2	6.8	8.2	10.4	9.5
7 P Na Mg	2.1	1.8	6.4	7.2	7.8	7.2	8.4	7.7	11.7	9.0
4 P K Na Mg	2.0	1.8	5.8	7.2	7.5	8.0*	7.5	9.1	10.2	10.3
1 D	5.2	6.2	12.2	11.5	10.6	11.1	10.3	11.4	12.1	11.4
2 D P K	5.5	5.9	9.0	8.6	11.0	9.9	9.8	9.8	11.2	10.3

*Sodium nitrate replaced by a mixture of potassium and calcium nitrates.