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# Memoranda of the Field Experiments at Rothamsted: May 1880



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## **Experiments on Mangold-wurzel; Barn-field**

### **Rothamsted Research**

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(18)

EXPERIMENTS ON MANGOLD WURZEL.—BARN FIELD (after Sugar-Beet); commencing 1876.

The arrangement of the Plots is precisely the same as previously for Sugar-beet, excepting that Plot 9, which was unmanured for Sugar-beet, and also previously for Swedes, is now added as a manured Plot. With this exception, the manures are also substantially the same as previously for Sugar-beet; in fact, precisely the same as for the Sugar-beet in 1872 and 1873. Seed, Yellow Globe; dibbled on ridges, rows 26 inches apart; plants 11 inches apart in the rows (3). Area under experiment about 8 acres. Roots all carted off; Leaves weighed, spread on the respective Plots, and ploughed in.

	-1 -1	Manure	es per Ace	RE PER ANI	NUM.						
CLOTS.	Series 1.			As Se	res 2. eries 1, dressed with litrate Soda.	As Se and Cross- 400 lbs. '	IES 3. eries 1, dressed with 'Ammonia- tts,"	As Se and Cross- 2000 lbs and 400	eries 1, dressed with Rape-cake lbs. "Am- a-salts."	SERIES 5. As Series 1, and Cross-dressed w 2000 lbs. Rape-cak	
	First Season, 1876.	Seed dibbl	ed, May 2	2-26. Cro	p taken uj	, Nov. 3–2	17.				
		Roots.	Leaves.	Roots.	Leaves.	Roots.	Leaves.	Roots.	Leaves.	Roots.	Leaves.
1 2 3 4 5 6 7 8	Farmyard Manure (14 tons) and 3½ cwis. Superphosphate (¹) Without Manure (1846, and since) (3½ cwts. Superphosphate, 500 lbs. Sulphate Potass, 200 lbs. Chloride Sodium (common salt), 200 lbs. Sulphate Magnesia 3½ cwts. Superphosphate, 500 lbs. Sulphate Potass 3½ cwts. Superphosphate (²) Unmanured. 1853, and since; previously part Umman, part Superphos. Farmyard Manure (14 tons), 3½ cwts. Superphosphate (³)	Tons. cwts. 19 12 19 13 6 10 8 8 7 10 6 16 8 13 5 9	Tons. cwts. 4 9 4 6 1 14 1 15 1 14 1 12 2 3 1 10	Tons, cwts. 25 2 27 13 20 13 25 1 21 0 21 2 22 11 15 16	Tons. cwts.  7 5. 7 3 5 12 6 0 5 14 5 8 5 14 5 3	Tons. cwts, 29 19 29 8 14 3 19 19 13 10 17 15 19 2 11 17 25 14	Tons, cwts. 7 12 7 10 4 10 4 9 5 1 4 13 5 11 4 16 7 6	Tons, cwts, 31 9 30 18 19 19 30 8 17 2 26 8 27 2 18 2	Tons. cwts. 10 5 9 16 7 7 8 13 7 14 9 0 9 9 7 11	Tons, cwts, 24 9 29 19 17 4 25 8 17 17 20 10 20 12 15 12	Tons. cw 5 19 6 12 4 15 5 10 5 17 5 4 5 15 4 18
	Second Season, 1877. Seed dibbled	June 4-6	(Plots 8 a	nd 9, June	e 11th). (	Prop taken	up, Nov. 1	4-23.			
1 2 3 4 5 6 7 8 9	Farmyard Manure (14 tons)	Tons. cwts.  15	Tons. cwts.  2 1 1 19 1 0 1 3 0 19 0 18 1 3 1 3	Tons. cwts.  24 13  26 8  16 17  21 10  20 5  20 19  22 2  9 17	Tons. cwts. 3 14 3 12 3 14 3 10 3 1 2 18 3 16 5 4	Tons. cwts. 27 1 26 18 8 16 16 10 12 2 15 6 16 13 7 4 13 17	Tons. cwts. 4 4 4 6 3 0 2 2 2 10 1 16 2 7 3 10 4 0	Tons. cwts. 30 5 28 15 13 9 27 9 15 3 24 18 25 15 11 9	Tons. cwts. 5 5 5 5 9 3 19 3 8 3 8 3 16 5 0 4 11	Tons. cwts. 25 18 24 12 13 17 21 14 15 3 19 3 20 13 10 3	Tons. cwt 3 4 2 19 2 10 1 17 2 2 1 12 2 8 3 3
	THIRD SEASON, 1878. Seed dibb	led, June 8	2-9 (Plot 9	), June 11t	h). Crop	taken up,	Nov. 7-20	. 54)			
1 2 3 4 5 6 7 8 9	Farmyard Manure (14 tons) .  Farmyard Manure (14 tons), and 3½ cwts. Superphosphate (¹)  Without Manure (1846, and since) (3½ cwts. Superphosphate, 500 lbs. Sulphate Potass, 200 lbs. Chloride   Sodium (common salt), 200 lbs. Sulphate Magnesia  ½ cwts. Superphosphate ½ cwts. Superphosphate ½ cwts. Superphosphate, 500 lbs. Sulphate Potass, 36½ lbs. Amsalts (²) Unmanured, 1853, and since; previously part Unman., part Superphos. Farmyard Manure (14 tons), 3½ cwts. Superphosphate (³)	Tons, cwts.  13	2 16 2 19 1 4 1 7 1 8 1 3 1 9 1 4	Tons. ewts.  18 15 21 4 10 2 18 10 14 11 15 1 13 18 11 19	4 4 4 15 2 16 4 6 3 18 3 7 3 1 4 7	20 11 19 15 4 7 14 3 8 2 12 0 11 18 6 13 15 17	Tons, cwts.  5 6 5 3 2 11 2 12 3 6 2 14 2 18 3 5 5 9	Tons, cwts. 22 4 20 18 6 11 21 2 8 4 15 3 14 0 6 12	Tons, cwts, 6 3 5 17 3 7 4 14 3 3 4 11 4 5 4 10	Tons. cwts. 17 1 18 17 6 3 15 19 8 1 12 5 11 19 6 4	Tons. cwts 3 13 3 15 2 17 3 2 3 6 3 3 8 3 5
	Fourth Season, 1879.			8-15. Cro							-
1 2 3 4 5 6 7 8 9	Farmyard Manure (14 tons)  Farmyard Manure (14 tons), and 3½ cwts. Superphosphate (*)  Without Manure (1846, and since) (3½ cwts. Superphosphate, 500 lbs. Sulphate Potass, 200 lbs. Chloride) Sodium (common salt), 200 lbs. Sulphate Magnesia 3½ cwts. Superphosphate 3½ cwts. Superphosphate 3½ cwts. Superphosphate 3½ cwts. Superphosphate Potass, 36½ lbs. Amsalts (*) Unmanured, 1853, and since; previously part Unman, part Superphos. Farmyard Manure (14 tons), 3½ cwts. Superphosphate (*)	Tons. cwts. 6 3 6 13 1 12 2 2 1 18 1 15 1 18 1 3	Tons. cwts.  1 15 1 16 0 12 0 14 0 14 0 13 0 14 0 11	Tons. cwts. 9 8 11 11 4 17 8 13 8 5 7 16 8 2 5 16	Tons. cwts. 2 9 2 18 1 19 2 8 2 9 2 7 2 6 2 7	Tons. cwts, 12 6 11 12 3 12 7 10 5 0 6 9 6 7 3 10 9 7	Tons. cwts. 3 11 3 9 2 4 1 15 1 16 1 12 1 14 1 16 2 19	Tons. cwts. 13 16 14 1 7 17 12 10 9 13 11 11 11 2 9 2	Tons cwts. 3 15 3 17 3 3 2 19 3 5 3 5 3 6 3 14	Tons. cwts. 10 14 9 18 6 8 7 7 6 11 7 17 8 4 6 9	Tons. cw 2 12 2 11 1 17 1 14 1 12 1 13 2 0 2 5
	Fifth Season, 1880. Seed	dibbled, A	pril 22–23	(Plot 9, A	pril 24th).	Crop tal	ken up.				
1 2 3 4 5 6 7 8 9	Farmyard Manure (14 tons)  Farmyard Manure (14 tons), and 3½ cwts. Superphosphate (¹)  Without Manure (1846, and since) (3½ cwts. Superphosphate, 500 lbs. Sulphate Potass, 200 lbs. Chloride) Sodium (common salt), 200 lbs. Sulphate Magnesia  3½ cwts. Superphosphate  3½ cwts. Superphosphate  3½ cwts. Superphosphate  3½ cwts. Superphosphate  1½ cwts. Superphosphate	Tons, ewts.	Tons. cwts.	Tons, cwts.	Tons. cwts.	Tous, cwts.	Tons. cwts.	Tons. cwts.	Tons, cwts.	Tous. cwts.	Tons, cwt

 <sup>(1) &</sup>quot;Superphosphate of Lime"—in all cases made from 200 Uts. Bone-ash, 150 Uts. Subpuric acid, sp. gr.; 1.7 (and water).
 (2) "Ammonia-aslts"—in each case equal parts Sulphate and Muriate of Ammonia of Commerce.
 (3) Plot 9 sown on the flat instead of on ridges; plants ridged up afterwards; rows 22 inches apart, plants 10 inches apart in the rows.

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#### EXPERIMENTS ON MANGOLD WURZEL .- BARN FIELD-continued.

#### SUMMARY OF THE COMPOSITION OF THE MANGEL ROOTS.

As it will be some time before we shall be able to report fully the results obtained, or to be yet obtained, illustrating the influence of different manures, and of different seasons, on the composition of Mangels, an abstract of some of the analytical results, at present at command, is given below. The dry matter, ash, and nitrogen, are of course determined in the roots themselves. The sugar is determined in the expressed juice; and calculated into its percentage in the roots, on the assumption that they contain uniformly 96 per cent. of juice. But, with roots varying so much in character of growth, size, and ripeness, this will not be the case. Nevertheless, the results so calculated, approximately, and usefully, represent both the actual and relative amounts of sugar in the various roots. The amounts of dry matter, ash, and nitrogen, have also, in many cases, been determined in the expressed juice. In many cases also, the amount of the nitrogen existing as albuminoids has been determined (by Church's method). It may be observed that by far the larger proportion of both the mineral matter and the nitrogen of the roots is found in the juice; and of the nitrogen in the juice a variable proportion, ranging from less than one-fifth to not more than one-third of the total, is found to exist as albuminoids.

In interpreting the figures, it must be borne in mind, that, with forty different experiments each year, and, in each year four, or five, or more, times, as much produce on some plots as on others, it would be impossible to sample each at its best, and all in the same condition of ripeness. Each year the seed was sown on all the plots at the same time. The sample analysed was in each case a mixture of vertical sections of ten or fifteen crops would be much riper than the larger ones.

For anures		-				RESSED MANURES, PER ACRE, PER				ANNUM,	SERIES	4.		Series 5.						
and oduce, facing page.	SERIES 1. No cross-dressing.				SERIES 2, As Series 1, and Cross-dressed with 550 lbs. Nitrate Soda.				SERIES 3. As Series 1, and Cross-dressed with 400 lbs. Ammonia-salts.				As Series 1, and Cross-dressed with 2000 lbs. Rape-cake and 400 lbs. Ammonia-salts.				As Series 1, and Cross-dressed with 2000 lbs. Rape-cake.			
			- ,						FIRST S	EASON,	1876.					3				
					1	Iean Per	Cent. Tot	al Dr <b>y M</b>	atter, Sugar	Mineral	Matter (	Crude Asl	), and Nitro	gen in the	e Roots.		0	1		
LOTS.	Dry Matter.	Sugar.	Ash.	Nitrogen.	Dry Matter.	Sugar.	Ash.	Nitrogen.	Dry Matter.	Sugar.	Ash.	Nitrogen.	Dry Matter.	Sugar.	Ash.	Nitrogen.	Dry Matter.	Sugar.	Ash.	Nitrog
1	Per cent. 12·14	Per cent. 7·14	Per cent. 0.969	Per cent.	Per cent. 10.54		Per cent. 1.031	Per cent.	Per cent. 10.65		Per cent. 1.080	Per cent.	Per cent. 8.98	Per cent.	Per cent. 1.065	Per cent.	Per cent.	Per cent.	0.989	Per ce
2 3	12·41 15·14	7.19	0.943 0.828		9·35 11·94	4.85	1·020 0·903		9·64 12·16	5.72	1·018 0·904		8·92 11·60	= 355±	0.811	- 1	10·51 12·42	::	1.005 0.751	
4	13.99	8.98	0.905		11.36	6.32	1.013		12.23	7.03	0-989		9.91	5.62	1.067		11.28	6.94	1.003	
5 6	13·51 13·67	9·48 8·74	0.818		10·99 11·23	6·36 7·67	0·917 0·929		11·73 11·02	7·93 7·41	0·735 0·993		10·93 10·56	6·05 5·40	0.816 1.036		10.65 11.55	6·84 7·30	0·744 0·911	
7 8	13·63 13·06		0.882		11·61 11·23		0.922 0.945		10·62 11·43		0·969 0·905		10.66 10.20		1.015 0.856		11·58 11·61		0.936 0.757	
9						244			11.59	7.80	0.876			••	bee I		***	,,	••	
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2 3	13·85 16·58	10·02 11·19	0.961 0.827		12·91 14·06	8·22 8·76	1·107 1·072		13·24 17·11	7·84 10·16	1·089 0·888		11·78 14·44	9.80	0.834		16.41	10.51	0.819	
4	15.42	10.92	0.948		12.25	7.26	1.121		13.11	9.35	1.085		12.69	7.51	1.221		13.45	9.81	1 046	
5 6	15·84 16·15	11·62 11·31	0·797 0·891		12·90 12·53	8·54 9·10	0·889 1·135		15.63 15.05	10·00 9·45	0.838 1.095		14·36 14·27	8·24 8·90	0.786 1.061		15.35	9.94	0.784	
7 8	15·88 16·23		0.943 0.933		12·74 14·01	::	1.034		13·96 14·95	1996	1·098 0·932		12·58 14·51	**	1.136 0.811	· ·	13·83 14·87	***	1 036 0·807	
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1	Per cent. 12·26 11·51	7:32 6:97	0.995 0.981	Per cent. 0 · 170 0 · 182	Per cent. 11:47 10:05	6·36 5·21	1:036 1:072	0·218 0·216	11.17	6.27	1.013 1.034	0·206 0·206	10.83 10.50	5.65 5.94	1·046 0·987	0.241	11.98	6.90	0.985 0.948	
$\frac{2}{3}$	15.25	10.20	0.824	0.186	12.02	7.08	0.908	0.211	13.47	8.09	0.811	0.261	12.86	7.61	0.802	0.247	14.10	8.82		9
4	13.56	9.01	0.928	0.129	11.03	6.24	1·084 0·873	0.188	11.90	7·27 8·14	0.975	0.144	10·33 12·69	5·88 7·68	1·027 0·739	0.181	11·22 13·87	6 · 53 8 · 66	1·044 0·786	
5 6	13·91 14·23	9·17 9·12	0.810	0·144 0·173	11.04	6.53	0.986 0.982	0.193	13·55 11·92	8.67	0.988 0.932	0.184	12·09 12·03	6.96	1·016 0·986	0.235	12·18 12·05	7:36	0.940	0.1
7 8	13·42 14·50	**	0 · 976 0 903		11·26 11·10	::	0.937		12·81 10·77	6.21	0·869 0·939		11.93		0.879		12.52		0-863	
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$\frac{1}{2}$	14·91 14·78	9.62	1.007	0.185	13·18 13·43	7·97 8·08	1.010	0.196	13·86 13·14	8.67	1.025	0.181	13·34 13·54	8.32	1.064	0·186 0·260	14·40 16·16	9.24	0.995	0.2
3	18.81	12.50	0.861	0.205	16·01 12·83	8.10	1.010	0.226	17·18 14·03	9.28	0.834	0·252 0·134	16·27 13·67	8.36	1.086	0.171	13.51	8.62	0:938	
4 5	15·56 16·53	11.29	0.848	0.159	12.60	7.82	0.951	0.180	15.61	10.43	0.814	0.202	14.84	9.25	0.810	0.220	15.57	10.40	0.840	
6 7	16·34 16·33	10.97	1.008 0.895	0.156	13·75 12·97	8.76	0.972 0.997	0.180	14·50 14·48	9.60	0.998	0.162	13·49 14·18	8.47	1·038 0·947	0.214	14·42 15·35	9.35	0:949	i
8	18.46	110	0.903		13.78		0.963		15·44 14·52	9:36	0.812		14.13		0.853		15.58	10	0.852	
		1 336	J anne	-	4				FIFTH	SEASON,	1880.						X			
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