ROTHAMSTED RESEARCH

Report for 1937

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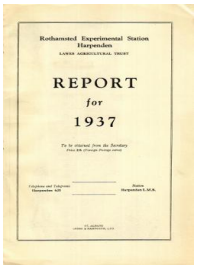

Potatoes

Rothamsted Research

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	1932		1933		1934	
	Dung		Dung		Dung	
	Absent	Present	Absent	Present	Absent	Present
Response to :						
Sulphate of ammonia ..	+11.74[1]	+5.79[1]	+2.28	+0.56	+3.02	+1.39
Potash salt ..	+6.18[2]	+5.08[2]	+4.90	+2.44	+9.26	+4.38
	([1]) ±0.690 ([2]) ±0.498		±1.38		±0.856	

As in the Rothamsted experiments both sulphate of ammonia and potash salt produced increases in the presence of dung, while in the absence of dung larger (in some cases considerably larger) increases were obtained.

Potatoes

For the past thirteen years experiments on the manuring of potatoes have been made at Rothamsted and Woburn and on potato growing farms in different parts of the country : some of the recent results are collected in Table XXXII.

TABLE XXXII

Main Crop Potatoes. Summary of Experiments 1932-37[1]
Mean Yields and Mean Increases, Tons per Acre

	Yield without nitrogen	*Increase for* N_1	N_2	Yield without phosphate	*Increase for* P_1	P_2	Yield without potash	*Increase for* K_1	K_2
MINERAL SOILS									
No dung									
Light (1 expt.) ..	11.84	+0.60	+0.84	—	—	—	12.34	−0.08	+0.03
Medium (1 expt.)	12.25	+1.03	+1.91	12.42	+0.80	+1.63	12.87	+0.23	+0.85
Heavy (2 expts.)..	10.61	+1.19	+1.47	—	—	—	11.59	−0.21	−0.08
With Dung									
Light (2 expts.) ..	7.16	−0.20	−0.17	—	—	—	6.98	−0.07	+0.24
Medium (2 expts.)	10.86	+1.32	+1.50	11.49	+0.60	+0.32	11.55	+0.53	+0.21
Heavy (1 expt.) ..	10.24	+2.34	+3.22	—	—	—	12.07	+0.16	−0.10
FENLAND SOILS									
No Dung									
Light (6 expts.) ..	7.01	+1.11	+1.53	6.96	+1.23	+1.56	6.16	+2.08	+2.67
Heavy (5 expts.) ..	10.11	+2.10	+3.13	9.92	+2.54	+3.26	11.00	+0.28	+0.46
With Dung									
Light (2 expts.) ..	8.08	+1.16	+1.17	8.43	+0.36	+0.93	8.09	+0.75	+1.55
Heavy (1 expt.) ..	12.73	+1.59	+2.56	13.60	+0.55	+0.99	13.49	+0.58	+1.29

[1] Dressings per acre :
N_1 = 1½ cwt. sulphate of ammonia (0.3 cwt. nitrogen).
N_2 = 3 cwt. sulphate of ammonia (0.6 cwt. nitrogen).
P_1 = 4½ cwt. superphosphate (0.75 cwt. P_2O_5).
P_2 = 9 cwt. superphosphate (1.5 cwt. P_2O_5).
K_1 = 1½ cwt. sulphate of potash (0.75 cwt. K_2O).
K_2 = 3 cwt. sulphate of potash (1.5 cwt. K_2O).

They show that one dose of the fertilizer usually gives a good result even when farmyard manure is also supplied but the double dose may not give a sufficiently greater increase to pay for the extra manure. Nitrogen (sulphate of ammonia) has given the most consistent increases both on mineral and on fenland soils, whether dung is added or not. Phosphate and potash have given marked increases on fenland soils, greater indeed than on the mineral soils.

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The results thus resemble those for sugar beet in that the effects of phosphatic and potassic manures vary considerably from soil to soil: attempts are being made in the Chemical Department to find some chemical method of ascertaining beforehand whether the soil is or is not likely to respond. This is well illustrated by the following pair of results obtained in our "3 x 3 x 3" experiments, one obtained on a light, the other on a heavy fen soil; both soils responded to nitrogenous fertilizer; the light soil responded to potash but not to phosphate while the heavy soil responded to phosphate but not to potash.

TABLE XXXIII

Effect of Phosphate

Yields, tons per acre ±0.354 Heavy Soil (Little Downham, 1934) Marked response					*Yields, tons per acre* ±0.970 Light Soil (Thorney, 1934) No response			
Super-phosphate cwt. per acre	No sulphate of ammonia	Sulphate of ammonia		Mean ±0.204	No sulphate of ammonia	Sulphate of ammonia		Mean ±0.560
		1½ cwt.	3 cwt.			1½ cwt.	3 cwt.	
0	10.0	12.3	12.9	11.7	6.3	7.1	9.3	7.6
4½	13.8	15.8	16.8	15.5	5.5	8.4	9.1	7.7
9	14.8	16.7	18.4	16.6	8.6	7.3	8.9	8.2
Mean ±0.204	12.9	14.9	16.0	14.6				
Mean ±0.560					6.8	7.6	9.1	7.8

TABLE XXXIV

Effect of Potash

Yields, tons per acre ±0.354 Heavy Soil (Little Downham, 1934) No response					*Yields, tons per acre* ±0.970 Light Soil (Thorney, 1934) Clear response			
Sulphate of potash, cwt. per acre	No Sulphate of ammonia	Sulphate of ammonia		Mean ±0.204	No Sulphate of ammonia	Sulphate of ammonia		Mean ±0.560
		1½ cwt.	3 cwt.			1½ cwt.	3 cwt.	
0	12.3	14.5	15.8	14.2	5.0	5.9	9.5	6.8
1½	13.2	15.4	16.0	14.8	7.9	8.2	8.4	8.1
3	13.1	15.0	16.4	14.8	7.5	8.8	9.5	8.6
Mean ±0.204	12.9	14.9	16.0	14.6				
Mean ±0.560					6.8	7.6	9.1	7.8

The contrast is shown perhaps more clearly in Table XXXV when all levels of nitrogen are grouped together so as to show only the potash and phosphate effects :—

TABLE XXXV

Yields, tons per acre ±0.354 Heavy Soil (Little Downham, 1934) Phosphate response					*Yields, tons per acre* ±0.970 Light Soil (Thorney, 1934) Potash response			
Sulphate of potash, cwt. per acre	No Super-phosphate	Super-phosphate		Mean ±0.204	No Super-phosphate	Super-phosphate		Mean ±0.560
		4½ cwt.	9 cwt.			4½ cwt.	9 cwt.	
0	11.3	14.8	16.5	14.2	7.0	6.5	6.9	6.8
1½	12.1	16.0	16.4	14.8	8.0	8.1	8.2	8.1
3	11.8	15.6	17.1	14.8	7.8	8.4	9.6	8.6
Mean ±0.204	11.7	15.5	16.6	14.6				
Mean ±0.560					7.6	7.7	8.2	7.8

Interactions. It not infrequently happens that a fertilizer acts better in presence of another than when it is used alone. Occasionally the reinforcement is very pronounced as in the following experiments on potatoes at Thorney, Isle of Ely, in 1933 :—

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TABLE XXXVI

Mean yield, tons per acre	Addition given by sulphate of ammonia, tons per acre		Mean yield, tons per acre	Addition given by sulphate of ammonia, tons per acre	
	Used alone	With potassic fertilizer		Used alone	With phosphatic fertilizer
9.00	0.43	1.72	14.52	1.05	4.00
10.17	0.41	1.86	14.11	0.47	3.33

The figures in the upper line are in presence of farmyard manure : those in the lower line in absence of farmyard manure.

The total number of interactions of this kind obtained up to the present (**1925-1937** inclusive) is shown in Table XXXVII.

TABLE XXXVII

	Nitrogen and potash interaction	Nitrogen and phosphate interaction	Phosphate and potash interaction
Total number of experiments	55	40	39
Positive interactions ..	35	29	27
No interaction or negative	20	11	12

Most of the interactions, however, are not statistically significant but all significant results are positive.

The proportion of ware. Mr. Garner has recently collected all the results relating to the percentage of ware and finds that fertilizers have a very marked effect in raising the proportion of ware in cases where the percentage without manure is low, but not where it is high.

TABLE XXXVIII

Percentage Ware

Mean Effects of Nutrients and Organic Manures Grouped according to Initial Percentage Ware

Initial percentage ware (no manure)	Increase due to						Total expts.
	N	P	K	Organic	Dung	NPK	
Over 90 ..	−0.4	−1.1	+0.6	−0.3	—	—	9
80 ..	+1.2	−1.1	+1.5	+0.7	—	—	34
70 ..	+2.6	+3.6	+8.7	−1.0	+5.5	+4.0	29
60 ..	+0.7	+6.8	+8.4	+2.8	+15.2	+4.4	29
50 ..	+16.8	+5.9	+15.8	—	+25.9	+22.4	9
Under 50 ..	—	—	+20.3	—	+34.2	—	3
Weighted mean	+2.0	+2.1	+7.6	+1.2	+15.3	+6.9	113

KALE

Marrow stem kale is one of the most useful of fodder crops and one of the best converters of cheap fertilizer nitrogen into valuable

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