ROTHAMSTED RESEARCH

Report for 1937

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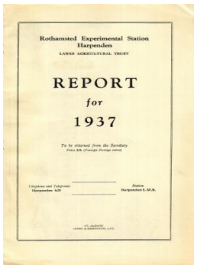

Residual Effects of Chalk

Rothamsted Research

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expected, the responses to both manures are greater on plots without manuring in the previous year than on plots which were then manured. The average differences between the increases to artificials and the increases to compost are 3.7 cwt. per acre on plots unmanured and 7.0 cwt. per acre on plots manured. This indicates that artificials are more effective relatively to compost at higher levels of yield.

TABLE III

First Year Residual Effects of Artificials and Compost

	No manure in current year		Manured in current year	
	Response to		Response to	
	Artificials	Compost	Artificials	Compost
1933	+0.7	+2.8	−0.8	−0.9
1934	+9.8	+21.7	+8.1	+7.8
1935	+2.8	+9.7	−3.2	+5.2
1936	+7.5	+10.2	+1.4	+3.4
1937	+3.2	+13.4	−1.8	−2.3

In most years there were also good responses to a previous year's dressing of manures on plots receiving no manure in the current year. The relative effectiveness of the two manures has, however, been reversed, compost giving about 6.7 cwt. per acre more than artificials. On plots manured in the current year, the residual effects were small or negligible except in 1934, in which the residual responses to the two manures were roughly equal; at these higher levels of yield compost has apparently little residual value, a result in accordance with that indicated above.

ARABLE LAND

The Liming Programme

Some of the results of the 1936-37 experiments have an important bearing on the liming programme of the Ministry of Agriculture. In many parts of England there is a dislike of magnesian limestone and of the lime prepared from it. We have made a number of experiments in different parts of the country but so far obtained no evidence that the magnesian limestones are detrimental. When used in the quantities indicated by the ordinary lime requirement methods they give fully as good results as the corresponding high-calcium products. In some pot experiments, indeed, magnesium proved beneficial, but not in any of the field experiments. No full survey has been made but there is no present evidence of widespread magnesium deficiency in English soils.

Residual Effects of Chalk

The residual effects of chalk have been studied in three experiments, in two of which there were several dressings of chalk so as to determine the most effective amount to apply.

At Tunstall on an acid sandy soil, chalk was applied in 1932 but nothing was added afterwards. Sugar-beet was grown by Mr. A. W. Oldershaw, for the first four years, 1932-5.

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TABLE IV

Sugar Beet : Tunstall. Root (tons per acre)

Chalk tons per acre (1932)	1932		1933		1934		1935	
		Increase		Increase		Increase		Increase
None	1.82		2.94		Nil		Nil	
1	12.61	+10.79	11.40	+8.46	13.37	+13.37	14.64	+14.64
2	14.30	+ 1.69	13.23	+1.83	16.36	+ 2.99	15.90	+ 1.26
3	14.27	− 0.03	13.26	+0.03	16.81	+ 0.45	15.43	− 0.47
4	14.74	+ 0.47	13.91	+0.65	17.26	+ 0.45	15.97	+ 0.54
Standard Error	± 0.432	± 0.611	± 0.437	±0.618	±0.332	±0.469	± 0.242	±0.342

The plots without chalk gave negligible yields throughout. The single dressing (1 ton chalk per acre) in 1932 raised the yield of roots to 12.6 tons per acre and continued to give good crops in subsequent years, with no indication of a decrease in effectiveness. The double dressing gave a further increase in yield each year of between 1.2 and 3 tons per acre. The 3 ton dressing proved no better than the 2 ton dressing in three years out of four. For this dressing, however, the choice of plots may have been unfortunate, since the highest dressing (4 tons) did not fail similarly but gave the best yields throughout, about half a ton per acre more roots than the 2 ton dressing.

The four levels of chalk produced no apparent differences in sugar percentage. The residual effects on the tops were similar to those on roots, except that the response fell off less sharply at the two highest dressings than with roots.

The experiment was continued with barley in 1936 and clover hay in 1937.

TABLE V

Chalk : tons per acre (1932)	Barley : Grain 1936		Clover : Hay 1937	
		Increase		Increase
None	Nil		5.0	
1	14.5	+14.5	32.3	+27.3
2	17.0	+2.5	34.9	+2.6
3	18.3	+1.3	37.4	+2.5
4	18.4	+0.1	38.8	+1.4
Standard Error	—	—	±1.04	±1.47

The residual effects persist and the results are similar to those with sugar beet, except that with both crops the 3 ton dressing has given higher yields than the 2 ton dressing.

The experiment has not yet proceeded long enough to tell how long the effects of the chalk will persist, but at least in the first five years there is little sign that the effects of the 1932 dressings are disappearing. It will also be interesting to see whether the effects of the largest dressings persist longer than those of the smaller ones.

A similar experiment has been carried out by Mr. H. W. Gardner, of the Herts. Farm Institute, at Stevenage on a gravelly loam soil with somewhat smaller dressings of chalk. The experiment started in 1933 with a crop of lucerne which failed owing to drought. Winter oats followed in 1934, but the yields were not

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recorded. The oats were undersown with a seeds mixture, which constitutes the 1935 crop, while mangolds were grown in 1936.

TABLE VI

Chalk : cwt. per acre (1933)	1935 Hay : cwt. per acre Yield	1935 Hay : cwt. per acre Increase for each dressing	1936 Mangolds roots : tons per acre Yield	1936 Mangolds roots : tons per acre Increase for each dressing
None	25.5		17.22	
35	46.0	+20.5	24.92	+7.70
70	59.2	+13.2	29.12	+4.20
140	66.0	+6.8	31.49	+2.37
210	67.3	+1.3	31.57	+0.08
Standard Error	±2.70	±3.82	±1.42	±2.01

The effects of acidity are clearly much less marked than at Tunstall, moderate crops being obtained in both years even in the absence of chalk. The successive increases per 35 cwt. of chalk were 20.5, 13.2, 3.4 and 0.6 cwt. hay in 1935 and 7.70, 4.20, 1.18 and 0.04 tons mangolds in 1936. Thus the residual response falls off steadily at the higher levels of application; in particular, the highest dressing would not have proved economically efficient.

In a second experiment by Mr. Gardner, started in 1934, the residual effects on hay of chalk, potash salt, slag and Gafsa phosphate are studied alone and in combination. The phosphatic treatments have so far had no beneficial effect, while potash salt has produced only small increases which were not significant. The responses to 75 cwt. chalk applied in 1934 are shown in Table VII.

TABLE VII

Responses to 75 cwt. chalk applied in 1934, Barnet, Herts

Hay cwt.per acre	Mean response	Potash: (applied in 1934) Absent	Potash: (applied in 1934) Present	Standard error	Mean yield
1934	+1.7	+1.6	+1.8	±0.806	16.1
1935	+5.4	+5.2	+5.6	±1.17	28.8
1936	+8.6	+4.4	+12.8	±1.55	35.7
1937	+5.9	+6.3	+5.5	±1.38	25.7

As in the other experiments there is no sign that the effects of chalk are dying away, good responses being obtained in each of the last three seasons. In 1936 the effectiveness of chalk was increased by the presence of potash, the increase to chalk being 12.8 cwt. with potash present as against 4.4 cwt. with no potash. In the other years, however, the response to chalk has not been affected by potash.

Organic Manures

The growing shortage of stable manure has seriously curtailed the supply of organic manure for the soil and alternative sources are being studied. More and more there is a tendency to divert waste products to other purposes but certain products, particularly sewage sludge and town refuse, still offer some possibilities. The manurial value of town refuse treated by a new process is being tested.

The experiments on the making of artificial farmyard manure from straw have been much facilitated and improved as a result of the erection of the new building at the farm.

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