ROTHAMSTED RESEARCH

Report for 1927-28

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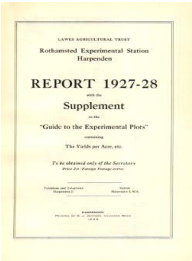

Grassland

Rothamsted Research

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	No Nitrogen	Straw, Cwt. per Acre.							
		Sulphate of Ammonia.				Muriate of Ammonia.			
		Single dose.		Double dose.		Single dose.		Double dose.	
		Early.	Late.	Early.	Late.	Early.	Late.	Early.	Late.
Oats, 1925	23.5	31.8	30.8	36.7	34.6	31.8	—	37.4	—
Oats, 1926	44.1	50.0	50.0	58.9	50.3	52.6	48.6	58.2	47.2
Wheat, 1926	41.3	43.7	44.9	46.2	46.7	46.4	44.8	50.3	43.1
Wheat, 1927	45.8	51.4	48.6	55.8	48.9	48.4	50.0	55.3	49.1
Wheat, 1928	29.2	32.5	36.7	—	—	33.3	33.7	—	—

Cereal mixtures for green feed, hay or silage, and therefore grown for leaf rather than grain, should receive their nitrogenous dressing during tillering time.

Nitrogen in wheat grain. An experiment was made in 1928 in conjunction with the Research Association of British Flour Millers to ascertain how far the nitrogen content of wheat can be altered by variations in time of application of nitrogenous fertiliser. No significant effect was produced by manuring, although there were differences between the varieties: Yeoman II and Square Head's Master both contained more nitrogen in the grain than Swedish Iron or Million III. The percentage of nitrogen in the dry grain was:—

Different Varieties.		*Different Times of Applying Nitrogenous Fertiliser.*	
Yeoman II	1.700	No nitrogenous fertiliser	1.646
Square Head's Master	1.698	Early top dressing ...	1.642
Million III	1.565	Late top dressing ...	1.639
Swedish Iron	1.539	Early and late top dressings	1.657

Grassland.

Grass presents special problems because it is not a single crop but a mixture, the members of which are competing with one another. Further, the value of grass is not sufficiently expressed by its weight: it depends not only on the kind of plant but on the way the plant grows, whether leafy or stemmy. Two qualities are important to the farmer: palatability and feeding value. Palatability is tested in the Woburn experiments in Broadmead, where grass is treated with lime, basic slag, superphosphate, potassium salts on separate unfenced plots, all of which are then grazed by animals free to wander where they will. They congregate on the most palatable herbage and leave the rest: they choose always the plots treated with lime and phosphate. Feeding value is tested at Rothamsted; the plots are fenced in and the animals are given no option as to where they shall go: they are weighed each fortnight. The results again show the value of phosphate, especially the basic slag of high solubility: within certain limits they show that a 2 per cent. solution of citric acid is a useful agent for estimating agricultural value, though others are being tested with promising results. The experiments have emphasised the importance of skilful and close grazing in the management of grassland; this is even more important than manuring and, indeed, some of the records show that a properly manured pasture badly grazed may be worse than one left unmanured.

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Grazing experiments are, however, the most unsatisfactory of all field trials; they are crude and liable to gross errors. They answer well enough to show strikingly obvious differences, such as those obtained at Cockle Park; and, with proper precautions to ensure success, they can make effective demonstrations, but they give little or no information beyond what a competent grazier could deduce on mere inspection of the herbage. The variations in the individual animals, the marked difference in results according as one more or one less is put on a particular plot, and the impossibility of allowing for their maintenance requirements, complicate a problem already rendered difficult by the variations in the land itself. We are endeavouring, during the present season, to improve the method so as to make it yield more useful results. We are also testing the mowing method used successfully in certain investigations.

The results have given some interesting measurements to show what grassland can do in various parts of the country. The live weight increases in pounds per acre of the sheep grazed on the unmanured plots have been :—

	Leicestershire. Thrussington.	Somersetshire. Fiddington.	Hertfordshire. Rothamsted.
1921–4	—	—	115
1925...	133.8	242	81*
1926...	217.0	187	204
1927...	274.6	297	—
1928...	203.8	428	91*
Average	207.3	313	

* Part of Season only.

The live weight increases on the slag plots at Rothamsted when that on the unmanured is put at 100 are :—

Per cent. soluble in Citric Acid.	81	77	71		28	Gafsa.
Average—						
1921-4	98	112	141	128	100	99
1925	95	127	90	168	59	123
1926	112	110	104	104	104	95
1928	94	112	109	109	115	125
Mean	99	114	124	128	95	105

The first dressing was given in 1921, and the plots were redressed in 1925.

Much clearer results are obtained in the manuring of hay land. Experiments on this subject were begun in 1856 on grass which even then was very old, and they have been continued ever since, the land being hayed every year, two crops being taken without grazing. The results are given on pp. 126-7[1]; they show the importance of potassic and phosphatic fertilisers for ensuring quality, and of nitrogenous fertilisers for giving bulk and early growth.

The effect of slag depends on its solubility : slags of 60 per cent. or more solubility in the 2 per cent. citric acid solution are

[1] Full Report.

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more effective than those of 40 per cent. or less. The results were :—

	Yield, cwt. per acre : No manure.		Improvement given by slag. Yield when unmanured = 100.			
			Enmore, Somerset. Solubility.		Brooke, Norfolk. Solubility.	
	Old meadow. Enmore, Somerset.	New ley. Brooke, Norfolk.	37%	87%	37%	87%
1926 ...	27.4	45.7	109	112	100	116
1927 ...	26.1	18.8	115	123	133	169
1928 ...	9.4	14.9	119	125	128	171

The rapid fall in yield of hay from the new ley is characteristic of the Eastern counties, and illustrates one of the difficulties of grassland farming there.

The experiments show that the old citric solubility test is of considerable practical utility in discriminating between the various slags now offered to the farmer, and they show the wisdom of insisting on a high solubility in general. Low soluble slags may serve a useful purpose in special conditions, but they should be bought only when the farmer has good reason to know that they will act well.

Fallow.

One of the most striking of recent changes in agriculture has been the increase in land under bare fallow. This represents a loss of crop in the current year, but a gain, and sometimes a marked gain, in the next, so that it is not necessarily as wasteful as it appears. The fallowing of part of Broadbalk has given us opportunities of observing some of the results : on part of it that has had a two years' fallow, the yields have been :—

	Plot.	1928.		Average 77 years, 1852-1928.	
		Grain. Bushels per acre.	Straw. Cwt. per acre.	Grain. Bushels per acre.	Straw. Cwt. per acre.
No manure since 1839	3	27.9	27.8	11.8	9.9
Complete artificials	13	55.2	32.0	29.2	30.8
No potash	11	56.9	31.4	21.4	21.8
No potash or phosphate	10	47.0	25.8	18.8	18.1
No nitrogen ...	5	35.2	34.8	13.6	10.6
Farmyard manure ...	2B	48.4	61.4	33.2	34.5

The result is a remarkable increase in the yield of grain and in the proportion of grain to straw. Never in the 86 years of successive wheat growing has Broadbalk grown a crop so thick set with grain, and we are unable at present to explain it. The season was very favourable, but probably not more so than some of the great wheat seasons of the past, 1854, 1857, 1863, 1894, yet in none of these was so much grain produced. Much of the effect is probably attributable to the fallow, but whether the action is the suppression of weeds, the decomposition of vegetable and other matter, or some physical change in the soil, we cannot decide. Something more seems to be involved than an increase in plant nutrients, for no fertiliser scheme we have yet tested produces this great increase in the proportion of grain. The ordinary fertilisers increase both grain and straw : the fallowing somehow caused the plant to produce grain and not straw. The investigation is being continued.

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