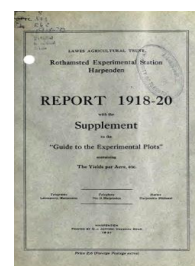


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Report 1918-20 With the Supplement to the Guide to the Experimental Plots Containing the Yields per Acre Etc.



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Expenditure on Crops

Rothamsted Research

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the surface soil by steam tackle in the 'sixties and 'seventies, and the waste arising from improper use of manures and feeding stuffs in our own time, have involved the farming community in losses amounting in the aggregate to millions of pounds sterling, and they could have been avoided had more accurate knowledge been available.

It is for this reason that the Station is staffed with highly trained scientific workers accustomed to critical examination for the detection of errors and equipped with appliances capable of giving very accurate results. The rapid development of general science and engineering during the past thirty years calls for a corresponding development of agricultural science so as to ensure that the farmer should derive the full benefit of any new improvements and at the same time be protected against proposed improvements which, as a matter of fact, are of no advantage to him.

The farm on which many of these experiments are carried out is the old Home Farm of Rothamsted—289 acres in extent—which was taken over by the Experimental Station in 1911. It is bounded on the south side by a wood, in which a certain amount of game is preserved, and in every field there are large trees, which, while adding to the picturesqueness of the landscape, detract from the productiveness of the farm. The soil is a poor stony clay (clay with flints). Under good management and moderate manurial treatment it is capable of yielding about 28 bushels of wheat and barley, 32 bushels of winter oats, 25 tons of mangolds, 6 tons of potatoes, and 10 tons of swedes per acre. Spring oats rarely succeed by reason of the spring droughts, which also adversely affect the yield of swedes. Clover is apt to make only moderate growth and to fail in patches over the field. The farm is thus one where the cultivator sees more of the difficulties than the profits of farming. It is, however, typical of much of the second rate land of England, and, as experience shows, the experimental results hold very generally throughout the country. For some time past attempts have been made to reduce the cost of production and to increase the yields.

POSSIBILITY OF REDUCTION IN COSTS OF PRODUCTION.

Full accounts of expenditure* are kept and these, when analyzed, give the following results per acre:—

	1913-14		1917-18		1918-19		1919-20	
	£	s.	£	s.	£	s.	£	s.
Wheat	5	13	11	2	13	9	15	1
Oats	6	9	9	14	14	11	14	12
Barley	6	11	12	10	13	17	17	16
Roots	18	13	29	18	37	0	—	
Potatoes	22	6	39	3	46	0	57	9
Grass (Hay)	3	16	4	19	6	0	5	17
„ (Grazing)	2	15	2	4	3	2	3	7

* By expenditure is meant the actual money expended on the crop. No allowance is made here for interest on capital or for remuneration to the farmer beyond the sum of £100 per annum (rising to £175 in 1921) allocation for supervision and spread over 178½ acres.

THE CASH RETURNS HAVE BEEN:—

	1913-1914	1917-18	1918-19	1919-20 (estimated)
	£ s.	£ s.	£ s.	£ s.
Wheat	7 3	18 0	14 1	19 14
Oats	8 1	12 0	31 1	15 1
Barley	6 6	11 0	24 12	18 13
Roots	10 11	19 12	23 9	— [†]
Potatoes	23 7	35 14	57 8	27 6
Grass (Hay)	2 15	—	18 11 [†]	4 6
„ (Grazing)		2 16	3 8	—

[†] Clover.[‡] Fed to Cattle.

The great increase in cost since 1917 is due in the main to the rise in wages and to the reduction in hours, which has meant not only an increased cost, but a decreased output per hour. The decreased output probably arises from the circumstance that only part of the workers' time on the farm is spent on actual crop production, the remainder being taken up with yoking and unyoking, attending to the animals, travelling from the farm buildings and back again, etc., etc. This "dead" time is the same whether the working day is 8 or 9 hours in duration, consequently the whole reduction in hours falls on the "working time." If two hours of the day is "dead" time (and this is an under-estimate) a reduction of hours from 9 to 8 means a reduction of 11% in total time, but of 14% in working time.

Further analysis of expenditure shows two great controllable items:—(1) the cost of cultivation; (2) the cost of cleaning. Our experience shows that the tractor is likely to help considerably in reducing both items. The rapid development of the tractor on the farm is the direct outcome of the war conditions. Few farmers used tractors before 1916, but many have done so since, thanks to the activities of the Machinery Section of the Food Production Department. A 20h.p. "Titan" (Internat. Harvester Co.) was purchased at Rothamsted in May, 1919, this make being selected because it was known to be reliable on heavy land, and because no English firm was then in a position to guarantee delivery in a reasonable time. This machine has given satisfactory service; it has remained in good condition with only little expenditure on repairs. Its drawback is its weight, which is approximately 60 cwts., and which, of course, renders it unsuitable for spring cultivations. For the season 1921, the Austin Company have placed at our disposal one of their new tractors which is much lighter, weighing only 30 cwts., and it is satisfactory to record that this British machine is so far doing very good work.

The tractor has proved its value in four directions:—

I. RAPIDITY OF WORK.

On heavy loams such as ours it is essential that cultivations should be carried out quickly; they are entirely dependent on the weather, and unless done when the conditions allow, they have to be postponed or curtailed considerably. The tractor hastens cultivation; it moves at the rate of $3\frac{1}{2}$ miles per hour instead of $1\frac{1}{2}$ - $2\frac{1}{2}$ miles, the speed of horses; it ploughs 3 furrows at a time, and will go on working longer than horses. Our horse team takes up to a day and a-half to plough an acre; the tractor does it in 4 hours and

does it better, for it readily works to 7 inches while the horse teams usually go only to 5 inches. The value of this additional speed has been shown in the rate at which the sowing of wheat over the whole farm has been completed. In the old days of slow horse cultivations, sowings could not be completed in October or November, and there remained always fields to be sown in January or February, according as the weather allowed. Since the advent of the tractor, however, the work has been pushed well forward and the land has all been sown in November. The dates of completion of sowing are :—

	AUTUMN SEEDING TIME.	OATS.	WHEAT.
Horses only used .	1915	Oct. 16, 1915	Feb. 27, 1916
„ „ .	1916	„ 17, 1916	Mar. 16, 1917
„ „ .	1917	„ 27, 1917	Jan. 26, 1918
Tractor used .	1918	„ 5, 1918	Nov. 26, 1918
„ „ .	1919	„ 4, 1919	Oct. 30, 1919
„ „ .	1920	„ 14, 1920	Nov. 11, 1920

Many of our experiments show the vital necessity on this land of sowing at the proper time; the following is an example :—

Wheat sown in time (Nov. 24th, 1915) 26 $\frac{3}{4}$ bushels
 „ „ sown late (Feb. 17th, 1916) ... 19 $\frac{1}{4}$ bushels

II. CLEANING STUBBLES IN AUTUMN.

In the autumn of 1919 the arable fields were very weedy, as usual over wide tracts of England where cultivation had perforce been neglected for three years. Summer fallowing during 1920 would, of course, have been effective, but it was too costly; instead, therefore, the tractor was liberally used for cultivating the stubbles during harvest, and much cleaning was done during August, September and October. The effect was very striking. The weed seeds germinated in the warm moist land; the seedlings being very susceptible to injury were easily killed by cultivations; and as the cultivation was carried out before instead of after sowing the crop, it was entirely beneficial and did no damage. In consequence, the land which had been foul in 1919 became tolerably clean in 1920 in spite of the fact that a second winter corn crop was sown. The autumn cleaning was repeated in 1920 and a third corn crop sown; at the time of writing this remains free from troublesome weeds.

The advantage of this method is to give us much more latitude in cropping than we had before. Under the old horse cultivation it was imperative to grow a root crop once in 5 or 6 years to keep down weeds, and we were always rather beaten in the struggle; under the present method we can apparently grow any crops we please, unless a prolonged wet autumn should set in. This is illustrated by the Great Harpenden Field where the crops and yields per acre have been :—