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*Sugar  
Beets  
Cost of  
production*

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**UNIVERSITY OF NOTTINGHAM  
SCHOOL OF AGRICULTURE**



PROFITABILITY OF SUGAR BEET PRODUCTION IN LINDSEY IN

1951

**DEPARTMENT OF AGRICULTURAL ECONOMICS  
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1951.

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April, 1952.



## PROFITABILITY OF SUGAR BEET PRODUCTION IN LINDSEY IN 1951

### INTRODUCTION

Sugar beet was first grown in this country just before the 1914-18 war. In the early years the acreage did not expand at all rapidly but this gradually changed and just prior to the Second World War the value of the sugar beet output at £5.1 million constitutes 11 per cent of the output of all farm crops. In fact the value of the sugar beet crop was almost as great as that of the barley crop at £5.6 million. During the war, however, the output of sugar beet did not increase as much as that of all farm crops and by 1945-46 it only constituted 10 per cent of the latter.

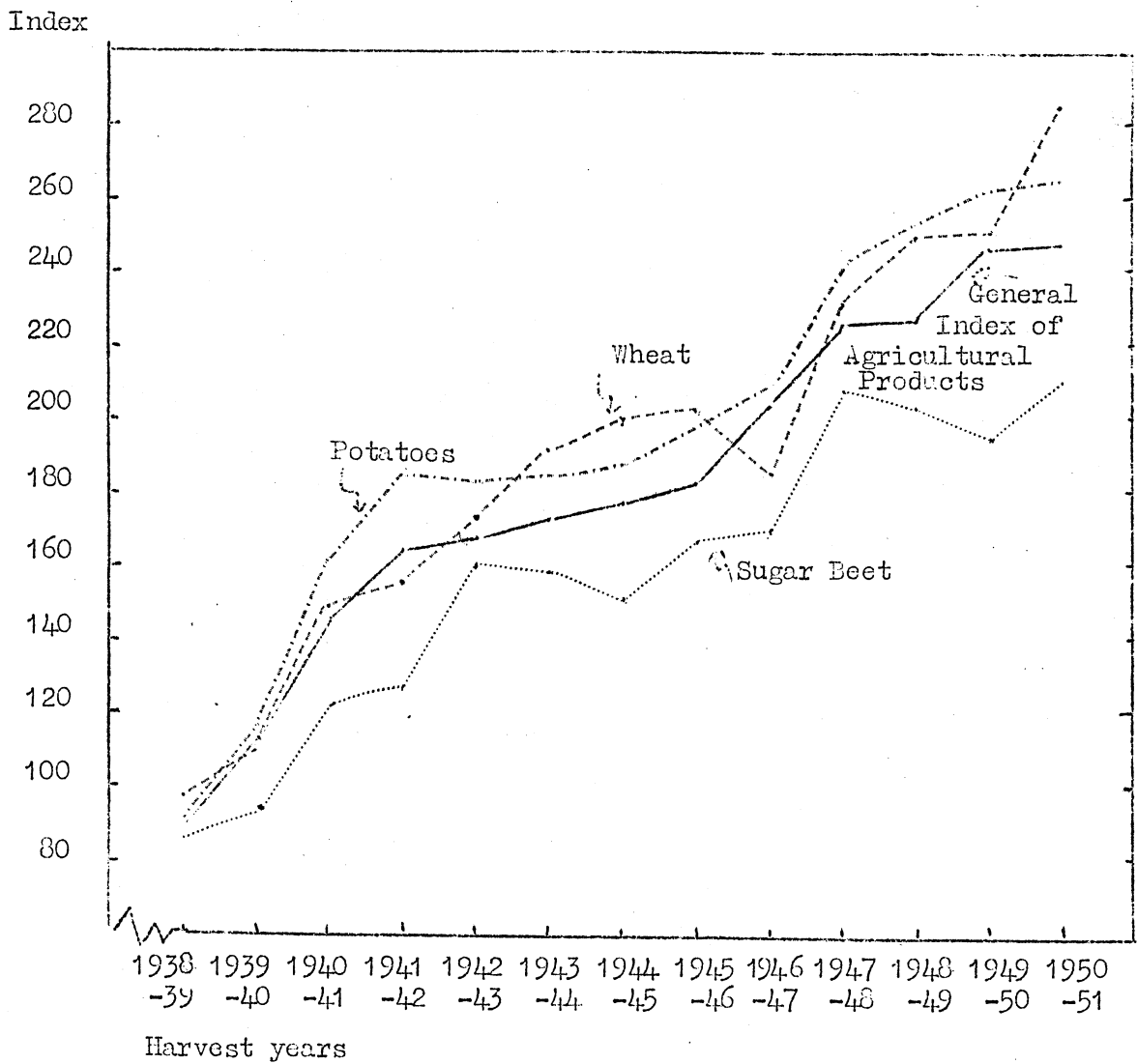
More than two fifths of all the sugar beet grown in the East Midlands Province<sup>(1)</sup> is to be found in Lindsey, where the crop has become quite important. The 32,217 acres grown in 1951 was the fourth largest acreage of the crop ever grown in the county, and constituted 6.5 per cent of the total tillage acreage. In the same year, however, the potato acreage was 57,759 acres, or 11.7 per cent of the total tillage acreage, so that sugar beet was not as important a crop as potatoes.

Sugar beet has declined in importance relative to potatoes in Lindsey during and since the war. Between 1939 and 1951 the sugar beet acreage increased from 25,349 to 32,217 acres, or by 27 per cent. During the same years the potato acreage increased from 40,075 to 57,759 acres, or by 44 per cent. This smaller increase in the sugar beet acreage can be partly attributed to relatively less favourable prices for sugar beet compared with potatoes. Since 1938-39 potato prices have been continuously above those for sugar beet when both sets of prices are compared with those for the years 1927-28 to 1929-30. (Figure 1).

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(1) Comprises the counties of Derbyshire, Leicestershire, Lincolnshire (Kesteven and Lindsey), Nottinghamshire and Rutland.

Fig. 1. INDEX NUMBERS OF PRICES OF AGRICULTURAL PRODUCTS IN ENGLAND AND WALES. 1927-28 to 1929-30 = 100.



But the price position for sugar beet was not sufficiently unfavourable to prevent an expansion of the acreage devoted to the crop in Lindsey and although there was a slight decline in the following year in 1950 the acreage in the county was the largest ever grown. A contributory cause for the smaller increase in the sugar beet acreage may have been the limitation of factory capacity, except in so far as this could be expanded by lengthening the campaign.

### COSTS AND RETURNS

One reason for the expansion of the sugar beet acreage in Lindsey between the wars was the setting up by the British Sugar Corporation Ltd. of a factory at Brigg in 1928. This factory now makes over 1,900 contracts annually with farmers to grow some 18,000 acres of sugar beet. During 1951 an investigation was carried out into the costs of and returns from growing sugar beet on 33 farms supplying this factory. The farms concerned were within boundaries set by the Humber on the north, the Trent on the west, Gainsborough on the south and Brigg on the east.

A few of the farmers who co-operated only provided information for part of their acreage, but most of them gave data for the whole of their sugar beet crop. Of the latter group, some chose to treat their whole acreage as one "field", while others preferred to consider each field separately. Consequently 37 records were obtained from the 33 farmers, relating to 358 acres of sugar beet. The individual records related to acreages which varied from one and a half to 30 acres, the average size being 9.7 acres. This compares very closely with the average size of contract made by the Brigg factory in the same year, which at 9.6 acres was slightly smaller than in the three previous years.

The total costs<sup>(1)</sup> incurred in growing the 358 acres amounted to £18,392.14s. 1d. and the total returns to £23,212. 4s. 2d. Expressed on a per acre basis the costs amounted to £51. 8s. 3d. and the returns to £64.17s. 8d. (Table 1) On the basis of the average yield of 11.33 tons

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(1) The items included in "total costs" are indicated in Table 1.

COSTS AND RETURNS FROM GROWING SUGAR BEET ON 358 ACRES IN  
LINDSEY, 1951

TABLE 1

	Per Acre	
	£. s. d.	Per Cent
Cost of work:		
Manual labour	19. 5. 5.	37.5
Horse labour	12. 5.	1.2
Tractor labour	4. 3. 1.	8.1
Contract machine labour(1)	6. 6. 5.	12.3
Total cost of work	30. 7. 4.	59.1
Other costs:		
Rent	1.14. 9	3.4
Seed	1. 4. 0.	2.3
Manures (net)(2)	8.14. 4.	17.0
Miscellaneous costs	3.	-
Machinery depreciation and repairs	4. 5. 3.	8.3
Overheads	5. 2. 4.	9.9
Total other costs	21. 0.11.	40.9
Total costs	51. 8. 3.	100.0
Total returns	64.17. 8.	
Number of records	37	
Acres per record	9.67	
Average yield of clean beet per acre (tons)	11.3	
Cost per ton	£4.10. 9.	
Return per ton	£5.14. 6.	

- (1) Includes haulage of beet to factory (£5. 7s.11d. per acre)  
(2) Includes lime, farmyard manure and manurial residues.

of clean beet per acre, the costs and returns per ton were respectively £4.10s. 9d. and £5.14s. 6d.

The total cost of performing the work on sugar beet amounted to £30. 7s. 4d. or 59 per cent of all costs. The cost of manual labour amounted to almost two thirds of the total work cost and that of contract machine labour to over one fifth. The latter, however, is very largely composed of the cost of hauling the beet to the factory, which at £5. 7s.11d. per acre is more than one tenth of the total cost incurred in growing and selling sugar beet.

Of the other cost items, the most important individual one is the net charge for manures, which at £8.14s. 4d. per acre constitutes one sixth of all costs. Overheads and machinery depreciation and repairs were the only other important cost items. Both these, however, were determined in a completely arbitrary manner. (See Appendix 1). Compared with the other expenses, both rent and seed were of little importance.

Gross returns are dependent almost entirely on the yield. The only other factor which can influence them is the sugar content of the beet, but compared with the yield per acre this is of little importance. The average yield for the records obtained from the 33 farms investigated was 11.33 tons per acre, which is only slightly lower than the average yield of 11.51 tons obtained for the total acreage contracted for at Brigg. This was the third highest average yield ever obtained for beet supplied to Brigg, only being surpassed by those of 12.56 and 12.57 tons obtained in 1949 and 1950 respectively. Further, the average sugar percentage at Brigg of 16.58 per cent was the highest obtained there since 1947, when the all time record for that factory of 19.0 per cent was achieved. It can thus be said that 1951 was quite a good year for sugar beet in Lindsey and this was shown by gross returns of £64.17s. 8d. which left a margin over costs of £13. 9s. 5d. per acre.

#### VARIATIONS IN MARGINS

To state that the average margin was £13. 9s. 5d. per acre is to hide a very great deal of variation within the sample. Thus individual margins varied from a profit



of £40.12s.11d. to a loss of £17.10s. 2d. per acre, or a range of more than £58. These extreme results, however, were rather exceptional and in order to obtain a clearer picture of the range in margins the records were grouped as follows:-

<u>Margin per acre</u>	<u>Number of records</u>
£25 and over	5
£15 to £24	10
£5 to £14	9
£0 to £4	7
Loss	6
Total	<u>37</u>

Thus one third of the records show that either a loss was suffered or else only a very small surplus was obtained.

In order to try and determine the causes responsible for this great variation in margins comparison was made of the four records showing the greatest surplus with the four showing the largest loss (Table 2). One of the most noticeable features was that total costs were practically the same for both these groups and for the whole sample. Total operational costs were much higher in the least profitable group, £26. 9s. 8d. compared with £22.14s. 3d. per acre but when the cost of haulage is included the total cost of work shows much less variation between the two groups. This was because of the much higher charge for haulage in the most profitable group, due almost entirely to the larger yield.

The charge for rent and the cost of seed were both lower in the least profitable group, but that for manures was somewhat higher. As the yield was very much lower in the least profitable group there would appear to be little relationship between the amount of manuring as

COMPARISON OF THE FOUR MOST AND FOUR LEAST PROFITABLE RECORDS  
WITH ALL RECORDS - LINDSEY SUGAR BEET INVESTIGATION, 1951.

TABLE 2

	All records	Four most profitable	Four least profitable
Number of acres	358	65½	26
Cost of work (per acre)	£. s. d.	£. s. d.	£. s. d.
Manual labour	19. 5. 5.	17.14.10.	20.18. 4.
Horse labour	12. 5.	3. 8.	16. 5.
Tractor labour	4. 3. 1.	4. 2. 0.	4.12. 1.
Contract machine labour	18. 6.	13. 9.	2.10.
Total operational cost	24.19. 5.	22.14. 3.	26. 9. 8.
Haulage to factory	5. 7.11.	8. 1.10.	3. 5. 4.
Total cost of work	30. 7. 4.	30.16. 1.	29.15. 0.
Other costs (per acre)			
Rent	1.14. 9.	1.17. 7.	1. 0. 5.
Seed	1. 4. 0.	1. 8. 9.	1. 1. 9.
Manures (net)(1)	8.14. 4.	8. 5. 2.	9. 9. 2.
Miscellaneous	3.	7.	-
Machinery depreciation and repairs	4. 5. 3.	4. 9.11.	4.19.11.
Overheads	5. 2. 4.	4.14. 6.	5.10. 4.
Total other costs	21. 0.11.	20.16. 6.	22. 1. 7.
Total costs	51. 8. 3.	51.12. 7.	51.16. 7.
Total returns	64.17. 8.	84.17.10.	36.11. 3.
Margin	13. 9. 5.	33. 5. 3.	-15. 5. 4.
Yield of clean beet (tons)	11.3	14.8	6.5
	£. s. d.	£. s. d.	£. s. d.
Cost per ton	4.10. 9.	3. 9. 9.	8. 0. 8.
Return per ton	5.14. 6.	5.14. 9.	5.11. 4.
Margin per ton	1. 3. 9.	2. 5. 0.	-2. 9. 4.

(1) Includes lime, farmyard manure and manurial residues.

measured by cost and the yield. The most important fact brought out by the comparison is the dominating influence of yield in determining profits, since with costs the same in both groups the difference in profits can only be due to the difference in yields and therefore in gross returns.

EFFECT OF YIELD ON MARGIN

In order to study this factor further the records were arrayed in order of yield and then grouped together within certain yield ranges. (Table 3).

EFFECT OF YIELD ON COSTS, RETURNS AND MARGINS - LINDSEY  
SUGAR BEET INVESTIGATION, 1951.

TABLE 3

Range of yield	Number of records	Number of acres	Average yield (tons)	Total costs		Total returns		Margin				
				£.	s.	d.	£.	s.	d.	£.	s.	d.
Under 8 tons	7	65	6.8	42.	14.	2	39.	1.	11.	-3.	12.	3
8 tons and under 10½ tons	8	57½	9.0	46.	13.	8	50.	19.	7	4.	5.	11.
10½ tons and under 13 tons	11	97	11.5	53.	4.	8	65.	14.	6	12.	9.	10
13 tons and over	11	138½	14.3	56.	3.	10	82.	4.	0	26.	0.	2

As the yield increased so did the total costs and total returns per acre. But since costs only increased from £42.14s. 2d. in the lowest yield group to £56. 3s.10d. in the highest whilst returns increased from £39. 1s.11d. to £82. 4s. 0d. the margin increased tremendously as the yield increased (Figure 2). Further, whilst costs per acre increased as the yield increased costs per ton fell rapidly. (Figure 3). As would be expected, returns per ton were practically the same for each yield group.

Fig. 2. MARGIN PER ACRE. LINDSEY SUGAR BEET INVESTIGATION 1951.

Margin  
per acre  
£.

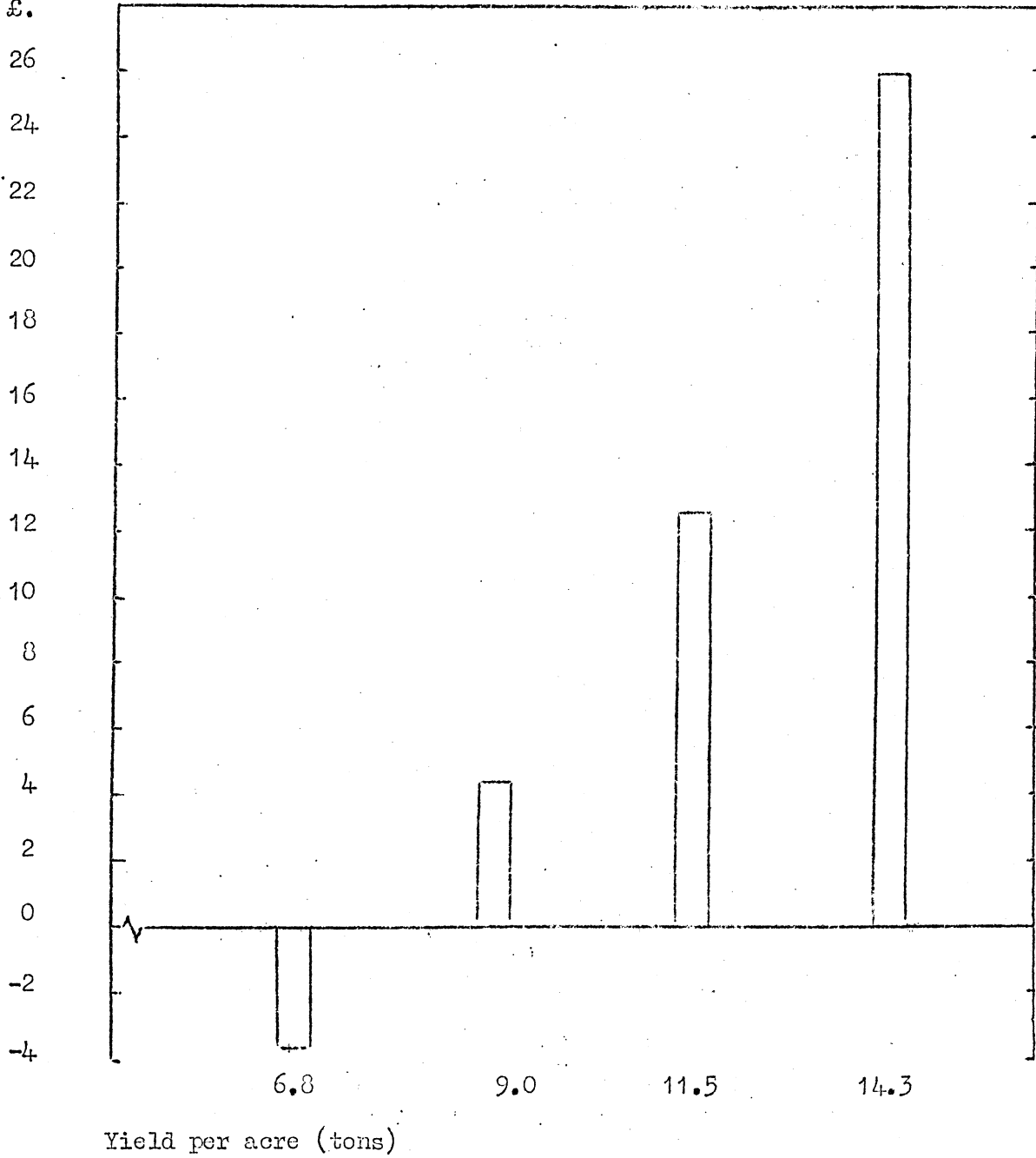
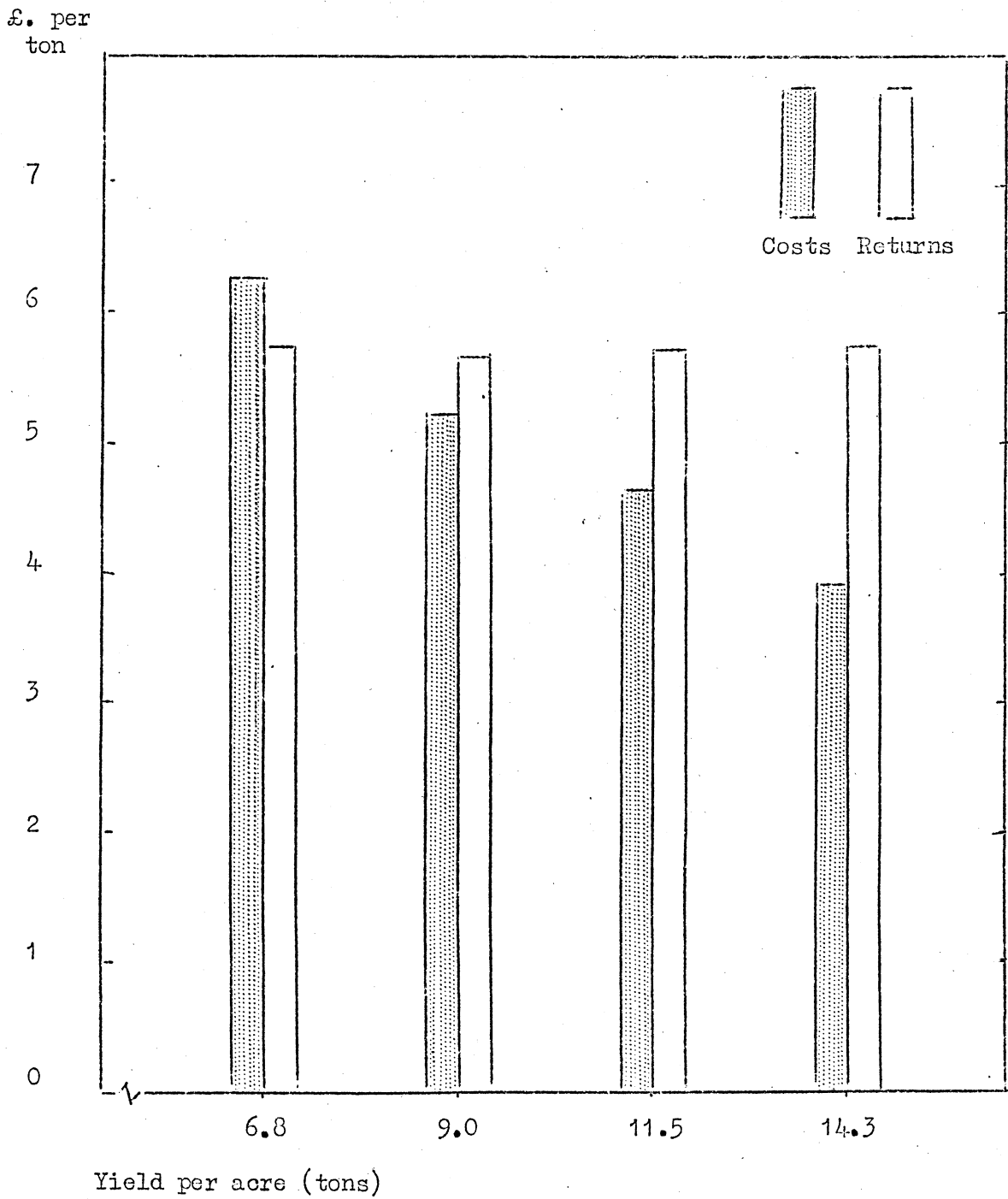


Fig. 3. COSTS AND RETURNS PER TON. LINDSEY SUGAR BEET INVESTIGATION  
1951.





CAUSES OF VARIATION IN YIELDS

A great many factors affect the yield of sugar beet. Amongst the more important, the following may be mentioned:- type of seed, time of sowing, singling and lifting, skilful application of manures, incidence of virus yellows, damage by pests and the presence of weeds, the plant population, efficiency of topping and the soil type. With only 37 records and so many different factors to take into account it was impossible to determine the causes of individual high or low yields. It was observed, however, that the four records with the highest margins were all obtained from limestone soils, whereas three of the four records with the largest losses were obtained from sand land. The 33 records which were not obtained from fields with mixed soils were consequently sorted according to the type of soil from which they were derived. (Table 4). With few records in some of the groups, nothing much can be said about the results except that, as far as 1951 alone is concerned, yields on sand land were not as good as on other soil types. Since, of the 12 records obtained from

YIELD OBTAINED ON DIFFERENT TYPES OF SOILS - LINDSEY SUGAR BEET INVESTIGATION, 1951.

TABLE 4

Soil Type	Number of records	Total number of acres	Average yield per acre (tons)
Sand	12	108 $\frac{1}{2}$	8.9
Loam	5	28	9.9
Limestone	12	145 $\frac{1}{2}$	12.0
Warp	4	42 $\frac{1}{2}$	11.4
Total	33	324 $\frac{1}{2}$	-

sand land four showed losses, it would seem that in 1951 at any rate growing sugar beet on sand was inclined to be a risky undertaking. But type of soil is only one of the factors affecting yield, and not one of the most important at that, so that the low yields obtained from sand may

have been due to other causes and not to the type of soil at all.

### CONCLUSION

Measured by the net return or margin per acre of £13. 9s. 5d. sugar beet was not an unprofitable crop on the farms from which information was obtained in Lindsey in 1951. When considered in connection with the costs incurred of £51. 8s. 3d., however, this only represented a net return of 26 per cent on net costs, which is low in comparison with the net return of 38 per cent on net costs obtained from potatoes in 1950 with a margin per acre of £23. 2s. 0d. (1)

Expressed on a unit basis costs were £4.10s. 9d. and returns £5.14s. 6d. per ton, giving a margin of £1. 3s. 9d. Great variation existed, however, and the margin for the four least profitable records was minus £2. 9s. 4d. per ton whereas that for the four most profitable was plus £2. 5s. 0d. Per acre these figures represent respectively a loss of £15. 5s. 4d. and a profit of £33. 5s. 3d.

Differences in yield were obviously the most important cause of variations in margins, either per acre or per ton. The relationship between yield and profit was impressive, since with some individual exceptions profit increased directly as yield increased. Many factors account for variations in yield but because of the smallness of the sample the importance of individual factors cannot be measured with any confidence. It was found, however, that in 1951 at least, yields were lower on sand than on other types of soil.

Compared with yield, costs were of comparatively little importance in affecting profitability. It was found that the costs for the four most and four least profitable records and for all records were almost the same. High yields caused an increase in costs per acre, due in part to the increased costs involved in handling a larger crop - but a rapid fall in per ton costs. But the higher per acre costs associated with a high yield were amply covered by the improved returns obtained.

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(1) "Potato Growing in Kesteven. Some Costs and Returns in 1950", F.R. No. 112. Department of Agricultural Economics, University of Nottingham, School of Agriculture. September, 1951.

The investigation shows that few farmers can expect to grow sugar beet for less than £40 per acre, and in most instances the cost will probably be nearer £45. At a price of £5. 8s. 8d. per ton an 8 ton crop would just break even on a per acre cost of £40, while if costs were as much as £45 a 9 ton crop would be needed to cover costs.

This study suggests that the cash profit from sugar beet production is very closely related to the yield a farmer gets over and above about 8 to 9 tons per acre. There are probably some conditions where a farmer may continue to produce sugar beet while achieving a yield of less than 8 tons per acre. He may be able to make some saving by growing large acreages. He may be content to accept a very modest direct return from sugar beet because of the importance of the crop in his rotation and in the maintenance of the fertility and cleanliness of his land. He may also be able to make good use of the sugar beet pulp to which he is entitled. It is certain that while the farmer is naturally concerned about the direct return from each crop and enterprise, he must ultimately assess each on the basis of its contribution to the economy of the whole farm.

APPENDIX: I

STANDARD CHARGES USED AND PROCEDURES ADOPTED IN THIS INVESTIGATION

LABOUR

The charges for labour were as follows, unless the farmer paid more than the standard rate, when the full amount was charged:-

<u>Per hour</u>	<u>To 21.10.51.</u>	<u>From 22.10.51.</u>
	s. d.	s. d.
Men	2. 6.	2. 8 $\frac{1}{2}$ .
Women	2. 0.	2. 1 $\frac{1}{2}$ .
Youths	1. 8.	1. 9 $\frac{3}{4}$ .
		s. d.
Wheel tractor		4. 0.
Tracklaying tractor		5. 6.
Lorry		4. 6.
Horse		1. 4.

Contract work was taken at cost.

MANURES

Artificial fertilisers were taken at cost and farmyard manure was charged at 10s.0d. per ton. Lime was charged at cost, less the subsidy.

MANURIAL RESIDUES

The residual debit or credit was reached by deducting any residues chargeable from previous crops from the sum of residues to be credited to the present crop.

The residual value of artificial fertilisers was calculated according to the tables in "Residual Values of Fertilisers and Feeding Stuffs", Advisory Leaflet No. 20. Department of Agriculture for Scotland. No manurial residues were allowed to farmyard manure.

Where sugar beet tops were ploughed in or folded - the sugar beet was credited with 3s.0d. per ton of dirty beet carted off.

The charge for lime was spread equally over four years.

#### MACHINERY DEPRECIATION AND REPAIRS

Mechanical harvesters were depreciated at a rate of 28,125 per cent per annum on the diminishing value. In addition a charge was made for repairs.

A charge of 2s.6d. per hour of tractor work and 7½d. per hour of horse work was made in order to cover depreciation of and repairs to all other machinery.

#### OVERHEADS

- (i) Hedging and ditching - information was obtained on the actual expenditure incurred on each field in the sample and the average cost per acre calculated for the entire sample. This average cost was then applied to each record.
- (ii) All other overheads were calculated for each record on the basis of 5s.0d. for each £ of direct manual labour.

A.W.A.



