Sugar beets — Cost of production

University of Cambridge School of Agriculture

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ECONOMICS OF PRODUCING SUGAR BEET, 1957

by

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Economics of Producing Sugar Beet, 1957.

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I. INTRODUCTION: THE 1957 SEASON & SURVEY

The average yield of sugar beet in 1957 was 11.2 tons an acre - slightly below the five-year (1952-6) average of 11.5 tons, yet the fifth highest yield ever recorded. In view of the experiences of many Eastern Counties' growers this result was surprising, for they had known their worst year since the disastrous season of 1947, when the national average was only 7.6 tons an acre.

There were three main reasons for this:

Firstly, the mild winter of 1956/7, with its absence of severe frosts, failed to produce a natural tilth. As a result, seedbeds had to be made by mechanical means - many more cultivations were required and even so the tilth was not to be compared with that produced by frost action. Farmers on heavy land were naturally the chief sufferers in this respect.

Secondly, a prolonged spring drought made germination slow and patchy. The drought lasted into July in some central and southern areas of the Eastern Counties. The effect was worsened by the loss of surface moisture that had already occurred through the excessive number of cultivations. As it happened, those who drilled on rougher but still moist seedbeds fared better than those who strove after a finer tilth. Acres of beet as well as other spring-sown crops were ploughed up in the vicinity of North Essex. Heavy rainfall from July onwards, however, helped the crops to recover considerably later in the season.

Thirdly, 1957 was the worst season for virus yellows for nearly ten years. Many crops were sprayed, but mainly too late. Early spraying as a routine measure to combat this disease was practised only on a very few farms. The national average sugar content, 15.28%, was the lowest since 1949.

The survey the results of which are presented in this report, covered 100 farms in the Eastern Counties. One-third were on heavy or medium-heavy land in North Essex and South-West Suffolk, one-third on light land in South Cambridgeshire and West Norfolk, and one-third on fen and silt soils in the Isle of Ely and the Holland division of Lincolnshire. In the Isle of Ely, beet covered 19% of the arable acreage, in West Norfolk 13% and in the other three areas 11%. Usually only one field was chosen, at random, for detailed investigation, but sometimes all fields were taken together.

In all areas, one-third of the farms were small, one-third of medium size, and one-third large. In the fen and silt areas the size groups were 20-50 acres, 80-150 acres, and over 200 acres. In the remaining areas they were 40-99, 100-299, and 300 acres and over.

II. YIELDS

Table I shows for each area the frequency distribution of yields of clean beet, the average yield and "normal" yield. The latter is the rounded average yield for the previous five years on the farms surveyed. In addition the table gives tare and sugar content figures.

The Essex-Suffolk and South Cambs. areas suffered most from the factors described above. On the heavy lands of North Essex the acreage sown was substantially reduced owing to the difficulty of getting a sufficiently fine tilth. Much of the beet were drilled not where originally planned but on the "kindest" fields - particularly old meadowland. In this area 6% of the beet acreage was ploughed up; in South Cambs., 3%. The yields given in the table refer to the acreage drilled, not the acreage harvested.

West Norfolk is a district of mainly light land and its farms had the benefit of some spring showers. In addition, virus yellows were less severe or widespread in this area. As a result, crops were near average on most farms, and the

Table I: Yields, Tare & Sugar Content

Yield of Clean Beet	N. Essex & S. W. Suffolk (Heavy Soil)	South Cambs. (Light Soil)	West Norfolk (Light Soil)	Holland (Silt & Fen Soils)	Isle of Ely (Silt & Fen Soils)
Over 15 tons	-	-	-	1	5
12.5-14.9 "	-	-	4	10	5
10.0-12.4 "	3	4	7	3	7
7.5-9.9 "	12	6	6	1	2
5.0-7.4 "	12	2	1	-	-
Below 5 "	6	3	-	-	-
Average	7.2	7.5	10.5	13.2	12.8
"Normal"	12.5	11.0	10.5	15.5	15.0
Average Tare (lbs. p. cwt.)	20	20	16	19	17
Average Sugar Content (%)	15.2	14.6	15.8	14.5	13.6
No. of farms	33	15	18	15	19

sugar content, although still low, was substantially higher than in the other districts.

Yields on the fen and silts were two or three tons an acre below normal but were nevertheless high compared even with normal crops elsewhere.

Dirt tare figures were high everywhere. More than 10% of the crops had an average total tare figure of 28 lbs. or more: over a quarter of the total weight of unwashed beet sent to the factory. The tendency of the roots to be comparatively small and fangy was the main reason for this; on balance, harvesting conditions were about average.

III. COSTS

In total, costs varied from £57. 7s. an acre in West Norfolk to £67. 12s. in Holland. Details are given in Table II. Very broadly, manures and manuring (after allowing for residues) cost £12 to £14, seed £1, tractor cultivations (including hoeing) £7 to £9, hand hoeing £8 to £11, harvesting (including carting and clamping) £11 to £15, transport £5 to £6, and rent £2 to £6. In addition, £8 has been allowed for general farm overheads.

Harvesting and transport costs would have been higher in all areas except West Norfolk had yields been nearer their normal level. Hoeing costs, too, would have been slightly higher in the Essex/Suffolk and South Cambs. groups if some fields had not been partly ploughed up. Allowing for such changes, total costs in the five areas would have been approximately: N. Essex and S. W. Suffolk £69. 10s., South Cambs. £65, West Norfolk £57. 10s., Holland £69, Isle of Ely £64. 10s. Details of the main changes caused in individual items of cost in the four areas affected are shown in Table III.

The main factors leading to differences in the level of beet costs between areas are:

(a) Weather conditions in the spring and at hoeing and harvesting times.
(b) The type of soil, which affects the costs of cultivations, hand hoeing and harvesting. The anticipated response will also largely govern fertiliser expenditure. In addition, the better soils obviously command higher rents.

Table II: Sugar Beet Costs, 1957.

Item	N. Essex & S. W. Suffolk	South Cambs.	West Norfolk	Holland	Isle of Ely
	£ s	£ s	£ s	£ s	£ s
Farmyard Manure	1 13	2 19	2 6	1 3	1 8
Applying Farmyard Manure	1 13	2 13	1 10	16	1 13
Kainit or Salt	-	1 14	1 10	-	3
Applying Kainit or Salt	-	8	7	-	1
Fertiliser	12 0	9 19	8 18	10 1	8 0
Applying Fertiliser	16	13	13	17	11
MANURES & MANURING	16 2	18 6	15 4	12 17	11 16
Stubble Cultivations	4	7	12	5	2
Ploughing	1 10	1 9	1 15	2 8	1 18
Seedbed Cultivations	2 0	1 7	1 6	1 11	2 7
Seed	1 3	18	1 2	1 3	1 5
Drilling	15	14	13	15	13
Rolling	6	3	6	6	7
Chopping out & Singling	7 0	5 7	5 3	6 12	5 18
Second Hoeing	3 10	3 2	2 16	3 9	2 6
Tractor/Horse Hoeing	2 7	2 2	2 1	2 17	2 6
Additional Hand Hoeing	4	7	1	11	13
Spraying	6	1 4	5	15	1 19
CULTIVATIONS, SEED & HOEING	19 5	17 0	16 0	20 12	19 14
Lifting, Knocking & Topping.	9 0	6 3	8 15	8 10	5 8
Carting Off	5 5	4 9	4 14	4 10	4 14
Loading	13	1 1	6	1 2	1 3
HARVESTING	14 18	11 13	13 15	14 2	11 5
Transport	4 4	6 4	5 15	6 4	5 17
Rent	2 15	2 8	1 14	6 3	6 13
Overheads	8 0	8 0	8 0	8 0	8 0
CASH COSTS	65 4	63 11	60 8	67 18	63 5
Residues brought forward (+)	1 15	1 15	1 6	3 0	3 8
Residues carried forward (-)	4 7	5 10	4 7	3 6	3 10
GROSS COSTS	62 12	59 16	57 7	67 12	63 3

Table III: Costs Adjusted for "Normal" Yields

Item	N. Essex – S. W. Suffolk	South Cambs.	Holland	Isle of Ely
	£ s	£ s	£ s	£ s
Hand Hoeing	11 2	9 8	)	)
Tractor Hoeing	2 9	2 5	) No change	) No change
Lifting, Knocking & Topping	9 18	6 15	)	)
Carting off	7 17	6 0	5 1	5 6
Loading	1 3	1 11	1 6	1 7
Transport	6 16	7 18	7 0	6 9
Gross Costs	69 14	64 18	69 3	64 11

(c) Distance from the factory, which largely determines transport costs. A difference of 10 to 15 miles will cause contractors' charges to vary by about 7s. 6d. a ton. This is equivalent to £5 an acre for a 13 ton crop of unwashed beet.

(d) Yields, which affect harvesting and transport costs.

Different combinations of these factors gave three different levels of cost amongst the areas covered:

(i) Low: about £60 an acre. This level is found in West Norfolk, where the soil is light and the factory close to a large part of the area covered by this survey. Piece-work rates are moderate, rents are low, and really high yields are rare.

(ii) Medium: about £65 an acre. South Cambs. and the Isle of Ely are at this level. In the former area the soil is more mixed than in West Norfolk and beet growers there strive to obtain higher yields. More fertiliser is applied and piece-work rates are higher. The factory is some distance away. In the Isle of Ely, fertiliser expenditure is lower because sugar beet often follows a heavily manured potato crop. The easily worked soil keeps down hoeing and harvesting costs and the factory is nearby. On the other hand rents are high and a drainage rate averaging 33s. an acre has to be paid.

(iii) High: about £70 an acre. This level applies to N. Essex S. W. Suffolk and Holland. In the former area, the heavy land causes piece-work rates and harvesting costs to be high. Expenditure on fertilisers also is comparatively heavy. In Holland, piece-work rates, harvesting costs and rents are high, and the drainage rate averages £1 an acre.

Range in Costs

Even within areas, costs vary widely. There are many reasons for this, of which the most important are:
(a) differences in yield, (b) distance from the factory, (c) whether or not farmyard manure is applied to the crop and (d) whether harvesting is by hand or by machine. The first two points have already been referred to above. The other two are discussed below.

The frequency distribution of costs in each district is given in Table IV.

Farmyard Manure Costs

Where farmyard manure is applied to the beet crop, half its value and the cost of applying it is carried forward to succeeding crops. Similarly, a propor-

Table IV: Range in Costs (no. of fields)

Cost per acre	N. Essex & S. W. Suffolk	South Cambs.	West Norfolk	Holland	Isle of Ely
Less than £45	-	-	1	-	-
£45-49. 19s.	4	2	2	-	1
£50-54. 19s.	3	2	2	-	2
£55-59. 19s.	3	3	5	2	6
£60-64. 19s.	6	7	8	5	2
£65-69. 19s.	11	-	-	5	3
£70-74. 19s.	5	-	-	2	3
£75 & over	1	1	-	1	2

forward to the current beet crop. Nevertheless, the net cost of farmyard manure varies widely from farm to farm. It ranges from zero on fields where none has been applied for the past four years up to £8 or £9 on fields receiving a heavy dressing on the beet crop or a very heavy dressing the previous year.

The following table shows the frequency distribution of farmyard manure costs net of residues in each district, and the percentage of the costed beet fields and of the total beet acreage on the surveyed farms which were farmyard manured.

Table VA: Net Farmyard Manure Costs (no.of fields)

Net F. Y. M. Cost	N. Essex & S. W. Suffolk	South Cambs.	West Norfolk	Holland	Isle of Ely
Nil	18	4	7	5	8
0-£2. 9s.	3	4	2	4	4
£2. 10s. -£4. 19s.	4	1	6	1	1
£5. -£7. 9s.	3	4	3	2	4
£7. 10s. -£10. 0s.	5	2	-	3	2
Average	£2. 9s.	£3. 13s.	£2. 8s.	£2. 17s.	£2. 16s.

Table VB: Proportion of Costed Fields & Total Beet Acreage Farmyard Manured

Costed Fields (%)	20	42	38	13	21
Total Beet (%)	10	36	26	18	6

Farmyard manure costs are determined by the quantity applied and the method of application. Loading and spreading mechanically in one operation from yard to field may cost as little as 5s. a ton (about £3 an acre). When carried out in three separate operations, using hand methods entirely, it can cost as much as 30s. a ton (about £18 an acre).

The benefits of applying farmyard manure cannot be accurately assessed from a survey such as this, covering as it does a wide variety of farms with differing soils and management. Many factors disguise the effect of the manure, and much of the benefit may be felt only over a long period of time. The results from this survey were conflicting. Three groups showed an increase in yield from the application of farmyard manure, one actually showed a decrease, and one showed

no effect. Overall, the yield was about ½ ton an acre higher on the manured fields, but the difference was far from being statistically significant.

It may well be argued that when assessing farmyard manure costs on crops the value of the manure on a mixed farm can be ignored (the livestock should pay their way regardless of the manure produced). If this is done and, in addition, application costs are kept down to 10s. a ton, farmyard manure costs would be only £6 an acre for an average dressing. In a typical five-course shift, half this sum might be allocated to the root crop and the other half spread over three corn crops. On this reckoning, half a ton of beet would roughly cover the root crop's share of these costs even if a dressing of farmyard manure were given in each rotation.

Many farmers are not so much concerned with obtaining immediate benefits in yields from applying farmyard manure as with safeguarding the long-term value of the soil. Some argue that manure carting using hand methods merely utilises labour during otherwise slack periods, and the addition to total farm costs of this job is very small. There is some truth in this, but the object of efficient management of farm labour should be to keep such slack periods to a minimum.

Harvesting Costs

Another big influence on costs is the method of harvesting. In most cases, costs were lower where mechanical harvesters were used than where the job was done by hand. More than half the costed fields were harvested by a complete harvester. There were, however, large differences between districts and size-groups, as shown in Table VI.

Table VI: Method of Harvesting on Costed Fields (no. of fields)

	Farmer's Machine	Contractor's Machine	Spinner (Hand Topped)	Hand Knocking & Topping	Total
All Farms	45	10	16	29	100
Essex/Suffolk	10	1	15	7	33
S. Cambs.	13	-	-	2	15
W. Norfolk	-	-	1	17	18
Holland	7	7	-	1	15
Isle of Ely	15	2	-	2	19
Small Farms	9	5	8	10	32
Medium "	13	4	5	12	34
Large "	23	1	3	7	34

In South Cambs. the Isle of Ely and Holland, most fields were mechanically harvested. Hiring contractors was popular in the latter area. In West Suffolk, spinning out and topping by hand remains the most widespread method, while in North and West-Central Essex the number of mechanical harvesters has increased rapidly in recent years despite the heavy land. In West Norfolk, hand methods still prevail, due largely to the stony nature of the soil.

In Table VII, costs are shown for all areas and size-groups together. (Two fields mechanically harvested by small "two-part" machines are omitted). These overall averages, however, are biased in favour of hand harvesting by the inclusion of West Norfolk, which accounts for over half the hand harvested fields

and where costs are uncommonly low, owing to the light soil. For this reason figures are also shown excluding that district.

Table VII: Average Harvesting Costs (excluding carting)

Method of Harvesting	Farmer's Machine	Contractor's Machine	Spinner & Hand Topping	Hand Knocking & Topping
	£ s	£ s	£ s	£ s
All Districts	6 2	8 12	8 14	9 17
" " excl. W. Norfolk	do.	do.	8 15	11 5

Overall, with allowance for soil differences, the farmer-owned machines showed a saving of £4 or £5 an acre compared with hand methods. The spinner method, with hand topping, showed, as one might expect, an average cost between those of the completely mechanical and completely hand methods.

Apart from soil differences, however, these averages are of little significance because they conceal the effect of farm size. As Table VI showed, half the machines were on the large farms, where the acreage might be expected to justify the high initial cost, and less than a fifth on the small farms. Overall, two-thirds of the large farms had their own harvesters, but only two-sevenths of the small farms. The importance of this and other points are discussed in Part VII, where further details of costs of operating complete harvesters and spinners are given.

Factor Costs

Factor costs per acre are shown in Table VIII. Labour costs constitute a third of the total and net manures 17%. Differences between districts in labour and machinery costs are due primarily to differences in the proportion of beet mechanically harvested. The labour costs of mechanical harvesting averaged £1. 18s. an acre (excluding carting), compared with about £10 for hand harvest-

Table VIII: Factor Costs per acre

Factor	N. Essex & S. W. Suffolk	South Cambs.	West Norfolk	Holland	Isle of Ely
	£ s	£ s	£ s	£ s	£ s
Labour	23 17	18 7	22 11	21 4	18 14
Tractor	6 3	6 13	5 12	5 7	6 19
Horse	1	-	3	15	1
Net Manurial Value	11 1	10 17	9 13	10 18	9 9
Seed	1 3	18	1 2	1 3	1 5
Spraying Materials	4	15	2	4	1 4
Contract Services (excl. Transport)	1 4	10	18	4 18	1 7
Machinery depreciation & repairs	4 2	5 12	2 6	3 14	4 5
Transport: Contract	3 2	3 11	4 0	4 15	3 9
" : Own Lorry Expenses	1 0	2 4	1 6	11	1 17
Rent + Drainage Rate	2 15	2 8	1 14	6 3	6 13
Overheads	8 0	8 0	8 0	8 0	8 0
GROSS COSTS	62 12	59 15	57 7	67 12	63 3

ing, but machinery costs were more than £3 an acre higher in the former case.

Fertiliser and Seed Use

Details of fertiliser use are given in Table IX. Kainit or (more rarely) salt was applied in the autumn on most farms in the light land areas: South Cambs. and West Norfolk. Only four fields had no fertiliser put on the seedbed; three of these followed a heavily manured potato crop. Straight fertilisers were applied on only four fields. The compound fertilisers used were mainly concentrated, the most common dressing being 10 cwts. - rather less in West Norfolk. On some farms, extra nitrogen was applied with compounds on the seedbed. In three of the five districts, roughly half the fields were top dressed.

It is likely that the bulk of East Anglian farmers are applying fertiliser to the beet crop at close to optimum rates for "normal" seasons. Probably as many farmers over-manure as under-manure their beet; it is not uncommon to find 15 to 20 cwts. an acre applied. As we have seen, top dressing is still common practice, although experimental evidence has shown this to be uneconomic except where the tops are highly valued.

Details of seed use are given in Table X. Natural seed continued to predominate except in South Cambs. More rubbed seed was used on the large farms: 44%, as against 22% on the small farms.

Table IX: Fertiliser Use*

District	N. Essex & S. W. Suffolk	South Cambs.	West Norfolk	Holland	Isle of Ely
No. of Farms	33	15	18	15	19
No. who applied fertiliser to seedbed	33	15	17	14	17
Av. weight where applied⊕	9.7	9.0	7.4	9.8	8.8
" " overall	9.7	9.0	7.0	9.2	7.9
No. who applied extra nitrogen to seedbed	2	4	3	-	-
Av. weight where applied	3.0	2.2	3.0	-	-
" " overall	0.2	0.6	0.5	-	-
No. who applied Kainit or Salt	2	12	14	-	-
Av. weight where applied	3.5	5.8	4.9	-	-
" " overall	0.2	4.6	3.8	-	-
No. who Top Dressed (nitrog. fert.)	14	2	9	8	3
Av. weight where applied	2.5	2.7	1.5	2.2	2.0
" " overall	1.1	0.4	0.8	1.2	0.3

* Quantities in cwts. of fertiliser applied.

⊕ Straight fertilisers, where used, have been translated into the equivalent weight of compound fertiliser.

Table X: Seed Rates

District	Natural Seed		Rubbed Seed	
	No. of fields	Av. Rate (lbs.)	No. of fields	Av. Rate (lbs.)
Essex/Suffolk	24	13	9	8
South Cambs.	3½	12½	11½	6½
West Norfolk	16	12	2	7½
Holland	11	14½	4	6
Isle of Ely	13	14	6	7½

IV: PROFITS

1957 Results

In all areas except West Norfolk profits were well below normal, owing to low yields and low sugar content. In the Essex/Suffolk and South Cambs. groups, in fact, average losses of £16. 16s. and £13. 19s. an acre respectively were made even after allowing for the value of the tops. Only four fields in each of these areas showed a profit. In both the Isle of Ely and Holland a profit was obtained on average, but it was low compared with normal expectations for the beet crop in those areas.

In West Norfolk, three-fifths of the tops were fed as against less than a fifth in all other areas.

Table XI: Returns & Profit per acre

District	N. Essex & S. W. Suffolk	South Cambs.	West Norfolk	Holland	Isle of Ely
Cash Returns	43 10	43 14	65 16	76 4	68 19
Gross Cost	62 12	59 16	57 7	67 12	63 0
Cash Margin	- 19 2	- 16 2	+ 8 9	+ 8 12	+ 5 19
Value of Tops	2 6	2 3	5 14	3 13	3 17
Profit or Loss	- 16 16	- 13 19	+ 14 3	+ 12 5	+ 9 16

"Break-even" yields

The yields required to cover costs, assuming the national ten-year average sugar content of 16.0%, are shown in Table XII. Figures apply to 1958, and are given for three different cost levels: £60, £65 and £70 an acre, and for three different assumptions regarding tops: (a) value of tops ignored, (b) tops valued at 5s. a ton (manurial value), (c) tops valued at £1 a ton (feeding value, allowing for wastage).

With an average cost of £65 an acre, and a sugar content of 16.0%, 10¼ tons of washed beet are required for cash returns to cover gross costs, while 9¼ tons are required if the value of tops fed to stock is allowed for. This break-even yield varies by about ¾ ton for a £5 an acre difference in costs. Sugar content

Table XII: "Break-even" Yields (16.0% sugar content)

Level of Costs per acre	£60	£65	£70
(a) Value of Tops Ignored	$9\frac{1}{2}$	$10\frac{1}{4}$	11
(b) Tops at Manurial Value	$9\frac{1}{4}$	10	$10\frac{3}{4}$
(c) Tops at Feeding Value	$8\frac{1}{2}$	$9\frac{1}{4}$	$9\frac{3}{4}$

For 15.0% sugar content, add $\frac{1}{2}$ ton
For 17.0% " " deduct $\frac{1}{2}$ ton
For 14.0% " " add $1\frac{1}{4}$ tons
For 18.0% " " deduct $1\frac{1}{4}$ tons

also affects the profitable level of yields considerably: a variation of 2% in the sugar content makes a difference in value equivalent to nearly $1\frac{1}{4}$ tons an acre.

A reasonable profit for this crop, involving as it does much trouble, labour and expenditure, is not less than £15 an acre. In estimating the yields which give such a profit, allowance must be made for the rise in costs of harvesting (especially carting) and transport as yields increase. A reasonable figure to assume for this would be £1. 5s. an acre for every extra ton of clean beet.

Consequently, the yields in Table XVI must be increased by 3 tons an acre to give a profit of £15 an acre at 16.0% sugar content. Thus, at the £65 an acre cost level, $13\frac{1}{4}$ tons an acre are required for cash returns to produce such a profit, and $12\frac{1}{4}$ tons if tops are allowed for at feeding value.

If the national five-year average of $11\frac{1}{2}$ tons an acre at 16.0% sugar content were considered to vary from $10\frac{1}{2}$ tons on low cost (£60 an acre) farms to $12\frac{1}{2}$ tons on high cost (£70 an acre) farms, the average profit from the crop would appear to be £8 to £12 where tops are ploughed in and £15 to £20 where they are fed to stock. Obviously there are wide variations between areas, farms and seasons. Sometimes high costs will be combined with poor yields and sometimes the reverse.

Beet Production and Total Farm Profits

It must be emphasised, however, that even if enterprise costings show the beet crop on any particular farm to be showing an inadequate profit or even a loss, this does not necessarily mean that it would pay to replace it with another crop which costings on the same farm indicate to be more profitable. The reason is that even a moderate crop of sugar beet provides a substantial monetary contribution towards covering a farm's overhead costs, which will include much - possibly all - of the labour used on the crop.

If sugar beet is replaced by a less intensive crop, total farm profits will probably fall unless (a) labour costs can be substantially reduced or (b) other profitable work can be found for the labour saved. It is on the small family farm in particular that net farm income is most likely to fall if sugar beet is given up. Even if the return per labour-hour spent on sugar beet is low, it is at least earning more than if it were largely unemployed - as would be the case, for instance, if sugar beet were replaced by barley and no productive work could be found to occupy the $2\frac{1}{2}$-3 man-weeks per acre saved.

A partial budget, i.e. a list of gains and losses, would have to be drawn up in order to gauge the likely effect on total farm profits of changing from beet to some other crop. For a change to be worthwhile, the returns from the new crop plus the costs saved by no longer growing sugar beet would have to exceed the loss of revenue from sugar beet plus the additional costs of the new crop.

If sugar beet were no longer grown, the following ("variable") costs would be saved: fertiliser, seed, tractor fuel, tractor and implement repairs and contract operations (including transport in many cases). These amount to about £25 an acre. If labour costs could not be reduced, the remaining costs of £35-£45 per acre would all be "fixed" costs, i.e. they would still be incurred despite the change in cropping. Even if the return from beet had been only £65 a year, the return from the new crop would have to be at least £65 - £25 = £40 plus its own "variable" costs before the change increased farm profits.

In four situations, however, the profitability of replacing beet with another crop becomes more likely:-

(i) Where casual labour is used for hoeing and harvesting (in which case the "variable" (i.e. avoidable) costs increase to about £45 an acre).

(ii) Where the change would enable a reduction in the regular staff (representing a saving of about £450 a year per man saved).

(iii) Where sugar beet can be replaced by an equally, or more, intensive crop such as potatoes.

(iv) Where sugar beet is replaced by a less intensive crop but there is sufficient capital available to start up or expand a livestock enterprise which will absorb the labour saved.

V: LABOUR AND TRACTOR REQUIREMENTS

Table XIII gives details of labour requirements for the beet crop in each district, together with the overall average (with each district given equal weight). Labour-hours per acre averaged 120 on the small farms compared with 95 on the large. In the first two districts, the figures have been amended to allow for the part-fields which were ploughed up. With "normal" yields, the labour required for certain items would have been higher - as shown below the main table.

Of the "normalised" total of 118 hours per acre, hand hoeing (46) and harvesting, including carting, clamping and loading, (45), together account for just over 75%. Any efforts to reduce labour requirements for this crop must therefore be concentrated on these "peaks". The harvesting problem has already been successfully tackled, except where soils are excessively heavy or stony. Thus the harvesting figures for South Cambs., the Isle of Ely and Holland are far lower than for the other two areas, because most crops were harvested mechanically. In Essex/Suffolk mechanical harvesters were used only on a third of the fields, but spinners, which reduce substantially the time taken to lift and knock the beet, were common. In West Norfolk, where the soil is light but stony, the beet are still mainly hand harvested, but little knocking is necessary and work is comparatively rapid.

Average figures for the alternative methods of lifting, knocking and topping are given in Table XIV. The figures for complete harvesters include contractors' machines. In three out of five cases the machine was operated by the tractor-driver. The average rate of work was 5.5 hours per acre.

In the case of hand work, two sets of figures are given: (a) excludes West Norfolk and the Isle of Ely, where conditions permit rapid work. The 11 fields supplying these averages were mainly in Essex/Suffolk and the figures are excessively high. The work was often done by family labour working very carefully or by regular staff being paid day-rates. In addition, many of the lifters were 1-row types, some of them ex-horse-drawn implements requiring two men when pulled by a tractor. (b) shows figures for West Norfolk, where rapid two-row "squeezer" type lifters are used. Very few fields were hand harvested in the Isle of Ely.

Taking reasonable averages - 3 to 4 man-hours for lifting and 40 to 45 for

Table XIII: Labour Hours per acre

Item	N. Essex & S. W. Suffolk	South Cambs.	West Norfolk	Holland	Isle of Ely	All
Stubble Cultivations	.1	.5	1.3	.5	.2	.5
Farmyard Manure	3.9	7.6	4.3	2.9	5.4	4.8
Ploughing	3.2	3.2	3.9	5.3	4.0	3.9
Seedbed Cultivations	3.9	2.8	2.8	3.1	4.5	3.4
Manuring	1.4	2.1	1.6	1.7	1.1	1.7
Drilling	2.0	1.6	1.6	2.0	1.5	1.7
Rolling	.6	.3	.8	.9	.8	.7
Chopping out & Singling	36.1	26.9	24.5	29.4	27.0	28.8
Second Hoeing	19.6	16.6	13.0	15.7	10.2	15.0
Tractor Hoeing	6.9	6.6	5.8	6.5	5.7	6.3
Horse Hoeing	.5	-	-	3.0	.5	.8
Additional Hand Hoeing	1.2	2.2	.1	3.6	3.6	2.2
Top Dressing	.5	.1	.5	.8	.1	.4
Spraying	.1	.3	.1	.1	.6	.2
TOTAL CULTIVATIONS, ETC.	80.0	70.8	60.3	75.5	65.2	70.4
Lifting, Knocking & Topping	31.3	13.1	33.1	15.7	9.2	20.6
Carting & Clamping	16.9	12.2	12.0	14.2	11.6	13.3
Loading	4.4	4.1	3.3	6.7	6.1	4.9
Transport	.7	2.5	2.0	2.1	2.9	2.0
TOTAL	133.3	102.7	110.7	114.2	95.0	111.2

Harvesting & Total Labour Requirements
adjusted for "Normal" Yields

Operation	N. Essex & S. W. Suffolk	South Cambs.	West Norfolk	Holland	Isle of Ely	All
Lifting, Knocking & Topping	37	16	33	18	11	23
Carting & Clamping	23	15½	12	16	13½	16
Loading	7	5½	3½	7½	7	6
Transport	1	3½	2	2½	3½	2½
TOTAL	148	111	111	120	100	118

knocking and topping - the complete harvester saves roughly 40 man-hours an acre, and about 24 compared with the spinner.

Requirements for chopping out, singling and second hoeing vary considerably between districts - from only 37 man-hours an acre in West Norfolk and the Isle of Ely to 56 on the heavy soils of Essex/Suffolk - 50% more. Hoeing and harvesting differences alone can thus cause total labour requirements to vary by 60

Table XIV: Average Labour Requirements per acre for Different Methods of Harvesting

1. Complete Harvester	7.6
2. Spinner	
Spinning out	3.8
Topping (hand)	27.3
Total	31.1
3. Hand:	
(a) Excluding West Norfolk & the Isle of Ely	
Lifting	6.6
Knocking & Topping	51.2
Total	57.8
(b) West Norfolk	
Lifting	2.5
Knocking & Topping*	30.6
Total	33.1

* On many farms the beet are only pulled and topped - no knocking is required.

labour-hours: from 95 hours (light soil and mechanical harvesting) to 155 (heavy soil and hand harvesting). None of the fields was mechanically thinned. Twice through with a down-the-row thinner, together with a minimum quantity of hand hoeing, could reduce labour-hours for this job to 10 to 15 an acre instead of 35 to 60. This point is further discussed in the next section of this report.

Possible Variations in Labour Requirements

The figures in Table XV show just how widely total labour requirements for the beet crop could conceivably vary between farms of similar soil conditions, doing the same cultivations and manuring. The "low requirements" total of 40 labour hours is less than a quarter of the "high requirements" total of 185. The latter figure is by no means the maximum possible - it is not uncommonly obtained even excluding farmyard manure application. If, in addition, the whole of the beet acreage is farmyard manured, the total can reach 225.

Power Requirements

The tractor and horse requirements for the 1957 beet crop are given in Table XVI. These figures are a straight average of the five district averages, between which there were no major differences.

Table XV: High & Low Labour Requirements for Sugar Beet

Operation	Low Requirements		High Requirements	
	Man-Hours	Notes	Man-Hours	Notes
Applying F. Y. M. to one-third	1.7	Yard to Field. Mechanical loading & spreading	13.4	Moved in 3 stages. Hand methods only
Ploughing	1.4	4-furrow, tracklayer.	2.8	2-furrow, wheeled tractor.
Seedbed Cultivations	2.3	Wide implements	5.0	Narrow implements
Applying fertiliser	.7	" " (1 man)	2.0	" " (2 men)
Drilling	1.0	One-man drill	1.8	Two-men drill
Rolling	0.3	Slowly. 16' roll	0.6	Slowly. 8' roll
Thinning	13.0	Machine thinned twice, + hand weeding.	60.0	By hand, day-work.
Tractor Hoeing (4 times)	3.4	Mid-mounted hoe.	8.0	Steerage hoe
Spraying	0.2	Wide boom	0.4	Small sprayer
Lifting, Knocking & Topping	5.0	1-man harvester	60.0	By hand, day-work.
Carting off & Clamping	10.0	2 men with tipping trailers	25.0	Large gang
Loading	1.0	Beet Bucket on Foreloader	6.0	By hand
TOTAL	40.0		185.0	

Table XVI: Tractor-Hours & Horse-Hours per acre

Operation	Tractor	Horse
Stubble Cultivations	.5	-
Farmyard Manure	2.5	.5
Ploughing	3.9	-
Seedbed Cultivations	3.2	.2
Manuring	1.2	.1
Drilling	.8	.2
Rolling	.5	.1
Tractor/Horse Hoeing	3.7	.5
Spraying	.2	-
Lifting, etc.	4.2	.1
Carting off	7.5	1.0
Loading & Transport	.2	-
TOTAL	28.4	2.7

VI: MECHANICAL THINNING

In the last section it was pointed out that the use of a mechanical thinner could reduce labour requirements for this job from 35 to 60 man-hours an acre to 10 to 15. Yet most of the relatively few farmers who at present own such machines tend only to use them in emergencies - particularly where the crop is "getting ahead of the hoe" - and in any event they only use them together with a substantial amount of hand labour. There are two reasons for this. Firstly, if the machine only were used, the regular labour on many farms would have little to do between the end of haymaking and the beginning of harvest (this reason would ultimately disappear as labour staffs were "pruned").

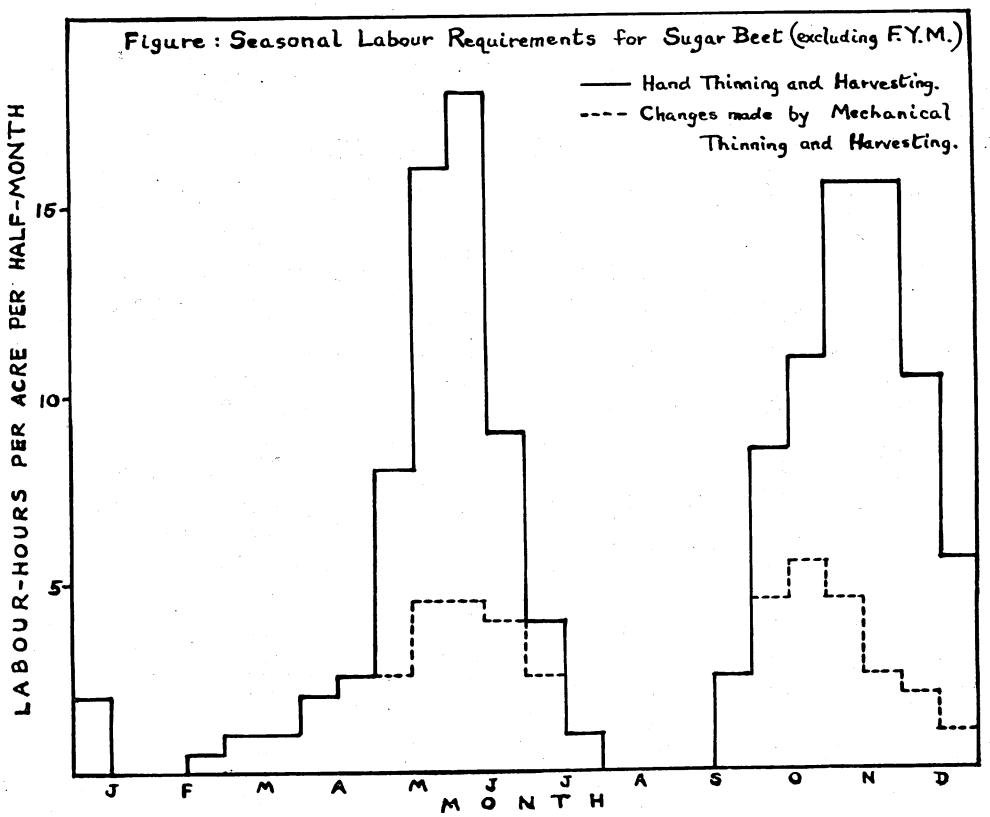
The second, and more important, reason is the fear of a drop in yield as a result of mechanical thinning. Experiments conducted by the National Institute of Agricultural Engineering* between 1954 and 1957 have indeed shown an average yield of two tons an acre less from crops twice machine-thinned with no hand trimming compared with crops thinned entirely by hand. The research workers responsible for these experiments have pointed out however that the hand-thinning on the experimental plots has been perfectly done, leaving a plant population of about 30,000 per acre. This compares with a national average plant population of about 20,000 per acre. Provided machine-thinned crops are not too enthusiastically hand-trimmed afterwards, i.e. provided plants are often left close together to compensate for the inevitable large gaps - thus maintaining a high plant population - yields may suffer little in comparison with crops which have had the much lower standard of hand-thinning commonly found in practice. Due to the high proportion of small roots, however, harvesting losses with the type of mechanical harvester commonly used at present may be greater than with hand-thinned crops.

The cost of operating a down-the-row thinner costing £140 and working at the rate of 15 acres a day would range from 30s. an acre for twice through the crop on 50 acres a year to £3 an acre twice through on only 10 acres a year. If there is, say, 12 hours an acre of hand weeding, the total cost per acre is between £4 and £5. 10s. an acre. This compares with £8 to £12 for hand work. If no loss of yield resulted, therefore, an average of about £5 an acre would be saved where casual labour is at present used for hand hoeing, and only very few acres would be needed to justify the purchase of a thinner. Whether there would be any monetary benefit where regular labour at present does the hand work depends on whether the labour saved can either be dispensed with or found other profitable work. Where casual labour is difficult to obtain and the spring hoeing of roots represents the main annual labour "peak" on the farm, machine thinning, by enabling a reduction in the permanent labour staff, may well result in a larger saving than £5 an acre.

Where not already owned, a precision drill will have to be purchased at a cost of about £120, which will mean another £15 to £20 a year in machinery costs.

The results of mechanical thinning (with 12 man-hours per acre hand weeding) and machine harvesting on seasonal labour requirements for sugar beet can be seen in the following diagram:

* By G. L. Maughan, E. T. Chittey and G. M. Wood.



VIII: MECHANICAL HARVESTING

Average Costs

The average costs obtained in this survey for machine and hand harvesting have already been compared in Part III. In this section, further details are given of the costs of mechanical harvesters. Table XVII shows the "breakdown" of the average total cost of £6. 2s. an acre. Depreciation accounted for £3. 3s., repairs 7s., labour £1. 9s. and tractor £1. 4s. Allowance for interest on capital (normally excluded from enterprise costs) would add roughly 10s. an acre to these costs.

Depreciation per acre depends on initial cost, estimated life and annual use. The difference in the latter had the effect of making depreciation per acre on small farms which owned complete harvesters £1. 12s. higher than on the large farms. The annual use averaged 19 acres in the former case and 50 in the latter.

Repair costs averaged only 2s. an acre in the first year, rising to 7s. in the 2nd year and 9s. in the 4th and 5th season. Repairs for the smaller complete harvesters of recent years are substantially less than for some of the older types, for which repair bills amounting to £1 an acre were not uncommon. There was a fairly even age distribution of machines from new to four or more years old.

Table XVII: Average Costs per acre of Operating Complete Harvesters

Number of Machines	Average Acreage Harvested per year	Average Rate of work (hrs./ac.)	Man-hours per acre	Deprecn. £ s	Repairs £ s	Labour £ s	Tractor £ s	Total £ s
44	30	5.6	7.8	3 3	7	1 8	1 4	6 2

Labour and tractor costs depend mainly on the rate of work. An increase from 1½ to 2 acres a day lowers these costs by more than 10s. an acre. Some of the harvesters (61% in the survey) are operated by the driver of the tractor drawing them, others have an additional man. The latter adds £1 an acre to costs, for no difference in the rate of work could be discerned. This averaged 5.6 hours an acre, or 1½ acres a day, which included time spent in preparation, greasing, etc. The main factors determining the rate of work were the soil, weather conditions and the size and organisation of the carting gang. Work was slowest on the heavy land (6.0 hours an acre) and quickest in the fens (5.3).

Effect of Acreage on Costs of Machine Harvesting: Comparison with Contractors' Charges and Cost of Handwork

Average costs such as those above are misleading, since wherever a costly machine is involved its costs vary substantially from farm to farm according to its annual use. Consider the schedule of costs given below. Depreciation has been calculated at a steadily increasing rate as annual use increases, on the assumption that more intensive use will shorten a machine's life. For example, for 10 acres or less 15% is taken; 25 acres, 20%; 50 acres or more, 25%. Interest on capital is included at 6% on the average investment. Fixed costs on a machine costing £350 will be as follows:

Annual Acreage	5	10	15	20	25	50
Total Fixed Costs:	£64 1s	£64 1s	£69 18s	£75 14s	£81 11s	£99 1s
Fixed Costs per acre:	£12 16s	£6 8s	£4 13s	£3 16s	£3 5s	£2 0s

Assuming a rate of work of 1½ acres an hour and a repair cost of 8s. an acre (the average repair cost obtained in the survey excluding machines in their first season), variable costs are £2. 13s. per acre for a one-man harvester and £3. 16s. for a two-man machine. Total costs per acre are thus:-

Annual Acreage	5	10	15	20	25	50
1-man machine:	£15 9s	£9 1s	£7 6s	£6 9s	£5 18s	£4 13s
2-man machine:	£16 12s	£10 4s	£8 9s	£7 12s	£7 1s	£5 16s

Compared with a contractor charging £8. 10s. an acre it would pay the farmer to have his own machine at between 11 and 15 acres - according to whether there are one or two men with the tractor and harvester. There would be the added advantage of being able to use the machine when most convenient and when weather conditions are most suitable, but the disadvantage of having to find the necessary capital. Because harvesting can normally be spread over a fairly long period there is obvious scope here for co-operative ownership on the part of two or more small growers.

Compared with hand work on a direct cost basis the machine pays at 9 or 10 acres against a hand harvesting cost of £10 per acre (including 30s. for lifting) and 7 or 8 against a hand harvesting cost of £12 per acre. On large acreages the saving can be as great as £6 an acre.

One must again qualify this, however, by pointing out that the above is only true if the saving in labour-requirements is translated into one of labour costs. This will in fact occur if the work was previously done by casual labour. But if the work was previously done by regular labour, either the labour saved must be found other profitable work or the machine must make possible a reduction in the regular staff. The latter may be impracticable unless other "peaks" (especially spring hoeing) are cut by mechanisation also.

The above assumes further that there is no change in carting and clamping costs. On balance this might well be true, although one cannot generalise. While the job of picking the beet off the ground is cut out, mechanised harvesting may involve more clamping than with hand methods - especially on heavy soils where the best must be lifted early - and less loading direct from the field into lorries or on to rail. In addition, machine stoppages often cause the carting gang to be idle for lengthy periods.

Other relevant points apart from costs are:

(i) The quality of the work. Most farmers are satisfied with the work done by a properly adjusted machine. The variable quality of hand work makes comparison difficult. Indifferent hand work may result in more over- and under-topping than with a machine, and may knock less dirt off. With mechanised harvesting, the use of tipping trailers and direct loading with a beet bucket fitted on a foreloader often results in abnormally high dirt tares. These can usually be avoided by leaving the beet in a clamp with a hard base for a period and using a cleaning elevator when loading.

(ii) Tops. Where tops are required for feeding, a top saver is required, costing an extra £100 or so.

(iii) Effect on Yield. Anything between $\frac{1}{4}$ and 2 tons of roots an acre may be left in or on the ground behind mechanical harvesters. The amount should be less than $\frac{1}{2}$ a ton with a well-tried, well-adjusted machine, a level seed-bed and not too large a proportion of small roots. The necessity for early lifting on difficult soils may also lower yields. In a mild autumn, the crop might gain a ton or two in weight if harvested later. But this would only apply to part of the crop since hand harvesting would have to be spread over the early as well as the later months. In addition, carting off in bad conditions late in the season can have harmful results on the soil structure, thus depressing yields from the crops that follow. Speedy harvesting permits subsequent cultivations - and possibly the drilling of winter corn - to be carried out in good time.

In the survey, the total tare averaged 4 lbs. higher for machine-harvested beet (this would cost 5s. to 7s. 6d. an acre in extra cartage), the sugar content was 0.5% less (worth about £2. 5s. an acre) and the yields were slightly lower. But none of these differences were statistically significant.

Spinner

The average costs of spinners were as follows: depreciation, £1. 0s. 6d;

repairs, 4s. 6d.; labour, 15s. 6d.; and tractors, 12s. 9d.; total, £2. 13s. 3d. per acre. The average rate of work was 3 hours an acre; on half the fields there was only one man with the tractor and spinner and on the other half, two. Allowing for interest and calculating depreciation at the same rates as for complete harvesters, we have the following schedule of costs on a new machine costing £120. It is assumed that only one man is employed on the spinner except occasionally when conditions are bad.

Annual Acreage	5	10	15	20	25	50
Fixed costs per acre:	£4 9s	£2 5s	£1 12s	£1 6s	£1 3s	£1 0s
Total costs per acre:	£6 2s	£3 18s	£3 5s	£2 19s	£2 16s	£2 13s

If £6 an acre is allowed for hand topping, the spinner becomes cheaper than hand knocking and topping at about 7 acres, and is cheaper than a complete harvester up to 10 acres.

Finally, a comparison of four methods is given below:

Annual Acreage	5	10	15	20	25	50
	£ s	£ s	£ s	£ s	£ s	£ s
Hand Harvesting and Topping*	11 10	11 5	11 2	11 0	10 19	10 17
Spinner and Hand Topping	12 2	9 18	9 5	8 19	8 16	8 13
Complete Harvester (own, 1 man)	15 9	9 1	7 6	6 9	5 18	4 13
" " (contractor)	9 0	8 15	8 10	8 10	8 10	8 5

* Knocking and topping at £9. 10s. an acre.

Carting and Clamping

All but four of the 44 machines had side elevators. There were four different arrangements for carting and clamping, with a similar number of farmers utilising each of them:

(i) Three men and two tractors - one man at the clamp. If the distance to the clamp was short, only two trailers were needed and each tractor driver helped the man at the clamp to unload. With longer distances there would be three trailers, one being left at the clamp each time; the tractor drivers might help to start unloading if the distances were not too great. In a few instances an extra man or tractor was provided.
(ii) Two men and two tractors, with or without tipping trailers. The tractor drivers emptied their own trailers. Where tipping trailers were not used, the clamp had to be in or very close to the field if delays were to be avoided.
(iii) Two men and one tractor. Two trailers were used, one being left at the clamp each time for the man at the clamp to empty.
(iv) One man and one tractor. In this case, either a tipping trailer was used or the man or men on the harvester and its tractor helped unload when the trailer - or two or three of them - had been filled.

It will be apparent that the last two methods involve inevitable delays in operating the harvester. But while the last system listed above definitely slowed down work (to an average of $1\frac{1}{3}$ acres a day), there was little to choose between

the others. Under perfect conditions, the first system - and the second, where distances are short or tipping trailers used - must mean faster work because there is no stopping to wait for trailers. However, perfect conditions are rare. Machine stoppages of various duration are fairly frequent. Tops, clods or mud clog the machine, with consequent delays to clear it both in and at the end of the rows. This cleaning, and greasing also, can often be done during the delays involved in systems (iii) and (iv) above. If the next tractor and trailer is invariably ready at the end of the row when a load is completed then they often have to wait while the machine is seen to. The effect of the size of carting gang on the rate of work is thus far less than might be supposed.

Table XVIII: Effect of Size of Carting Gang on Labour and Tractor Costs (including Harvester)

	A			B		
Carting Gang	Average Rate of Work (acs/day)	Labour and Tractor Cost (One-man harvester)	Ditto but two-man harvester	"Theoretical" Rate of Work (acs/day)	Labour and Tractor Cost (One-man harvester)	Ditto but two-man harvester
		£ s	£ s		£ s	£ s
1 man, 1 tractor.	1.3	5 5	6 11	1.25	5 9	6 16
2 men, 1 tractor.	1.5	5 13	6 16	1.5	5 13	6 16
2 men, 2 tractors.	1.5	6 16	7 19	1.75	5 17	6 17
3 men, 2 tractors.	1.5	7 9	8 10	2.0	5 19	6 16

Table XVIII(A) shows in fact that total labour and tractor costs were substantially less where smaller gangs were employed. Where there is an extra man on the harvester the difference is still greater - speedy work becomes more essential. However, farmers with large acreages to harvest are unlikely to be deterred by this from getting on as quickly as possible. Indeed, if conditions are favourable enough to allow the full effect which might theoretically be expected from large gangs, there is little difference in cost between the methods - particularly with an extra man on the harvester (see Table XVIII(B)).

VIII: SUMMARY

The average cost of producing sugar beet on 100 farms studied in 1957 in five areas of the Eastern Counties was approximately £62 an acre. It ranged from £57 in West Norfolk to £68 in the Holland division of Lincolnshire. Yields were low, particularly in N. Essex-S. W. Suffolk and South Cambs., where they averaged only 7 to 7½ tons of clean beet per acre. Had yields been "normal", costs would have averaged roughly £65 an acre. Sugar content also was low.

As a result, although profits were at a fair level in West Norfolk (£14 an acre), they were down in the Isle of Ely (£10) and Holland (£12), and heavy losses were made in the other two areas - averaging £14 an acre in South Cambs. and £17 in Essex/Suffolk. A yield of 12 to 13 tons (depending on the use made of the tops) is needed to give a profit of £15 an acre with costs at the average level.

Allowing for "normal" yields, labour-hours per acre averaged 140-150 where hand harvesting was practised and 100-110 where mechanical harvesters were used. The variation between individual farms can be much wider.

Mechanical thinning offers considerable scope for cutting labour requirements and - in certain circumstances - increasing the profitability of the crop. Mechanical harvesters saved an average of £4 or £5 an acre in costs, but much depends on the annual use made of the machine, and factors other than costs must be carefully considered.

J. S. Nix,
October, 1958.

Appendix I: Costing Details

Labour was costed at the actual rates paid, with allowances made for employers' insurance contributions, paid holidays, perquisites, etc. The weekly minimum wage for men was £7. 1s. until 27th October, 1957 and £7. 10s. after that date, but higher rates than these were commonly paid and piece-work earnings were considerably greater. The farmer's own labour and that of his family were charged at slightly above the minimum rates.

Tractors. Between 4s. 0d. and 4s. 6d. an hour was charged for wheeled tractors, according to the type and size. Tracklayers were similarly costed at 6s. 6d. and 8s. 0d. per hour. Farmers' lorries for carting beet to the factory were costed individually on each farm.

Horses were charged at 1s. 6d. an hour.

Machinery. Standard rates were charged for each implement. Sugar beet harvesters, spinners and lifters were costed separately on each farm. A modified decreasing balances method was used to calculate depreciation; the rates varied with the age and annual use of the machine.

Seed, Fertiliser and Spray Materials were charged at cost (net of subsidy in the case of fertilisers).

Farmyard Manure was charged at 15s. a ton.

Manurial Residues. Half the total farmyard manure cost including application was carried forward to subsequent crops. Residues from farmyard manure applied in 1956, 1955 and 1954 were brought forward to the current crop at 7s. 6d., 4s. 0d., and 2s. 0d. per ton respectively. Fertiliser residues were brought or carried forward as follows (one year only); compounds $\frac{1}{4}$, straight phosphatic and potassic fertilisers: $\frac{1}{3}$. The cost of lime was spread over 8 years. Cultivation residues were ignored, except when a fallow was taken some time during the previous three years.

Averaging all districts, the residue details for this survey are as follows:

	Brought forward		Carried forward	
	£	s	£	s
Fertiliser	1	0	2	7
F. Y. M.	1	1	1	15
Other		4		1
	2	5	4	3

Overheads. A rounded estimate of £8 an acre was charged to cover those general farm costs which cannot be specifically allocated to any one particular enterprise. These include labour-time lost owing to bad weather, labour employed on general maintenance such as hedging and ditching, and such miscellaneous items as telephone bills and use of the farm car.

Value of Tops. Tops ploughed in were valued at 5s. per ton, and tops folded or carted off for feeding to stock at £1 per ton (25s. less 20% wastage). The weight of tops was estimated to be 80% of the weight of washed beet.

Appendix II: Standard Presentation of Results

The figures in this Appendix are based on 100 records, on 1249 acres, on 100 farms.

Table I Summary of Average Costs per acre

Item of Cost	Hours		£	s
	Men	Women & Boys		
Labour	98	5	19	15
Power: Tractor	26		5	12
Horse	$2\frac{1}{2}$			4
Machinery Depreciation & Repair Allowance			3	16
Contract Services			1	14
Other Fuel				1
Materials: Seed			1	2
Fertiliser and Manures applied			13	18
Sundries (Spray Materials)				10
Rent			3	8
Marketing Costs (Transport)			5	10
Total Direct Costs			55	10
Plus Share of General Farm Expenses (inc. Drainage Rate)			8	11
			64	1
Adjustment for Residual Manurial Values			- 1	19
Gross Cost of Production at Delivery Point			62	2
Credit Value of Beet Tops			3	11
Net Cost of Production at Delivery Point			58	11

This table is given to facilitate comparison with data produced for other areas of England and Wales. Some items differ from those given in the main body of the report. The cost of applying farmyard manure is included in this table under "Fertilisers and Manures applied" instead of under "Labour, Tractor", etc., and the labour cost of carting beet to the factory in the farmer's own lorry is included here under "Marketing Costs" instead of "Labour", as in the main report.

The figures in this and the following table cover a wide variety of soil conditions. They are a simple average of the average costs in each of the areas surveyed.

Table II Yield, Costs, Returns and Margins.

Yield of Clean Beet per acre	10.2 tons	
	per acre	per ton
	£ s	£ s
Sales of Clean Beet	59 13	5 17
Net Cost at Delivery Point	58 11	5 15
Margin*	+ 1 2	+ 2

* Calculated on a 'per field' basis, the margin per acre was -5s. a ton, since below average yields increase the cost per ton more than above average yields reduce it.

Seed: Natural seed was used on 67% of the fields at an average rate of 13 lbs. an acre, and rubbed seed on 33% at an average of 7 lbs. an acre.
F.Y.M. Overall, F.Y.M. was applied on 25.5% of the fields and the average dressing was 9.2 tons an acre. The overall dressing averaged 2.4 tons an acre.
Fertiliser: Full details are given in Table IX of the report.