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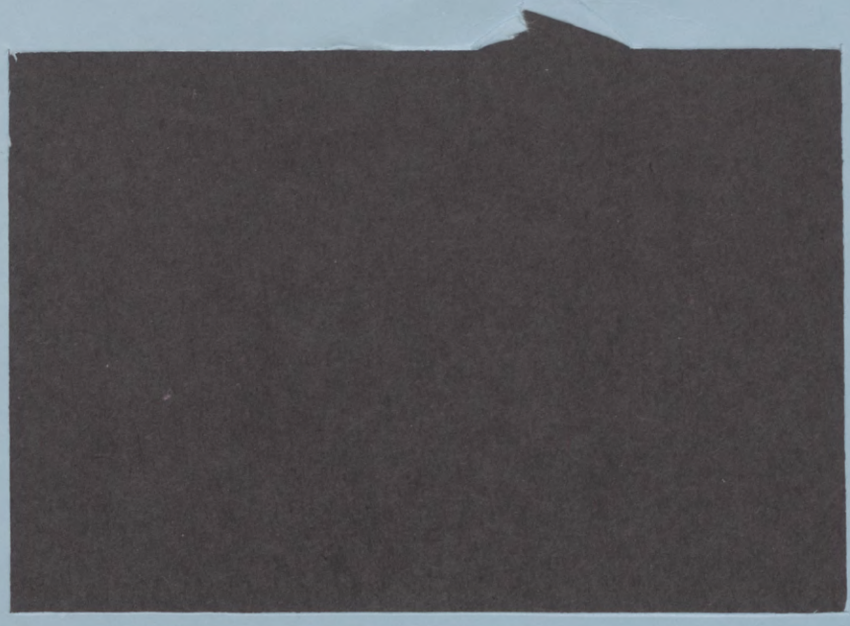

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PROFITABILITY OF THE SUGAR BEET CROP: ANALYSES OVER TIME AND ACROSS SECTIONS

by

I.M. STURGESS

OCCASIONAL PAPERS No 29

An extended version of a lecture presented at Brooms Barn Experimental Station

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INTRODUCTION

Three aspects of the profitability of sugar beet will be considered.

1. How does profitability vary with size of unit?

2. How does profitability vary between regions?

3. How has profitability changed over time and how may it change in the future?

The raw material for answering these questions are data from economic surveys carried out by the Cambridge University Agricultural Economics Unit (formerly Farm Economics Branch). The first two sections are based mainly on a survey of the 1980 crop. The third part draws on six surveys made between 1954 and 1980 together with some provisional results from a survey of the 1982 crop.

ECONOMIES OF SIZE

Net margins and yields

To examine economies of size the units surveyed in 1980 were split into three groups by area of sugar beet

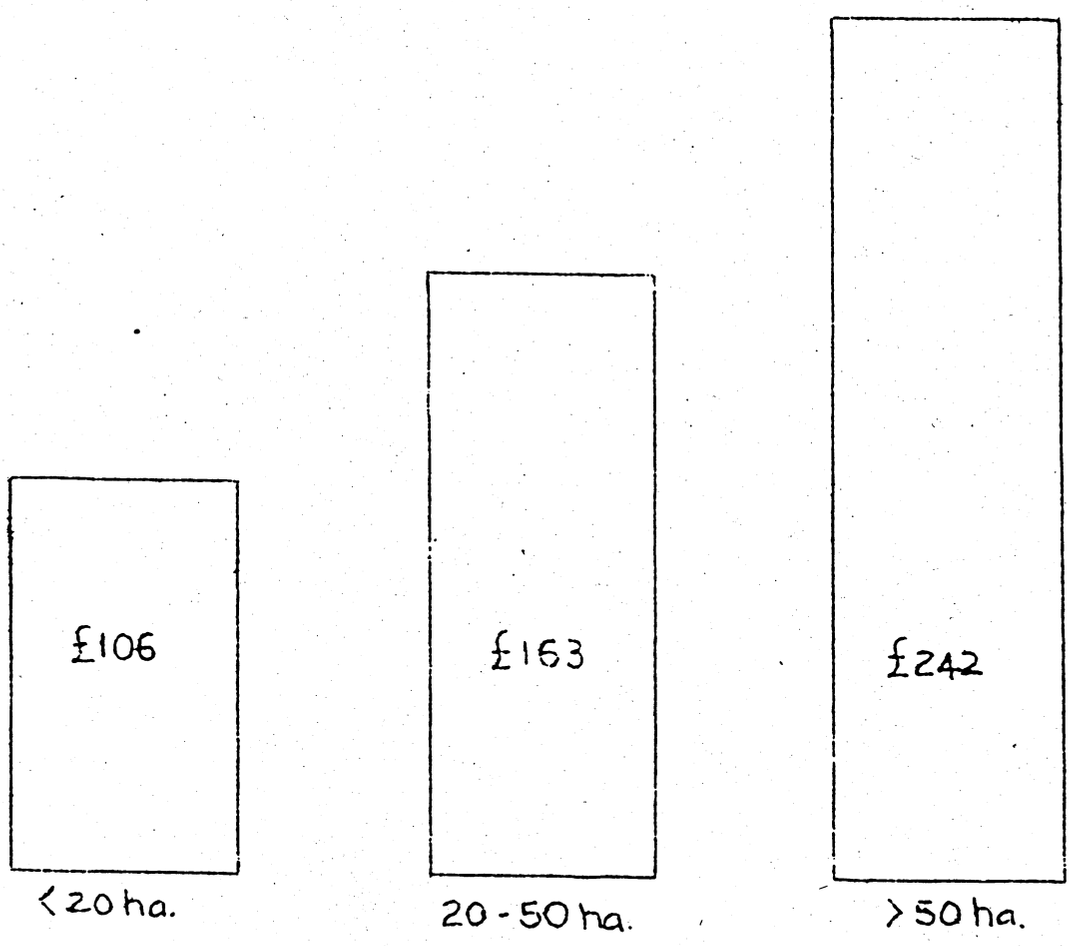
- small, under 20 ha.
- medium, 20 to 50 ha. and
- large, 50 ha. and above.

If one simply compares the mean net margins per hectare of the three groups economies of size appear to be both great and regular. (Figure 1). The per hectare net margin, i.e. the margin of output value above all costs other than interest and operators' managerial time was 50 per cent greater on medium than on small units and again 50 per cent greater on large than on medium units.

FIGURE 1

NET MARGINS PER HECTARE

BY UNIT SIZE



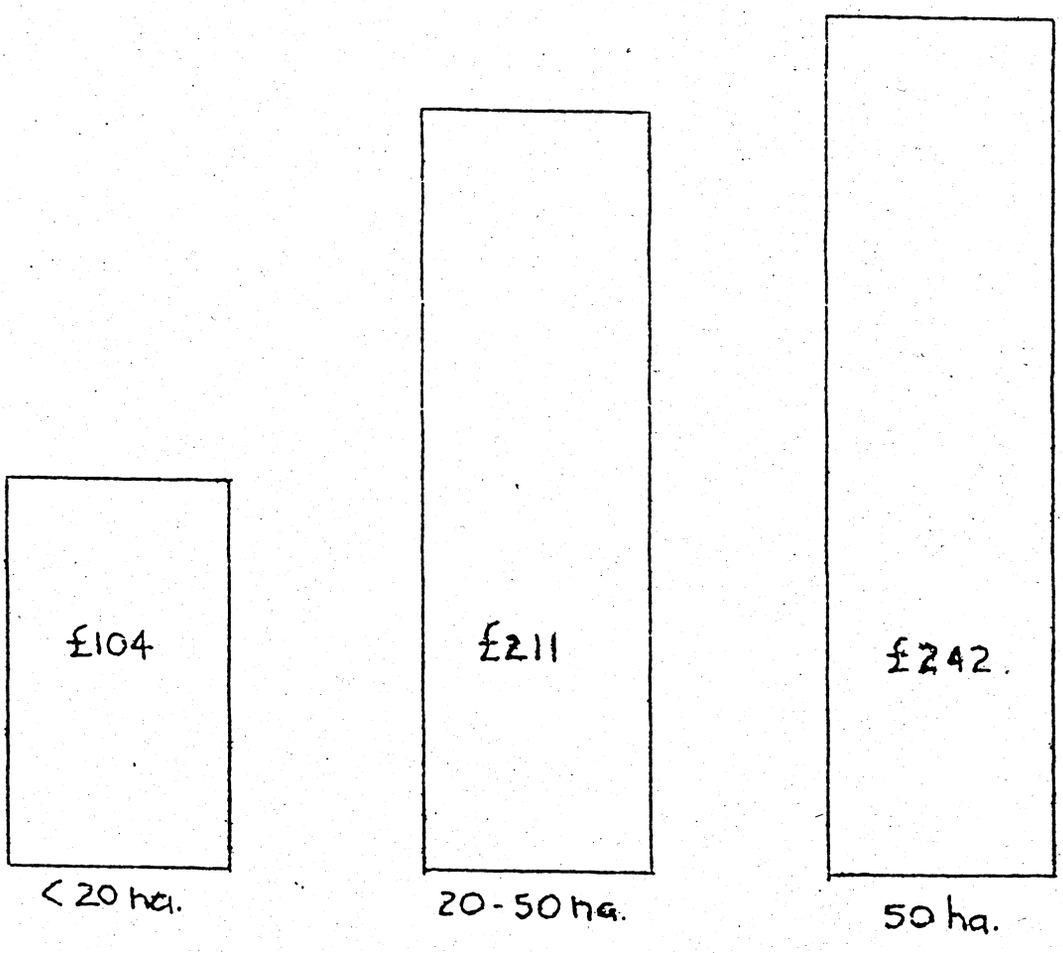
These differences are convincingly large. They are however strongly influenced by the pattern of difference in yield between our size group samples. A net margin is a small difference between two much larger quantities, output and costs. So a small change in either of these has a disproportionately large effect on the net margin. For example a five per cent adjustment of yield and therefore of output would change the estimated net margin on medium units by as much as 30 per cent. The actual pattern of yield found in our sample was that average yield on units of medium size was five per cent lower than on either large or small units. There are reasons to doubt whether this reflects the true relation between unit size and yield on all beet growing farms. First the dispersions of yields within size group samples were great enough in relation to the size of those samples that differences in mean yields between them were not statistically significant at the ten per cent level. (Analysis of variance showed that populations of units with no difference in their mean yields would produce samples with differences of this order on at least ten per cent of drawings.) This difference however is statistically insignificant and there is no reason in theory or from other evidence to suppose the relationship between yield and unit size is U shaped. I would therefore infer that there was no consistent difference in yield between size groups. I have recalculated the net margin on medium units accordingly. My best estimate then is that net margins on both large and medium units were on average about double those on small units (of less than 20 ha.); net margins were greater on large than medium units but only by 10 to 15 per cent (Figure 2).

FIGURE 2

NET MARGINS PER HECTARE

BY UNIT SIZE

(NO YIELD DIFFERENCE)



Cost differences

In short, the disadvantages of small size were much more marked than the advantages of large size. The estimated pattern of margins necessarily follows that of costs. For both costs in total and many individual categories of costs the main difference was between small units on the one hand and large and medium units on the other. Costs on large units were in most cases lower than on medium units but usually by a small and often statistically insignificant margin. (Figure 3). The diseconomies of small size can therefore be shown, clearly and vividly, by directly comparing small and large units since a comparison of small with medium units would produce essentially the same conclusions.

Why were total costs per unit of area nearly 20 per cent greater on small than large units? Essentially because of higher labour and machinery costs. Total costs per hectare were £136 higher on small than on large units; labour and machinery costs, broadly defined, were £137 per hectare higher. Differences in other categories of cost were much smaller and were not in all cases in favour of larger size groups.

Labour and machinery costs

The disadvantage of small units is composed thus, roughly a sixth each for transport, overhead and other machinery, and almost a half for labour. (Figure 4).

Labour costs

So half the calculated cost disadvantage of small units is explained by more labour being applied to the crop. Small units, of under 20 ha., spent 65 man hours per hectare (on operations up to the farm gate); this was 90 per cent more than large units who used only 34. What accounted for these 31 extra man hours on small units? Eight of them came from slower harvesting. (While over 90 per cent of small units used single row harvesters, all but 15 per cent of the large units used harvesters of three rows or more). Most of the difference however - 19 hours per hectare - was the result of more intensive hand hoeing.

FIGURE 3

TOTAL COSTS PER HECTARE

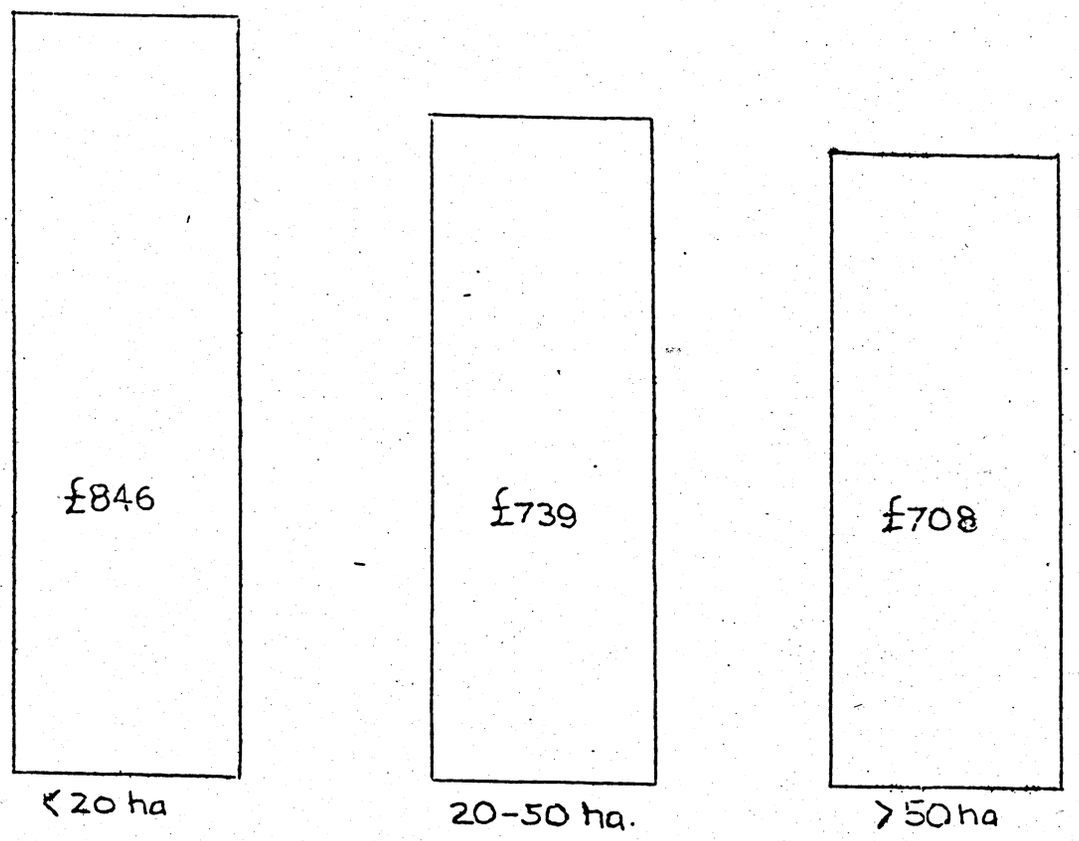
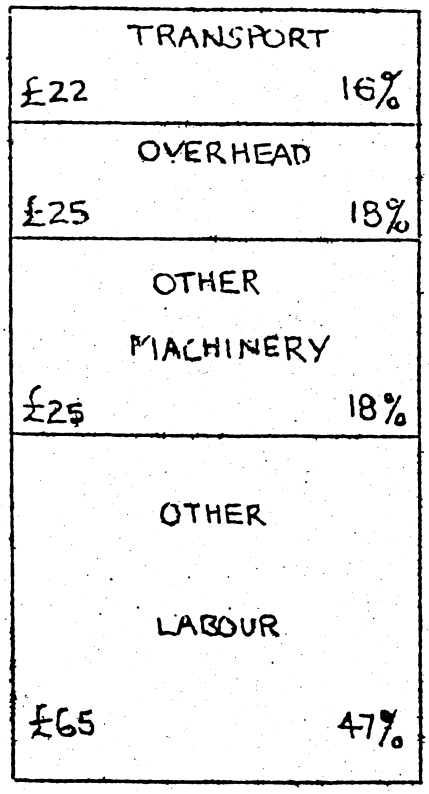


FIGURE 4

DISADVANTAGE OF SMALL cf. LARGE UNITS IN LABOUR AND MACHINERY COSTS

PER HECTARE



One might think that this was because on small units family labour hoe sugar beet when there is little else to do. But this does not seem to be the whole story, since small units also spent per hectare twice as much as large units on hand hoeing by casual labour. Nor did the extra time spent by small units bring compensensating benefits in either yields or savings on other costs. Yields were the same on small as on large units - 34.5 tonnes per hectare. There was no time saving on mechanized operations. On the contrary for example small units spent over one man hour per hectare more on tractor hoeing. (They used smaller hoes and more two man units).

Materials costs

In expenditure on all materials incidentally there was no significant difference between units of different size. Expenditure on fertilizer was almost exactly the same on large and small units. Large units did spend nearly 20 per cent more on insecticides but this made a difference of less than £3 per hectare.

Machinery costs

In allocated machinery costs the disadvantage of small units was much less than for labour. Whereas for labour, costs of small units were 90 per cent higher, for machinery they were only 13 per cent per hectare more. If units using contractors are excluded, the difference increases to 22 per cent. This is because contract costs (mainly for harvesting and drilling) are somewhat greater on large than small units whereas costs of operations when done by farmers themselves were generally higher on small than large units.

This might lead one to expect that small units would make much greater use of agricultural contractors. This was the case for drilling (27 per cent compared to 7 per cent) but not for harvesting for which a slightly higher proportion of the large units used a contractor - 29 per cent compared to 27 per cent on the small units. (Overall in financial terms, the ratio of contract costs per hectare to allocated own machinery costs was 17 per cent for small units and 19 per cent for large units:) I presume that despite the advantage in calculated costs of contracting out operations, especially harvesting, many small units do not do so because they do not have good alternative uses for their labour.

On units not employing contractors, machinery costs per hectare were over 20 per cent greater on small units for two main reasons. First and foremost costs of machinery specific to beet production were over 40 per cent higher. Although small units used machines which were both older and smaller, the costs of these when spread over a small area, were per unit of area much greater than the costs per hectare of newer and bigger machines on large units. Second, the lower capacity of the machines used by small units meant that more tractor time had to be used on each operation.

Most of the annual cost of machinery specifically required for sugar beet - harvesters, drills, tractor hoes, cleaner loaders, and band sprayers - is the decline in its value over the year. This depreciation cost is calculated as a standard percentage of current value and so the lower the current value of machinery used the lower is this cost. Current values of specific machinery are lower on small units but not in proportion to unit size. They are lower in aggregate partly because many of the machines handle more rows per pass. Machines on average are also kept longer on small units or else are bought second-hand. Thus harvesters on small units were on average four years old compared to only two years old on large units. Parsimony and ingenuity however only mitigate the difficulty of economic mechanisation on small units. The current value of machinery specific to sugar beet on small units was nearly £250 per hectare compared to only £150 per hectare on large units.

Tractor costs

Because small units use smaller implements they spend more hours of tractor time for each operation. On the other hand they can use weaker tractors which have lower standard hourly costs. On soil working operations, for which the average size tractor used by large units was over 80 horse power, these two effects were offsetting so that calculated tractor costs per hectare were much the same on large and small units. For harvesting and loading (and to a lesser extent for application of materials) however the effect on costs of more tractor time on small units outweighted that of using cheaper tractors. Calculated tractor costs per hectare were about 17 per cent higher on small units, almost all because of a one third higher harvesting cost. These estimates are based on the assumption that the cost per hour of a tractor of given

horse power (and type of motion) is the same on all units whatever their size. The survey results are therefore best summarized in the form of standard tractor hours, defined as the equivalent in cost of one hour of time of a 61 to 70 horse power wheeled tractor. In round terms the results were as shown.

Standard tractor hours per hectare

	Small units 20 ha.	Large units 50 ha.
Harvesting and loading	21	16
Soil working	11	11
Materials application	5	5
Total	37	32

The remaining third of the disadvantage in estimated labour and machinery costs of small units lies in transport and overheads. These are more diseconomies of farm size than directly of unit size. However these are obviously related. Small units tend to be mainly found on small farms while large units must necessarily be on large farms. Thus in our sample the mean size of farm containing small units was 85 hectares while that containing large units was 638 hectares.

Transport costs, per hectare and per tonne, were over 30 per cent greater on small units than on large. This was mainly because large units had to rely less on contract haulage - for only half their crop compared to over 80 per cent on the small units. Where a farmers own lorry was used the calculated cost was much less than the contract rate, typically by 40 to 50 per cent. However, keeping a lorry only to haul sugar beet can not be justified; there must be work for it at other times of the year. (This can more readily be found on larger farms. Costs for each method of transport - own lorry, contractors lorry and tractor and trailer - were also higher on large units but this had much less effect than the mix of methods used. Had this mix been the same for both large and small units, transport costs would have been only some ten per cent higher on small units.)

Overhead labour and machinery costs are in large part a share of the estimated costs of retaining men on the farm when they are not working on a particular enterprise. (These costs were calculated in our study, for each farm surrounding a beet unit surveyed, as the surplus of total labour hours employed above the estimated total requirements of its enterprises.) Per hectare the cost of such 'surplus' labour was found to be about 40 per cent lower on the large farms in which large beet units were embedded.

I shall at this point summarize the findings of comparison of profitability between units of differing size. When one abstracts the effect of statistically insignificant differences in yields between size groups, the pattern of profitability is this. Large units - over 50 hectares - have some advantage over medium units - of 20-50 hectares. However large units, and also medium units, have a much clearer and larger advantage over small units, the net margin being over two and a half times greater. In short our results show great disadvantages in being very small but only modest advantages in being very large.

This was incontestably the pattern of costs per hectare. Total costs on small units were 15 per cent above those on medium units and nearly 20 per cent higher than those on large units. Though there are differences in other costs, the main disadvantage of small units lies in extended labour and machinery costs. Half the cost difference is attributable to higher allocated labour costs, man hours per hectare on small units being almost double those on large units. Sixty per cent of this difference was the result of more time spent hand hoeing. This extra time did not apparently bring compensating advantages in either yields or cost savings.

Machinery costs were also higher on small units by about 20 per cent, despite the use of older and smaller implements and weaker tractors. The remaining third of the disadvantage of small units was in transport - fewer small units being or farms large enough to justify their own lorries - and in the share of overhead labour and machinery costs.

Differences in materials costs were relatively small. Large units spend £10 per hectare more on sprays and small units £5 per hectare more on seed.

Fertilizer composition

Of fertilizer there was no significant difference in total costs. As a by-product of our economic investigation we did however find marked and significant differences in the composition of nutrients applied other than nitrogen. Small units applied more potash but less sodium. They also used rather more potash but considerably less magnesium.

Fertilizer inputs on small and large units

	Small	Large
	kg per hectare	
Nitrogen	157	148
Phosphate	85	72
Potash	177	158
Sodium	75	101
Magnesium	8	40

Economies of size in 1980 and 1970

Small units are at a greater economic disadvantage than ten years ago because higher costs appear no longer to be compensated by higher yields. The corresponding comparisons from the Unit's survey of the 1970 crop of course are over a much lower range of size. Indeed the change in definition of small and large units over the decade graphically indicates how fast the structure of the enterprise has changed. In 1970 a small unit was one under 20 acres, it is now one under 20 hectares. A large unit is now one of over 50 hectares; ten years ago a unit was large if it was over 50 acres.

In total costs per hectare, small units were above large by about the same percentage in 1980 as in 1970 - but for rather different reasons. In 1970 much more of the difference lay in machinery services and much less in labour costs. On units of all sizes in 1970 some hand hoeing was considered indispensable. (Large units, at 32 man hours per hectare, spent only seven hours less than small units. Hence, even though small units spent considerably more time on mechanized operations, labour costs accounted for only one sixth of the difference between size groups in

total costs per hectare compared to nearly one half in 1980. Correspondingly machinery and transport costs made up over half the difference in 1970 compared to only one third in 1980). Higher machinery costs reflected not only the inescapably high depreciation costs per hectare of specific machinery on very small units but also a greater number of passes made for most operations.

Small units also in 1970 spent more per hectare on all materials, seed, fertilizer and sprays. This more intensive application of inputs was no doubt largely responsible for significantly higher yields on the small units. Because yield was on average 12 per cent higher than on large units, the net margin per hectare of the small units was at most only 15 per cent lower. This compares with a difference of over 50 per cent in 1980.

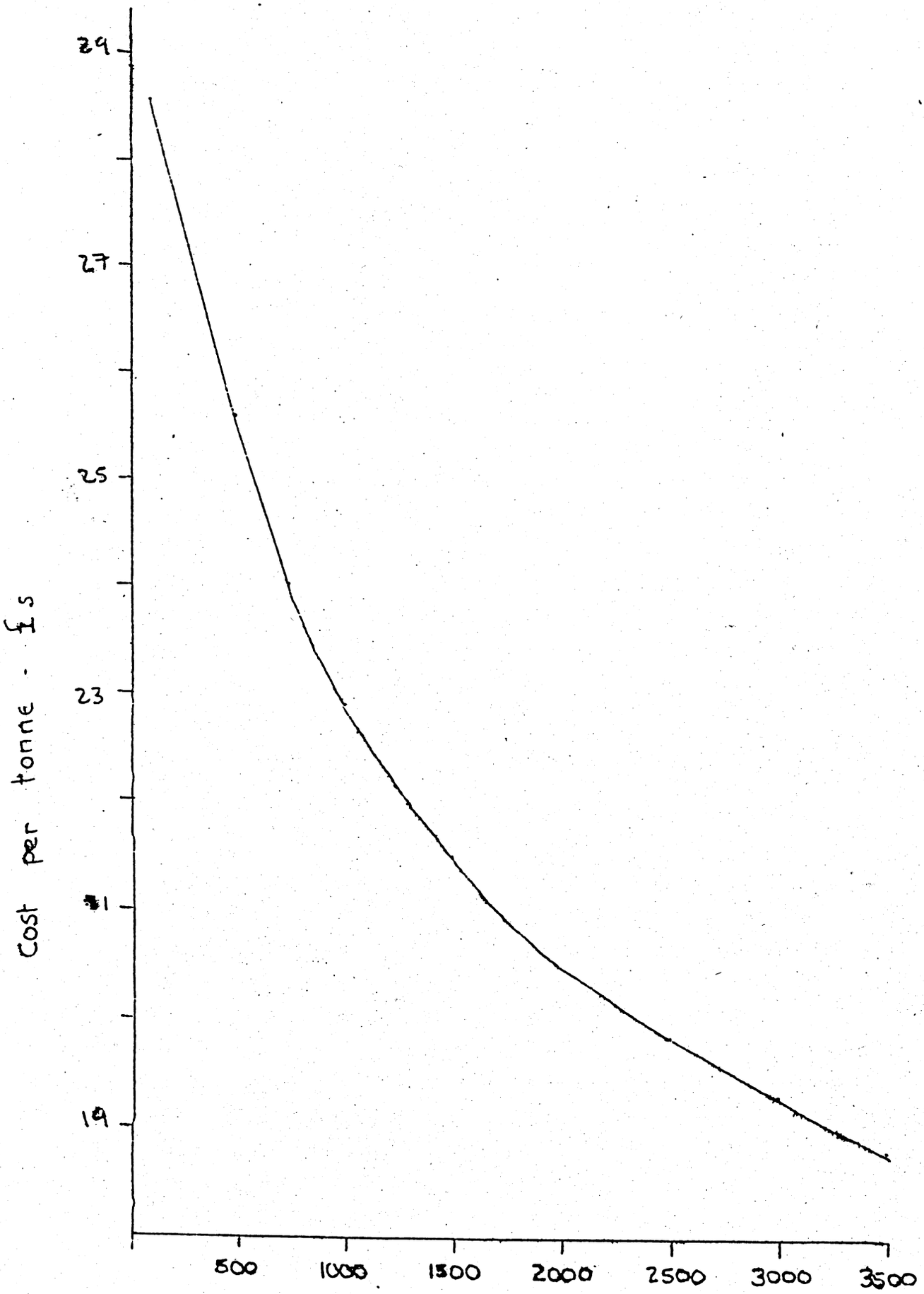
In sum greater costs per hectare of small units are now less indicative than ten years ago of a generally higher level of application of inputs. Rather they reflect some particular differences - especially more hand hoeing - and higher costs for given levels of intensity. As such they are no longer associated with better yields but lead directly to much lower levels of profitability.

Economies of size measured by production

Though it is common practice in agriculture to measure size of business by land area, a case can be made for measuring size by output. Economies of size defined this way are inevitably greater than when size is measured by area. (Within any area size group, units with lower yields, and therefore probably higher costs per tonne, are relegated to a lower output size group; likewise higher yielding units, with probably lower costs per tonne, are promoted to higher output groups.) A correlation of costs and production gives a remarkably close statistical fit. Translated to an average cost curve it looks like this. (Figure 5). The implication of the correlation equation is that for each 10 per cent production is increased on a unit (land use being unconstrained) costs per tonne are reduced by 1.6 per cent. The production function implicitly underlying the fitted cost function is such that a ten per cent increase in all inputs increases production by 13 per cent. There are clearly increasing returns to scale in production of sugar beet, a phenomenon which is often assumed in agriculture but is identified only rarely.

FIGURE 5

COST PER TONNE AND OUTPUT PER UNIT



Our curve suggests that a unit producing 350 tonnes had in 1980 an average cost of production (excluding contribution to overheads) of £27 a tonne. The corresponding cost per tonne for a unit producing 3,500 tonnes was only £19. This suggests that the replacement of ten units each producing 350 tonnes by one unit producing 3,500 tonnes would reduce the cost of producing each tonne by 30 per cent. This estimate can be expanded to replicate the order of structural change that took place in the four years up to 1980. The replacement of 2,000 units each producing 350 tonnes (of washed beet) by 200 units each producing 3,500 tonnes would produce a cost saving of about £5 million.

REGIONAL COMPARISONS

Classification

The regional comparisons from our 1980 survey previously published have been by BSC administrative region (as defined in that season). The BSC Northern and Southern regions however cover a wide range of soil types. We have therefore refined our analysis by splitting these regions into four sub-regions. We have extracted two groups of units operating on readily distinguishable soil types, sand-land and fen and silt. The remaining units have been divided according to location into a Northern upland group, comprising the factory areas of Brigg, Bardney, Newark and Nottingham, and a residual Southern group; this comprises units in the Eastern Counties not on sand, fen or silt; they are thus mainly on soils overlying clay and can be said to be operating on land which is heavier, if not necessarily heavy in the conventional sense.

The peripheral regions

Both the Yorkshire and Western regions had significantly lower net margins per hectare than the other four regions. The problem of the Western region was essentially one of low yield, output per hectare being 13 per cent below the national average. Output in Yorkshire was also lower but only by six per cent; the main problem here was higher costs of machinery and labour, especially labour. The Northern uplands on the evidence of the 1980 crop is a low input : low output area. While output per hectare was approaching £100 below the national average, total costs were £65 lower, so that net margin was only 15 per cent lower.

Fen and silt units

Units on fen and silt soils were remarkably similar to the national average in output and total costs, and therefore also in net margin. This masks some interesting differences in cost structure. The pattern of these differences you may find less than astounding. To take extreme examples - university survey was hardly required to establish that Fen farms have lower costs of FYM but higher drainage rates and rents. It was also predictable

- that fen units would have higher allocated, (though not overhead) labour costs mainly because of more time spent on hand work by both regular and causal workers,
- that kind soil would produce lower implement costs, and
- that the structure and intensity of Fen farming should make them exceptionally reliant on contractors.

You may nevertheless find surprising the size of differences in these respects between Fen units and adjacent areas in the residual Southern region.

Fen and silt costs per hectare cf. residual Southern

Labour (regular)	+ 13%
Handwork (regular and casual)	+ 165%
Overhead labour (and tractor)	- 46%
Implement	- 31%
Contracting (ex transport)	+ 72%
Total fixed costs	- 12%

Units on sandland

A similar comparison with our sandland sub-sample is of interest for the light it throws on the economics of growing sugar beet on light and heavy soils. It is often suggested - and I quote now the recently published NEDO report on sugar beet - that beet shows lower yields on poorer sandy soils though production costs are lower. This belief is not supported by our survey results in either of its aspects. Output was no lower on the sandland units than on units on heavier land while total costs were if anything a little higher. To be more specific, extended labour and machinery costs were six per cent or £23 per hectare higher. Costs of labour, tractor use and contracting services were all higher on sandland farms. This was partly because of more time being spent on pre-ploughing operations and inter-row cultivation but was

largely the result of slower harvesting. For harvesting the costs of both labour and, despite the use of smaller tractors, of tractor time were found to be significantly higher than on units with heavier soils. It might be argued that, because they know that harvesting is less likely to be interrupted by wet weather, sandland farms choose to use machinery of lower capacity. On this reasoning the apparent advantage of the units on heavier land would in fact represent more hours of time when men and machines are forced to be idle by weather conditions. If this were the case however one would expect to find a lower average harvester cost on sandland farms; in fact it was almost exactly the same as on the heavier land units. The correct conslusion seems to be that the cost advantages of sandland units are - as the Scots would say - not proven.

While the reasons for moving beet off heavy land need further investigation, the fact of the movement is not disputed. The switch to lighter land is crudely reflected in county census data. The share of Cambridgeshire, Essex and Suffolk in the national beet area in 1981 was, at 27 per cent, five per cent lower than in 1971. The decline in actual area, dating from 1973, was by six per cent or nearly four thousand hectares. Over the same decade, the share of Norfolk increased by 2½ per cent to 27 per cent, the actual area having risen by over a quarter or nearly seven thousand hectares.

East Anglia as a whole thus increased its beet area between 1971 and 1981 but at a slower rate than the country as a whole; its share declined from 58 to 55 per cent.

This reduction in share has been mainly taken up by Yorkshire, but there have also been increases in the fractions grown by Shropshire and Lincolnshire. The slight increases in the shares of the East and West Midlands over the past decade extend trends between 1961 and 1971. For East Anglia and Yorkshire and Humberside, however, the trends in share have been reversed. In the sixties East Anglia slightly increased its share of the area, even though the rate of growth in national area was only a little less than the net rate of growth between 1971 and 1981, while Yorkshire and Humberside (defined as now) lost ground.

The present broad situation, as of 1981, is that East Anglia and the East Midlands together account for over three quarters of national plantings of sugar beet; the leading counties in the two regions, Norfolk and Lincolnshire, contain nearly half the national beet area.

CHANGES OVER TIME

Adjustment to real terms

To explore changes in profitability of sugar beet over the past twentyfive to thirty years I shall use the evidence provided by six surveys carried out by the Agricultural Economics Unit at regular intervals of around five years from 1954 onwards. Over this period the value of money in terms of goods and services it will buy has changed greatly and erratically. Thus as measured by the retail price index, what 16 pence or 3 shillings twopence hapenny bought in 1954 would have required 28 pence in 1970 and £1 in 1980. In other words a £1 in 1954 had six times the buying power of one in 1980; a £1 in 1970 bought over three and half times as much. Therefore comparisons over these spans of time in terms of prices actually paid and received in each period have no immediate meaning. To overcome this difficulty all the financial measures I use are expressed in terms of money of 1980 purchasing power. (This has been achieved by dividing each current price by an index of retail prices with a value of 1 in 1980).

I shall first describe changes in costs per hectare and then go on to consider changes in profitability by introducing the effects of changes in yields and product prices.

Cost changes 1954-1980

In terms of money of 1980 purchasing power, costs per hectare of sugar beet in 1954 were £963 per hectare, i.e. 25 per cent greater than for the 1980 crop. The difference of about £200 per hectare is almost precisely matched by the decline in the cost of regular allocated labour. This is not however to suggest that all other items of costs are in real terms at the same level as in 1980. On the contrary the mix of costs has changed greatly. While costs of materials are £53 and 35 per cent higher, contract costs are £30 per hectare lower. There are also offsetting differences within these categories. In materials costs a lower cost of fertilizer, by nearly £30 per hectare, is outweighted by a combination of somewhat higher costs of seed (by £17 per hectare) and much greater costs of sprays. Insecticides and herbicides which cost £66 per hectare in 1980 were barely used at all in 1954. The difference

in contract costs is the resultant of a rise of £21 per hectare for contracting of mechanized farm operations and a much larger fall in the costs of casual handwork. This is now only £9 per hectare or one per cent of total costs; in 1954 casual hoeing cost £63 a hectare which was seven per cent of total costs.

Comparison of sixties and seventies

The achievement of such an overall reduction in real costs is an impressive performance of which technologists, advisers and farmers may all be justifiably proud. It is salutary however to note that this cost reduction was all made by 1970, with the most rapid progress being made in the early sixties.

Average annual rates of cost change between surveys were

1954-61	- 0.9%
1961-65	- 3.6%
1965-70	- 1.1%

Since 1970 costs have moved erratically but the net tendency seems to be upwards

1970-76	+ 1.2%
1976-80	- 0.9%

This is not to suggest that there has been a resting on laurels. Cost reductions were easier to achieve in the sixties because the real unit prices of many inputs to farms were declining. For example, if one compares 1970 with 1954, energy in real terms was cheaper by 17 per cent, fertilizer by 36 per cent and machinery by 14 per cent. In the seventies by contrast prices of most inputs went up faster than the general price level, energy by 26 per cent, fertilizer by 21 per cent, and machinery by 25 per cent.

The striking feature of the period 1954 to 1970 was that a cut in labour costs of £181 per hectare (or nearly 60 per cent) was achieved without a concomitant increase in machinery costs. On the contrary

machinery costs were over the same period reduced by £50 per hectare. This in part reflects the effects of a declining real price of fossil fuel and therefore in the costs of owning and operating machines of a given design. It was also however the result of improvements in machinery. These were especially marked in the sixties; between 1961 and 1970 the number of tractor hours required per hectare was cut in half.

The period from 1970 to date has presented much fewer opportunities for cost saving. The scope for further reduction in labour input was much more limited.

In the mid-fifties there was great scope for labour saving in beet production because of the many hours spent doing things other than driving tractors - mainly in thinning, weeding, and lifting by hand but also in spreading FYM and guiding steerage hoes. In 1954, no less than 238 hours per hectare were spent on such handwork. This was then three-quarters of the total labour input and is nearly five times the present total input. By 1970 lifting and muck spreading by hand had vanished - to no one's great regret. The time spent on hand hoeing was down to 32 man hours per hectare. The remaining 50 hours for tractor driving could and would be reduced somewhat by using bigger machines with stronger tractors. But it was clear that the effect of this marginal economy and a residual displacement of hand hoeing could not match the previous wholesale labour savings made by replacing manual with mechanical and chemical methods. In fact whereas 226 labour hours per hectare were shed between 1954 and 1970, only 34 more were lost between 1970 and 1980.

But the real change in trend took place on the machinery side. The rising price of energy based inputs increased the costs of owning and operating machinery. Technological improvements were not great enough to overcome these effects. For example though tractor hours per hectare were reduced by one third from 50 to 32 the combination of a rise in costs of all tractors and a switch to more powerful tractors caused a rise in tractor costs per hectare by over a half. The cost of other machinery per hectare also increased, leading to a rise in the overall cost of machinery over the decade of £69 per hectare. This was reinforced by a rise in spray costs. Savings in all categories of labour - were not great enough to balance these effects and so there was a small net increase in total costs per hectare over the decade of three and a half per cent.

Trends in profitability

To extend the discussion from costs to profitability, changes in prices and yields must be taken into account. For the discussion of trends I have standardized both yields and prices to equivalents in terms of beet of 16 per cent sugar content. This simplifies the discussion and is justified by the random movement of sugar content over time. (Figure 6).

Yield was rising during the fifties and into the early sixties at a trend rate of .6 tonne per ha. but then stagnated until a period of depressed yields in the mid-seventies. Yield has since recovered but until this year, to a level below that of the early seventies. (Figures 7 and 8) Price in real terms was falling consistently between 1954 and 1970, the fall being especially rapid in the late sixties. In the early seventies there was a rare period of increasing real prices reflecting an EEC policy of expanding production, following the world shortage of 1974, but prices have since fallen back almost as rapidly. (Figure 9).

To show changes in profitability over this same period the best summary measure is the net margin. This is price times yield minus all costs per hectare other than interest on capital and the cost of managerial time in terms of what it could earn elsewhere. It is thus the return to investment and management. As indicators of underlying trends in profitability such margins from single survey years have one outstanding defect. Yield in a year of survey may have been untypically high or low compared to those in the surrounding period. The calculated net margin as a measure of profitability in that period corresponding will be eighter exaggerated or conservative. To overcome this defect I have re-calculated the net margins, leaving standard price and cost per hectare as before, but using for root yield and sugar content three year averages of the year of survey and the years before and after.

The broad pattern shown by these normalized net margins is that the profitability per hectare of sugar beet rose from the mid-fifties to a peak in the mid-sixties; it then fell sharply in the late sixties and in the earlier seventies, the downward trend levelling out only in the late seventies, (Figure 10).

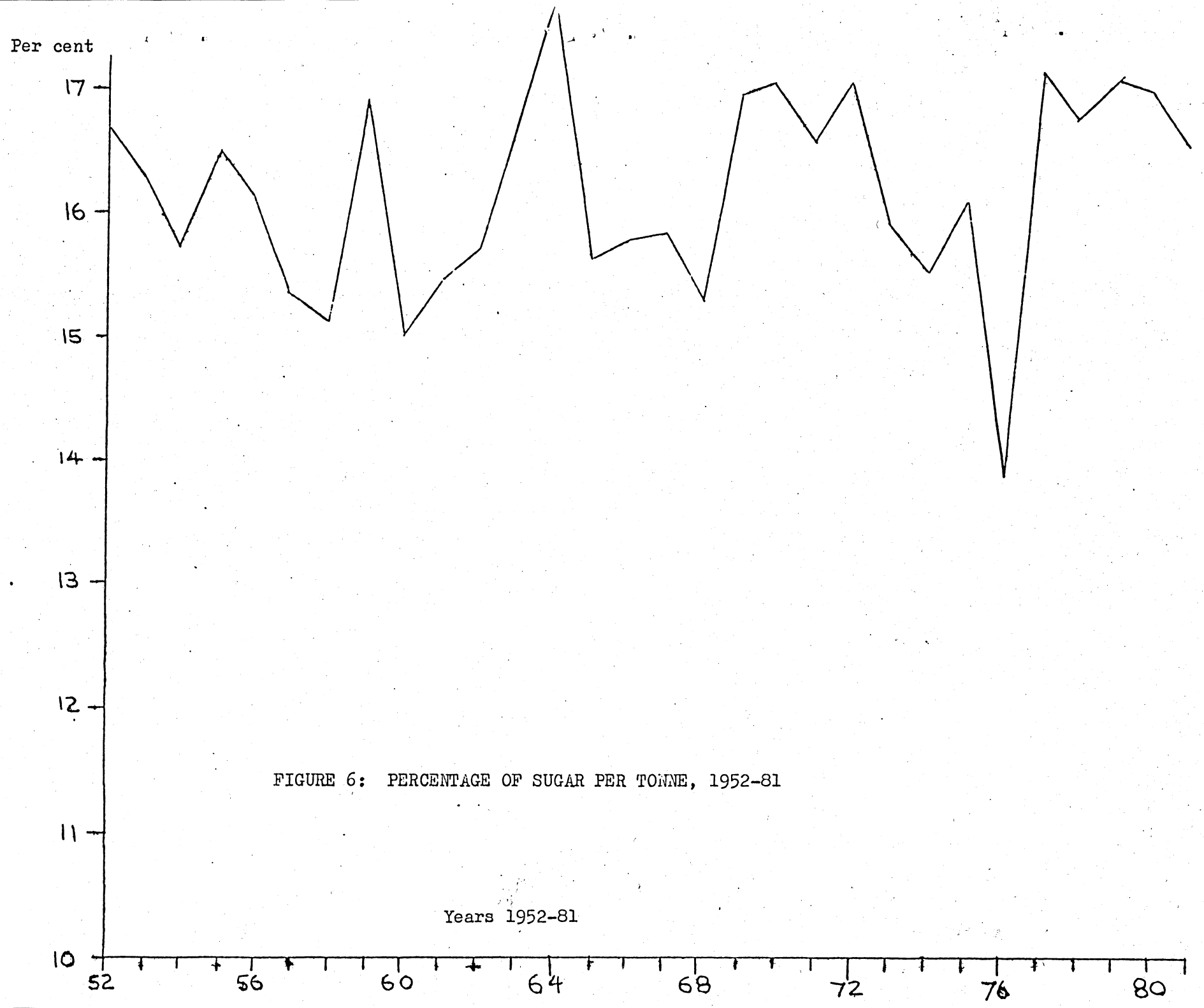


FIGURE 6: PERCENTAGE OF SUGAR PER TONNE, 1952-81

FIGURE 7: YIELD PER HECTARE IN TONNES EQUIVALENT TO 16 PER CENT SUGAR CONTENT, 1952-1982

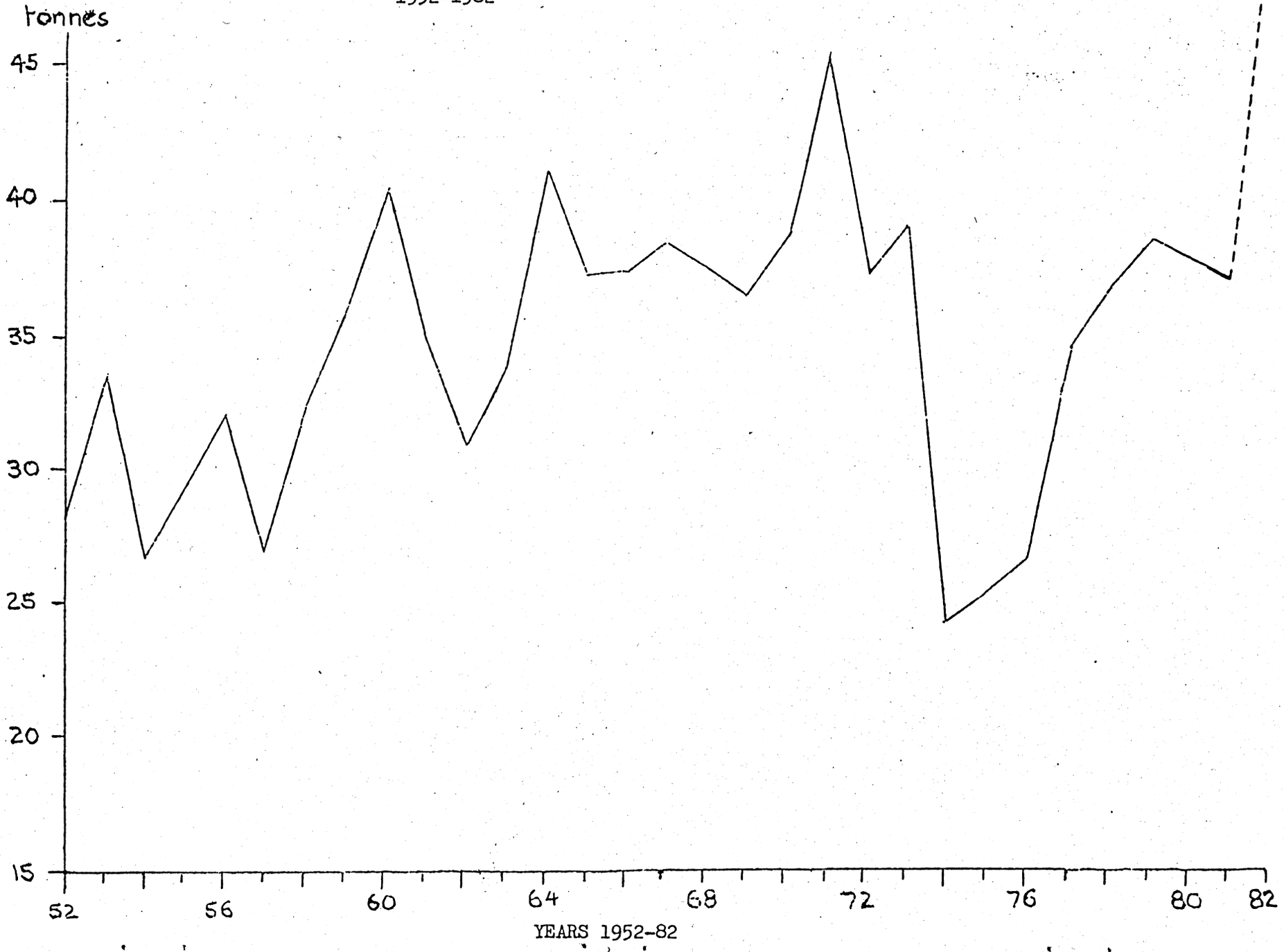


FIGURE 8: STANDARDIZED YIELD PER THREE YEAR MOVING AVERAGE

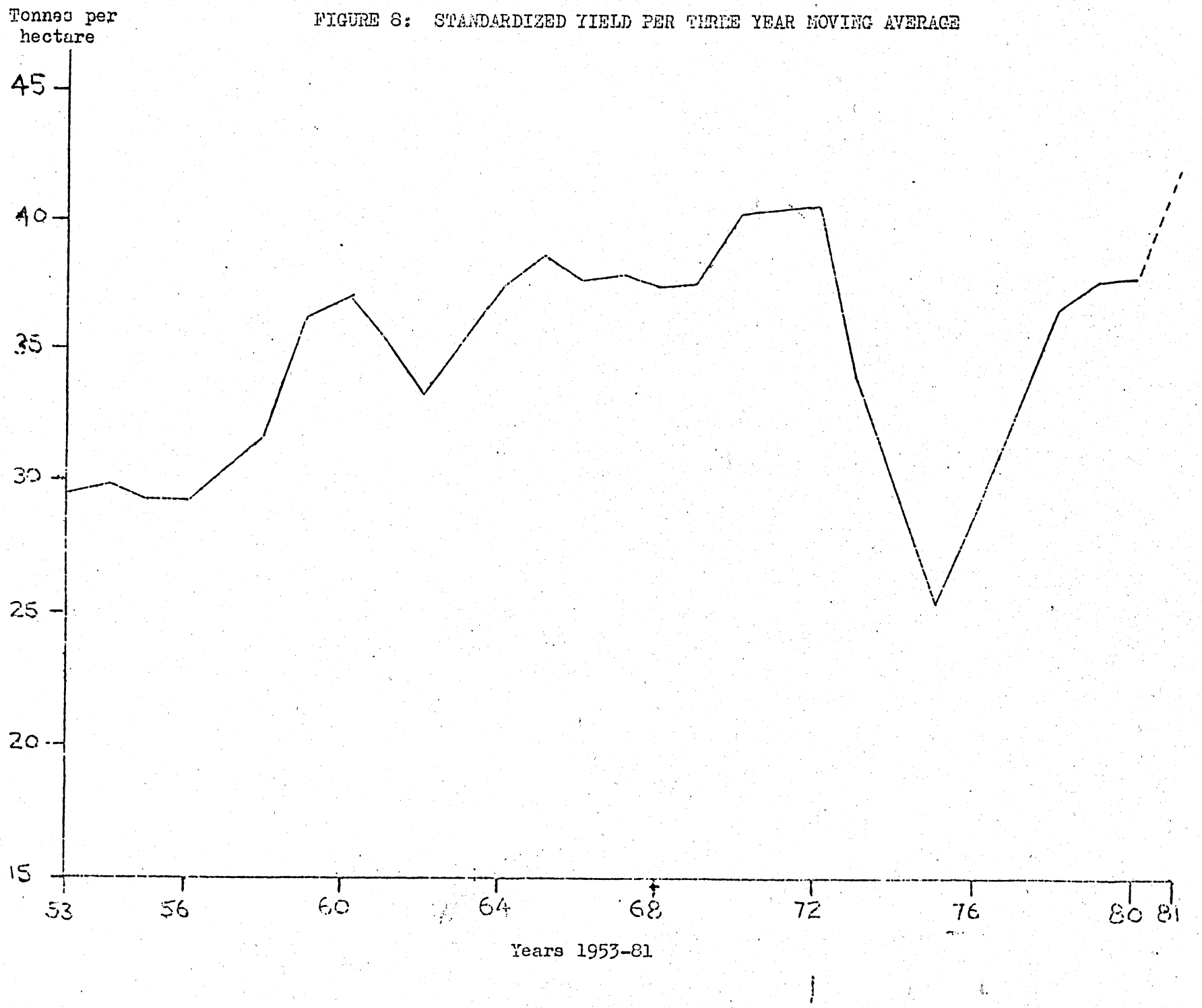


FIGURE 9: PRICE IN £1980 AT 16 PER CENT, 1953-1981

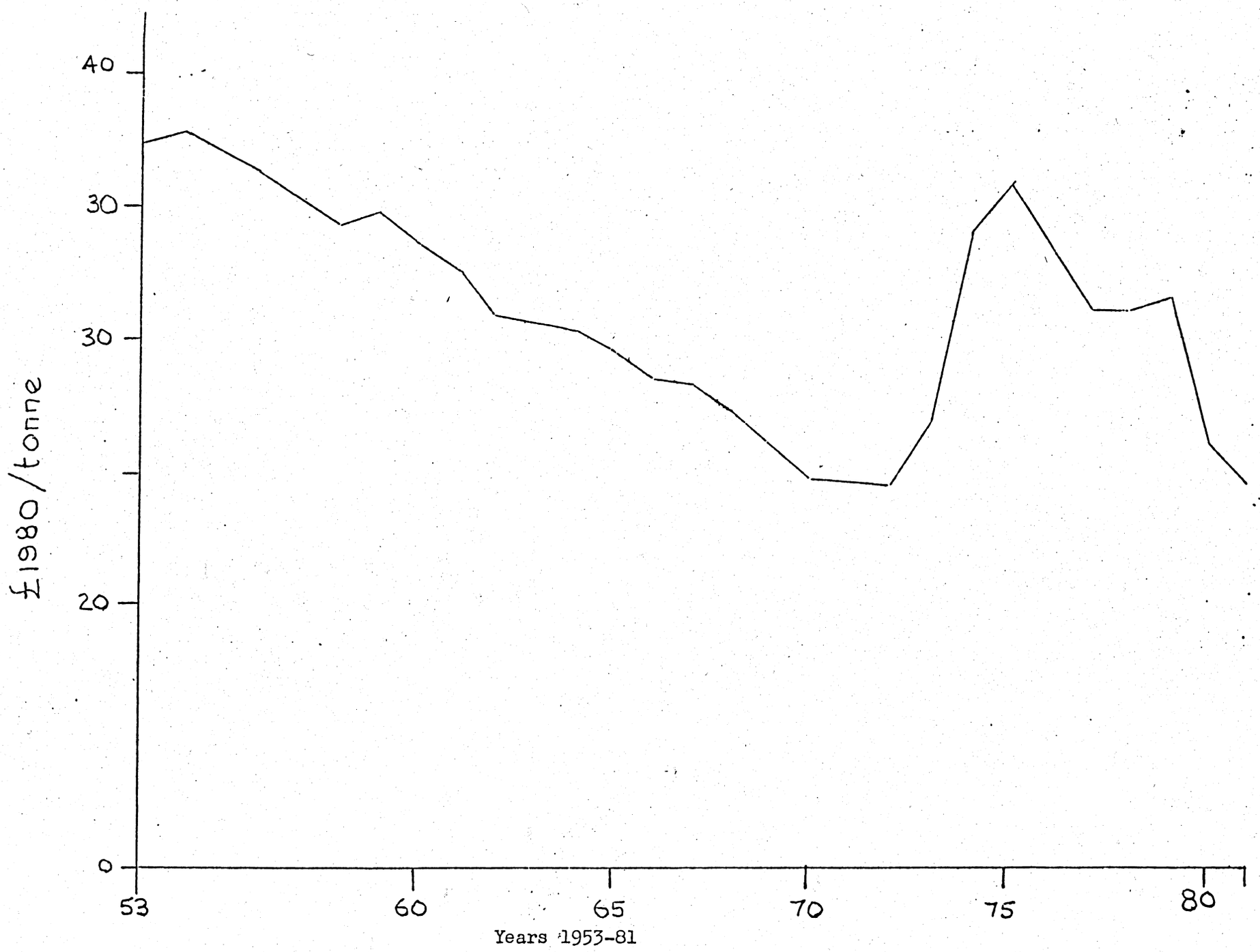
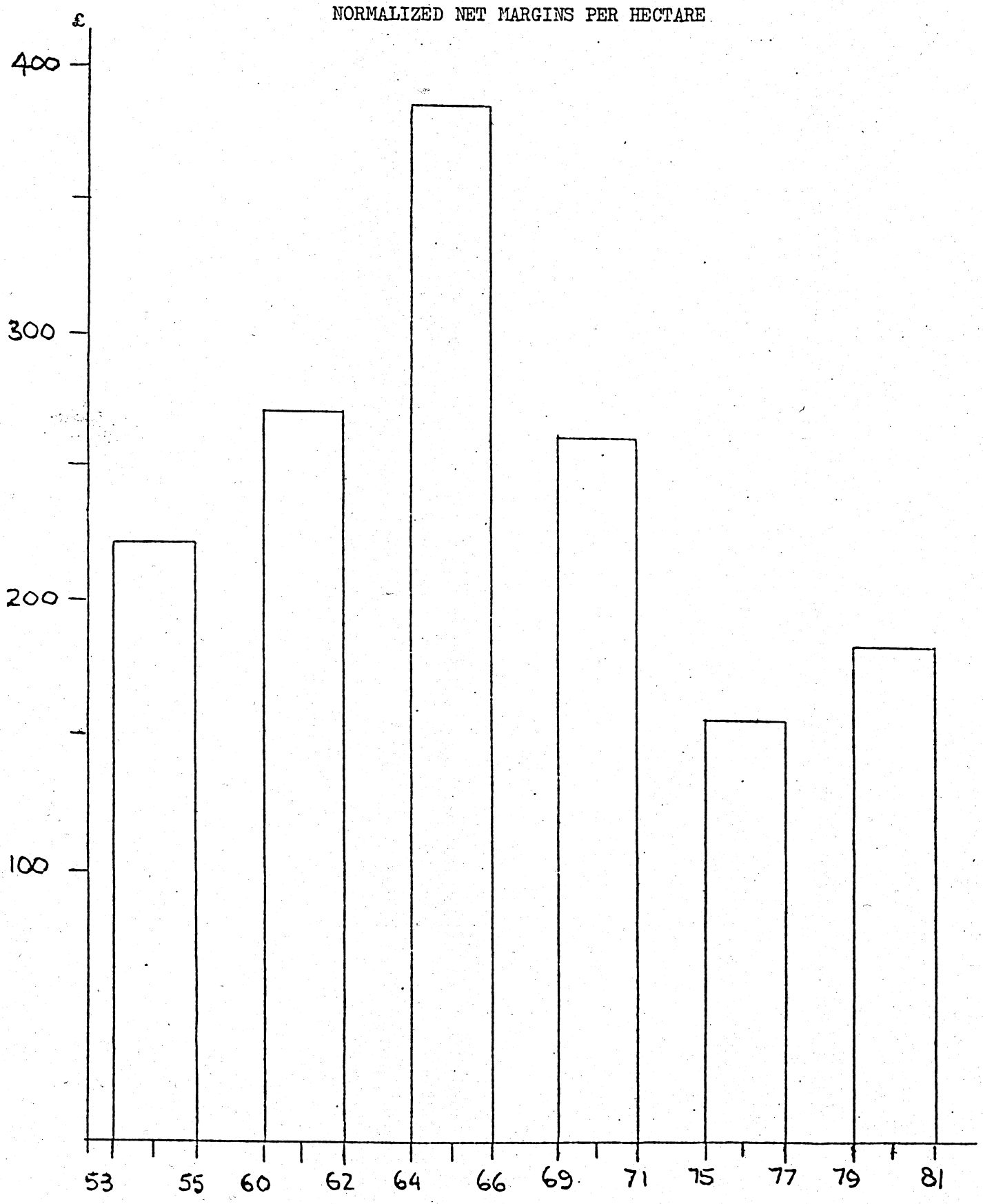


FIGURE 10

NORMALIZED NET MARGINS PER HECTARE



The differences in trend from period to period arise from differing inter-relations between trends in costs, prices and yields. In the late fifties and early sixties two of these factors, yield and cost, were moving very favourably for producers - each by two per cent a year in the right direction. Though price, as over most of the thirty year period, was moving downwards, the rate of decline at little more than two per cent a year was much less than in either the late seventies or in the late sixties which immediately followed. In that period a fall in price of three per cent a year, combined with a stagnating yield meant that, despite a continuing fall in costs, profitability dropped sharply. There followed in the mid-seventies a period of slightly rising costs and strongly depressed yields. Margins would surely have taken an even more precipitous nosedrive had not price been unusually high (Figure 11). In the late seventies the roles of price and yield were reversed; yield recovered but price fell. The result was that up to 1980 there was no real revival in profitability from the doldrums of the mid-seventies. The normalized net margin for the period centred on 1980 was in real terms only half that in the halcyon years of the mid 60's and still 30 per cent lower than a decade earlier.

Break-even versus actual yields

The phases of profitability of sugar beet production can also be shown by relations between actual and break-even yields. Break-even is the yield required to provide a return that will cover all costs of production, other than interest and the opportunity cost of management. It therefore reflects the relation of the price of sugar beet to the cost per hectare of growing it. The break-even yield was fairly stable between the mid-fifties and mid-sixties ranging between about 25 and 28 tonnes per hectare, but tending to move upwards slightly. (Figure 12) Since the mid-sixties it has been much more erratic, because of different phases of pricing policy - severe in the late sixties, expansionary in the mid-seventies and restrictive once again in the late seventies. The break-even yield thus rose from about 26½ tonnes per hectare in 1965 to over 29½ in 1970 then fell to 24 in 1976 and finally rose back to 30 tonnes a hectare in 1980.

FIGURE 11: PRICE IN £1980 AT 16 PER CENT SUGAR CONTENT, 1969-1981

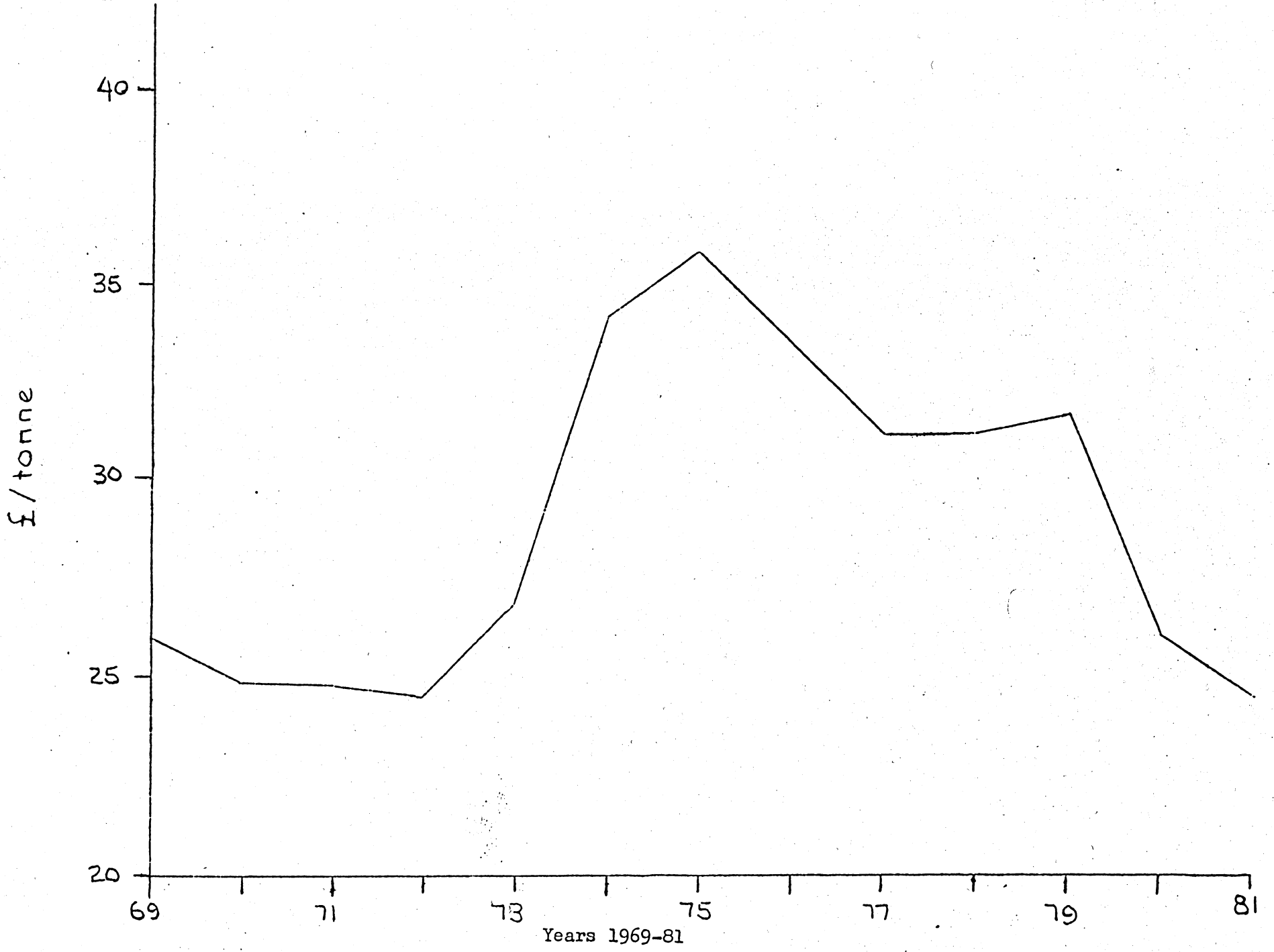
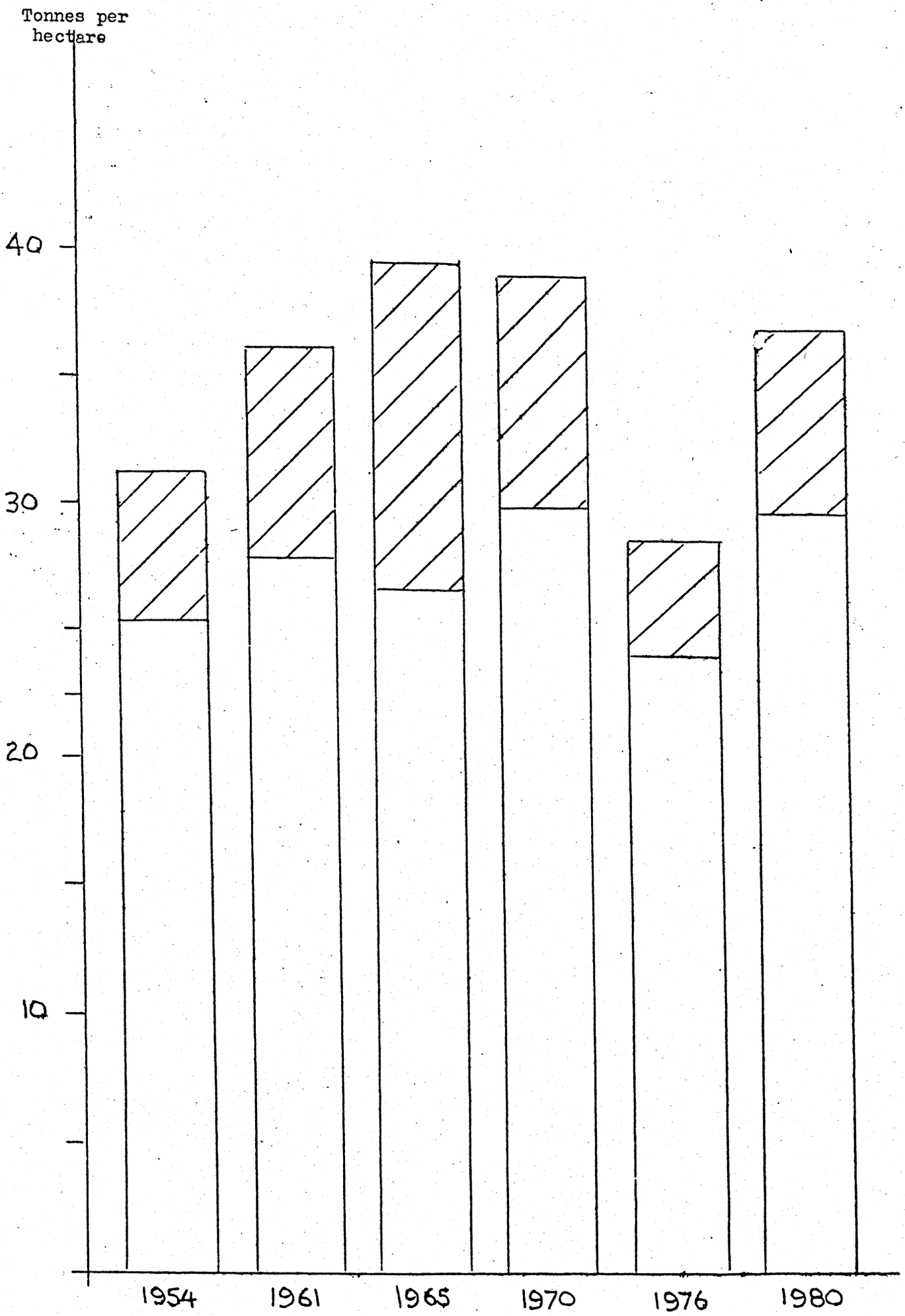


FIGURE 12: ACTUAL AND BREAK-EVEN YIELDS (16 PER CENT SUGAR EQUIVALENT)



The higher is actual yield in relation to the break-even, the greater the profitability of the crop. In the chart the actual yields shown are once again three year averages, and like the break-even yield, are in terms of equivalents at 16 per cent sugar content. It can be seen that actual yield which was about a quarter above break-even in the mid-fifties rose to 50 per cent above break-even in the mid-sixties. While actual yield rose by over two per cent a year the break-even yield was fairly static. Government pricing policy was generous in relation to the effect of technological advance and of falling prices of fossil fuel on costs and yields.

Since the mid-sixties, the excess of actual over break-even yield has dropped back to below a quarter in 1980. The decline has been erratic and for reasons differing between periods. In the late sixties the break-even was squeezed upwards towards a static actual yield, leaving less headroom for profit. In the mid-seventies depressed actual yields fortunately coincided with low break-even yields caused by a Community wish to stimulate production. The net result nevertheless was that actual yield was less than 20 per cent above break even. In the late seventies yields recovered a little more than the break even increased. The proportion of yield available for profit and interest payments was thus raised but remained below that of the early seventies and well below that of the mid-sixties.

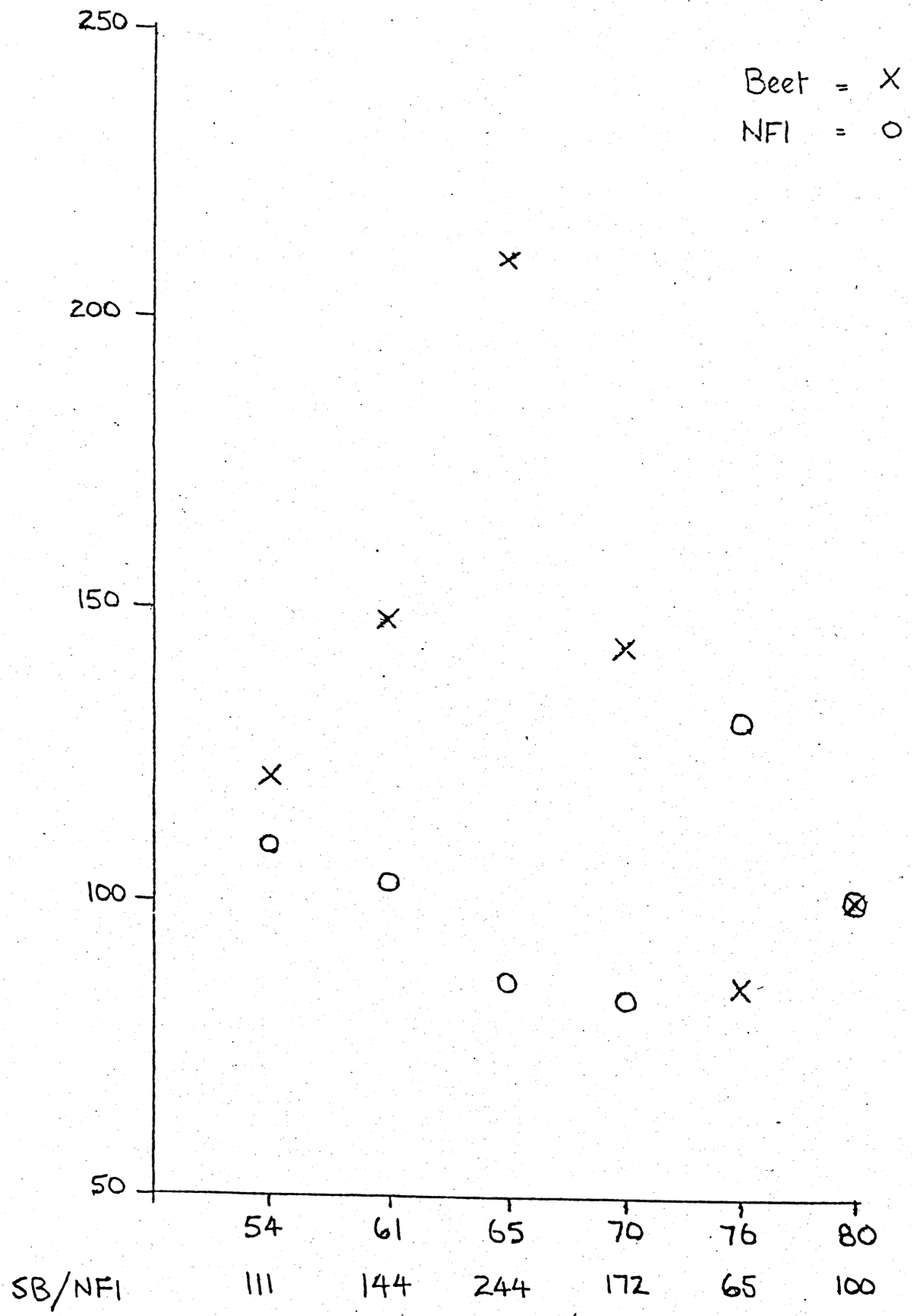
Profitability in relation to all other enterprises

It might well be asked how much have these phases of profitability been the results of changes common to arable farming in general as opposed to causes peculiar to sugar beet. The answer is very little. On the contrary, beet growing has tended to prosper when farming in the main surrounding area has been in recession - and conversely (Figure 13). This has been particularly so in the past twenty years. In the mid fifties and early sixties both farm income per hectare in the Eastern Counties and the net margin per hectare on sugar beet were in real terms above the level of the early eighties. The discrepancy was that the beet margin was considerably higher but net farm income only slightly higher. In the sixties and seventies

FIGURE 13

INDICES OF REAL NET MARGIN ON SUGAR BEET AND NET FARM INCOME IN THE EASTERN COUNTIES.

(3 year averages - 1980 = 100)



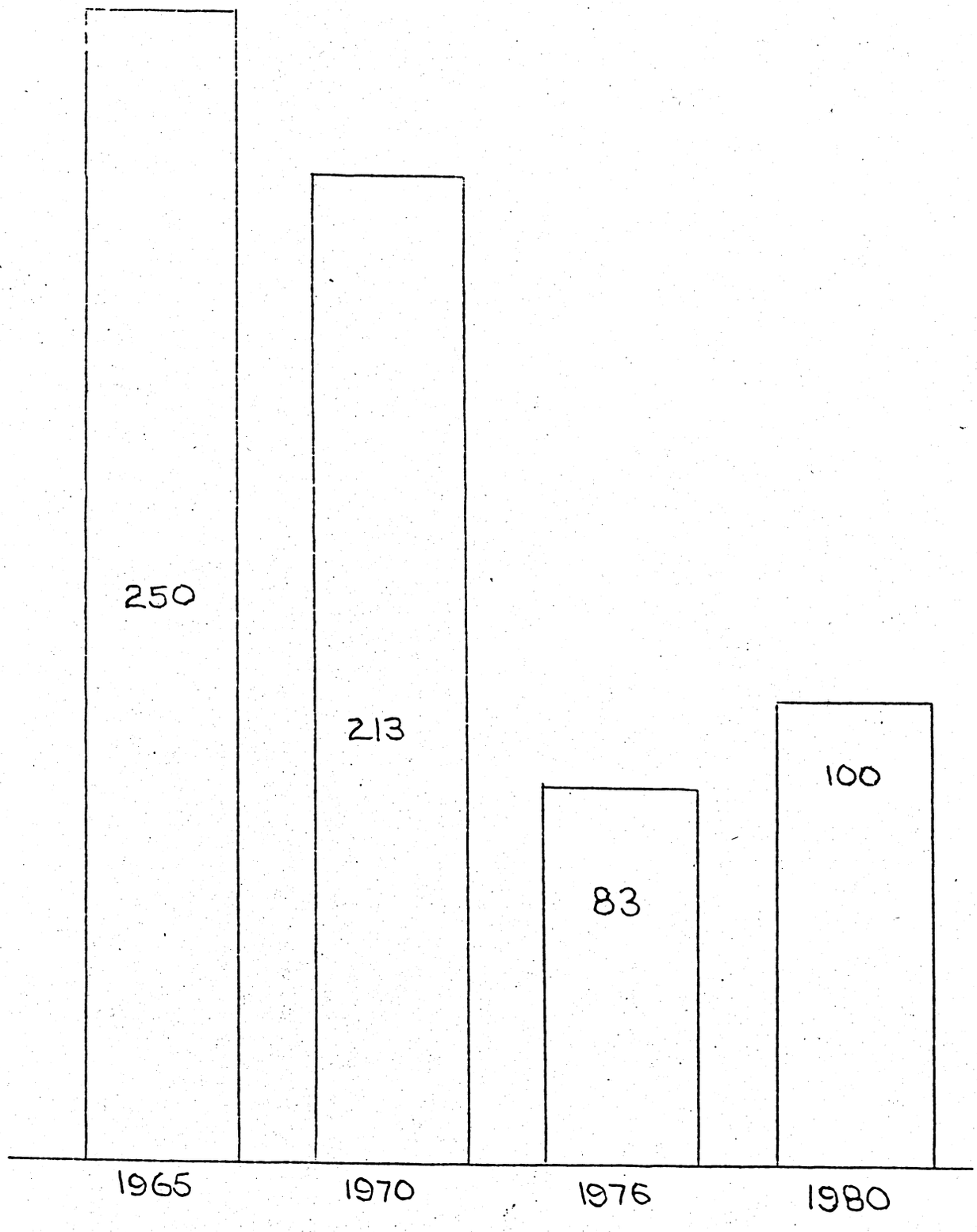
the divergences became much greater. Between the early and mid sixties total farm income per hectare in the Eastern Counties was going down while income from beet growing was rising. In the mid-sixties therefore beet growing was unusually prosperous not only in absolute terms but also in relation to other farming enterprises. The ratio per hectare of net margin on beet to net farm income in the Eastern Counties was then two and a half times greater than in the late seventies and double that in the mid-fifties. Understandably growers very very eager to expand the area contracted. Even though the return per hectare from beet growing subsequently dropped faster than the overall return from farming in the Eastern Counties, beet growing remained relatively attractive into the early seventies. Growers in that period wished to grow about a quarter larger area than they were allotted by their contracts. In the mid-seventies there was a dramatic reversal. For Eastern Counties farmers in general this was a boom period but returns from beet growing were exceptionally low. The ratio of returns per hectare from sugar beet to total farming returns in the Eastern Counties dropped by 60 per cent to a level only a quarter of what it had been at its zenith. In the most recent period - the pendulum has swung back once more. Margins per hectare on beet have been rising while aggregate net farm incomes have been falling. For the triennium centered on 1980 the ratio per hectare of income from beet to overall income has been 50 per cent higher then for that centered on 1976. For the triennium centered on 1981 the ratio will be higher again, probably by as much as 20 per cent.

Profitability in relation to cereals

The overall margin from farming in the Eastern Counties is of course very much affected by the profitability of growing cereals. Hence the ratio of beet margin to overall margin which I have been discussing approximately maps out the movement of the relative profitability of growing sugar beet and cereals. This movement can be shown more precisely by the relation of the net margin on sugar beet to that on wheat. (Figure 14). A reasonable, if possibly oversimplified, interpretation of this chart is that incentives to give up production of sugar beet in order to grow cereals continuously were increasing between the mid-sixties and mid-seventies and were only mildly

FIGURE 14

INDEX OF RATIO OF REAL NET MARGINS ON SUGAR BEET AND WHEAT (1980 = 100)



weakened in the late seventies. Indeed the actual net margin on sugar beet fell below that on wheat in the mid-seventies and remained so in the late seventies.

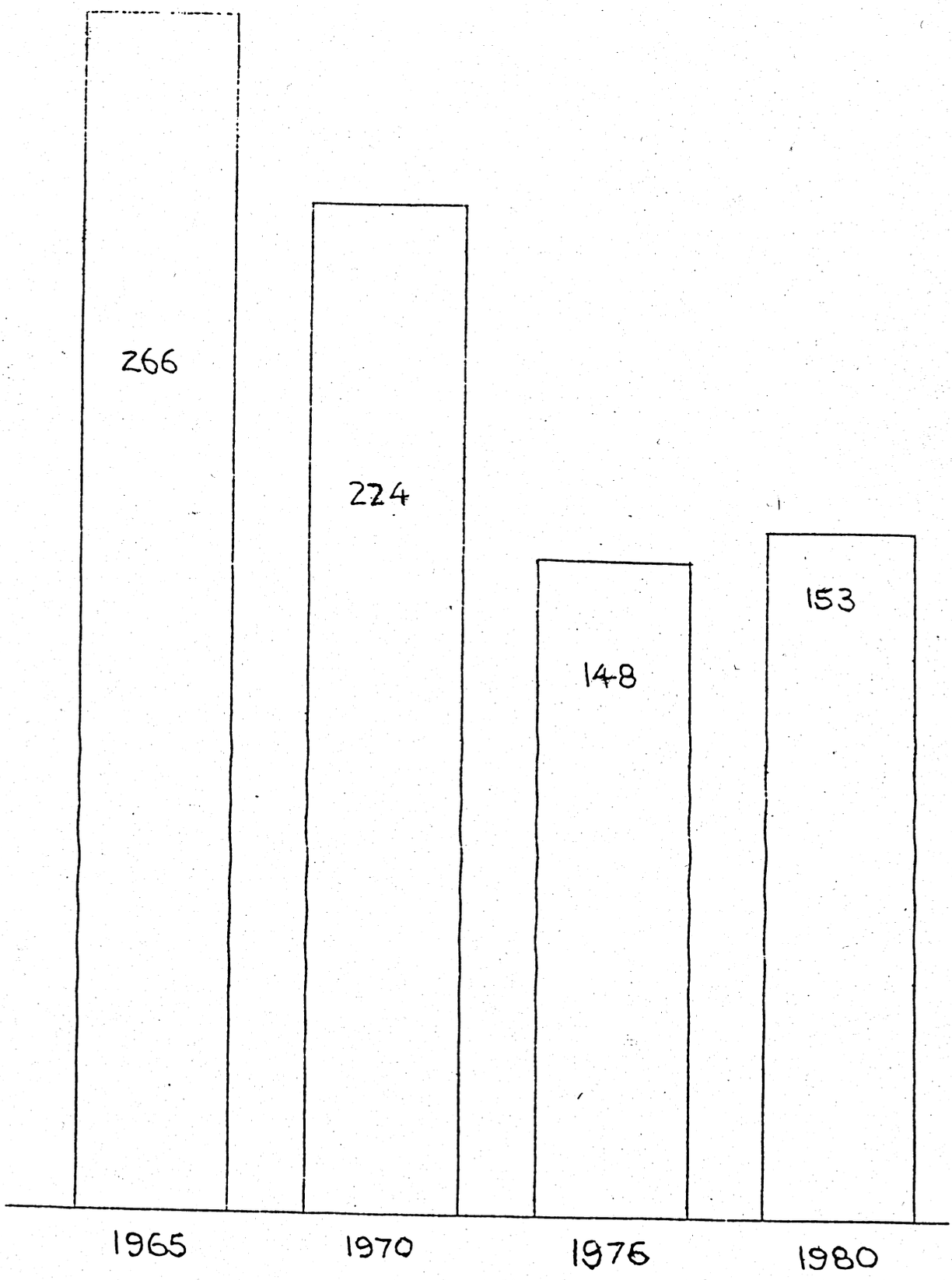
This comparison of net margins is a valid indicator of the incentive (for growers in appropriate circumstances) to give up sugar beet, lock stock and barrel and switch the land into cereals. In studying a period when BSC was seeking to expand the area planted however, it is necessary also to consider the incentive for existing growers to make marginal increases in area. Since such marginal increases often involve no changes in machinery stock or labour employed, the best measure of this incentive is the relationship between gross margins - i.e. margins above those costs which change proportionately with the area of enterprise. (Conventionally these are taken to be the costs of fertilizers, sprays, seed and contract services though there are other costs such as fuel which would also be included were there not difficulties in measurement. In the calculation of gross margins of sugar beet I have left contract services out of account to avoid distortions through the reduction of casual hoeing). The pattern shown, (Figure 15), is that the incentive for established growers to make marginal increases in beet area at the expense of cereals weakened somewhat in the late sixties, then markedly in the mid-seventies, and remained fairly weak in the late seventies. If one allows for inevitable lags in response it is perhaps not surprising then that the sugar beet area peaked off in 1979 at 214 thousand hectares and has since declined by about seven per cent.

Margins in 1982

This of course is not the end of the story since we are now in 1982. I shall I am sure not be allowed to escape today without giving some view of margins from the 1982 crop. We are in the process of doing a survey of this crop and have enough information to make a reasonable estimate of the margin over materials. Our estimate is that it will turn out to be £1080 per hectare or in real terms nearly 20 per cent above the 1980 level. For the detection of trends however I have calculated a normalized margin over materials for which I have used average yields and sugar contents over the past three seasons i.e. 1980-1982. I have adjusted price accordingly to take account of a lower proportion of C sugar. The resulting 'trend' output is £1200 per hectare, compared to an estimated actual output of £1340.

FIGURE 15

RATIO OF GROSS MARGINS ON SUGAR BEET AND WHEAT



My 'trend' yield is about eight per cent above the level of the mid-sixties which does not seem unreasonable in the light of the improved varieties now available and the recent redirection of research from labour saving to yield improvement. The normalized margin over materials of £940 per ha. is some 75 per cent above a similarly calculated margin on wheat, compared to only 50 per cent in 1980.

A corresponding calculation of relative net margins must be more tentative, involving liberal use of indexation and assumptions. My estimates of trend net margins are about £270 per hectare for sugar beet and about £220 for wheat. Thus whereas in 1980 the normalized net margin of sugar beet was nearly 30 per cent <u>below</u> those of wheat it is now, I estimate, about 20 per cent higher. This may be compared with an excess of 50 per cent in the early seventies. If continued in the future this relation should maintain the present beet area and is unlikely to expand it. The 64 ECU question is will this relationship hold in the future?

My starting point for considering this question is that the relative profitability of beet and cereals in the future will be more seriously affected by EEC pricing provisions then by technological developments. The second point is that I believe in the 1980's there will be strong pressures to make the CAP less favourable tp producers. This pressure will come from a number of sources, the effect on food prices in a time of recession, relations with third countries, and a general quest for economic efficiency but above all from a desire to curb exchequer payments to agriculture. From this standpoint, cereals producers are much more vulnerable than sugar beet producers. The Community has made the sugar regime largely self financing. The levy on the B quota price financies the greater part of the restitution and intervention payments on sugar and the excess of production above A and B quotas has to be exported at world market prices. The cereals section by contrast is becoming an increasing burden on Community exchequer, the cost to the budget having been rising by 17 per cent a year over the past four years. An additional consideration is that whereas sugar production is controlled by quotas, similar quota arrangements for cereals would be impossible to administer since, unlike sugar beet, production does not have to be funnelled through a few central processing points. (It would be in practice impossible

to regulate the amount of cereals each producer sells on the EEC market since restrictions would be evaded by inter-farm sales or sales in the form of livestock and products). Production control must inevitably be by cutting real prices.

For these reasons I expect, that, despite the dismal market prospects for sugar on both world and EEC markets, EEC support prices of cereals will be cut more severely than that of sugar beet. Thus even if yields of cereals as in the past rise from now onwards faster than those of sugar beet, it is unlikely that cereals will regain the advantage in profitability over sugar beet which they had in the later seventies.

Profitability in relation to oilseed rape

Finally by way of a postscript I must say something on oilseed rape. For the Unit the topic of rapeseed versus sugar beet has to be classed under agenda rather than acta . However the sparse information available suggests that rapeseed has progressed from being a Cinderella crop in relation to sugar beet in the early seventies to a crop which now shows very similar financial performance. Whereas in the triennium ending in 1971 the net margin on sugar beet was over £200 per hectare higher than on rapeseed, and in that ending 1977 was of the same order, in the triennium ending in 1982 the net margin on rapeseed was about £20 per hectare or seven per cent more than those on beet. The main reason rapeseed has overtaken beet (in an aggregate measurement) is that whereas the yield of sugar beet, after a prolonged depression, has done little more then regain the level of the early seventies, the yield of rape has shown a clear if unsteady rise over the decade, so that yield in 1980-82 was more than 60 per cent greater then the average of 1969 through 1971. Of late price changes have also favoured rapeseed. (The broad effects of joining the EEC can be measured by comparing 1976-78 with 1970-72. This procedure abstracts the temporary effects of the boom in world commodity prices from 1973-75). Between the triennia ending 1972 and 1978 the real price of rapeseed rose by 35 per cent and that of beet by nearly 30 per cent. Since then however up to 1981 the price of rapeseed held its value in real terms while that of beet fell back by 20 per cent.

The only respect in which beet has been at an advantage is in cost per hectare. Costs per hectare on rapeseed appear to have increased by as much as a half over the decade while those for beet have hardly changed. What of the future?

My feeling is that it would be wrong to extrapolate the increasing profitability of oilseed rape in relation to beet into the future. First the limited substitutability of rapeseed oil and meal for other oilseed products makes it likely that EEC price policy will become increasingly conservative. For the same reason producers are likely to have to pay more attention to quality in terms of reducing the contents of erucic acid in oil and glucosinolate in meal. At present it seems that this will involve a yield penalty. On the cost side more selective buying by processors will require greater specific investment in both machinery and storage.

There are also three more general considerations which I suggest make a further invasion of oilseed rape into the beet area unlikely. First as a break crop for cereals rape is inferior to sugar beet in two respects. It does not allow autumn weed control by cultivation and it is less complementary in its labour requirements. Rape is also less likely to displace sugar beet on the lighter lands onto which beet has become increasingly concentrated. A final consideration is that a squeeze on cereal growing may encourage the greater use of all break crops so that a further increase in the rapeseed area may be achieved without a further contraction in the area of sugar beet.

CONCLUSIONS

My conclusions in brief are these.

1. Great and increasing diseconomies of small size in beet production will make it increasingly the province of the large specialist.

2. Some doubt is cast by our survey results on the conventional wisdom on differences between soil types in production costs and margins.

3. The absolute and relative profitability of growing sugar beet though well below its zenith in the mid-sixties has recovered sufficiently to maintain its area at about the present level.