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Economics of the UK Sugar Beet Industry

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Special Studies in Agricultural Economics

University departments of Agricultural Economics in England and Wales have for many years undertaken economic studies of crop and livestock enterprises, receiving financial and technical support from the Ministry of Agriculture, Fisheries and Food. Since April 1978 this work has been supported in Wales by the Welsh Office following the transfer of responsibilities for agriculture to the Secretary of State for Wales.

The departments in different regions conduct joint studies of those enterprises in which they have a particular interest. This community of interest is recognised by issuing reports prepared and published by individual departments in a common series entitled *Special Studies in Agricultural Economics*. Titles of recent publications in this series are given in Appendix C. The addresses of all departments involved in the collection of data are given in Appendix D.

Foreword

This report on the economics of the sugar beet crop is timely for several reasons. First it is almost fifteen years since a similar rigorous and independent survey of costs and returns was carried out by an association of university and college units. In the interim there has been recourse to results which have been synthesised or produced as by-products of other work. These can not have the accuracy or authority of analyses based on random sampling, detailed and specifically focused farm visits and well tested accounting and data processing procedures. Therefore the results and perceptive commentaries in this report should provide a singularly valuable source of information not only for growers but also for those who advise them and supply them with inputs and professional and financial services.

The report is also timely for policy makers and commentators. Despite the radical changes which have been made to the CAP regimes for competing crops (cereals, oilseeds and proteins) the sugar regime has so far escaped serious revision. There will certainly be proposals for, and discussion of, more fundamental change and it is important that they be based on solid data and analyses such as those here provide.

Even within the existing policy framework, there is concern about how far the efficiency of the industry may be hampered by its rigid contractual arrangements. The report throws fascinating light on this issue. Inevitably, what is said can not be the last word but the possible gains from further consideration are striking.

Also contained are interesting and useful analyses of some other questions of continuing interest such as the merits of using contractors and economies of size. Other economic features of the production of sugar beet such as the increasing standardisation of management practice are precisely quantified.

The report presents exact analyses in an accessible and lively way. On this account a wide range of managerial and political decision makers will find it valuable and stimulating to read, as well as to retain as a source of reference.

Ian Sturgess
Director
June 1997

Acknowledgements

Although only one author appears on the front cover of this report, many people have been involved in the planning and execution of this study. The study was planned with the help of the Economics and Statistics (Farm Business) Division at the Ministry of Agriculture Fisheries and Food, and Geoff Davidson and Ian Sturgess from Cambridge University. Members of the research units at the Universities of Cambridge, Nottingham, Reading and Askham Bryan College of Agriculture jointly co-operated to collect the required information.

In house, my thanks go to Johann Tasker, and on his departure, Richard Hodgkins who undertook the coding and checking of the data. Special thanks go to Joe Barker who spent many hours on all aspects of data handling, whilst Faisal Sabbah's help with programming the analyses (and retrieving deleted chapters!) was invaluable.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Chapter 1 Summary and Conclusions

1.1 Introduction

This chapter reproduces in summary form the main findings presented in this report. The sections to which the points refer are shown in parentheses after each point.

1.2 Objectives and Sampling

- This report is based primarily on the findings of a survey of the 1995 harvest year (1995/6 campaign). The survey data was collected from a sample of 206 farms throughout the sugar beet growing regions of the United Kingdom. (2.3)

- The survey was designed to collect information relating to the sugar beet enterprise on the survey farm. The methodology adopted was that which has been successfully used for a large number of arable crop surveys. (2.3)

1.3 The United Kingdom Sugar Beet Industry

- The first beet processing factory in the United Kingdom was constructed at Cantley in Norfolk in 1912, although beet production did not really begin to take off until the introduction of a subsidy by the Government in 1924. Since this point sugar beet production has always been influenced by agricultural policy. (2.2.1)

- Sugar beet in the UK has, since 1973, come under the sugar regime of the Common Agricultural Policy of the European Union. In summary the major effect of the EU regime on the UK sugar beet industry is that the overall level of production eligible for support is controlled by a quota on the final product, sugar. Producers are contracted to British Sugar plc to produce a certain tonnage ('A' and 'B' quota). For this contracted quantity they receive a guaranteed price which is known with some certainty in advance. Any production over this contracted amount, so called 'C' sugar, does not receive the guaranteed price, but one that is determined by world prices and the proportion of excess production carried forward to the next year. (2.2.2)

- In 1995 around 10,000 producers grew 196,000 hectares of sugar beet (June census definition). Although sugar beet occupies only a small proportion of the total arable area in the United Kingdom (just over three per cent) it is of particular importance to certain areas, especially in the Eastern counties of England. (2.2.4)

1.4 Costs and Returns of Sugar Beet Production, UK

- The average output from sugar beet, including an allowance for transport and delivery bonuses came to £1886 per hectare. Total costs were £1201, leaving a net margin of £685 per hectare. This is equivalent to £36 per £100 of output. (3.2.1, 3.2.2)

- On a per tonne basis, output on each adjusted tonne was £42 with costs at £27, leaving a margin of £15 per tonne to the producer. (3.2.2)

1.5 Costs and Returns of Sugar Beet Production, by EU Region in England

- Farms in the England North region had the highest yield per hectare (46.29 adjusted tonnes) and total output per hectare (£1966). However, at the 10 per cent level, the only significant advantage the North had was a higher level of output than the England West region.[1] The North's advantage was maintained only to the margin over materials level, beyond which lower costs for farms in the West ensured that differences between regions were not significant at the 10 per cent level. Nevertheless, the North did achieve the highest net margin at £744 per hectare. (3.3)

1.6 Costs and Returns of Sugar Beet Production, by Size of Enterprise

- Average yields were very similar between size groups, although enterprises between 20 and 50 hectares in size achieved a tonne more per hectare than those over 50 hectares. There were no significant differences in levels of output or material costs between size groups. Differences were evident in costs of contract services, regular labour and machinery. The largest enterprises had significantly lower overall costs than the smaller farms and consequently they achieved the highest net margin. However, the difference was not statistically significant at the ten per cent level.(3.4)

1.7 Costs and Returns by Method of Harvest

- Those using contractor services to harvest their crop (51 per cent of growers) achieved a significantly higher yield (46 adjusted tonnes per hectare compared with 43). Further analysis indicated that the advantage occurred mainly in the Eastern region of England, but cannot be accounted for by the location or size of enterprise. Anecdotal evidence suggests that it might be related to the timing of harvest and delivery to factory. The integrated approach of contractors and hauliers mean that beet harvested by contractors is likely to be stored on farm for a shorter period; therefore sugar loss and shrinkage is reduced. However, it is clear that the timeliness of the next crop is important in the decision when to harvest. (3.5)

- Average costs between those using contract services and those own-harvesting are virtually identical. However, this is not the case within size groups. Smaller enterprises tend to gain from using contractors, whilst for larger enterprises own machinery appears the better option. (3.5)

1.8 Costs and Returns by Net Margin Quartile Group

- Yield appears to be the fundamental determinant in profitability. Costs per hectare are similar between the most and least profitable holdings. Unusually the most profitable enterprises are smaller in size than the average (even though mean returns for all small units were below those on larger units). Other enterprise studies show a reverse relationship with larger enterprises achieving the greatest

[1] Statistical significance is explained in Section 3.3, footnote 8.

profit. There is a difference of £830 per hectare in the average net margin between the least and most profitable quarters. (3.6)

- On a cost per tonne basis the high income enterprises produce beet on average for £22 per adjusted tonne, whereas the figure is nearly £36 for the least profitable units. (3.6)

1.9 Physical Aspects of Production

- Total contracted tonnage for farms taking part in the survey was 429 thousand tonnes. Total production was 454 thousand, representing an excess of six per cent. Over-production varied between regions and size groups. (4.3.1)

- Thirty-three per cent of producers failed to achieve contracted tonnage, the drought conditions in 1995 playing a large part in this. A disproportionate number of large farms and those situated in the East failed to achieve their quota. (4.3.1)

- On average, the farms surveyed would like 774 more tonnes of quota per farm. This represents just over a quarter of current quota. (4.3.1)

- Few growers would deliberately plant over quota unless the price was known to be greater than £20 per tonne. (4.3.2).

- There does appear to be considerable interest in growing beet for industrial purposes, but only at the right price. Fifty-seven per cent of growers stated that they were interested in growing, on average, 21 hectares of industrial beet. The average price per tonne necessary to induce production is £27. If the beet was grown on set-aside land and the payment used as a production subsidy, this could make industrial beet viable at £18 per tonne. (4.3.3)

1.10 Input Usage

- Saxon accounted for just under 30 per cent of the seed planted. Those using Gaucho seed dressing (a quarter of the sample) attained significantly higher yields which cannot be explained by other factors. (4.4.1)

- Fertiliser usage appeared to be very much in line with recommendations. (4.4.2)

- Herbicides accounted for 80 per cent of crop protection costs. The type of seed dressing appeared to have an effect on crop protection costs; those using Force had the lowest costs whilst those using the standard dressing had the highest. Farms with potatoes in the rotation had significantly higher crop protection costs caused by increased herbicide usage. (4.4.3)

- Yields and margins did vary between soil types, however the differences were not significant at the 10 per cent level. (4.4.5)

- Man hours required were considerably less than those found on previous studies. On farms undertaking their own harvesting, the average labour requirement was

17.4 man hours per hectare. This fell to 11.8 hours on farms which used a contractor for harvesting. Examination of farms not using contractors indicated regional differences, with farms in the Northern region, on average, using the most labour per hectare. (4.4.6)

- Farms irrigating their sugar beet did not achieve a higher yield than those not having access to irrigation. This may be related to potatoes, a more valuable crop, having first call on the available resources. (4.4.7)

- On a range of features, growers rated British Sugar pretty highly; discontent centred around methods of sampling beet delivered to the factory and the length of the processing campaign. (4.5)

1.11 Efficiency and Quota Transfer

- Analysis indicated that the lowest cost producers (ranked by cost per tonne) produce beet on average for £15 per tonne less than the highest cost producers. (5.2)

- Preliminary analysis suggests that a national saving of up to £16.5 million in costs could be achieved if low cost farms were allocated the quota of high cost farms. (5.3)

- Using average yields from 1994 and 1995 a leasing value for sugar beet quota of £12.50 per tonne is estimated. This translates into a purchase price of £54 per tonne (assuming a discount rate of 10 per cent and that quotas will last for another six years). (5.3)

- A greater reduction in costs would occur if quota was freely transferable, but still significant reductions would be possible even if transfer were limited to within factory regions. (5.4)

1.12 Longitudinal Analysis

- Real costs of production have declined considerably since 1954. This is especially the case when they are presented on a per tonne produced. However, the real price of sugar has declined in line with increased productivity leaving margins per tonne similar over time. (6.2)

- The composition of costs has altered considerably with the share of total costs accounted for by labour (excluding that supplied by contractors) declining from 40 per cent in 1954 to under 10 per cent in 1995. Crop protection has risen from an insignificant level in 1954 to the largest single cost category in 1995. Contract costs have also risen steadily. (6.2)

- Comparison of the 1995 results with those from the last survey (1982) indicate that variations in performance between size groups and regions have decreased. Smaller units have caught up the larger units in terms of efficiency and this would appear to be because of adoption of the available technology. The Eastern region no longer has an advantage in production. (6.3)

- A considerable period of concentration has occurred in the beet growing sector. Analysis from 1965 to 1995 shows a fall of 18 thousand (66 per cent) in the number of growers. However, the vast majority of this decline occurred before 1985 since when the rate of change has declined. The proportion of area on holdings growing over 40 hectares of beet has increased from 11 per cent to 43 per cent, but again this has changed relatively little since 1985. (6.4)

Chapter 2 Sugar Beet in the United Kingdom

2.1 Structure of the Report

This section briefly describes the structure of the following report. This chapter will examine the structure of the UK sugar beet industry and consider the methodology adopted for the 1995 special study. However, before this, sugar beet in the UK is placed in the context of both its historical and political development to facilitate understanding of the constraints upon the industry and why the present structure exists. The next chapter will examine the economic results of the 1995 sugar beet study. Chapter 4 will consider further the results of the study, concentrating on physical and managerial aspects of production. A simplified analysis, undertaken in Chapter 5, highlights some of the potential gains that could arise from changing the present system (effectively one of non-transferable contracts) to a more flexible scheme. The final chapter compares the 1995 findings with those of previous studies stretching back to 1954. In addition a detailed examination of the changing structure of the industry is undertaken.

2.2 Overview of Sugar Beet in the UK

2.2.1 Historical Context [1]

Cultivated beets are believed to have been derived from *Beta Vulgaris L.*,[2] native to Mediterranean coastal areas of Europe. Beets as a sugar source have been developed only during the past 180 years, although use has been made of them as vegetable and feed crops for a much longer period. In 1811, following the discovery that some kinds of beets were rich in sugar, Napoleon ordered extensive production of such beets and the construction of plants to extract the sugar in France. Although this was partially successful and provided some sugar during the Napoleonic wars, the industry disappeared following his defeat at Waterloo and the opening of the country to imports of cane sugar from tropical areas. However, around the middle of the 19th century a substantial industry developed in Germany and France based on higher sugar content beets and improved techniques of sugar extraction.

The first beet factory in the United Kingdom was constructed at Cantley in Norfolk in 1912, although initially farmers were less than enthusiastic about the enterprise.[3] In 1924, due to the general depression surrounding many of the products of the traditional Norfolk four course rotation, the Government introduced a subsidy on sugar beet. Prices were guaranteed for ten years although on a descending scale by which time it was envisaged that the industry would be viable. The effect of the subsidy was immediate. By 1927, some 90,000 hectares were being grown and by 1934 this had almost doubled to 160,000 hectares. Because as usual it was easier to introduce a subsidy than remove one, the Government decided to continue the subsidy after the initial 10 year period.

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[1] Much of the following is derived from Murphy (1986) *Aspects of The UK Sugar Beet Industry.* (unpublished monograph) AEU, Department of Land Economy and Magness, J.R, Markle, G.M. and Compton C.C. (1971) *Food and Feed Crops of the United States.* Inter-regional Research Project IR-4, IR Bulletin 1 (Bul. 828 New Jersey Agr. Ept. Station)

[2] *Beta Maritima* was the genetic source of sugar beet

[3] In 1921 the Eastern Daily Press reported that the owners were threatening to dismantle the factory and ship it over to Holland.

National support for beet production was enshrined in the Agriculture Act of 1947, and was maintained (with revisions) up to the point when the UK joined the EU in 1973. Since then production has come under the sugar regime of the Common Agriculture Policy (CAP).

Up until the introduction of sugar beet, the UK was dependent upon imports of sugar. About half of these were in the form of beet sugar (from mainly Germany and Austria); the remainder came in the form of cane sugar from the colonies. Even though potentially domestic production could have expanded more it has been controlled to maintain a balance between domestic production and the refining of raw cane sugar by the port refiners. Historically, therefore, the UK has never been self-sufficient in sugar and this fact played an important part in the assigning of quota to the UK after accession to the European Union

2.2.2 EU Sugar Regime

On accession to the EU in 1973 the United Kingdom adopted the sugar regime as implemented in the other EU member countries as part of the Common Agricultural Policy. Much has been written on the EU regime (see for example, Harris *et al* (1983), Hallam *et al* (1994), and Sturgess, 1995).[4] A complete analysis of what is a complicated regime is clearly beyond the scope of this study. However, EU policy has shaped the sugar beet industry in the UK and the salient characteristics of the regime require exposition to place the current study in context. Much of the following is a brief synopsis of the EU regime as presented by Sturgess (*op. cit.*) and also Hallam *et al* (op.cit) who split the regime into four main components: price support, production quotas, producer levies, and cane sugar imports.

Price Supports

The sugar regime, as with most commodities covered by the CAP, involves price support through import controls and export subsidies. That is prices are set independently of the prevailing world price and are usually considerably higher (the exact difference varies depending on the current state of the world market). Price support for sugar applies at the level of the processed product (white sugar) with an institutionally determined Intervention Price, in effect, after the addition of a storage levy, a minimum wholesale price, being set annually by the EU Council of Agricultural Ministers. Processors are required to pay sugar beet growers at least the institutionally determined Minimum Beet prices (for production within quota) in return for the EU commitment to provide support at the level of the intervention price. In practice intervention support buying has never been used in the sugar regime.

Production Quotas

An unusual aspect of the sugar regime compared to those of many other agricultural commodities is that it has never involved open ended price support. The quantity of sugar eligible to receive the support price, whether through sale on the regulated internal market

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[4] Harris, Simon, Swinbank, Alan and Wilkinson, Guy (1983) *The food and farm policies of the European Community*, Chichester, Wiley. Hallam, David, Midmore, Peter and Lord Preston (1994) *The Economic Impact of the British Sugar Beet Industry*. Department of Agricultural Economics and Management, The University of Reading. Sturgess I.M. (1995) *The EU Sugar Regime: Prospects for Reform*. Paper presented to the Agricultural Economics Society Annual Conference, Cambridge, 1995.

or through subsidised exports, has always been limited by production quotas which are allocated to member states. These quotas are then allocated to the processing companies (British Sugar in the UK) by the member states. This is in contrast to milk, for example, where the quota is allocated to the producer. The sugar processors have contracts with individual growers for a sufficient tonneage of beet to enable them to fulfil their quota.[5] In 1995, for the United Kingdom, the quota was equivalent to 1.144 million tonnes of white sugar (ASIC 1995).

Although quotas are allocated to each member state, production over quota (known as 'C' beet) is allowed. However, this beet has to be exported with no subsidy, so usually producers will receive the 'world price' (normally substantially below quota price). However, in certain circumstances, 'C' beet may be held over to count against quota production in the following year so growers could receive a higher payment. Probably the most important feature of 'C' beet is that growers are unsure about the price they will receive at the time of planting. The position of the UK differs from most other EU countries in that the allocated quota represents barely half of its domestic consumption. The deficit is principally met by imports of raw cane sugar from the African, Caribbean and Pacific (ACP) states which are finally refined in the UK (discussed in more detail below). Quotas were last altered in 1981/2 when the UK was one of a number of countries to have their quota cut.

Producer Levies

A feature of the European sugar beet industry is that since 1980/1 it has been responsible for paying the full cost of the export refunds granted on disposing of the community's structural surplus (that is the difference between production and consumption). In order to determine the levies to be charged to the sugar industry to meet these costs, the production quotas are split into two ('A' and 'B' quota). Although it is often stated that the level of 'A' quota was determined by domestic consumption it was actually related to historical levels of production. Hence, if a country was historically an exporter of beet then 'A' quota may be above domestic consumption. 'B' quota was originally meant to represent a margin for specialisation between countries. A levy of 2 per cent is charged on all quota beet but a further levy of up to 37.5 per cent is payable on 'B' quota. Levies are collected from the processors although sixty per cent is subsequently passed on to growers in the form of lower beet prices. In theory prices for 'A' and 'B' sugar beet should be different reflecting the levies charged on each type. However in the UK (as in many EU countries) the price paid to producers for all quota beet is the same, because processors are allowed to average the levies between the two types of quota. [6]

The raising of levies to fund the subsidisation of exports has led to the sugar regime often being cited as self-financing. Although the levy does reduce the burden of the sugar regime on the CAP budget, it does not cover the whole costs. For example, the costs of disposing of sugar displaced by imports, notably preferential cane imports, is met by the budget. There are also considerable costs to consumers as the price of sugar in the EU is

[5] In the UK all aspects of these contracts are tightly regulated through the Inter Professional Agreement (IPA) signed between the processor and the National Farmers Union (NFU)

[6] Producers are informed by British Sugar of the separate prices for A and B quota and the average price for all quota beet.

commonly more than double what it would be without the regime because of the system of price supports and trade controls.

Imports

Another feature of the sugar regime is the large flow of imports, guaranteed under the sugar protocol. In its simplest form the sugar protocol adopted by the EU was derived from a commitment that the UK had with its former colonies at the time of the UK's accession. About 1.13 million of the 1.6 million tonnes imported are refined in the UK. This arises directly out of the UK's relationship with its former colonies and a wish to maintain the firmly established cane sugar processing industry in the UK. In addition Hallam *et al* argue that at the time it made sense to secure imports at guaranteed prices as the EU was not self- sufficient and the world market was volatile because of shortages. However, production quotas in the EU were subsequently increased and prices raised. In response, producers increased production to the point that the EU became (and remains) more than self-sufficient. Therefore, a striking feature of the EU regime is that it pays a guaranteed price for imports of sugar that it does not require, whilst exporting sugar onto world markets with subsidies. It is perhaps no wonder that the Court of Auditors (cited by the Catholic Institute for International Relations, CIIR, 1994),[7] see the sugar protocol as an obsolete aid package rather than a contractual trade agreement. However, one could easily argue that it was perverse of the EU to encourage further domestic production at high cost to consumers and taxpayers when supply was already guaranteed through the sugar protocol.

In summary the combined effects of the EU regime on the UK sugar beet industry are that the overall level of production eligible for support is controlled. Producers are contracted to British Sugar to produce a certain tonneage ('A' and 'B' quota). For this contracted quantity they receive an average guaranteed price (£39.77 per adjusted tonne in 1995) which is known with some certainty in advance. Any production over this contracted amount does not receive the guaranteed price, but one that is determined by the world price and how much of the excess is carried forward to the next year. In 1995 the estimated price for 'C' beet was £22.35 per adjusted tonne.

2.2.3 Pressures for Change

The sugar regime, with its features of subsidised exports, restricted imports and price support for EU growers, inevitably excites much controversy. Consumer groups have been calling for reform for a number of years. The following in a National Consumer Council report summarises succinctly the main thrust of their objections to the regime.

> 'For consumers and taxpayers the sugar regime is one of the worst excesses of the CAP. The current system imposes high prices on consumers in the European Union, a huge bill on European Union taxpayers and, by depressing world market prices, causes immense economic damage to other sugar producing countries, many of which are in the third world and highly dependent on sales of sugar for precious external revenue'

[7] CIIR (1994) *Sugar: Europe's bittersweet policies*, CIIR Comment Series

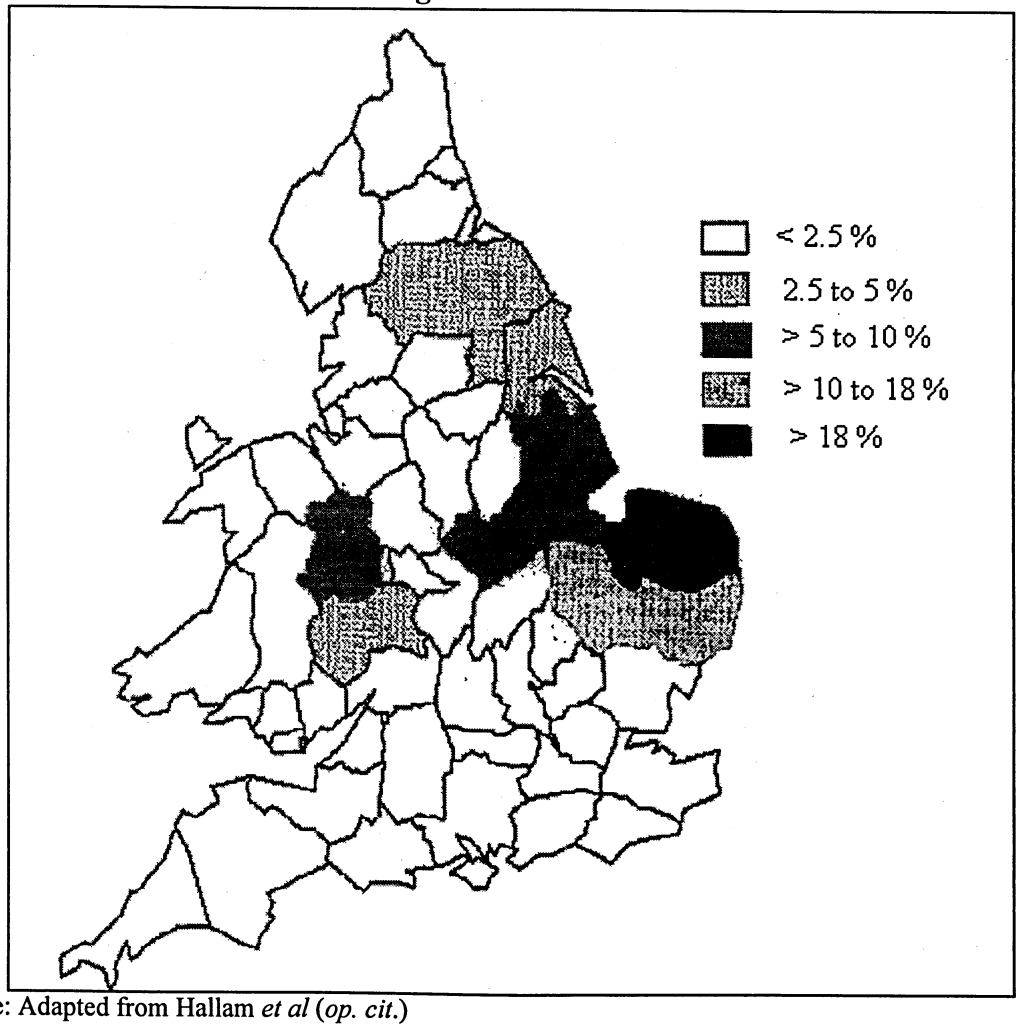
Table 2.1: Beet Area as a Proportion of Total Arable Land for Important Beet Growing Counties 1995

County	Total Arable Land (a)	Beet Area	Beet Area/ Arable Area
	ha	ha	Per cent
Norfolk	311,901	57,287	18.4
Cambridgeshire	221,455	23,365	10.6
Suffolk	220,252	23,086	10.5
Lincolnshire	410,366	34,187	8.3
Nottinghamshire	107,840	8,037	7.5
Shropshire	139,205	10,193	7.3
North Yorkshire	264,557	12,309	4.7
Humberside	222,213	9,629	4.3
Hereford and Worcester	153,120	4,466	2.9

(a) Total Arable Land includes Tillage and Grasses under 5 years

Source: Digest Agricultural Census Statistics, MAFF

Figure 2.1: Beet Area as a Percentage of Total Arable Land



Source: Adapted from Hallam *et al* (*op. cit.*)

Output from sugar beet represents eight per cent of that from arable crops in the UK, but only two per cent of total output from agriculture as a whole (Agriculture in the UK, 1995). In the recent past sugar beet has performed consistently well in terms of profitability; the largely assured prices coupled with few marketing problems makes the crop attractive to those fortunate enough to have contracts with British Sugar. However, the importance of sugar beet relates not only to its profitability but also its properties as a break crop from cereals. Sugar beet production has been undergoing a continued period of concentration. Over the last decade, the number of growers has fallen by 1673 (14 per cent) whilst total area grown has declined by only four per cent (Table 2.2). [9]

Table 2.2: Holdings and Area of Sugar Beet 1986 to 1995

Year	Number of Holdings	Hectares
1986	11,351	205,000
1987	11,136	202,500
1988	10,991	200,500
1989	10,767	196,600
1990	10,512	194,400
1991	10,332	195,700
1992	10,182	196,700
1993	10,021	196,945
1994	9,904	194,404
1995	9,678	195,977

Source: Agricultural Census Data

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Page 13 should precede Page 12

Aggregate information on the level of *sugar beet* production in the UK and the related output of *sugar* is presented for the last five years in Table 2.3. The estimated yield for 1995 is the lowest of the five years and consequently production is estimated at 8.6 million tonnes, nearly 1.5 million tonnes lower than that achieved in 1992 (and half a million tonnes down on the five year average). The 1995 yields might well have been lower. At one point in the growing season it looked like 1995 would be a disastrous year because of the lack of rain. However, above average rain in September coupled with British Sugar's decision to delay the opening of the beet processing factories enabled the crops to bulk up.

The lower half of Table 2.3 depicts the total supply situation of sugar and highlights the large part that imports play. Production as a percentage of new supply available to the UK has risen over the past five years. This rise appears to be mainly due to increased exports both to other EU countries and the rest of the world, rather than any significant changes in levels of imports or domestic production.

[9] This change is put in the context of a longer time period in Chapter 6 where structural change is considered

However, consumer lobbies are generally not sufficiently strong enough to alter EU policy. Even the concerns of the Court of Auditors, did not prevent the regime emerging largely unscathed from the 1992 MacSharry reforms which resulted in major changes in the cereals and livestock sectors. Subsequently, the Uruguay round of the GATT and the more recent EU review of the regime also have resulted in little reform. The resilience of the sugar regime is in part related to the commonly held perception that the regime is self-financing and therefore not a drain on the EU budget. The fact that the regime already allows for a substantial quantity of imports may also have protected it in trade negotiations.

More realistic dynamics for change arise from the World Trade Organisation (WTO) and the enlargement of the EU. The next round of WTO talks (scheduled for the end of century) are likely to be considerably more liberalising than the Uruguay round. The formula for reform has been set in place by the Uruguay round agreement with reduced levels of subsidised exports and increased access to markets being the practical outcome of the negotiations. To achieve these twin targets it is likely that either guaranteed prices will have to be lowered or quotas cut (or a combination of both). The WTO constraints are also likely to become more binding as the EU expands eastwards. Many of the Central and East European Countries (CEEC's) are well suited to sugar beet production which may well flourish under the Common Agricultural Policy. Part of the problem is that as some of the CEEC's have not in the past exported sugar onto the world market their baseline allowance for subsidised exports under the WTO agreements is likely to be zero. Therefore their accession will add to the EU's sugar production but not give it more scope for increasing subsidised exports. This will clearly put pressure on the EU regime.

Reduced support levels for sugar can be practically achieved by cutting the guaranteed price or reducing quotas (or a combination of both). Cutting price may well force out the marginal producers whilst reductions in quota (if applied uniformly) will hit both the efficient and inefficient producers alike. Some countries may favour quota cuts as a way of achieving policy objectives whilst others may promote price cuts. Clearly there is pressure for change to the EU regime both externally in the form of GATT and internally from those bearing the cost of the regime. It may well be the case that the next sugar beet study takes place within a very different policy framework.

2.2.4 Structure and Importance of the UK Sugar Beet Industry

In 1995 around 10,000 producers grew 196,000 hectares of sugar beet (June census definition). Although sugar beet as a whole occupies only a small proportion of the total arable area in the United Kingdom (just over three per cent) it is of particular importance to certain areas (Table 2.1 and Figure 2.1). Unlike many other arable crops, sugar beet is not universally grown within the UK. Production is concentrated in the Eastern Counties with smaller amounts grown in the North and West of England. [8] The low value, bulky nature of sugar beet means that beet can not be economically grown very far from the processing factories.

[8] As for the rest of the UK, a relatively small amount of sugar beet is grown in Wales, whilst none is produced in Scotland and Northern Ireland.

Table 2.3: Sugar Beet and Sugar in the UK 1991 to 1995

		1991	1992	1993	1994	1995	Average 1991-95
Sugar Beet (a)							
Area ('000 ha) (b)		196	197	197	195	196	196
Yield (t/ha) (b)		44.39	51.51	49.06	44.71	43.88	46.71
Production of Beet ('000 tonnes)		8701	10148	9666	8720	8600	9167
Average Market Price (£/t) (c)		31.92	35.44	32.84	35.25	37.56	34.60
Value Of Output (£ million)		278	360	317	307	323	317
Sugar Content		17.49	17.01	16.84	16.93	16.90	17.03
Sugar							
('000 tonnes refined basis)							
Production		1220	1476	1436	1263	1250	1329
Imports from	the Fourteen	136	139	105	112	119	122
	Rest of the World	1245	1156	1248	1138	1176	1193
Exports to	the Fourteen	64	117	76	35	110	80
	Rest of the World	172	228	383	473	432	338
Total New Supply		2276	2518	2220	2043	1872	2186
Production as % of New Supply		54	59	65	62	67	61

(a) From 1991 onwards yield, production and prices for sugar beet have been re-based to adjusted tonnes at standard 16% sugar content

(b) Area and related yield based on June census definitions

(c) estimated as return to grower price less transport costs

(d) Sugar coming out of the factory in the early part of the new year is regarded as part of the production of the previous calender year

(e) Includes imports from French Overseas Departments

(f) Includes only Sugar as such and takes no account of the sugar content of processed products

Source: Agriculture in the UK 1995, MAFF

2.2.5 Beet Processing

It is clear from much of the above discussion that beet growing is inextricably linked with beet processing in the UK. This section gives a brief overview of this sector. Since the amalgamation of the beet processing firms into the British Sugar Corporation in 1936, processing of sugar beet in the UK has been concentrated in the hands of one firm (although it has only fairly recently been in the private sector as British Sugar Plc). British Sugar is a major company. Hallam *et al* note that over the three year period 1990/1 to 1992/3 British Sugar's average revenue was £684 million from sugar sales and a further £69 million from sales of animal feeds.[10]

British Sugar ideally want to have contracts with producers who will consistently produce their quota tonneage with low amino acids and deliver the beet to the factory in a clean

[10] During the process of refining sugar, products are formed such as sugar beet pulp which are excellent feedstuffs.

state. British Sugar have the right to remove quota from growers who consistently fail to reach their contract tonneage. This is discussed in more detail in later chapters. The relationship between British Sugar and sugar beet growers is of some interest as it is in essence a classic case of a large number of small producers being faced with a monopsony (single) buyer of their product (albeit within the framework of EU policy). Later analyses (Chapter 4) suggest that the relationship between the processor and growers is generally good, although conflicts do arise.

Although British Sugar has a monopoly position with respect to beet processing, this is not the case for the supply of sugar. In 1991/2 they had over 50 per cent of the UK market (retail and industrial). Cane sugar, refined by Tate and Lyle, accounted for 37 per cent of the market, with imports of refined sugar accounting for the residual (Hallam *et al.)*

Like sugar beet production, beet refining has undergone a period of rationalisation (the number of factories has declined from 17 in 1980 to just nine now). It is claimed that the refining stage in the UK is one of the most efficient in the EU (in terms of cost per tonne refined). This is achieved, in part, through longer beet processing seasons (campaigns). In the UK processing usually takes place between September and February whereas on the continent it normally finishes by Christmas. The advantages of longer campaigns to the processors are two-fold. First, fewer factories are required and second, average costs of each factory are reduced as high fixed costs are spread over a greater level of production.

One disadvantage in having fewer factories is likely to be increased transport costs. However, the main effect is to increase the risks involved with beet production and therefore tensions between processor and grower. Longer campaigns mean that beet has to be stored on farm for a greater period. Thus, even with protection, there is a possibility of frost damage and shrinkage. As farmers are only paid on what is delivered to, and accepted by, the factory then any loss on farm is a direct cost to them. (Subsequently however British Sugar lose because they have less sugar to sell, hence their considerable interest in ensuring that beet is clamped properly). British Sugar's view is that longer campaigns and the subsequent increased efficiency of processing maintains the efficiency of UK beet industry as a whole, despite the fact that yields of white sugar per hectare grown are slightly below those of some other EU countries, for example France. The UK's relative efficiency, compared to other EU countries, will play an important part in any discussion of quota reductions arising as a result of trade negotiations.

2.3 The 1995 Special Study of Sugar Beet

2.3.1 Background

The 1995 economic survey of sugar beet production in the United Kingdom was part of a series of studies which can be traced back as far as 1954. However, the last study of this nature was undertaken in 1982 and the figures have become out of date. The aim of this study was to provide up-to-date information on the economics of sugar production to inform policy decisions which may affect the crop and for use in the construction of Standard Gross Margins for use in farm classification required under EU regulations The survey was planned and received considerable guidance from a small steering group consisting of representatives of the Economics and Statistics (Farm Business) Division at

MAFF, members of the research unit at the University of Cambridge, and employees of British Sugar. Thereafter members of research units in the Universities of Manchester, Nottingham and Reading, and in Askham Bryan College of Agriculture co-operated to collect the required information.

2.3.2 Methodology

The survey was designed to collect information relating to the sugar beet enterprise on the sample farm. The level of output, variable inputs and a proportion of the business fixed costs were allocated to give a comparison to the net margin stage. All the required information was collected through personal interview with each co-operating farmer typically being visited twice over the period the crop was been grown and harvested. During the course of each interview the investigator, in conjunction with the farmer, worked through the most recent part of the production and marketing year recording details of the quantity and cost of the fixed and variable inputs required to grow and market the particular crop being surveyed. In the majority of cases it was possible to identify the actual costs incurred and allocate these directly to a single crop. An obvious but not exclusive example are variable costs such as seed, fertiliser and spray chemicals. In other cases where a resource, such as tractors, is shared between several enterprises it has been necessary to use a standard cost to charge to the sugar beet crop.

Certain other costs which have been estimated are itemised under the heading of overheads. These are costs incurred in the general operation of a farm business, for example building and farm maintenance, which can not be allocated readily to any particular enterprise and as such will not be captured in a commodity study. Estimates for general overheads which includes, for example, legal and accountancy fees, insurance, telephone and office expenses, are derived from Farm Business Surveys in England and Wales and calculated for a range of farm types and size. Although individually these items of cost are relatively small, they do in total add to a significant charge for a sugar beet crop. The machinery overhead aims to estimate the operating cost of machinery used for general farm work, such as hedging and ditching, and includes a proportion of the annual cost of the farm car. Labour overhead figures were obtained from a pilot study of labour use undertaken by the University of Exeter. Together the overhead costs account for around 11 per cent of the total cost of sugar beet production. Once completed, the field-books were returned to Cambridge for checking and entering onto a computer database. [11]

2.3.4 Structure of Sugar Beet Production and Sampling

An analysis of the structure of production by size and location of sugar beet enterprises (Table 2.4) shows that production tends to be concentrated on the larger enterprises and in the main arable areas such as the Eastern region of England.[12] For example, almost 78 per cent of the UK sugar beet area is found in the Eastern region compared with less than ten per cent in the West.

[11] Conventions for Ouput and Margin Calculations are given in Appendix B

[12] The regions cited here North, East and West refer to EU definitions of regions in England.

Table 2.4: Percentage Distribution of Holdings and Area of Sugar Beet by EU Region 1995

Size Group (ha)		EU Region North	East	West	Total
	per cent total:				
<10	holdings	8.5	30.9	2.7	42.1
	area	2.5	8.4	0.9	11.8
10 to 20	holdings	5.3	19.2	2.7	27.1
	area	3.8	13.7	2.0	19.5
20 to 50	holdings	3.3	17.0	2.8	23.1
	area	4.9	26.4	4.5	35.7
>50	holdings	0.5	6.7	0.6	7.7
	area	1.7	29.3	2.1	33.0
Total	holdings	17.5	73.7	8.8	100.0
	area	12.8	77.9	9.4	100.0

Ideally the survey sample should be proportional to production. However, where a sample is drawn with the number of farms in a size group or region proportional to the sugar beet area within that cell, a single sample for the UK would need to be unnecessarily large to provide sub-samples of an adequate size to be representative of the areas where sugar beet is less widely grown. In the same way the sugar beet intensive regions of the UK would be heavily over-represented, and require resources which were not available for this survey. In a proportional sample the number of small growers would also be too few for meaningful analysis of the impact of size on costs and returns. To avoid these problems, a number of steps were taken. First, a core sample was derived of 160 farms (Column 1 in Table 2.5) using information on the distribution of production between factories supplied by British Sugar for 1994. The proportion of this core sample assigned to each factory represent their share of total beet deliveries in 1994. The next step was to double sample the Western and Northern regions in order to provide enough observations in these areas for statistical analysis (Column 2). Finally, the smallest growers (those with less than 500 tonnes of quota) were double sampled (Column 3). The double sampling resulted in a total sample sought of 206 farms (Column 4). Column 5 gives the actual numbers obtained by region.

Table 2.5: Sample Framework for the 1995 Sugar Beet Study

Region	Factory	Core Sample	Double Sampling		Total Number Sought	Total Number Obtained
			West/ North	Small		
Western Region						
	Allscott	7	14	15		
	Kidderminster	8	16	18		
					33	34
Eastern Region						
	Bury	27	27	28		
	Cantley	18	18	19		
	Ipswich	14	14	15		
	Wissington	38	38	41		
	Newark	18	18	19		
	Bardney	14	14	15		
					137	136
Northern Region						
	York	16	32	36		
					36	36
Total		160	191	206	206	206

Notes: Core sample based on proportion of total beet delivered to each factory.

The core sample was based on 1994 information on production. Given that the distribution might have changed slightly by 1995 and that cooperation in the survey was voluntary, recruitment inevitably did not achieve the exact distribution that was required. For example, double sampling of farms growing under 500 tonnes of beet was not achieved.

Examination of the sample obtained indicated that the sample lent itself to classification into three size groups (Table 2.6). Overall it can be seen that the under 20 hectare group was slightly oversampled, whilst the 20 to 50 hectare group was slightly undersampled. This pattern varied between regions as Table 2.6 also highlights.

Table 2.6: Distribution of Sugar Beet Production and Survey Sample

Size Group	Overall		North		East		West	
	per cent beet area	per cent sample	per cent beet area	per cent sample	per cent beet area	per cent sample	per cent beet area	per cent sample
< 20 ha	31.3	35.7	46.8	61.1	25.7	31.1	28.0	23.5
20 to 50 ha	35.7	30.4	37.3	25.0	34.8	30.1	47.9	41.2
> 50 ha	33.0	33.8	15.9	13.9	39.5	38.8	24.1	35.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

In order to correct for the differences between the actual and sample distributions, weighting was undertaken. Each observation was assigned to one of nine cells (the

distribution was disaggregated by region and size) and the mean of the cell was weighted according to that cell's share of the total national area of sugar beet.

2.3.5 Non-Cooperation in the Survey

For the survey as a whole, of the farms drawn, five per cent were not able to be contacted and 39 per cent refused. Overwhelmingly the most important reason for declining to take part in the survey, given by 64 per cent of non-responding farmers, was that they considered themselves to be too busy to spare the time. The remaining 36 per cent of this group declined or felt unable to take part in the survey for a variety of reasons, often personal. The main financial results from the survey are presented in Chapter 3.

Chapter 3 Costs and Returns of Sugar Beet Production

3.1 Introduction

The previous chapter has discussed both the nature of sugar beet production in the UK and the methodology adopted for this study. This chapter presents the core financial findings of the survey including, in standard format, the levels of output, costs and margins for the production of sugar beet. Where necessary, weighting, by the method described in the previous chapter, has been undertaken.

The results are initially presented on an aggregated per hectare basis to show the average cost of producing sugar beet in England (Table 1). The results are then disaggregated to investigate variations by EU region, size and method of harvest. Finally, in this chapter, the high and low performers (as measured by net margin) are compared to enable investigation of the possible reasons for differences in financial performance.

3.2 Financial Results for the United Kingdom

3.2.1 Yield and Output

The definition of area used to calculate yield is a sensitive subject in the United Kingdom. In the official figures area is defined as census area (196,000 hectares in 1995). Since 1993 IACS area has become available and is often used as a better guide of the area actually available for the crop. British Sugar collect planted area from farmers. This is the area of the field actually drilled to the crop, which in particular excludes unplanted headlands and the area under pylons. For around 90 farms in the survey the output data was collected directly from British Sugar; this meant that it was possible to obtain farmers' planted areas. On average this area was five per cent less than the recorded IACS area. In addition to the differences between IACS and planted area there is a further complication. British Sugar found that in many cases farmers were over-reporting the area actually planted to sugar beet. They also found that in other EU countries area *harvested* was taken as the measure. The previous chapter highlighted that efficient production (as measured by yield per hectare) is of paramount importance for the UK industry as a whole, because our national quota is to a certain extent gained in competition with other EU member states. If quota has to be cut (as is likely as part of the World Trade Organisation agreements) then the UK's negotiating position will be weakened if yields of sugar per hectare are seen to be lower than in other member states. This is likely to be the case despite the UK's apparent advantages in processing. Therefore we now see in the footnote to the figures published in Agriculture in the UK, that area cropped and harvested is 177,000 hectares. Obviously dividing total output by 177 thousand hectares rather than 196 has a considerable (10.7 per cent) effect on the yield per hectare.

Table 3.2 reproduces yields per hectare calculated using each definition of area. Although for certain purposes, planted and harvested areas are of use, all figures produced throughout this report are based on recorded IACS areas. This allows direct comparison of the profitability of sugar beet with other enterprises, such as wheat, where the whole available area in the field can be drilled.

Table 3.1 Costs and Returns for Sugar Beet 1995 Harvest Year All Holdings (weighted)

	Average All Holdings	s.e.m.
Crop Area (ha)	62.76	(4.79)
Yield (tonnes/ha clean)	42.46	(0.62)
Sugar (percent)	16.41	(0.05)
Yield (tonnes/ha adjusted)	44.28	(0.76)
Output	**£ per Hectare**	
Value of Beet [1]	1680.39	(25.31)
Early/Late Delivery Bonuses	26.62	(1.64)
Transport Allowance	176.77	(4.52)
Output - Tops	1.88	(0.48)
Total Output	1885.66	(28.70)
Material Costs		
Seed	101.09	(1.31)
Fertiliser	118.97	(2.75)
Crop Protection	158.12	(3.43)
Total Materials Cost	378.18	(4.52)
Margin over Materials	1507.48	(28.67)
Other Variable Costs		
Casual Labour	2.18	(0.37)
Contract Haulage	147.71	(5.38)
Contract Other	87.71	(6.33)
Miscellaneous	20.69	(1.17)
Total Other Variable Costs	258.29	(9.10)
Gross Margin	1249.19	(26.31)
Fixed costs		
Regular Labour	91.40	(3.53)
Machinery-Tractors	97.85	(3.36)
Machinery-Implements	77.97	(2.98)
Own Lorry	9.29	(2.07)
Sugar Beet Storage	3.14	(0.75)
Rhizomania Protection	0.04	(0.03)
Rent	145.21	(2.18)
Drainage charges	5.66	(0.54)
Total Fixed Costs	430.61	(9.49)
Margin before Overheads	818.58	(25.20)
Overheads		
Labour	37.47	
Machinery	41.42	
General	54.92	
Total overhead costs	133.81	
Total Costs	1200.89	(10.64)
Net Margin	684.77	(25.25)

Notes 1 Value of beet comprises of 'A' and 'B' beet at 39.77 per adjusted tonne and 'C' beet at £22.34.

Table 3.2: Estimated Yields Using Various Area Definitions

Area Definition	Tonnes ha Adjusted	Tonnes ha Clean
IACS Area	44.28	42.46
Planted Area	46.49	44.58
Cropped and Harvested Area	51.05	48.95

Calculated on the basis of IACS area, the yield of sugar beet from the survey is 42.46 tonnes of clean beet a hectare, which becomes 44.28 tonnes when adjusted to the equivalent of beet of standard 16 per cent sugar (the basis of payment). Some indication of the representativeness of the findings can be given by the similarity between the yield found in the study and that achieved overall. In terms of adjusted beet there is less than one per cent difference in the estimated yields (44.28 compared to 43.88 tones per hectare).[1] However, because the average sugar content from the sample surveyed is lower than that found overall, there is a slightly larger difference in estimated clean yield per hectare.

Table 1 highlights that the output per hectare from sugar beet alone comes to £1700; this is based on a value of £39.77 for contracted beet (A and B), £22.34 for any beet produced over contract (C) and includes early and late delivery bonuses. [2] One obvious advantage of sugar beet production is the certainty of price. The growers know (to a large extent) the price they will receive for contracted beet (although the value of C beet is less certain) and can budget accordingly. Therefore, even though over a longer time period sugar beet is not as profitable as say potatoes the return is more certain. Farmers only have to be concerned with variations in yield and not in both yield and price. This said, yield variations between 1994/5 and 1995/6 were dramatic because of the 1995 drought.

For the purposes of this study, output is not confined to the sale of sugar beet. If the tops from the sugar beet are used by farmers to feed their own animals (thus replacing purchased feed or forage crops) a value is imputed based on the nutritional value.[3] If the farmer sells the tops to another farmer then the payment received is also counted as an output. However, as Table 3.1 highlights, the average return from beet tops is a small proportion of total output. A more significant contribution to output (over nine per cent) is made by the transport allowance paid by British Sugar plc to farmers. [4] Unlike other crops where the commodity is usually sold ex-farm, sugar beet growers are responsible for paying for the beet to be transported to the factory. In return they receive an allowance paid per tonne delivered. As transport is a direct cost to the

[1] The actual yield is in fact a provisional yield published by MAFF in Agriculture in the UK. Therefore it may be adjusted when more complete information is available. Also the yields may not be exactly comparable as census area will vary to a small extent from IACS area.

[2] Standard Errors of the Mean are also presented in Table 1. The Standard Error of the Mean (s.e.m) indicates the precision of the mean value, and is often used to calculate the confidence interval of the mean. For a variable that has a normal distribution one would expect, with 95% confidence, that the mean of the whole population is included in the interval defined by: 'mean + 1.96 s.e.m' and 'mean - 1.96 s.e.m'.

[3] Effectively the tops are charged as a cost to the livestock enterprise and a return to the sugar beet enterprise.

[4] The transport allowance is paid per clean tonne and comprises a fixed sum and an allowance per mile to the relevant processing factory.

receive an allowance paid per tonne delivered. As transport is a direct cost to the farmer, the allowance itself is treated as a return. In theory it is designed to be neutral, that is a fair reflection of the costs of transport. However, in practice, some farmers are able to transport their beet for less than the allowance, the remainder effectively being an addition to the return from the enterprise.

The addition of the transport allowance to the value of the beet itself means that the total output figure cited here (£1886 per hectare) is above that in other statistics (see Agriculture in the UK).

3.2.2 Costs

As mentioned earlier, costs are broken up into various component parts, variable costs (which are further split into material and other variable costs), fixed costs and overheads.

Materials costs account for around 31 per cent of total costs and 20 per cent of output, (that is £20 per £100 of output). Crop protection is in fact the largest single cost component (13 per cent of total costs) in sugar beet production, ahead of haulage and rent. The small standard errors for items within material cost arise partly because of relatively little variation in usage between farms. This is not surprising for seeds given that seed rates are prescribed and prices fixed (although varying depending on date of payment and type of seed treatment). The strong push by British Sugar plc and the Sugar Beet Research Council for prescribed levels of fertiliser applications, coupled with what has become a fairly standard spray programme leads to quite uniform costs for these materials. However, there is still variation in costs; for example those growing potatoes in their rotation have significantly higher spray costs as do those growing sugar beet on organic soils. Variations in input usage will be discussed in more detail in the next chapter.

The analysis of costs is more complex for sugar beet than for say wheat, because many producers substitute contracting (treated as a variable cost) for own harvesting (a fixed cost). The average figures are just that, an average of both types of production and not particularly meaningful for individual producers for comparative analysis. Section 3.3 will compare the two methods in more detail. Here suffice to note that contract haulage and fieldwork account for a fifth of the total costs involved in sugar beet production, highlighting the importance of contracting services to the industry. Multiplying the per hectare figures by the area of beet grown in the UK we have a rough estimate of £46 million spent on contract services (£27 million on haulage and £19 million on fieldwork). The very small cost of casual labour reflects the virtual elimination of handwork in the production of sugar beet. The trend away from handwork (hand hoeing etc.) will be examined in more detail in later chapters.

After account is taken of all variable costs, the average gross margin for sugar beet is around £1249 per hectare (equivalent to £66 per £100 of output). This can be compared with gross margins of £977 and £883 for winter wheat and winter barley, respectively (see Asby and Sturgess 1996). The relative prosperity of the cereal

sector has considerably closed the gap between the gross margins of sugar beet and cereals. [5]

As with contract costs the analysis of fixed costs is complicated by the split between own harvesting and contracting. However, on average, labour and machinery (tractors and implements) account for 22 per cent of total costs. Only 18 producers used their own lorry to haul beet to the factory and, on average, own lorry costs account for only one per cent of total costs.

Given the consequences of rhizomania for growers, capital expenditure by farmers to increase protection against rhizomania, for example installation of wheel dips, might have been expected in infected areas. However, it is evident that few growers have undertaken such work and, in the context of the survey as a whole, the costs are insignificant. Rent (either paid or imputed) accounts for around 12 per cent of costs. Although sugar beet is seen as a high value crop, little is grown on seasonally rented land (unlike potatoes). Part of the explanation probably stems from production being controlled by contract, although it may be the case that sugar beet can not compete with higher value crops such as carrots and potatoes for available land.

A major contrast between sugar beet and many other arable crops is that storage is only a small component of costs (two pounds a hectare on average). This is to be expected given that the crop needs no specialist drying or handling, and can be stored in the field with only minimal covering, either straw or polythene, required to protect from frosts. Even when the crop is stored on purposely laid concrete pads, the cost is considered written off if they were laid before 1986 for the purpose of this study. [6] Figure 3.1 highlights the distribution of storage methods in the study.

Whilst on average drainage charges are relatively low, they can be a significant component of costs for individual farms. Overheads, as already mentioned, are calculated from average figures for similar types of farms that take part in the Farm Business Survey, a more comprehensive study of farms costs. On average they account for 11 per cent of costs. [7]

Total costs, therefore, account for just under two-thirds of the output value (£64 per £100 of output) with the remainder (£36 per £100 of output) accruing to the farmer as 'profit' from the enterprise (Figure 3.2). These figures highlight clearly the profitability of sugar beet to producers, although it must be remembered that this has to cover interest charges and the managerial input of the farmer and spouse.

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[5] Of course direct comparison of Gross Margins is difficult given the considerable use of contract services in sugar beet production. If contract services are not included in Gross Margin the relevant figures are £1476 per hectare for sugar beet, £1000 a hectare for winter wheat and £983 for winter barley.

[6] Capital expenditure is written-off after ten years in all special studies.

[7] The fact that overheads are not derived directly from the survey means that they are unlikely to be valid for individual farms within the study. For this reason a margin before overheads is given. At £811 per hectare this corresponds to £43 per £100 of output.

The results from the survey indicate that on average each adjusted tonne costs £27 to produce (£28 per clean tonne). This leaves a margin of £15 per adjusted tonne (£16 per clean tonne) to the producer.

Figure 3.1: Storage Methods

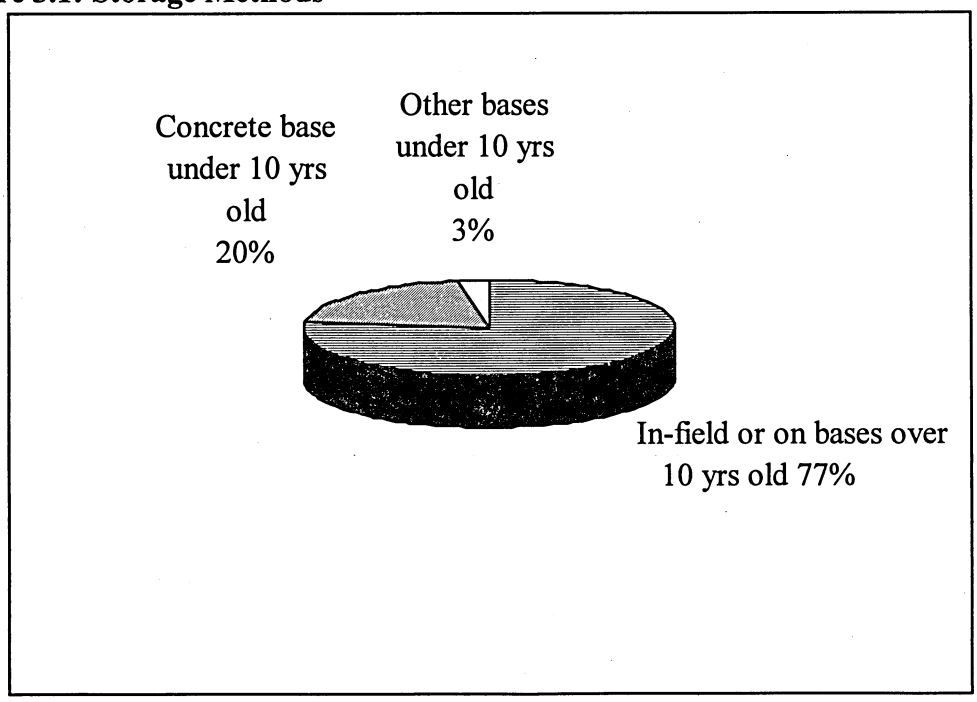


Figure 3.2: Composition of Total Output

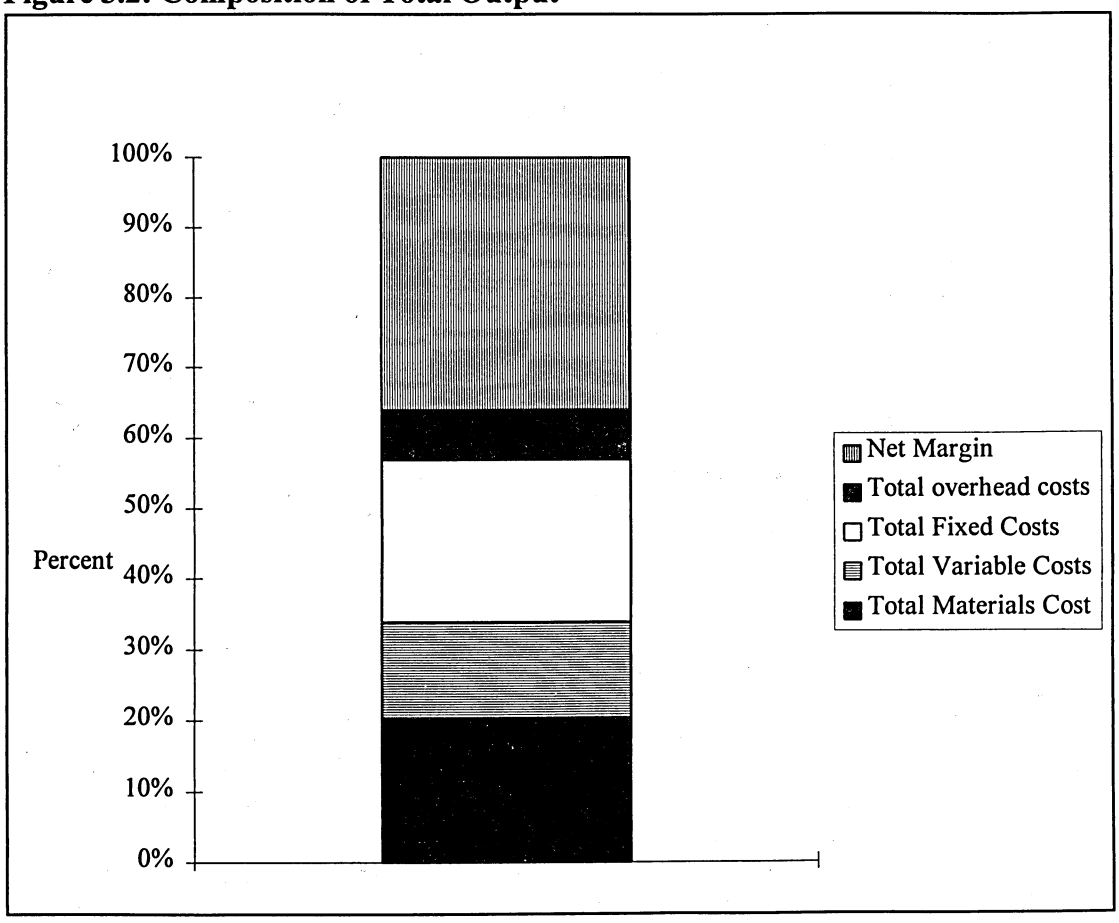


Table 3.3 Costs and Returns for Sugar Beet 1995 Harvest Year by EU Super Region (weighted)

	North	s.e.m	West	s.e.m	East	s.e.m	Significant Differences
Crop Area (ha)	21.27	(3.41)	39.50	(4.54)	65.06	(6.06)	E > N
Yield (tonnes/ha clean)	43.92	(0.99)	40.63	(1.52)	42.41	(0.78)	
Sugar (percent)	16.61	(0.10)	16.90	(0.12)	16.39	(0.06)	W > N > E
Yield (tonnes/ha adjusted)	46.29	(1.09)	43.99	(1.76)	44.16	(0.95)	
Output	**£ per Hectare**						
Value of Beet	1751.53	(35.73)	1634.18	(56.55)	1676.52	(31.79)	
Early/Late Delivery Bonuses	30.77	(4.63)	13.85	(3.44)	26.52	(1.97)	E, N > W
Transport Allowance	179.42	(9.98)	159.06	(15.87)	177.61	(5.53)	
Output - Tops	4.81	(1.89)	6.85	(3.26)	1.53	(0.48)	W > E
Total Output	1966.53	(38.59)	1813.94	(63.36)	1882.18	(36.07)	N > W
Material Costs							
Seed	90.85	(2.09)	85.90	(3.47)	102.01	(1.61)	E > N, W
Fertiliser	124.76	(6.26)	125.00	(9.15)	118.54	(3.38)	
Crop Protection	153.35	(11.42)	154.16	(6.25)	158.25	(4.14)	
Total Materials Cost	368.96	(13.40)	365.05	(12.64)	378.80	(5.48)	
Margin over Materials	1597.57	(42.32)	1448.89	(62.45)	1503.38	(35.94)	N > W
Other Variable Costs							
Casual Labour	2.20	(0.98)	2.61	(0.99)	2.16	(0.45)	
Contract Haulage	161.25	(11.61)	127.84	(12.85)	148.08	(6.63)	N > W
Contract Other	82.26	(11.62)	81.60	(16.16)	90.24	(8.06)	
Miscellaneous	21.26	(2.83)	22.36	(6.14)	20.57	(1.36)	
Total Other Variable Costs	266.97	(17.97)	234.40	(23.04)	261.05	(11.38)	
Gross Margin	1330.60	(40.49)	1214.49	(65.89)	1242.33	(32.90)	
Fixed costs							
Regular Labour	118.22	(13.58)	70.37	(6.90)	89.94	(4.17)	N > E > W
Machinery-Tractors	113.68	(9.44)	74.36	(6.33)	96.54	(4.09)	N,E > W
Machinery-Implements	71.74	(7.03)	94.05	(11.83)	76.95	(3.59)	
Own Lorry	1.53	(1.62)	3.84	(3.78)	9.61	(2.56)	
Sugar Beet Storage	0.94	(0.54)	6.67	(2.44)	3.18	(0.94)	W > N,E
Rhizomania Protection	0.00	(0.00)	0.00	(0.00)	0.04	(0.03)	
Rent	137.13	(4.06)	150.58	(6.19)	145.57	(2.71)	
Drainage charges	3.14	(0.50)	0.00	(0.00)	5.98	(0.68)	E > N > W
Total Fixed Costs	446.38	(24.59)	399.62	(19.38)	427.89	(11.67)	
Margin before Overheads	884.22	(39.33)	814.87	(61.59)	814.44	(31.51)	
Overheads							
Labour	42.88		26.18		37.33		N,E > W
Machinery	41.71		42.52		41.29		
General	54.91		54.93		54.92		
Total Overhead Costs	139.51	(4.45)	123.62	(2.56)	133.54	(2.02)	N,E > W
Total Costs	1221.82	(25.57)	1122.70	(28.64)	1201.28	(12.96)	N,E > W
Net Margin	744.71	(41.20)	691.25	(61.61)	680.90	(31.55)	

The figures in Table 3.1 may give a clear indication of the average profitability of the sugar beet enterprise and of the total costs involved. However, possibly important differences may be hidden because of the averaging. Disaggregation of the figures is clearly necessary to gain more insight into such aspects as differences in costs and returns between regions, size groups and methods of production.

3.3 Financial Results by European Union Super Region

A natural first step is to examine the results by region (Table 3.3). The regions chosen are EU super regions (as shown in Appendix A). Earlier studies of the economics of sugar beet (see for example Sturgess, 1983) [8] highlighted considerable variations between regions in both output and levels of input. It is of some interest to examine whether these differences have persisted into the 1990's.

There is a marked difference in the size of holdings surveyed between regions and this is reflected in enterprise size. The average sugar beet area per farm in the East is over three times that in the North.

In yields it appears that the North did have an advantage over the other regions for both clean and adjusted beet. However, the advantage is not statistically significant at the 10 per cent level. [9] Given the climatic conditions of 1995 the yield advantage of the North may have been only a 'one-off' occurrence. Data on yields from the 1994 campaign were collected from the majority of farms taking part. Table 3.4 compares the yields between years. It is evident that the yield advantage for the North was more marked in 1994/5 suggesting some continuity to their advantage. Possible explanations for the yield advantage are that the crop is harvested later, thus allowing the crop more time to bulk up or the longer daylight hours available to the crop.

Table 3.4: 1994 and 1995 Regional Yields for Sugar Beet

Region	Average Yield 1994/5 Campaign	Average Yield 1995/6 Campaign	Difference 95/6 from 94/5
	t/ha clean	t/ha clean	per cent
North	47.85	43.46	-9.17
West	40.54	40.33	-0.52
East	42.39	43.00	1.44

Note 1995/6 Yields vary from those in Table 3.2 as not all farms were able to supply previous years yields and were excluded from the comparison.

The higher yield in the Northern region results in increased returns from beet sales. The East and North appear to gain more from early and late delivery bonuses than the West which could be related either to the timing of deliveries for the sampled farms or to the opening and closing dates of the sugar beet factories. The lower transport

[8] Sturgess, I.M. (1983) *Profitability of the Sugar Beet Crop: Analyses over time and across sections.* AEU Occasional Paper No 29. Department of Land Economy, University of Cambridge.

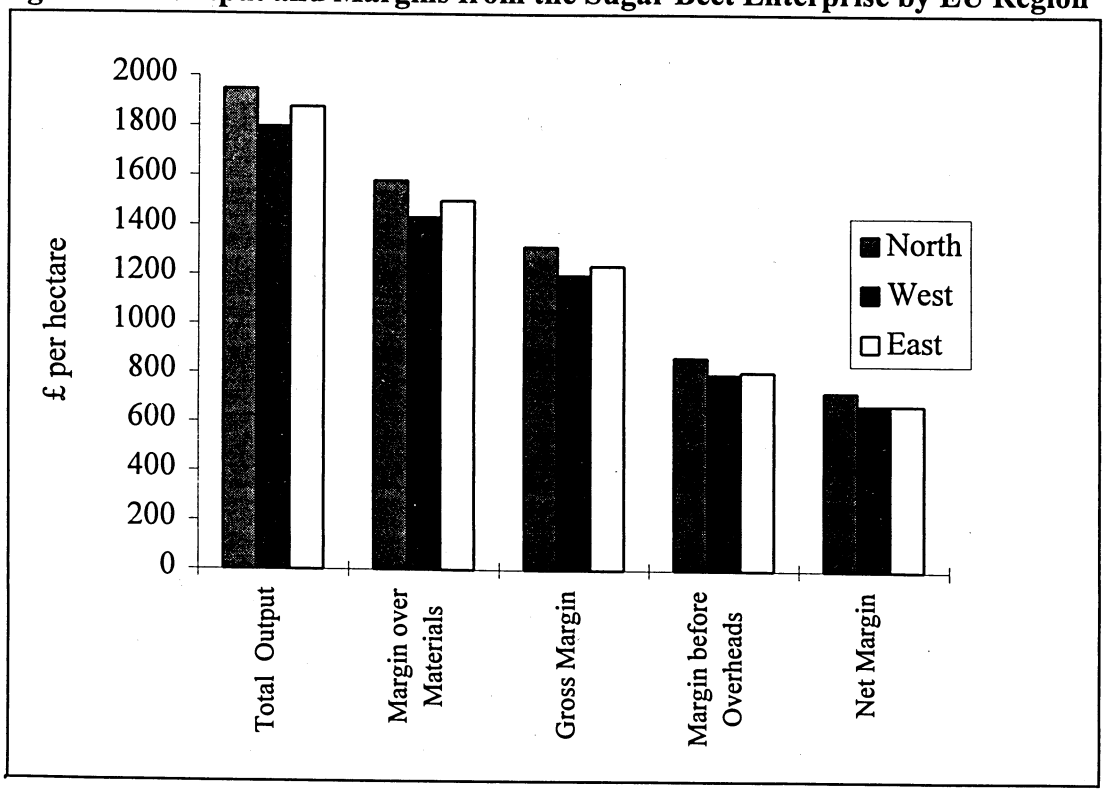
[9] Analysis of variance is used throughout this report to test for differences in the means of populations. The finding that the mean yields are not statistically different at the 10 per cent level between regions indicates that given the variability within samples and the sample size there is a better than ten per cent chance that variations could have arisen from sampling "error".

allowance for the West can partly be explained by the lower yields (as payment is per tonne), but probably also by the distances transported. For example the closure of the Kings Lynn factory would have led to the crop being transported further from some farms in the Eastern region, thus increasing the transport allowance.

There is a significant difference in the value of output from sugar beet tops between regions, although the amounts are small in all cases. Farms in the Western region, with on average more livestock, are able to utilise the tops for feed. In contrast, the vast majority of farms in the Eastern region simply plough in the tops.

The combination of higher yields, early and late delivery bonuses and transport allowances ensures that the farms in the Northern Region achieve a higher level of total output per hectare than those in the West or East. However, the difference is only statistically significant between the North and West. Differences in output and in the margins achieved after various costs have been deducted are highlighted in Figure 3.3.

Figure 3.3: Output and Margins from the Sugar Beet Enterprise by EU Region



Analysis of Variance tests indicate that the only materials cost that varies significantly between regions is seed cost, with farms in the East having higher costs on average than the other two regions. Two factors could be responsible for this increased cost either increased use of more expensive seed dressings, such as Gaucho, or delayed payment (because a discount is available for early payment). Further investigation indicates that it is the former of these factors. The majority of farms in the North and West tend to use standard seed, whilst in the East a fair proportion use Gaucho or some other dressing. Later chapters will highlight the effects of the choice of seed dressing on yields. The similarity of the other material costs, for fertiliser and crop

protection, between regions emphasises the earlier points about the prescriptive nature of beet growing.

The closeness of material costs per hectare between regions means that Northern farms, with their higher average output, achieved better margins over materials (around £150 pounds a hectare higher than in the West).

Other variable costs are also similar. The only significant difference arises for haulage. It is clear that shorter hauling distances, coupled with lower yields, account for the lower contract haulage charges in the Western region. This lower haulage charge reduces the differences between regions to the extent that, at the gross margin level, they are no longer statistically significant. Enterprises in the North did achieve a gross margin per hectare of over a £100 more than those in the West, but given the variability within samples and the sample size there is a better than ten per cent chance that this could have arisen from sampling "error".

Up to the gross margin level there was relatively little variation in production costs between regions. However, examination of fixed costs highlight more significant differences. The North has higher labour and tractor costs than the East and West. These can be explained in part by enterprise size (examined in more detail in the next section). The West has the lowest regular labour and tractor costs, significantly so. These lower costs are only partly offset by higher implement and rental charges leaving farms in the Western region with the lowest fixed costs. These lower costs erode further the differential between the North and West regions to under £70 per hectare at the margin before overheads level.

The lower cost of regular labour in the Western region results in lower overhead labour charges because overhead labour is taken as a percentage of regular and casual labour. This in turn leads to lower total overhead charges. Farms in the Western region have the lowest overall costs at just under £100 and £80 less per hectare than the North and East, respectively. The combination of the variations in output achieved and costs result in differences between regions in the net margin achieved which are too small to be statistically significant.

Variations in output and levels of input complicate examination of the relative efficiency of production by region. Placing the figures on a per tonne basis enables closer scrutiny of efficiency. Of course there are two possible tonnages (clean and adjusted) to use as the divisor. However, as the end product of the process is sugar production, placing our figures on a cost per tonne of adjusted sugar implicitly takes into account the sugar content (Table 3.5).

Table 3.5: Output, Costs and Margin per tonne adjusted of Sugar Beet by EU Super Region

Item	Region		
	North	West	East
	£/tonne		
Total Output (inc. EDB/LDB etc.)	42.40	41.21	42.61
Costs	26.39	25.52	27.20
Margin	16.01	15.69	15.41

Although the differences between regions are small, the East does appear to have higher costs in producing adjusted beet. This results in the other regions achieving a fractionally higher margin per tonne produced. The overall similarity in the results is of interest given that past studies have shown much more significant difference between regions. Sturgess (1983) concluded that the North was a low input: low output area. The results of this survey indicates that it is now farms in the West which are using fewer inputs. However, part of this difference is caused by lower transport costs (as mentioned earlier). For example, a third of the difference in costs between the North and West is made up of higher contract haulage charges.

The initial findings would suggest that differences between regions have eroded through time. These issues will be examined in more detail in Chapter 6 when the 1982 and 1995 results will be compared.

3.4 Financial Results by Size of Enterprise

Past studies have highlighted significant advantages of size in many agricultural enterprises including Sugar Beet (see for example Sturgess, (*op. cit.*) and Davidson, 1995). [10] The performance of small relative to large enterprises is of continuing interest to policy makers. In part these fuel debate on the ideal structure of agricultural production. Considerable changes have occurred in the structure of Sugar Beet production (discussed in the previous chapter and examined in more detail in Chapter 6). A falling number of growers coupled with a relatively stagnant area has led to a marked increase in average sugar beet area per holding. However, the fact that contracts are not saleable has ensured that a large proportion of producers are still small. It is not within the remit of the study to consider the ideal structure for sugar beet taking into account efficiency and welfare issues. As mentioned earlier size and efficiency have been linked in a number of studies. Therefore, a possible first step is to group enterprises by size to see if there any obvious economies of size that might be exploited by transfers in contracts. Table 3.6 breaks the sample into three size groups; up to twenty hectares; between twenty and fifty hectares; and over fifty hectares. These groups are chosen to ensure that a reasonable number of holdings from each region fall into each size group.

Although there are no statistically significant differences in yields, the largest of units had the lowest clean yield on average, but higher sugar content compensated for this

[10]Davidson J.G., (1995) UK Cereals 1993/4, AEU, Department of Land Economy, University of Cambridge

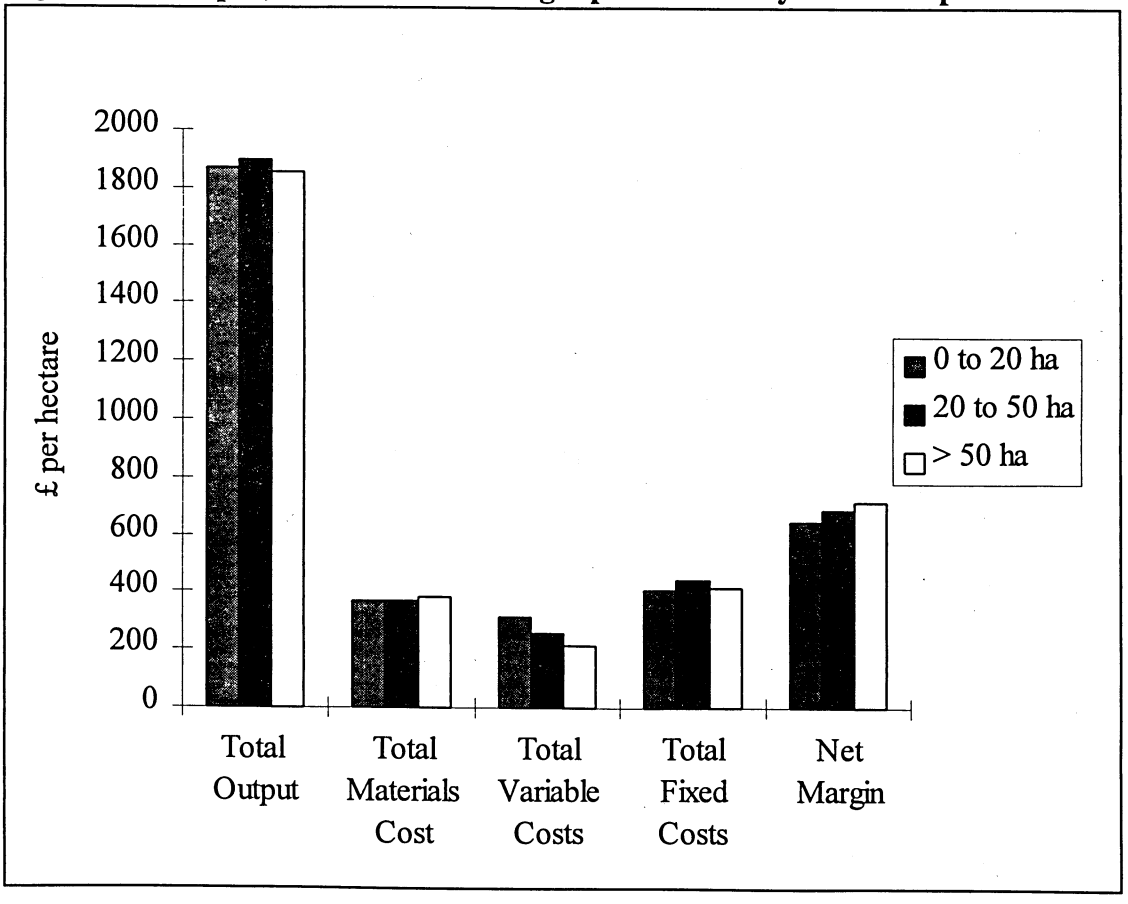
Table 3.6 Costs and Returns for Sugar Beet 1995 Harvest Year by Size of Enterprise

	Size Group 1		Size Group 2		Size Group 3		Sig.
	0 to 20 ha	s.e.m	to 50 ha	s.e.m	> 50 ha	s.e.m	Diff.
Crop Area (ha)	12.66	(0.55)	32.94	(1.05)	109.19	(8.35)	
Yield (tonnes/ha clean)	42.58	(1.05)	42.76	(1.08)	41.68	(0.99)	
Sugar (percent)	16.44	(0.08)	16.51	(0.10)	16.56	(0.08)	
Yield (tonnes/ha adjusted)	44.52	(1.22)	44.90	(1.33)	43.89	(1.18)	
Output	**£ per hectare**						
Value of Beet	1669.88	(42.37)	1698.54	(44.40)	1668.51	(37.11)	
Early/Late Delivery Bonuses	22.43	(2.71)	26.09	(3.41)	26.04	(2.33)	
Transport Allowance	180.88	(8.29)	170.43	(8.58)	174.99	(8.02)	
Output - Tops	4.28	(1.59)	3.67	(1.27)	0.91	(0.43)	1 > 3
Total Output	1877.47	(47.51)	1898.73	(49.79)	1870.45	(42.95)	
Material Costs							
Seed	95.12	(2.26)	98.05	(2.24)	98.46	(2.48)	
Fertiliser	120.40	(4.83)	117.76	(5.41)	120.15	(4.33)	
Crop Protection	153.42	(6.18)	154.62	(6.00)	162.56	(5.44)	
Total Materials Cost	368.94	(8.28)	370.44	(8.17)	381.18	(7.54)	
Margin over Materials	1508.53	(47.42)	1528.29	(50.17)	1489.28	(42.68)	
Other Variable Costs							
Casual Labour	1.32	(0.50)	1.55	(0.59)	3.31	(0.71)	3 > 1,2
Contract Haulage	161.52	(8.47)	148.99	(8.83)	133.60	(10.19)	1 > 3
Contract Other	129.32	(12.62)	81.89	(8.99)	55.61	(7.85)	1 > 2 > 3
Miscellaneous	20.26	(1.81)	22.47	(3.06)	19.35	(2.00)	
Total Other Variable Costs	312.42	(15.32)	254.91	(14.62)	211.88	(14.22)	1 > 2 > 3
Gross Margin	1196.11	(43.05)	1273.39	(46.89)	1277.40	(40.45)	
Fixed costs							
Regular Labour	98.86	(8.24)	92.85	(5.74)	82.28	(4.89)	1 > 3
Machinery-Tractors	90.40	(6.39)	104.19	(5.96)	92.34	(4.76)	2 > 1
Machinery-Implements	66.18	(5.38)	85.75	(6.57)	81.93	(4.45)	2,3 > 1
Own Lorry	3.88	(2.73)	7.78	(4.12)	10.32	(2.85)	
Sugar Beet Storage	2.90	(1.17)	2.45	(0.85)	4.39	(1.58)	
Rhizomania Protection	0.00	(0.00)	0.00	(0.00)	0.07	(0.06)	
Rent	144.47	(3.79)	149.48	(3.88)	140.57	(3.60)	
Drainage charges	5.32	(0.82)	4.92	(0.91)	3.61	(0.79)	
Total Fixed Costs	412.02	(17.43)	447.42	(16.87)	415.51	(13.28)	
Margin before Overheads	784.09	(40.65)	825.96	(45.26)	861.89	(38.50)	
Overheads							
Labour	39.45	(3.21)	37.44	(2.81)	32.56	(2.01)	1 > 3
Machinery	40.51	(0.93)	41.94	(0.51)	42.11	(0.47)	
General	54.92	(0.00)	54.92	(0.00)	54.92	(0.00)	
Total Overhead Costs	134.87	(3.40)	134.30	(2.75)	129.59	(1.98)	
Total Costs	1228.26	(18.50)	1207.06	(20.96)	1138.15	(15.28)	1,2 > 3
Net Margin	649.21	(41.12)	691.67	(45.30)	732.31	(38.38)	

to some degree. The level of total output per hectare is similar between all size groups, although the individual components do vary (Figure 3.4).

Total expenditure on materials is also similar between size groups. The closeness in fertiliser costs is of particular interest, given the perceived wisdom that larger farms are able to buy inputs at lower unit costs. Closer examination indicates that although the costs per hectare are very similar, in physical terms the larger farms are applying more units of fertiliser.[11] Consequently they must be purchasing the fertiliser for less. Larger farms are spending fractionally (but not statistically significantly) more on crop protection.

Figure 3.4: Output, Costs and Net Margin per Hectare by Size Group



Smaller producers, unsurprisingly, rely more heavily on contract services and appear to pay more for haulage. What is surprising is that given their increased use of contractors, small farms still have a significantly higher regular labour charge than large producers. This can be explained by the fact that although they are undertaking fewer field operations themselves, they are taking considerably longer.[12] However, their machinery costs are lower. This does not offset the higher labour and contract costs and total costs are higher for the lower two size groups. The cost advantage of

[11] The statistical significance of the differences in fertiliser use varies by type. For the Nitrogen example given the difference is significant at the six per cent level.

[12] In Chapter 4, analysis is undertaken which shows a reduction in man hours per hectare as the size of enterprise increases.

the largest units, though statistically significant at the 10 per cent level, was not in fact very great.

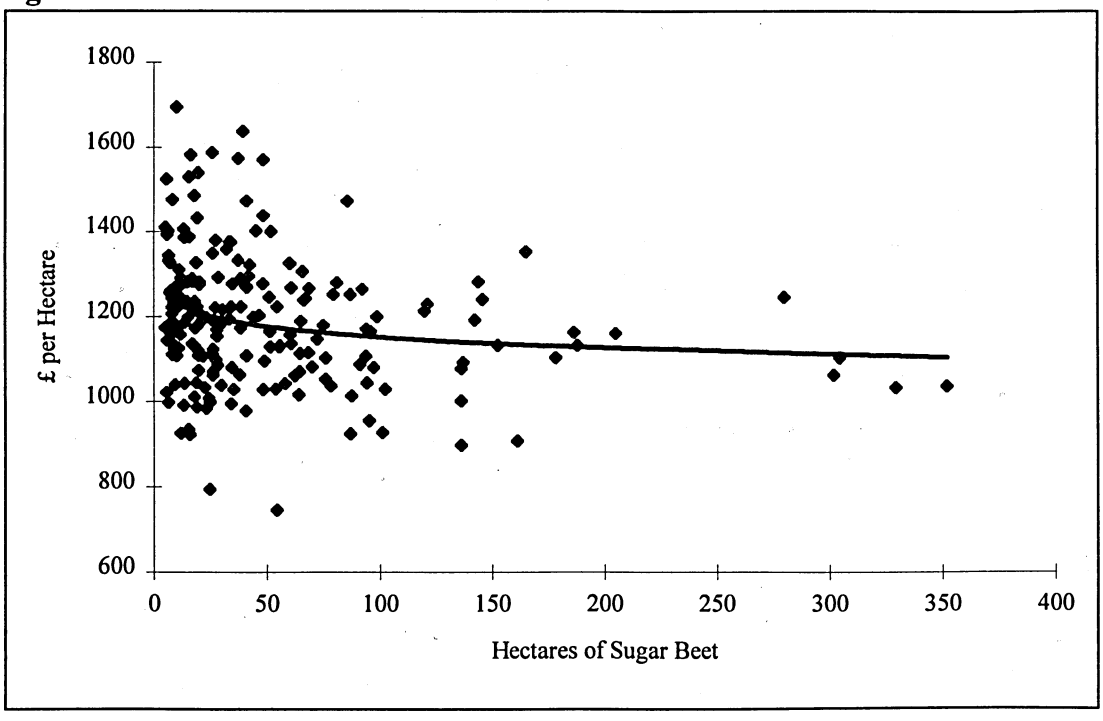
Placing the costs on a per tonne produced basis (Table 3.7), highlights the similarity in performance between the three size groups. The slightly higher margin per tonne attained by the largest producers is achieved through lower costs per tonne.

Table 3.7: Output. Costs and Margin per tonne adjusted by Size of Enterprise

	Size Group (ha)		
	< 20 ha	20 to 50 ha	> 50 ha
	£/tonne		
Total Output (inc. EDB/LDB etc.)	42.17	42.28	42.61
Costs	27.59	26.89	25.93
Margin	14.58	15.39	16.68

Simply splitting farms into three size groups to examine economies of size, can to a certain extent be misleading as even with the inclusion of standard errors the variation within size groups is not clearly highlighted. Figure 3.5 plots, for all farms taking part in the survey, costs against size of enterprise. Fitting of a trend line to the scatter graph of costs per hectare indicates a slight downward trend as size of enterprise increases. However it is only slight and size explains very little of the variation in costs. Perhaps the clearest outcome of this analysis is that although there is a slight downward trend, some of the lowest cost producers are small producers.

Figure 3.5: Costs Per Hectare All Farms



The apparent disappearance of marked economies of size could be due to small producers having access to large machinery, especially for harvesting, at low prices through contractors. Figures 3.6 and 3.7 break the sample down into those using contractors to harvest and others. There does appear to be more variation in costs for

those not using contractors but little difference is evident in terms of reduction of costs as size increases.

Figure 3.6: Costs Per Hectare Non-Contract Harvest Farms

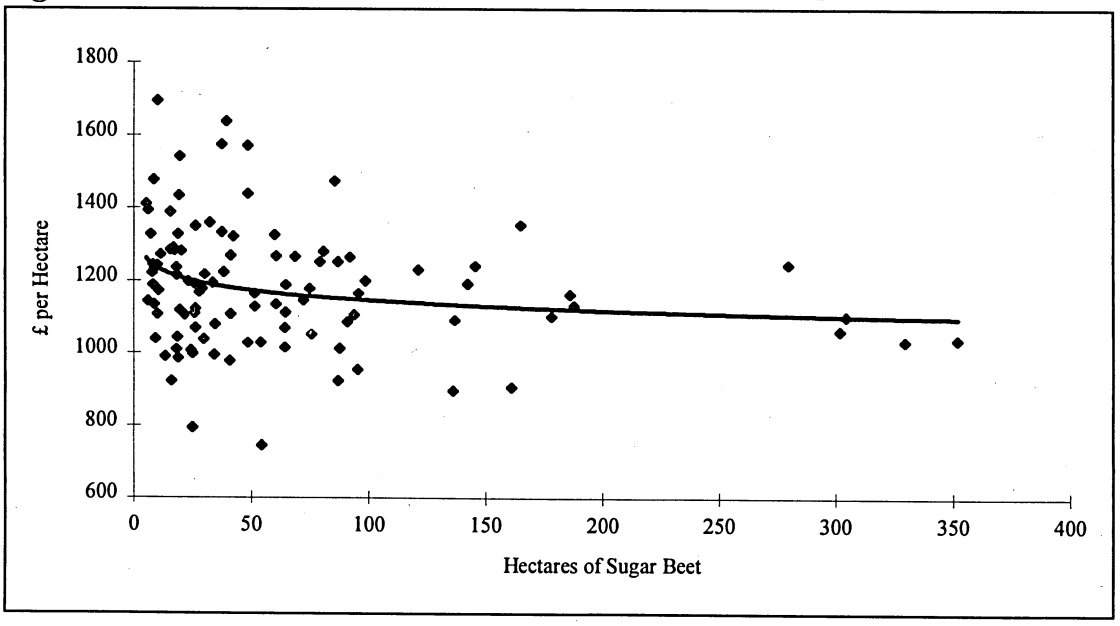
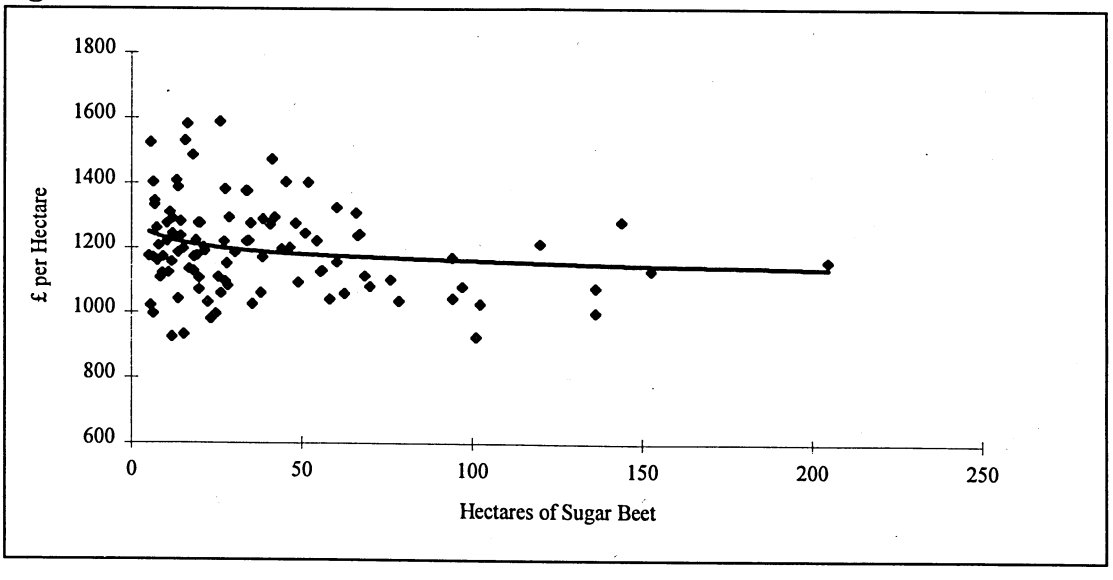


Figure 3.7: Cost Per Hectare Contract Harvest Farms



3.5 Contract Harvest versus Non-Contract Harvest

Although the above diagrams highlights no real difference in terms of economies of size between those that use contract services and others, there may well be other differences between them. This section will compare in more detail the two approaches to production (Table 3.8).

Sugar Beet is well suited to contracting of operations, especially harvesting, as timeliness is not so critical and the crop is easily stored. A continued trend towards the use of contracting services has been occurring over the last few decades. Within the total of 206 farms surveyed for this study 105 used contractors to harvest their

Table 3.8: Costs and Returns for Sugar Beet 1995 Harvest Year by Method of Harvest

	Own Harvest	s.e.	Contract Harvest	s.e.	Significant Differences
Crop Area (ha)	66.53	(7.13)	36.44	(3.52)	*
Yield (tonnes/ha clean)	40.99	(0.72)	43.63	(0.93)	*
Sugar (percent)	16.47	(0.07)	16.53	(0.07)	
Yield (tonnes/ha adjusted)	42.78	(0.84)	46.00	(1.13)	*
Output	**£ per hectare**				
Value of Beet	1642.64	(27.32)	1712.47	(38.29)	
Early/Late Delivery Bonuses	20.01	(1.66)	29.32	(2.69)	*
Transport Allowance	165.68	(6.38)	185.37	(6.99)	*
Output - Tops	1.47	(0.56)	4.40	(1.27)	*
Total Output	1829.80	(31.44)	1931.57	(42.69)	*
Material Costs					
Seed	95.01	(1.63)	99.93	(1.92)	
Fertiliser	120.00	(3.91)	119.04	(3.99)	
Crop Protection	161.33	(5.23)	152.54	(4.38)	
Total Materials Cost	376.34	(7.08)	371.51	(5.84)	
Margin over Materials	1453.46	(31.76)	1560.05	(42.49)	*
Other Variable Costs					
Casual Labour	2.16	(0.52)	1.96	(0.47)	
Contract Haulage	129.45	(7.67)	166.50	(7.04)	*
Contract Other	15.93	(2.39)	161.49	(6.88)	*
Miscellaneous	18.13	(1.33)	23.04	(2.23)	
Total Other Variable Costs	165.67	(8.22)	352.99	(9.21)	*
Gross Margin	1287.79	(29.46)	1207.06	(40.13)	
Fixed costs					
Regular Labour	114.67	(5.64)	69.16	(4.18)	*
Machinery-Tractors	120.62	(4.55)	70.88	(3.53)	*
Machinery-Implements	104.44	(4.13)	51.47	(3.27)	*
Own Lorry	12.22	(3.51)	2.42	(1.24)	*
Sugar Beet Storage	3.34	(1.11)	3.19	(0.94)	
Rhizomania Protection	0.05	(0.04)	0.00	(0.00)	
Rent	143.83	(2.87)	145.53	(3.27)	
Drainage charges	4.09	(0.69)	5.13	(0.68)	
Total Fixed Costs	503.16	(11.34)	347.89	(9.99)	*
Margin before Overheads	784.63	(29.60)	859.16	(36.81)	
Overheads					
Labour	45.24	(2.35)	28.14	(1.83)	*
Machinery	41.82	(0.41)	41.16	(0.68)	
General	54.92	(0.00)	54.92	(0.00)	
Total Overhead Costs	141.97	(2.26)	124.22	(2.00)	*
Total Costs	1187.14	(16.66)	1196.62	(13.86)	
Net Margin	642.66	(30.14)	734.94	(36.43)	*

crop. Clearly these producers individually feel that there are advantages to be had; the purpose of this section is to investigate whether this is the case overall.

It is unsurprising that the average size of enterprise of those using contractors for harvesting is smaller (an average size of 39 hectares compared to 113 hectares) as these growers are likely to find it less economical to purchase their own machinery. However, a much harder finding to explain is the higher yield achieved by enterprises using contract services. As an advert for the Association of Agricultural Contractors it couldn't be better. 'Use Contractors and your yield will increase by two and a half tonnes per hectare!'. Clearly the reasons are more complicated. Further investigation sheds some light on the results. Given the difference in size between those using contract and those not, it is possible that size is playing a part. However the yield advantage to contractors occurs in each of the three size groups analysed above. The next stage is to split the farms by contract usage and region. The only statistically significant difference in yield between the two groups occurs in the Eastern Region (an advantage of four tonnes per hectare for those using contractors). In the North the yields are similar, whilst there is a small, but statistically insignificant, yield advantage to non-contract harvesters in the West.

The Eastern Region (which accounts for two-thirds of our sample) appears to be the region where these differences are concentrated. The results from this region are therefore examined in more detail. First, yields between size groups are similar, suggesting that size does not appear a to be factor. Given the climatic effects on the 1995 harvest the result could simply be due to the location of the farms surveyed. Table 3.9 highlights that there were considerable differences in yields between factory regions. However, in all factory regions (except Bury) there was a noticeable advantage in yield for those that use contractors to harvest their crop (although with varying degrees of statistical significance). The advantage therefore does not seem to relate to size or location within the Eastern region.

Tentatively, one may conclude that there is something within the contracting process that is leading to better performance. Maybe employing contractors gives farms access to newer machinery with improved technology, which may result in better topping, or more complete harvesting. One possible explanation could come from increased expertise in harvesting from specialist contract drivers. British Sugar plc are keen to highlight the effect of good machines and proper setting up on the amount of beet removed from the field. However given that contractors are paid per hectare and they are probably keen to go as fast as possible it is not likely that they will be more careful than own harvesters.

Anecdotal evidence would suggest that a key factor is the relationship between contractors and hauliers, which results in the beet being harvested and transported to the factory within a few days. This would reduce shrinkage of the crop compared to those crops that are harvested and clamped for a longer period before being hauled to the factory. Own harvesters are likely to harvest as and when it suits them and store the beet until it is delivered, whereas contractors will move in to harvest the beet and use pooled delivery tickets to get the beet to the factory. The gains made by using contractors in this sense may be offset to some extent by timeliness of the following

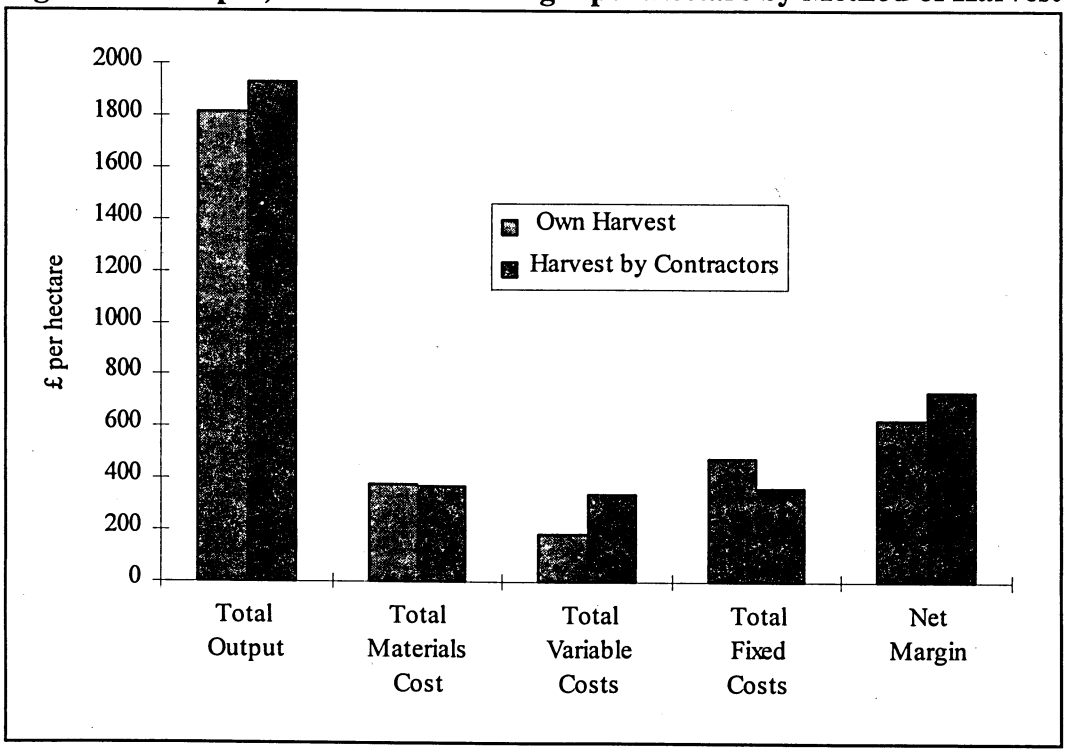
crop. In dry years, such as 1995, this may not be a problem, but in wet years timeliness will be more important.

Table 3.9: Yields by British Sugar Factory Region in Relation to the Average

Factory	Region	Yield	Difference from Average	Net Margin
		(t/ha Clean)	percent	£/ha
Ipswich	East	41.80	-1.55	469.18
Bury	East	41.07	-3.27	442.99
Wissington	East	43.12	1.55	533.36
Cantley	East	48.83	15.00	798.78
York	North	43.71	2.94	594.12
Allscott/Kidderminster	West	40.42	-4.80	539.48
Bardney/Newark	East	39.16	-7.77	446.93
Average		42.46	0.00	

Whatever the reason for the increased yield, the ensuing higher beet sales ensures a higher level of output for those using contractors. Whilst the variation in yield between the groups is of interest, a more pertinent issue is the levels of costs between the two groups. As expected there are no significant differences in any material costs. The major proportion of the difference in contract haulage is due to differences in distance travelled and yields. However, as would be expected those that are large enough to justify own machinery are also more likely to use their own lorries to haul the beet. For producers who did not contract harvest, the contract charge of £16 mainly comprises charges for autumn fertiliser application and the cleaning and loading of beet by hauliers. For those that engage contract services the average cost of £162 often includes some drilling, fertiliser application and other contract operations in addition to harvesting. The standard format table clearly is inadequate for comparing contract and non-contract as Figure 3.8 highlights. The variations in variable and fixed costs mean that the gross margin figures are not comparable.

Figure 3.8: Output, Costs and Net Margin per Hectare by Method of Harvest



A more thorough insight into the relative costs of the two methods can be gained by examining just those production costs that are directly affected by the decision to use contractors (Table 3.10).

Table 3.10: Comparison of Costs between Contract and Non-Contract Enterprises

Cost Item	Own Harvest	Contract Harvest
	£/ha	£/ha
Casual Labour	2.10	1.96
Contract - Fieldwork	15.93	161.49
Regular Labour	114.67	69.16
Machinery - Tractors	120.62	70.88
Machinery - Implements	104.44	51.77
Total	357.83	354.96

The above table suggests that the substitution of contract services for own leads to, on average, no saving in costs. This could induce the simple conclusion that there are no gains or losses to be incurred from using contractors. However, the best choice may vary with unit size. Within the smallest size group (under twenty hectares) those using contractors have significantly lower costs (£365 compared to £426), indicating that some gains in efficiency may be achieved by switching to contractors. In the middle size group (twenty to fifty hectares) the costs are roughly similar (£359 for those using

contractors and £373 for those own harvesting), whilst for the largest farms use of own machinery appears marginally a better option (£308 compared to £329). [13]

However, in all size groups, the yield advantage ensures that contract users receive a higher return from sugar beet. The increased yield, coupled with similar costs ensures that costs per tonne produced are lower for those using contract services (£26 per adjusted tonne compared to £27.50).

3.6 Dispersion in Net Margin

Thus far, disaggregation has yielded little insight into differences in profitability. Analysis by region and size has shown some gains but nothing very substantial. However, as Table 3.11 indicates, there are considerable differences in the profitability of holdings, when ranked by income quartile groups. The table simply reproduces the results of the most and least profitable quartile groups of enterprises as measured by net margin from sugar beet.

From the table, it is clear that the size of enterprise of the highest net margin quartile group is considerably lower than the average for the survey as a whole. This finding is in direct contrast with many other studies (see for example Lewis, 1996), [14]where the high earners of income per hectare are usually considerably above average in size (and low income below average).

Figure 3.9 highlights the main findings, Output of those farms in the highest income quartile group is over one and a half times greater; costs are virtually identical; consequently net margin is nearly four and a half times higher. Therefore, it is not more efficient use of resources that leads to higher incomes, but simply higher yields. The fact that costs per hectare are virtually identical suggests that extra inputs are not applied in anticipation of higher yields, but that growers apply a standard level of inputs and that yield variations are the pivotal factor in the profitability of the crop. Yield is the key factor in the efficiency of production with variations in input use having little effect. In terms of costs per tonne the highest income quartile group produce each adjusted tonne for just £21 a tonne whilst the cost to the lowest is nearly £36. Efficiency and possible gains from transferring quota are discussed in greater detail in Chapter 5. Here it is suffice to note that (if the yield differences are consistent) there is potential for significant gains by transferring quota from low to high yielding producers.

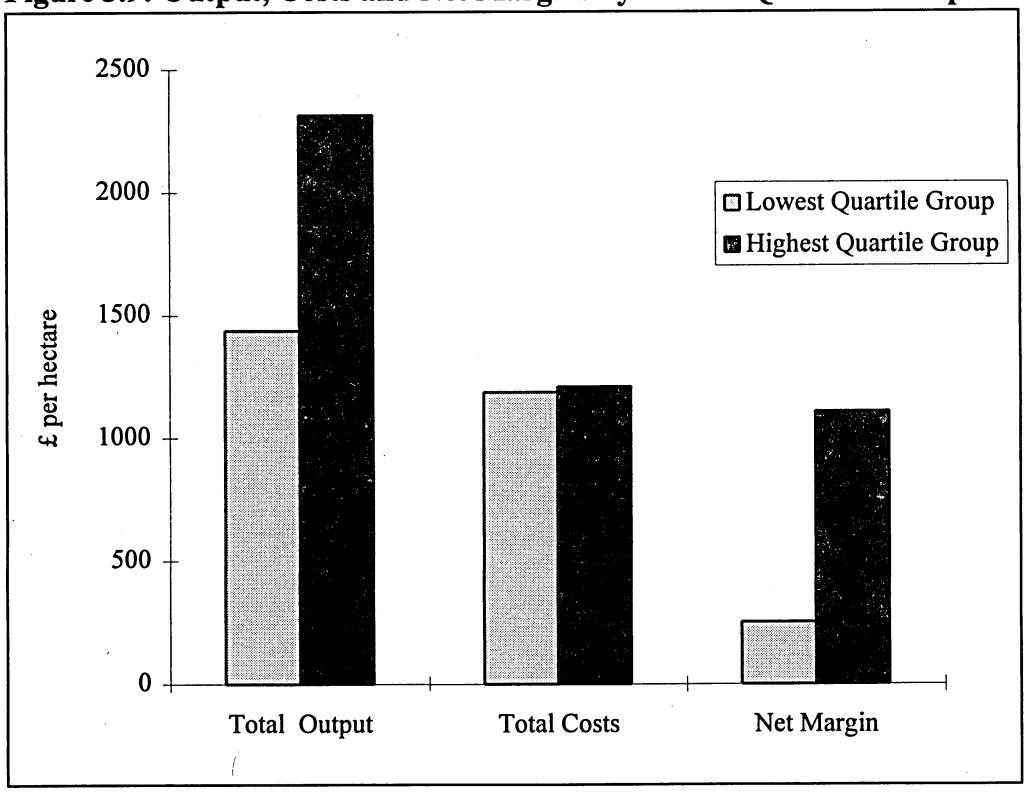
[13] The inclusion of overhead labour charges in this analysis accentuates the differences between those own harvesting and those using contractors as the figure is calculated as a percentage of regular and casual labour.

[14] Lewis, M (1996) *Linseed*, Rural Business Research Unit, Askham Bryan College.

Table 3.11 Costs and Returns for Sugar Beet 1995 Harvest Year by Net Margin Quartile

	Lowest Quartile	s.e.	Highest Quartile	s.e.	Percentage Difference	Significant Differences
Crop Area (ha)	49.09	(8.34)	39.56	(4.65)	-19.42	
Yield (tonnes/ha clean)	33.05	(0.82)	51.16	(0.99)	54.76	*
Sugar (percent)	16.06	(0.09)	16.98	(0.11)	5.75	*
Yield (tonnes/ha adjusted)	33.22	(0.86)	55.83	(1.28)	68.09	*
Output	**£ per hectare**					
Value of Beet	1300.79	(32.32)	2037.74	(39.24)	56.65	*
Early/Late Delivery Bonuses	13.57	(1.46)	37.09	(4.29)	173.32	*
Transport Allowance	132.93	(6.60)	227.67	(10.41)	71.27	*
Output - Tops	4.22	(1.94)	2.08	(1.07)	-50.67	
Total Output	1451.51	(36.60)	2304.58	(39.82)	58.77	*
Material Costs						
Seed	95.16	(2.55)	100.56	(3.04)	5.68	
Fertiliser	124.78	(5.62)	121.35	(6.82)	-2.76	
Crop Protection	174.14	(7.95)	151.15	(6.27)	-13.20	*
Total Materials Cost	394.08	(9.97)	373.05	(9.11)	-5.34	
Margin over Materials	1057.43	(35.08)	1931.53	(38.35)	82.66	*
Other Variable Costs						
Casual Labour	2.22	(0.81)	1.30	(0.42)	-41.60	
Contract Haulage	122.07	(8.70)	188.67	(12.29)	54.56	*
Contract Other	83.34	(13.74)	110.37	(12.71)	32.43	
Miscellaneous	19.30	(2.25)	23.06	(2.33)	19.51	
Total Other Variable Costs	226.92	(15.81)	323.40	(19.20)	42.51	*
Gross Margin	830.51	(38.26)	1608.13	(35.06)	93.63	*
Fixed costs						
Regular Labour	97.00	(6.80)	76.99	(5.60)	-20.63	*
Machinery-Tractors	105.47	(7.69)	80.74	(6.42)	-23.45	*
Machinery-Implements	78.90	(6.44)	64.23	(5.72)	-18.59	
Own Lorry	4.26	(2.44)	3.72	(2.23)	-12.49	
Sugar Beet Storage	2.11	(0.79)	2.24	(0.79)	6.36	
Rhizomania Protection	0.00	(0.00)	0.00	(0.00)		
Rent	139.38	(4.36)	150.61	(4.06)	8.05	
Drainage charges	3.81	(0.65)	5.54	(1.13)	45.26	
Total Fixed Costs	430.92	(18.09)	384.29	(15.93)	-10.82	
Margin before Overheads	399.59	(28.36)	1223.85	(29.72)	206.28	*
Overheads						
Labour	38.43	(3.22)	31.11	(2.60)	-19.04	
Machinery	41.18	(1.00)	41.81	(0.96)	1.54	
General	54.92	(0.00)	54.92	(0.00)	-0.01	
Total Overhead Costs	134.53	(3.27)	127.84	(2.95)	-4.97	
Total Costs	1186.45	(20.19)	1208.57	(20.12)	1.87	
Net Margin	265.06	(27.57)	1096.01	(29.38)	313.49	*

Figure 3.9: Output, Costs and Net Margins by Income Quartile Group



This chapter has concentrated on the financial results of the survey and analysed the performance of holdings classified by various criterion. The next chapter examines in further detail the outputs from and inputs into sugar beet production and highlights the more complex interactions that are occurring.

Chapter 4: Aspects of Yield, Output and Inputs

4.1 Introduction

The previous chapter examined the financial results from the study. This chapter will examine more closely the physical characteristics of the farms surveyed, in particular their yields and use of inputs. This sheds further light on the production process and highlights differences not shown by analysis of the financial situation.

4.2 Farm Enterprise Type and Labour Availability

4.2.1 Cropping

When examining regional variations in financial performance in Chapter 3, little attention was given to the composition of the survey farms in terms of cropping and stocking. Regional variations in farm type and size may help explain differences in performance. Table 4.1 examines the components of the total farm area for all holdings and by EU region.

Table 4.1: Cropping on Surveyed Farms All Holdings and by EU Region

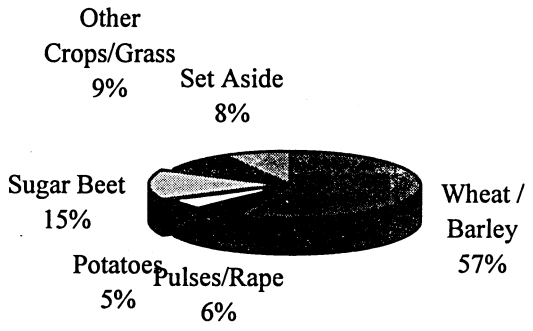
	North	West	East	All Holdings
Crop		hectares		
Winter Wheat	52.45	62.19	118.92	115.27
Winter Barley	22.32	22.99	50.24	48.34
Spring Barley	8.19	7.22	18.97	18.22
Field Beans	0.81	2.77	4.94	4.72
Combine Harvested Peas	3.02	0.00	5.62	5.38
Oilseed Rape	4.36	2.85	8.38	7.99
Potatoes	7.57	24.96	18.95	18.67
Sugar Beet	21.31	39.62	65.15	62.85
Other Crops	10.65	11.89	24.55	23.85
Grasses < 5 yrs	3.16	10.30	4.34	4.45
Industrial Set Aside	2.55	0.49	3.10	3.06
Other Set Aside	9.67	13.92	29.02	27.81
Rotational Area	146.07	199.20	352.19	340.60
Total Area Farmed	158.59	231.58	385.71	373.63

The difference in enterprise size shown in the last chapter is reflected in the total area farmed. The average size of farm is smallest in the North and largest in the East. Figures 4.1 to 4.4 place the figures into percentage terms. Clearly the major part of the rotation is similar between regions, especially for farms in the North and the East. Farms in the West have a higher proportion of potatoes in the rotation and a reduced area of cereals. This could be related to a higher degree of specialisation in crops in the Eastern and Northern regions whereby farms will often choose between potatoes and sugar beet. In the West with a smaller number of 'arable' units this degree of specialisation has not been possible.

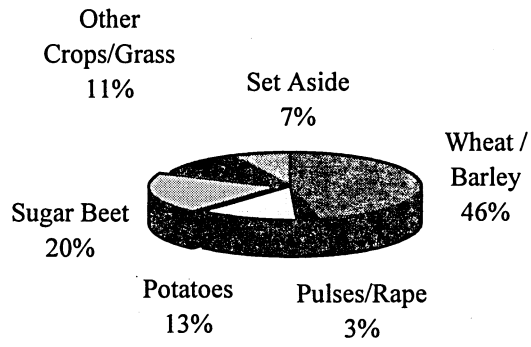
Sugar beet is grown in a fixed rotation in the majority of cases (71 per cent), with on average 3.9 years between each crop. This has been little affected by the advent of set-aside; only 11 growers stated that it has had any effect at all.

Figures 4.1 to 4.4 Distribution of Cropping on Survey Farms

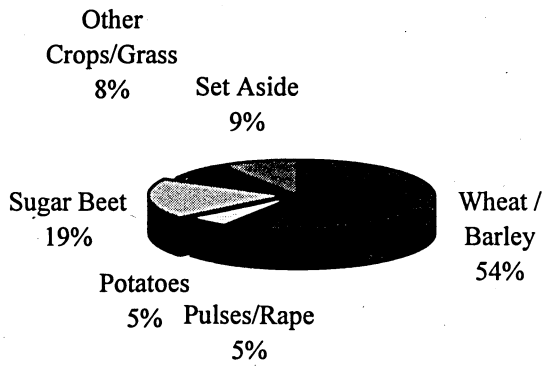
4.1
North Region



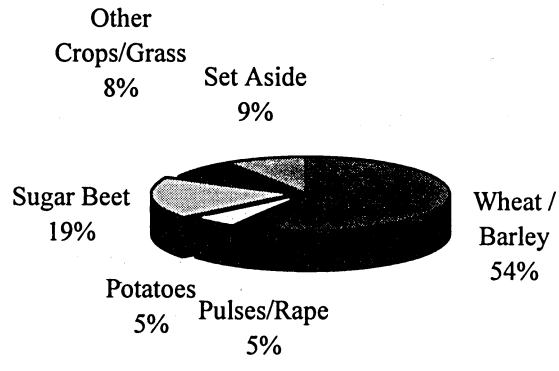
4.2
West Region



4.3
East Region



4.4
All Regions



4.2.2 Stocking

Farms in the Western region, on average, have twice as many grazing livestock units per farm than in the other regions (Table 4.2) which explains their higher use of beet tops for feed.

Table 4.2: Stocking on Surveyed Farms All Holdings and by EU Region

Livestock	North	West	East	Total
			Numbers	
Dairy Cows	1.26	26.60	15.45	15.31
Beef Cows	3.72	3.89	5.04	5.05
Other Cattle	20.79	34.21	21.93	22.59
Ewes	42.52	57.47	25.08	26.82
Other Sheep	75.62	88.39	8.29	14.49
Grazing Livestock Units: Total	42.04	82.45	41.00	42.91
Per 100 ha	26.51	35.60	10.63	11.49
Sows and Gilts	24.26	37.97	26.02	25.61
Other Pigs	234.26	237.46	169.47	176.51
Laying Hens	0.00	0.00	78.31	72.17
Broilers	0.00	20336.12	524.59	1122.18
Other Poultry	0.00	711.76	0.00	20.07
Other Livestock	0.10	0.04	0.30	0.28
Store Cattle	9.35	6.18	7.53	7.47
Store Sheep	32.14	87.41	16.22	20.35

4.2.3 Tenure

Table 4.3, examines tenure patterns on the surveyed farms. There are clear differences between regions, with owner occupancy ranging from nearly three quarters of the average area farmed in the North to little more than a half in the Western region.

Table 4.3: Tenure Type of Average Farm Area by EU Region

Tenure Type	North		West		East	
	Ha	%	Ha	%	Ha	%
Owner Occupied	115.13	72.6	123.15	53.2	248.12	64.3
Tenanted	41.47	26.1	91.62	39.6	123.77	32.1
Other	1.99	1.3	16.81	7.3	13.83	3.6
Total Farmed	158.59	100.0	231.58	100.0	385.71	100.0

4.2.4 Labour Availability

Labour availability includes the manual labour of the farmer and spouse, but excludes that considered managerial (Table 4.4). The work units are derived on the assumption that on average a person works 2200 hours in a year. Regular full time labour accounts for 64 per cent of the available labour and the farm family (including farmer and spouse) account for the majority of the remainder.

Table 4.4: Available Manual Labour on Farms

Available Manual Labour	Number	Annual Work Units	Total Labour per 100 hectares
Farmer and Spouse	0.92	0.88	0.24
Family	0.48	0.39	0.10
Regular Full Time	2.6	2.64	0.71
Regular Part Time	0.22	0.08	0.02
Casual	0.53	0.13	0.03
Total Labour	4.75	4.11	1.10

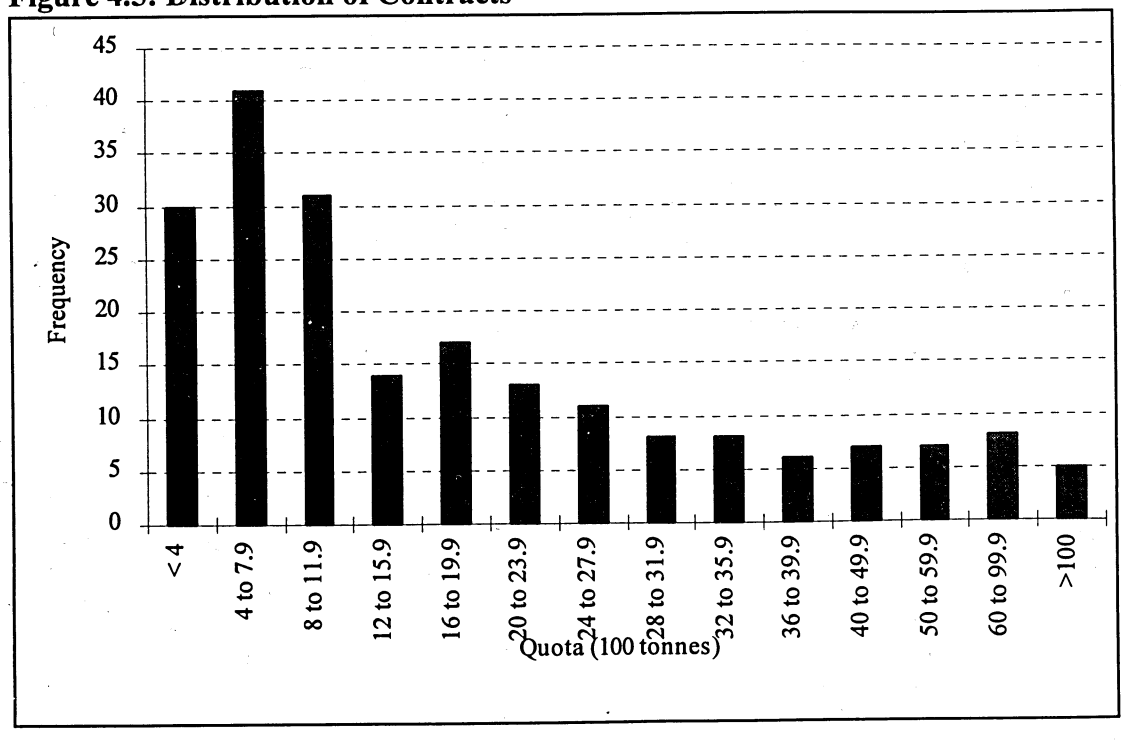
Note: Labour availability does not include that supplied by contractors

Regional differences in employment are apparent, reflecting both size of farms, and the cropping and stocking pattern. Farms in the West, on average, have the most available annual work units per 100 hectares farmed (2.1) which is likely to be related to their higher livestock numbers. Although the Northern Region with, on average, the smallest farms, has the least labour per farm (3.09 Annual Work Units), it is higher per 100 hectares farmed than in the Eastern region (1.94 compared to 1.09). There is also considerable variation in the proportion of farmer and spouses' own labour in the total, ranging from just under 30 per cent in the Northern region to only 18 per cent in the East.

4.3 Contracts and Production

A natural starting point in the examination of output is consideration of quota and its fulfilment by growers. Figure 4.5 reproduces the distribution of allocated quota to growers within the survey. Given the closeness in size distribution between the survey sample and the actual distribution (see Chapter 2), the results indicate that over half of the farms growing for British Sugar have a quota of less than 1200 tonnes.

Figure 4.5: Distribution of Contracts



4.3.1 Contract Performance

As mentioned in Chapter 2, of major importance to British Sugar is the ability of farms to fulfil their quota. Their processing costs depending heavily upon throughput. Failure of farms to fulfil contracts is likely to lead to higher unit processing costs. Table 4.5 indicates that, even in the dry year of 1995, all regions produced over quota, but to different degrees. Surveyed farms were contracted to produce 429,000 tonnes of sugar beet; in terms of beet of standard sugar content they produced 454,000 tonnes, just under six per cent more than quota. Overproduction varied from nearly 10 per cent in the Northern EU region to under five per cent in the East. Table 4.6 examines production by size group. Although the largest farms do grow more 'C' Beet in absolute terms, as a percentage of their total quota the excess is under four per cent compared with nearly 12 per cent for the smaller producers.

Table 4.5: Comparison of Quota and Actual Production between Regions

Region	Quota	Production	Production Over Quota	Percent Over Quota
		000 tonnes		%
North	41.23	45.32	4.09	9.93
West	57.92	63.39	5.48	9.46
East	330.22	345.48	15.27	4.62
Total	429.36	454.19	24.84	5.78

Table 4.6: Comparison of Quota and Actual Production between Size Groups

Size Group	Quota	Production	Production Over Quota	Percent Over Quota
		000 tonnes		%
< 20 ha	37.26	41.64	4.38	11.77
20 - 50 ha	86.27	95.18	8.91	10.33
> 50 ha	305.83	317.37	11.54	3.77
Total	429.36	454.19	24.84	5.78

Figures 4.6 and 4.7 place the above findings in the form of market shares. The North has under 10 per cent of the quota allowance, but it produced over 10 per cent of the total production and around 14 per cent of the production over quota. The East by contrast had a greater share of quota than of production and a disproportionately small share of 'C' beet. When the farms are grouped by size group larger producers are seen to have contributed much less to 'C' production than their share of quota or production.

Figure 4.6: Share of Quota, Production and Excess Production by Region

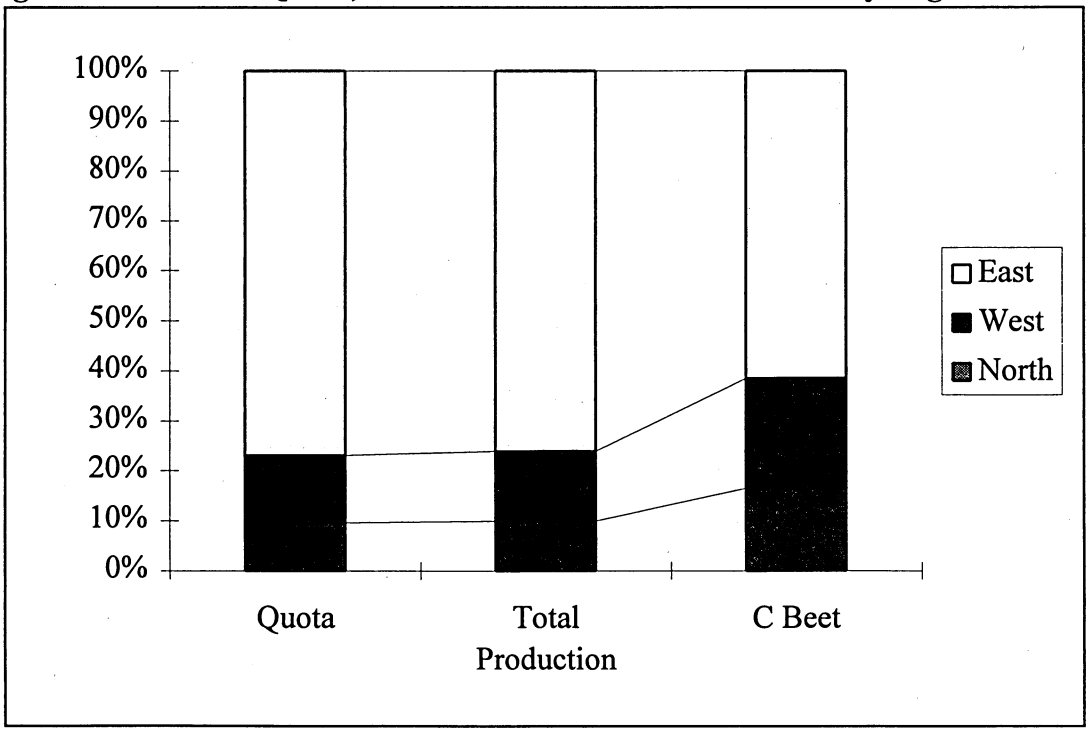
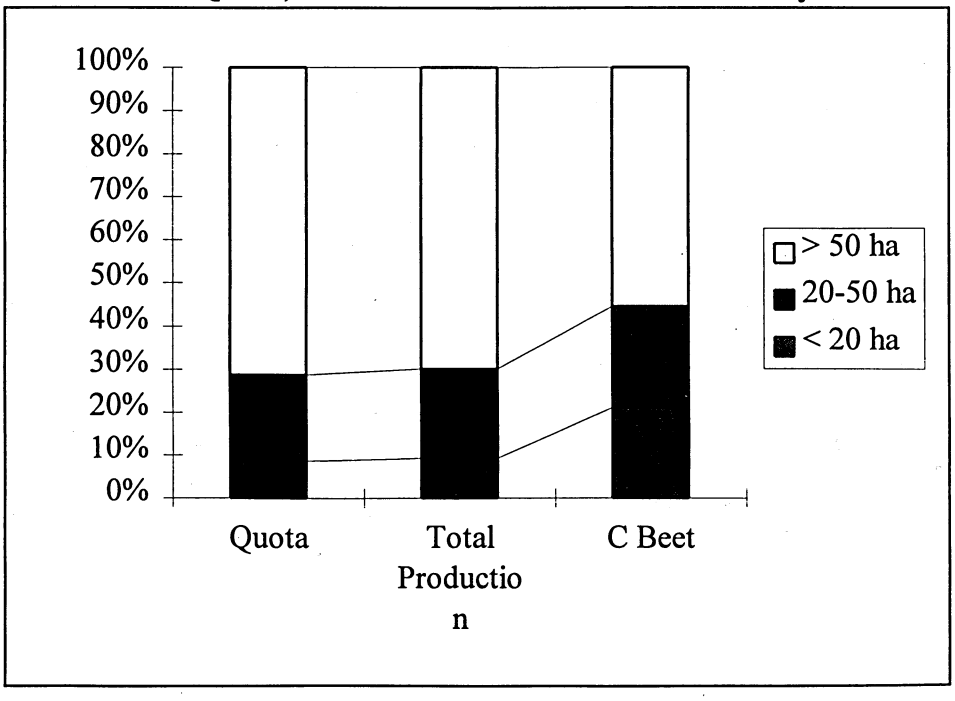


Figure 4.7: Share of Quota, Production and Excess Production by Size Group



Although the above tables and figures indicate that, on average, production was over quota, a large proportion of producers failed to achieve their target quota (Figure 4.8). This can have repercussions because persistent failure to achieve quota will lead to the quota being reduced accordingly.

Although quota is calculated on an adjusted tonne basis, Figure 4.8 shows quota achievement by the various tonneages. Only 12 per cent of producers delivered less than their quota in terms of dirty tonnes. Once the beet has been cleaned and topped around 45 per cent were actually below quota. Allowances for sugar content reduced

the number to a third of producers failing to reach their contracted tonnage in 1995. Figures 4.9 and 4.10 disaggregate these figures by region and size group, respectively. The line represents the average per cent not achieving their contracted quota. It is clear that farms in the East were more likely to fail to meet contract tonnage as were larger farms. Given the size distribution of the sample, with the largest beet enterprises in the East the correlation is not surprising.

Figure 4.8: Percentage of Producers Over and Under Contracted Tonnage by Various Measures

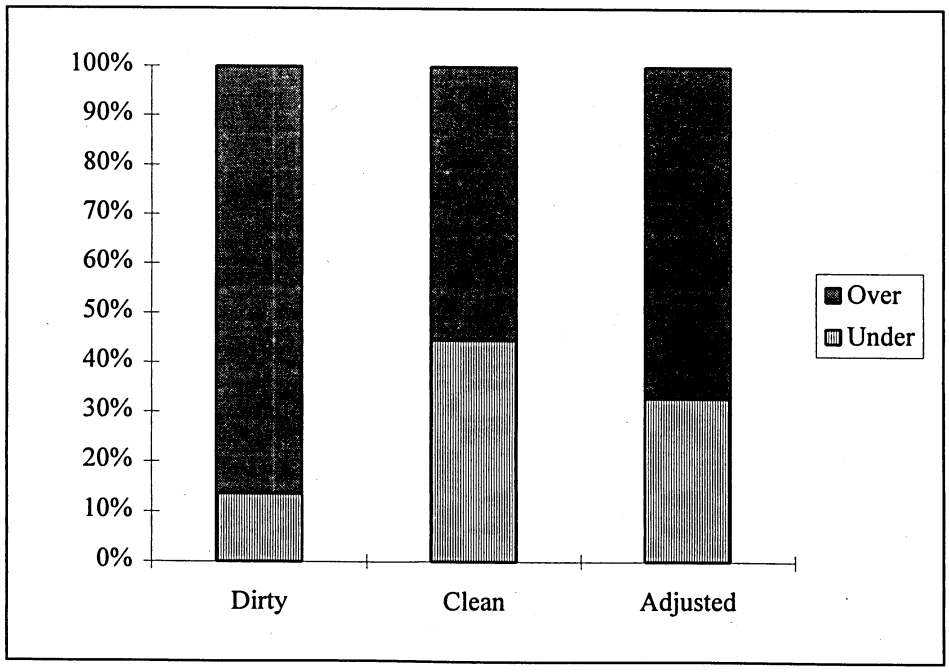


Figure 4.9: Per cent of Producers not Achieving Contracted Tonnage by Region

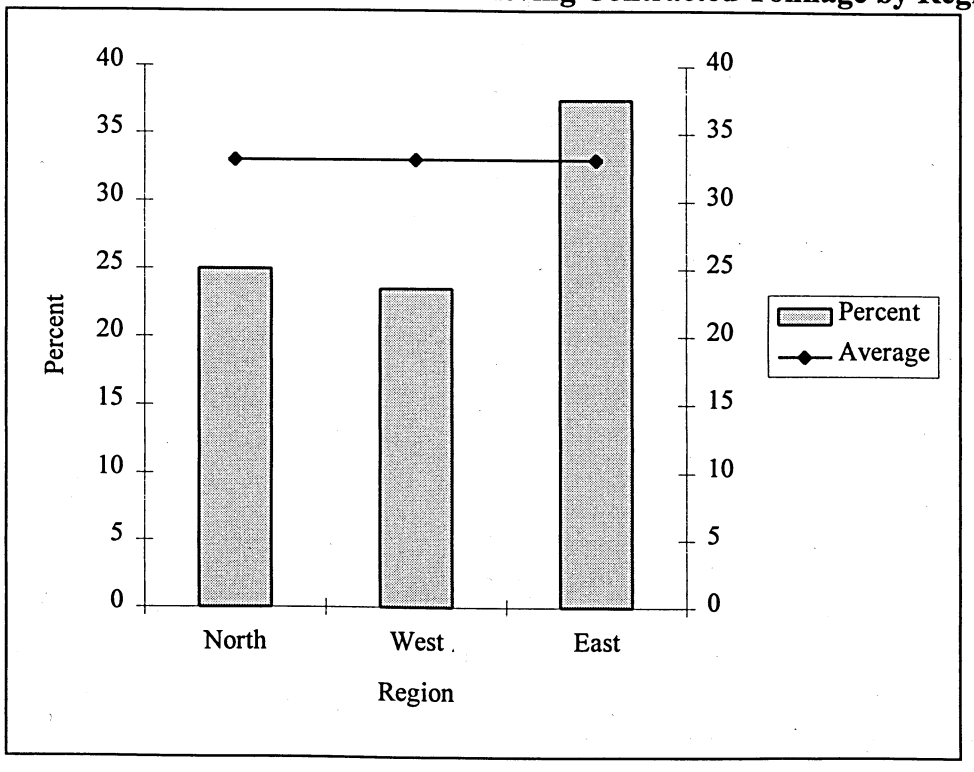
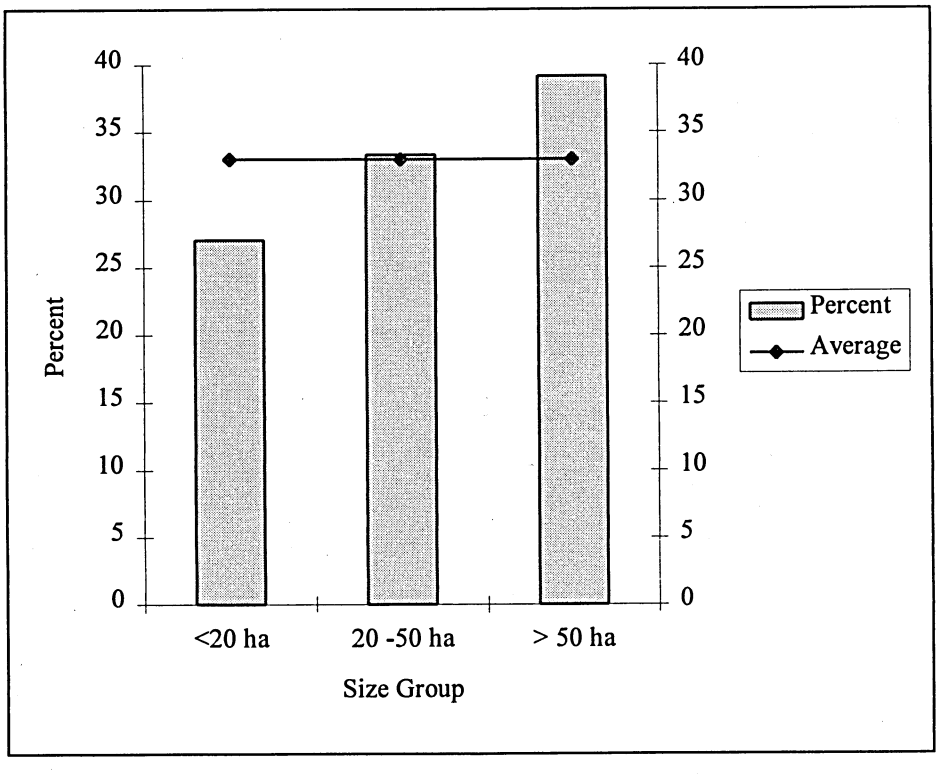


Figure 4.10: Per cent of Producers not Achieving Contracted Tonnage by Size Group



Of more interest is whether producers are continually failing to meet quota. We can see by comparing 1994 and 1995 figures that 54 per cent of growers were over contract in both years (Table 4.7). However a sizeable proportion (10 per cent) failed to make quota in either of the two years. The effect of the 1995 drought can be seen clearly by the fact that 22 per cent of growers who were over contract in 1994 failed to meet it in 1995.

Table 4.7: Contract Attainment 1994 and 1995

Contract Achievement	Number	Per cent
Over 94 and 95	98	54
Under 94 and 95	18	10
Over 94 Under 95	41	22
Under 94 Over 95	26	14
Totals	183	100

Note: 23 farms were unable to supply 1994 figures and were therefore excluded.

The total area of beet sown to achieve contracted tonneage gives some idea of the yield that growers were expecting. However, on its own it is not necessarily a good indication because growers may be deliberately planting extra for a number of reasons, not least because loss of quota has a capital cost as sugar beet production is more profitable than alternatives. Growers would therefore be expected to overplant in order to reduce this risk. Growers were asked their intentions when planting, that is whether they were planting just enough to cover quota or more. Table 4.8 indicates that, for example, in the West only 18 per cent planted just enough to cover quota, the rest were likely to plant enough to produce more than quota in a normal season. Whilst in the Eastern region 38 per cent of growers stated they only aimed to produce A and B beet.

However, despite these differences in intentions the area planted in relation to quota was similar, fluctuating around one hectare planted for every 40 tonnes of quota.

Table 4.8: Per cent Of Growers Plantings To Achieve Quota

	North	West	East
Cover Quota	36	18	38
Extra Always	56	52	32
Extra Sometimes	8	24	16
Other	0	6	14
Totals	100	100	100

The perceived profitability of beet is highlighted by the fact that 72 per cent of growers would like, on average, 774 more tonnes of quota per farm. The total desired quota is 110,000 tonnes, just over a quarter more than the current total quota for the sample. Those not wishing more quota were mainly constrained by rotations. While the likelihood of more quota being available is slim, in discussions on quota transferability, knowledge of those who want more and their costs is key information.

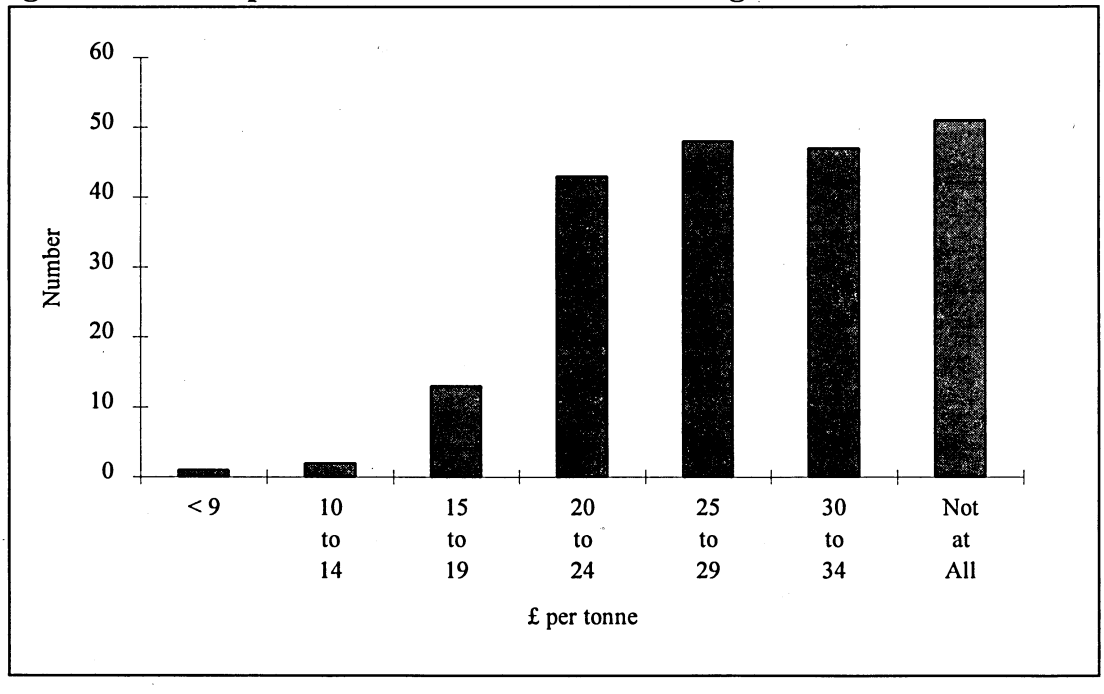
4.3.2 'C' Beet Production

Growers were asked the price of 'C' beet (if predicted accurately by British Sugar Plc) which would be sufficient to encourage them to deliberately produce over quota. The aim of this question was two-fold; first to examine the potential for farms to grow extra beet; and second to enable a comparison of perceived and actual costs.[1] Figure 4.11 highlights that few would plant extra for less than £20 per tonne.

Comparing actual costs incurred with those at which farmers would grow more beet may give an indication of whether farms have a clear knowledge of their production costs. In 22 per cent of cases the price required to induce production of 'C' beet was similar to actual average costs. In another 30 per cent of cases growers would only produce more if the returns were higher than their current cost. This could indicate a number of factors; they were overestimating their costs; they were seeking a reasonable 'profit' per tonne; or that because of labour and machinery constraints they assumed that their costs would rise if production increased. Perhaps the most interesting finding was that 35 per cent would produce 'C' beet for less than their actual average cost per tonne. This might suggest that these growers perceive economies of size that do not appear evident from the results of the study or that they are rightly taking into account only the marginal costs of producing above quota.

[1] The following discussion is based implicitly on the assumption that the incremental costs of further production is not very different from the average cost of production. Later analysis (in chapter 5) supports this assumption.

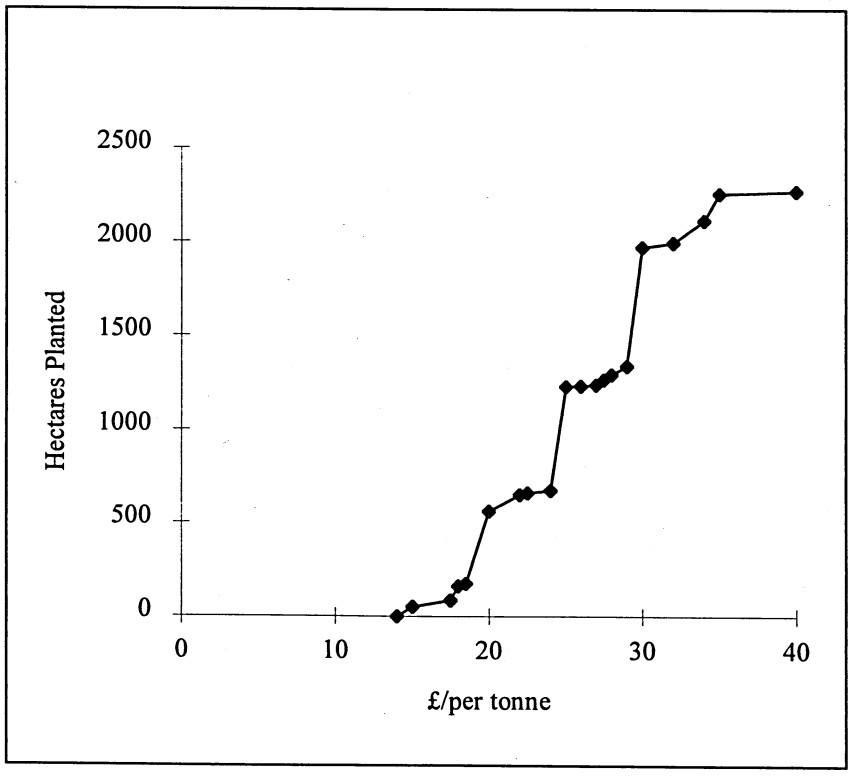
Figure 4.11: Price per tonne at which Growers would grow excess beet



4.3.3 Industrial Beet

There is potential for using beet for industrial purposes rather than the production of foodstuffs. An attempt was made to gain an indication of growers' willingness to grow industrial beet and the price necessary to encourage production. Growers were informed that costs of production were likely to be similar but that price would be below quota beet. Around 57 per cent of growers stated that they would grow industrial beet, for an average price of £27 per tonne, which is identical to the average costs of production per tonne highlighted in the previous chapter. On average growers stated they would grow 21 hectares of industrial beet. Rotational constraint was again the major reason given by those not wishing to grow industrial beet, although a significant proportion stated that it was not cost effective for less than quota price. Figure 4.12 produces a cumulative distribution relating price and the total area that would be grown at that price. Below £15 per tonne no one would grow industrial beet, whilst at £25 a total of 1200 hectares would be grown. If we accept our sample as being representative of the industry as a whole, then a price of £25 a tonne for industrial beet would induce 22,800 hectares for production whereas a price of £35 would induce 43,700 hectares. These figures ignore the possibility that industrial beet might be grown on set-aside land which is not possible at present. If the set-aside payment (£341 pounds per hectare) was taken into consideration as a production subsidy it would reduce the costs of production on an average yield of 42 clean tonnes by £8 per tonne. This would suggest that on set-aside land growers might be willing to grow industrial beet for an average price of £19 per tonne rather than £27.

Figure 4.12: Cumulative Distribution of Hectares Grown at Each Price



4.4 Inputs

Analysis of the financial data highlighted differences in inputs between size groups and regions. This section examines in further detail input usage in the production of sugar beet.

4.4.1 Seed

This section analyses aspects of seed use, including choice of seed and the effect of seed dressing. Figure 4.13 highlights the percentage of the 10 thousand hectares surveyed sown to each type of seed. Unfortunately, it was infeasible to collect yield data by seed type so no analysis can be undertaken as to the effect on yield of seed choice. The Figure highlights that five main varieties accounted for just under 90 per cent of the planted area, with Saxon alone accounting for nearly 30 per cent.

Growers must purchase the seed through British Sugar plc. This can be paid for either at the time of purchase or when the grower receives payment for beet in the Autumn (hereafter referred to early and late payment, respectively). A higher charge is made for late payment, reflecting the finance charge for the intervening period. It might be expected that the smaller farms would take greater advantage of the deferred payment given that they may have less access to capital. Table 4.9 indicates that this is not the case and that a smaller percentage of larger farms pay early.

Figure 4.13: Percentage of Area Sown by Seed Type

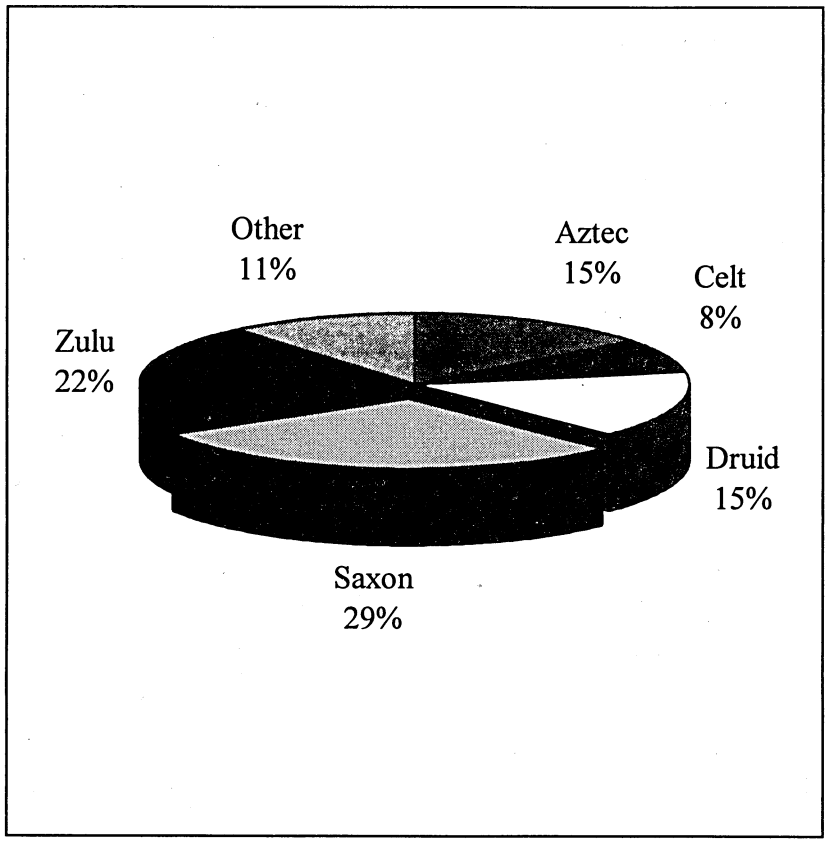


Table 4.9: Method of Payment by Size Group

Size Group	Early	Late	Percent Early
	No.	No.	%
< 20 ha	35	39	47.3
20 to 50 ha	27	36	42.9
>50 ha	30	39	43.5
All Farms	92	114	44.7

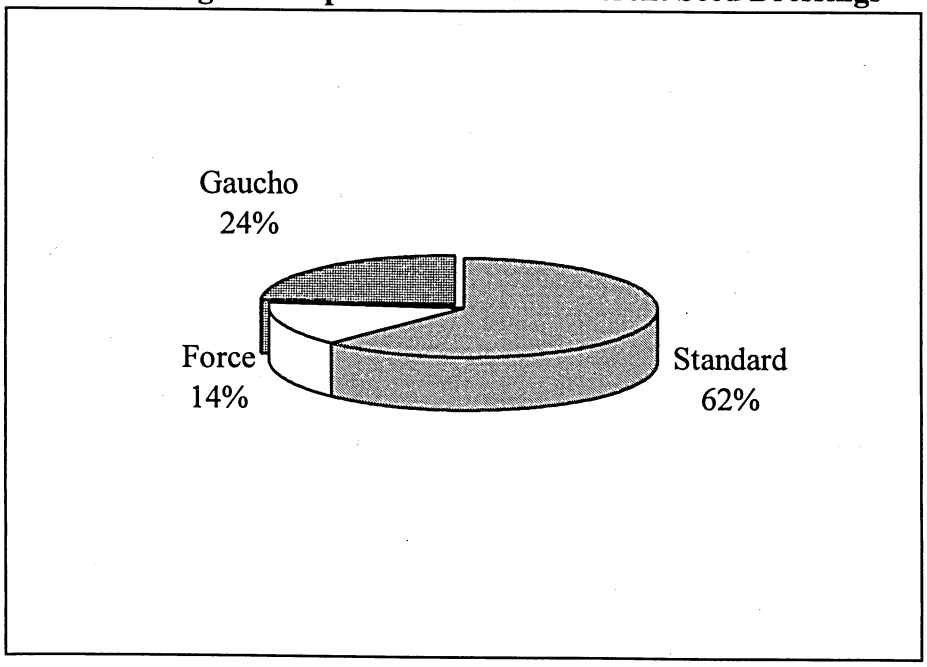
Growers have a choice of seed dressing to place on the seed. Table 4.10 relates the choice of dressing to yield, insecticide and pesticide usage, crop protection overall and net margin. It is apparent from this table that use of Gaucho had a significant effect on yields achieved, with on average a 5.7 tonne increase over standard dressing. This difference multiplied by the survey average price of £35 per tonne indicates an increase in output of around £180 per hectare. Even if the extra produced was all lower priced 'C' beet the increased output would have been worth £126 per hectare. This clearly outweighs any cost saving by using standard dressing. Of course, these findings are based on a one-off study of the economics of sugar beet and not scientifically controlled field trials. Therefore not too much can be deduced about the relative merits of the different seed dressings available on the market.

Table 4.10: Yield, Chemical Costs and Net Margin by choice of Seed Dressing

Type of Seed Dressing	Yield	Insecticides	Pesticides	Crop Protection	Net Margin
	t/ha		£/ha		
Standard	41.12	17.27	6.05	167.29	647.57
Gaucho	46.88	8.57	3.02	149.01	833.95
Force	39.87	10.03	4.14	135.80	625.62
Mixed (F/G)	42.69	11.71	1.39	154.14	692.98

The yield advantage obtained by those using Gaucho warrants further analysis of its use. Figure 4.9 highlights that nearly a quarter of the crop was treated with Gaucho in 1995. One of the benefits of Gaucho is protection against aphid attack. As aphids were a major problem in 1995 then this may explain the advantage gained by the use of this dressing. In 1996 a considerably greater proportion of seed was treated with Gaucho, although ironically there were not the same disease problems. The effect of seed treatment on crop protection costs will be analysed in more detail in Section 4.4.3

Figure 4.14: Percentage of Crop Treated With Different Seed Dressings



4.4.2 Fertiliser

Earlier analysis has already indicated that there was little difference in fertiliser costs per hectare between farms of different size or from different regions. This is of course likely to be the case as the treatment of much sugar beet follows standard recommendations. Figure 4.15 highlights clearly the concentration of application between 100 and 160 kg per hectare. The modal application of 120 kg fits in well with British Sugar recommendations for sandy loam and loamy sand which comprise the majority of soils on surveyed farms. A number of growers appear to be applying more than British Sugar recommended amounts, but this of course could be related to individual circumstances.

Figure 4.15: Nitrogen Application

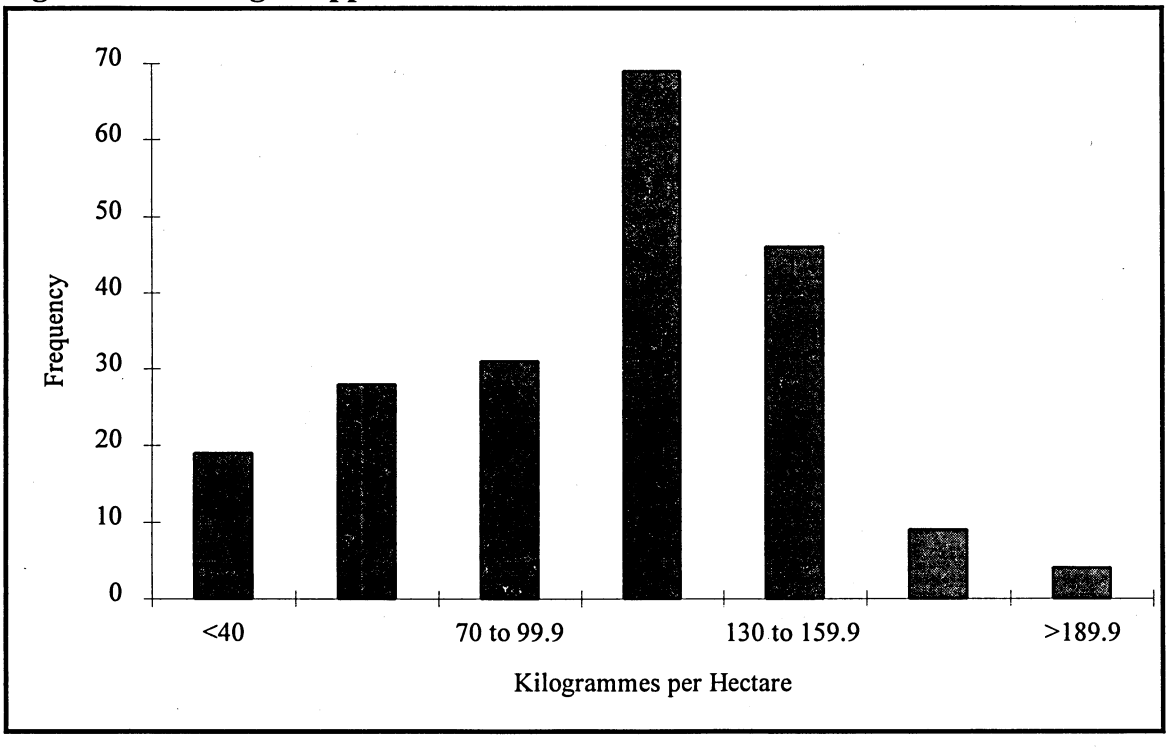


Table 4.11 highlights the average quantities of selected fertilisers applied on the surveyed farms. The final column simply reproduces the average quantities of those actually using the fertilisers.

Table 4.11: Application Rates for Fertiliser

Fertiliser/ Trace Element	Average Application Rate	Number Applying	Application Rate of those applying
	kg/ha	No.	Kg/ha
Nitrogen	106.26	201	108.90
Phosphate	57.12	174	67.63
Potassium	127.52	195	134.71
Sodium	124.51	165	155.45
Magnesium	20.29	103	40.58
Boron	3.48	56	12.79

Table 4.12 breaks down the average cost given in the previous chapter into its constituent parts. Again for each group, the average cost to those actually applying is reproduced in the final column.

Table 4.12: Composition of Total Fertiliser/ Trace Element Costs

Fertiliser/ Trace Element	Average Cost	Number Applying	Average Cost to those applying
	£/ha	No.	£/ha
Cost Fertiliser	105.19	206	105.19
Trace Elements/ Foliar Feeds	4.04	106	7.86
Purchased FYM	4.05	25	33.39
Lime	6.29	79	16.39
Total Cost	119.57		

In the previous chapter it was mentioned that statistical tests were undertaken to examine whether application rates and costs of nitrogen varied by size of farms. Although there were differences with the larger farms on average applying 15 kg per hectare more, the tests were not conclusive. Similar tests were carried out on the other fertilisers and again did not indicate a clear difference between size groups

4.4.3 Crop Protection

Table 4.13 breaks down crop protection costs into categories. It also indicates the number of holdings applying certain types of crop protection materials, and the average cost to those actually applying rather than to the survey groups as a whole. It is evident that most of the costs of crop protection (80 per cent) are for herbicides.

Table 4.13: Average Costs of Crop Protection by Category

Crop Protection	Average Cost	Number Applying	Average Cost to those applying
	£/ha	No.	£/ha
Herbicides	124.21	206	124.21
Soil Pesticides	4.77	29	33.88
Nematicides	7.89	46	35.35
Insecticides	13.72	150	18.84
Slugs	0.11	6	3.93
Fungicides	6.28	128	10.10
Total	156.98		

In an earlier section it was mentioned that seed dressing appeared to have a significant relationship with yield. Here analysis is made of its effect on expenditure on crop protection. Those using Gaucho have the lowest insecticide and pesticide costs, but those using Force have the lowest herbicide costs, and lower overall crop protection costs (Table 4.14).

Table 4.14: Crop Protection Costs by Seed Dressing

Type of Seed Dressing	Herbicides	Insecticides	Pesticides	Nematicides	Fungicides	Crop Protection
			£/ha			
Standard	126.71	17.27	6.05	11.37	5.74	167.29
Gaucho	126.66	8.57	3.02	4.46	6.24	149.01
Force	111.33	10.03	4.14	3.46	6.74	135.80
Mixed (F/G)	129.00	11.71	1.39	1.64	10.43	154.14

It is noticeable that use of standard seed is related to higher spray costs. It may be argued that the saving in seed costs compensates for the extra spray costs incurred. However, the considerable yield improvement (5.7 tonnes per hectare) with the use of Gaucho treated seed over standard seed is perhaps more significant when considering the performance of the different seed dressings. Although Force is associated with low spray costs the crops tended to have lower yields.

This was not a controlled experiment and part of the difference could be related to a host of different factors (location, microclimate, etc.) but the findings are nonetheless of interest. In particular the fact that Gaucho was used more widely in the otherwise generally lower yielding Eastern Region, adds credence to the hypothesis that its use boosted yields.

In the previous chapter it was mentioned that those growers who had potatoes in the rotation tended to have higher crop protection costs. Table 4.15 analyses this further. Potatoes in the rotation lead to crop protection problems that involve use of more expensive herbicides, such as Shield. Although crop protection costs are significantly higher there is no statistically significant effect on net margin.

Table 4.15: The Effect of Potatoes in the Rotation on Crop Protection Costs

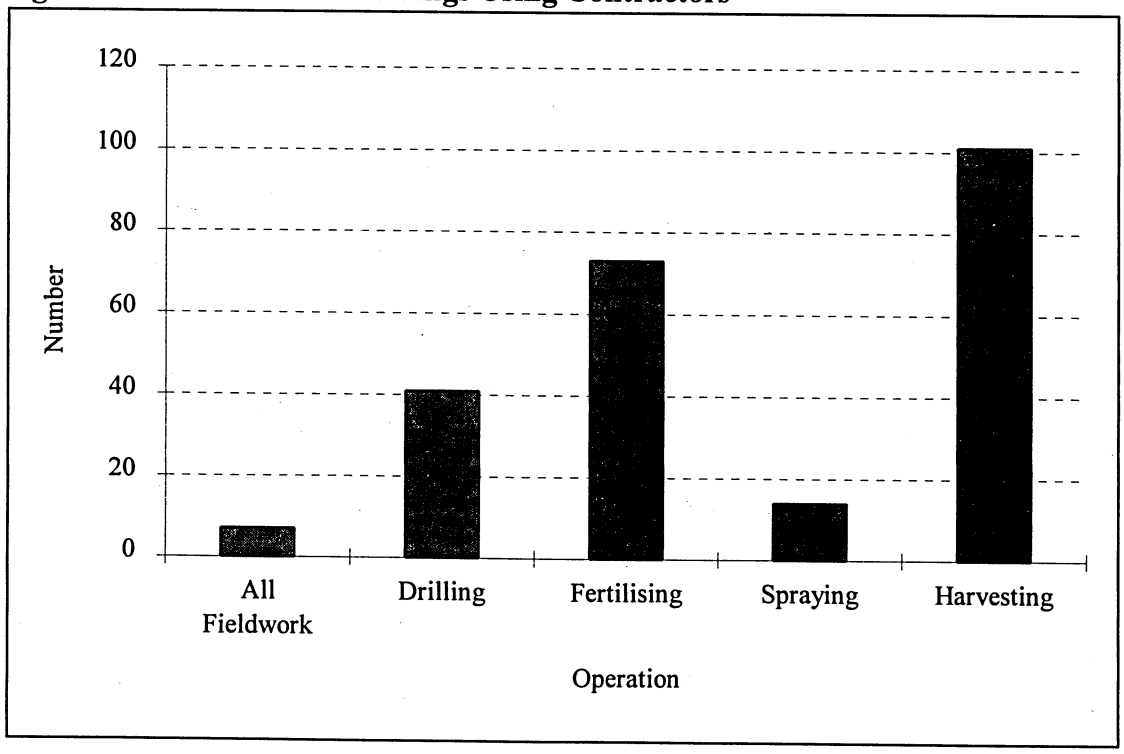
Type of Seed Dressing	Herbicide	Pesticide	Insecticide	Fungicide	Crop Protection	Net Margin
			£/ha			
No Potatoes	113.95	14.36	13.64	6.00	148.11	689.1
Potatoes	135.73	10.76	13.81	6.58	166.94	690.3
Statistical Dif.	Yes	No	No	No	Yes	No

The above has shown that although on average materials costs were similar by the categories chosen in Chapter 3, differences do occur between farms and these differences are significant. The following section analyses the contracting process in more depth, including analysis of the average costs of the various tasks undertaken by contractors.

4.4.4 Contracting

In chapter 3, those using contractors to harvest were compared with those own-harvesting. Whilst costs were remarkably similar between groups, the yield advantage led to contractors performing better. This section examines in more detail the use and costs of contracting. Figure 4.16 shows the numbers using contractors for various operations.

Figure 4.16: Numbers of Holdings Using Contractors



By far the most common use of contractors is for harvesting and after that for applying autumn fertiliser. Drilling is contracted on a fifth of all farms. Contractors with specialist harvesting machinery are often keen to drill the crop so that it suits the harvester. Table 4.16 reproduces the average contractors' charges for various operations.

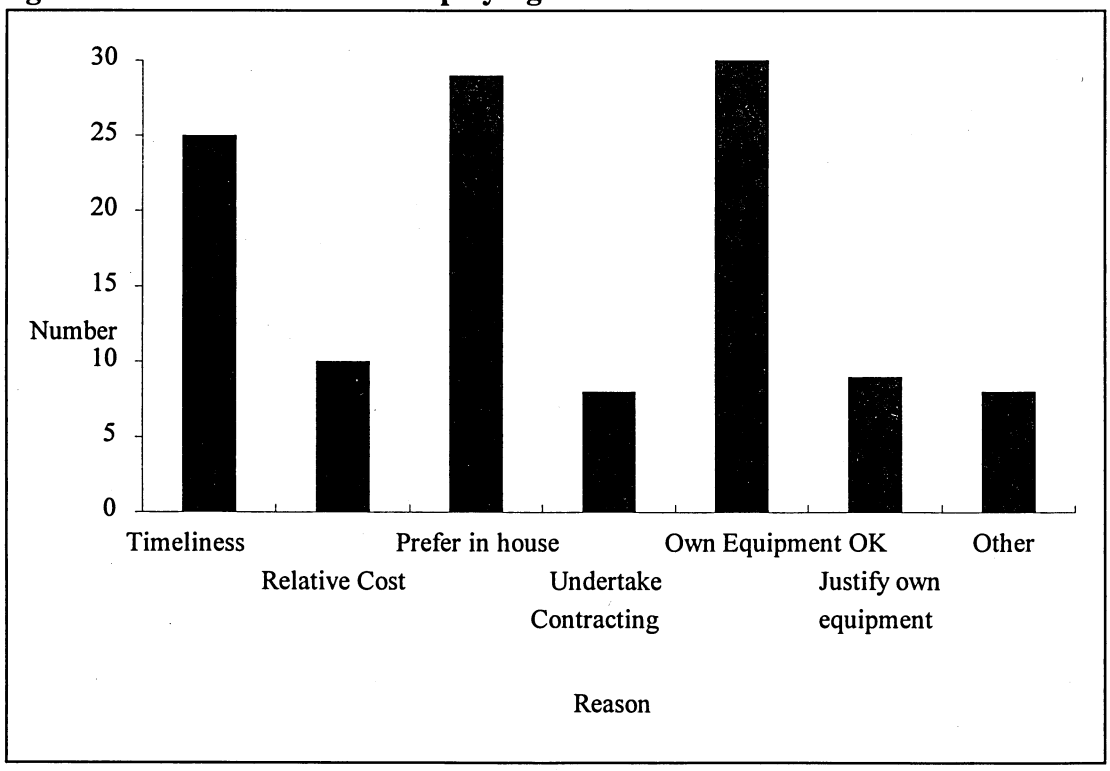
Table 4.16: Average Cost for Contracting Operations

Field Operation		Haulage Operation **	
	£/ha		£/t Dirty
Autumn Fertilising	10.00	Clean/Load	0.5
Drilling	25.14	Load/Haul	2.2
Harvesting	126.29	Load/Clean/Haul	3

**Note because the clean-load-haul operations are often tied together, it is difficult to split them up. Therefore these are best estimates of the costs.

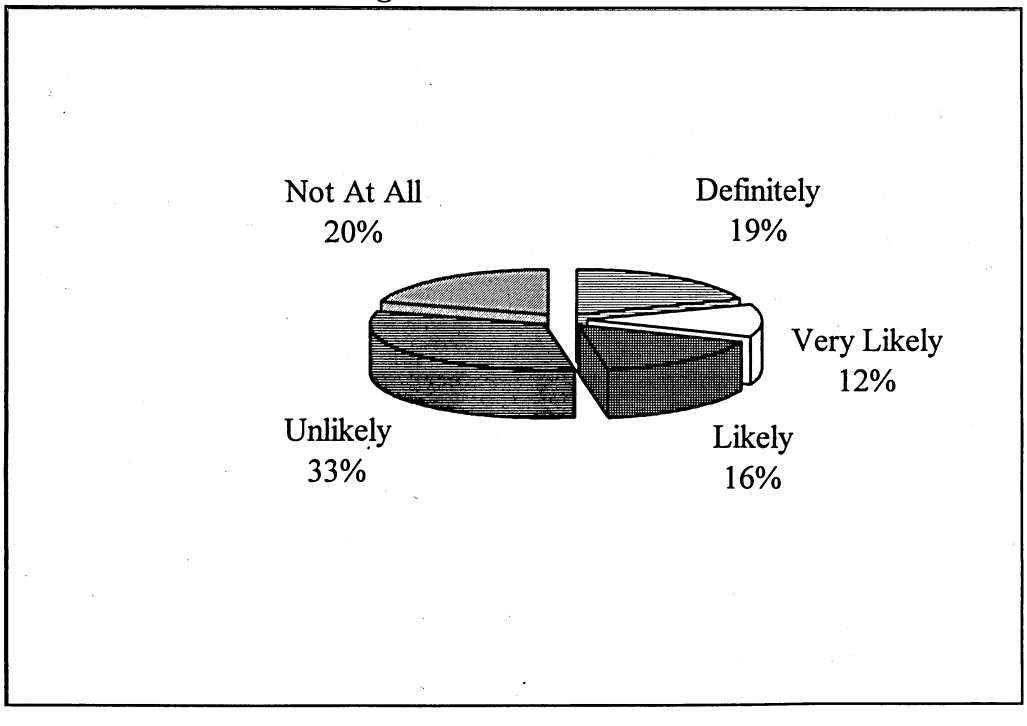
Those not using contractors were questioned as to why they still used their own machinery (Figure 4.17). The reasons most frequently cited were a concern about timeliness, that own machinery was still operational and a preference for keeping operations 'in-house'.

Figure 4.17: Reasons for not Employing Contractors



Growers were asked to indicate the likelihood of using contractors in the near future (Figure 4.18). Around 47 per cent of those not using contractors at present said they were, at least, likely to use contractors in the near future.[2] This would suggest that the growth in contract services is set to continue in the near future.

Figure 4.18: Likelihood of using Contractors in the Next Five Years



[2] It should be noted that the question asked whether the grower would use contractors for fieldwork in general and not whether the grower would use contractors for harvesting.

4.4.5 Soils

Factors such as soil type and microclimate are obviously important in agriculture. However significant problems arise when trying to examine their effect in enterprise studies. The facts that within farms soil types vary and that perceptions of different types also vary between regions complicate analysis. In this section soils are broken into a number of broad soil types although it must be realised that the classification into soil types based on co-operators' judgement is to a certain extent arbitrary (Figure 4.19).

Figure 4.19: Composition of Sugar Beet Area by Soil Type

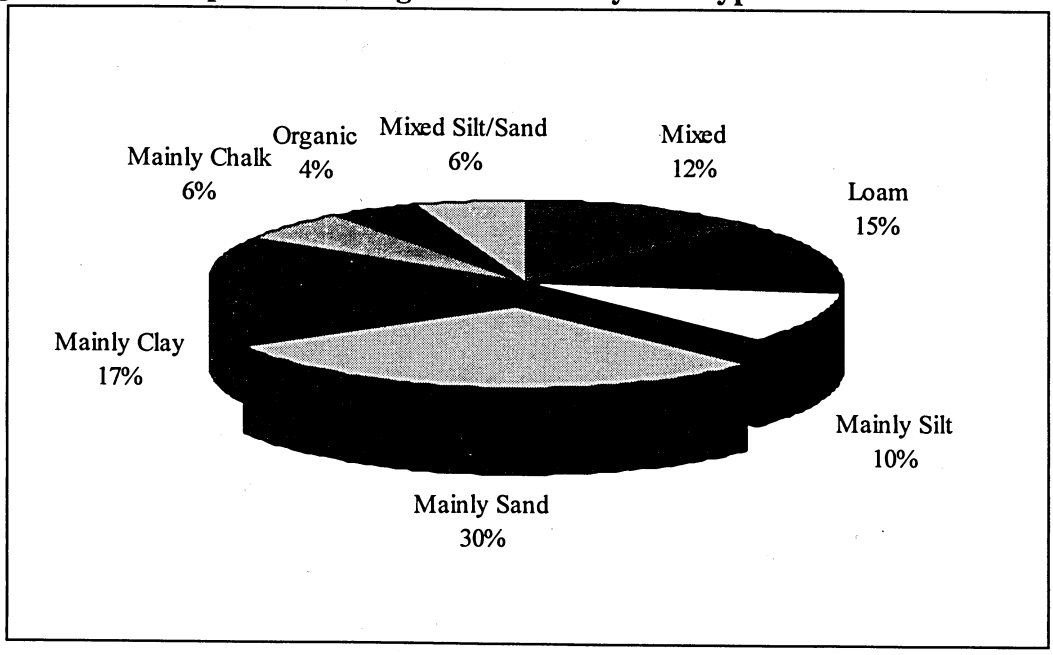


Table 4.17: Average Yield by Soil Type

Soil Type	Yield	Rent	Spray	Net Margin
	t/ha		£/ha	
Mixed	42.38	151.20	149.09	706.08
Loam	41.62	149.60	159.01	715.74
Mainly Silt	45.89	155.57	137.52	749.89
Mainly Sand	42.04	135.95	166.53	684.40
Mixed Silt/Sand	43.97	151.01	161.53	790.28
Mainly Clay	42.41	137.50	157.33	638.52
Mainly Chalk	38.59	150.64	128.47	657.30
Organic	41.22	155.18	186.58	564.50

Differences in yield are apparent between soil types with those farms on silt, sand or a combination of the two achieving the highest yields (Table 4.17). However the differences are not statistically significant between groups. The effect of soil types on spray costs are also of interest. Unsurprisingly, those on organic soil (where weeds grow as well as the crop itself) have the highest spray costs. It is clear from the final column that there was variability in returns by soil types

4.4.6 Labour

Labour costs have been discussed in detail above. Here the concern is the physical input of labour in terms of man-hours per hectare. Table 4.18 and 4.19 show this by region and size group as well as for contracting and non-contracting units. The most dramatic finding is how little labour appears to be required to produce the crop. Even those own harvesting now require only 17.4 hours per hectare on average. Sturgess (op. cit.) reports that in the 1950's up to 225 man hours per hectare were spent on the crop.

For those using contractors to harvest the crop the man hours required, in addition to those supplied by contractors, are remarkably similar in all regions. However, for those own harvesting, there is much greater variability between regions with man hours per hectare ranging from 25 on the Northern farms to just 13 in the West. The low figure for the West is at first sight puzzling. Table 4.19 and Figure 4.20 show that there is a clear relationship between man hours and size. For every hectare increase in enterprise size the labour input reduces by four per cent. Therefore the larger farms in the East would be expected to have the lowest figures. However, further examination indicates, that on average, farms within the West spent less time on operations such as tractor hoeing and clamp work.

Table 4.18: Man Hours per Hectare by Region [1]

Region	Average	Contract	Non-Contract
	Man Hours per Hectare		
North	17.82	12.62	25.09
West	12.19	11.71	12.62
East	14.39	11.47	16.99
All Farms	14.63	11.75	17.40

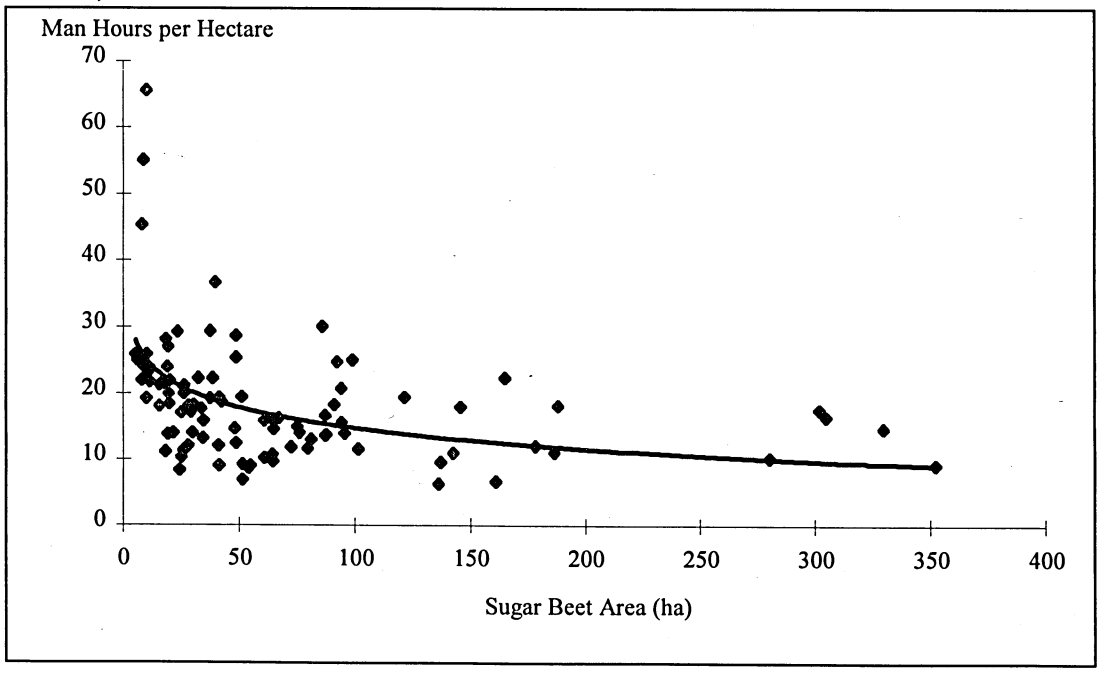
1 Excludes labour supplied by contractors

Table 4.19: Man Hours per Hectare by Size Group [1]

Size	Average	Contract	Non-Contract
	Man Hours per Hectare		
< 20 ha	16.10	12.58	20.46
20-50 ha	15.01	11.74	18.60
> 50 ha	12.70	10.48	14.12
All Farms	14.63	11.75	17.40

1 Excludes labour supplied by contractors

Figure 4.20: Relationship between Size of Enterprise and Man Hours per Hectare, Own Harvest Farms



4.4.7 Irrigation

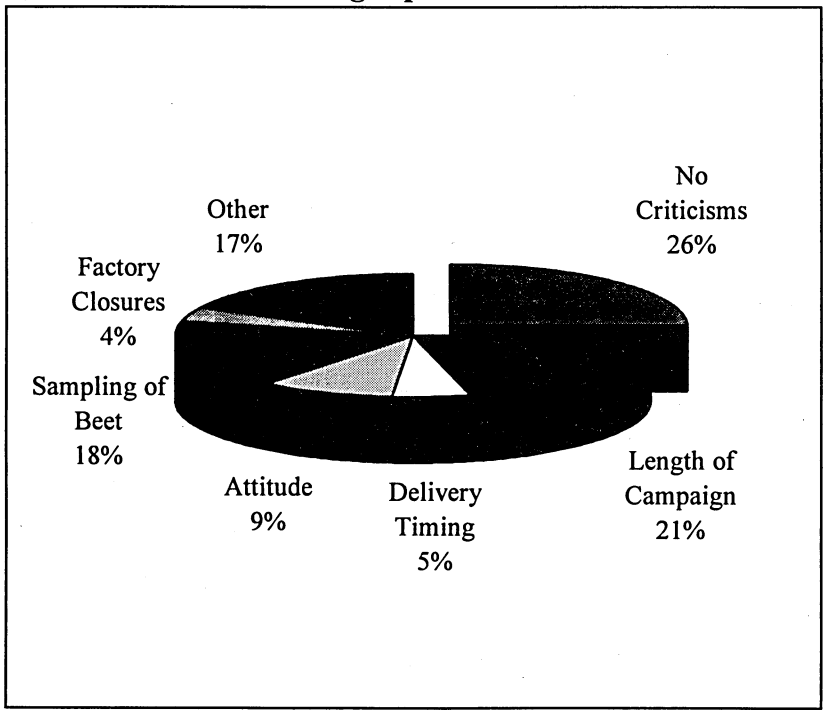
In a dry year such as 1995 the ability to irrigate would be expected to be of substantial value to growers. Of the growers surveyed 45 irrigated sugar beet in 1995. However they applied water to only 63 per cent of the crop, which represented 15 per cent of the total area surveyed. The vast majority of these holdings grew potatoes as well suggesting that the capital outlay and priority in use was for potatoes. The fact that sugar beet is likely to take second place to potatoes could explain, why even in the very dry year of 1995, those using irrigation did not obtain significantly higher yields, but the results remain surprising. Even when the sample is broken down into factory regions there are no statistically significant differences. Of course this is not to conclude that irrigation had no effect on the individual farms, only that those irrigating did not have a clear advantage over those who did not.

4.5 Relationship with British Sugar plc

In Chapter 2, it was noted that the relationship between growers and British Sugar was of interest given the monopsony position of the latter. To gain some insight into the relationship some general questions were asked. Growers were asked if they had any criticisms of British Sugar plc and if so what was the main one (Figure 4.21). An indication of the general nature of the relationship is given by the fact that a quarter of the sample had no criticisms of the processing company. Inevitably, the major criticism related to the extended length of the processing campaign (discussed in Chapter 2). However, nearly as many growers (18 per cent) were concerned about the methods of calculating tare and the general procedure for sampling beet as it arrives at factories. Other grievances related too the general attitude of the company. Under this category are complaints such that the growers felt the company was too dictatorial, unhelpful when problems arose and generally did not spend enough time with growers. A smaller proportion of growers were concerned about the allocation of delivery permits and the timing of deliveries. Growers were also concerned about the reduction

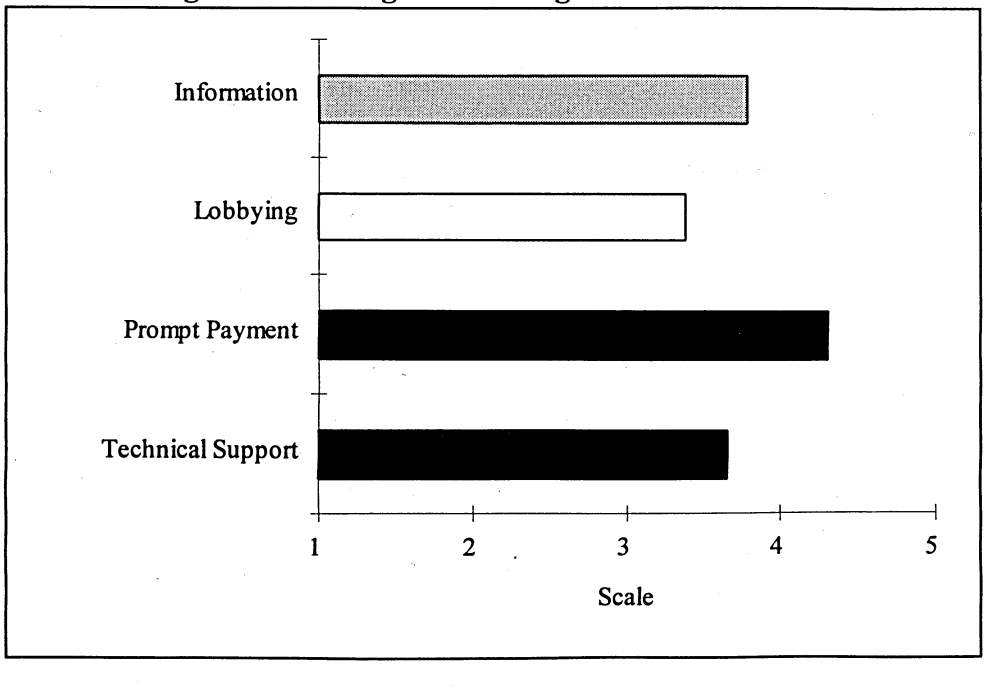
in the number of factories. The other category contains a host of criticisms generally relating to individuals' own experiences with dealing with British Sugar.

Figure 4.21: Criticisms of British Sugar plc



Co-operators were also asked to rate British Sugar on a scale of one to five (one for poor and five for very good) for a number of elements of the company (Figure 4.22). These related to disseminating information on new technology (information in the chart), lobbying for the UK sugar beet industry, promptness of payment and the level of technical support offered by fieldsmen. It is clear that the company fared fairly well with growers rating it particularly highly for prompt payment (4.31 on average).

Figure 4.22: Rating of British Sugar according to Various Indicators



4.6 Conclusions

This chapter has examined in detail further aspects of sugar production covered by the survey. Whilst the previous chapter highlighted that regional and size differences were unimportant in explaining differences in performance, this chapter has indicated that other factors, such as choice of seed dressing appear to have a considerable impact on production performance.

The chapter has also concentrated on quota fulfilment and the desire and capability of producers to increase production. The previous chapter showed that there were substantial differences in production costs between producers. The next chapter will consider some of the implications of this when the possibility of reallocating quota and the effect on the industry and its efficiency are analysed.

Chapter 5 Efficiency and the Scope for Quota Transfer

5.1 Introduction

Chapter 3 highlighted the current profitability of sugar beet production and that, on average, growers are performing well under the current EU regime. However in Chapter 2 it was noted that the environment is likely to change due to pressures exerted through the World Trade Organisation and EU expansion. The likelihood of increased competition within the sugar sector warrants further investigation of the efficiency of the UK industry and also of possible ways that the level of efficiency could be increased. At the end of Chapter 3, it was shown that the costs of production per tonne for those achieving the highest return from sugar beet were considerably lower than those achieving the lowest return. If some producers are able to produce beet at lower cost than others, simple economic theory tells us there are gains to be had in efficiency by transferring quota between farms.

This chapter will discuss gains in efficiency from quota transfer between growers. At the outset it must be stated that this is a first approach which could be further refined in several ways.

At present contracts are reallocated between growers only when there is a repeated failure to fulfil the contract. It may be supposed that this leaves some persistent differences in cost of production between growers which make the total costs of production unnecessarily high. If political circumstances allowed British Sugar to reallocate contracts more freely, total farm production costs would be reduced but less so than if contracts were vested in growers and made saleable. British Sugar would not have the information needed to make the same reallocation as a market transfer from high cost to low cost producers. More fundamentally, reallocation would be determined by considerations other than farm production costs.

Because yield is important in establishing a case for maintenance of national quotas British Sugar would be expected to make some transfers from lower yielding to higher yielding producers, and therefore broadly speaking from higher cost to lower cost producers. In making reallocations however the company would be influenced by aspects of performance which affect factory processing costs but not necessarily farm production costs.

The first analysis therefore compares the scope for reduction in total national costs of production between administrative and market reallocation of rights to produce.

5.2 Potential Gains from Market and Administrative Quota Transfer

At the outset it should be made clear that the concept of efficiency is a complicated one. There are a number of possible methods for measuring efficiency including output per £100 of input and costs of producing a unit of the good. For beet production there are a number of possible units that can be used, dirty tonnes, clean tonnes, or adjusted tonnes. Given that quota is assessed in terms of adjusted beet, it is reasonable to argue that the best measure of efficiency would be the costs of producing a tonne of adjusted beet. This implicitly allows for the sugar content of beet.

As mentioned earlier, differences in efficiency were highlighted in Chapter 3 when the high and low profit quartile groups were compared. Using the figures from Table 3.12 it can be calculated that the difference in the cost of production between these groups is £14 per adjusted tonne. However, those achieving the highest net margin may not necessary be the lowest cost producers, because of the impact of transport allowances on the returns to growers.

For present purposes farms were ranked by costs of producing a tonne of beet (Table 5.1). Here we see that, as with overall profitability, the determining factor in actual costs per tonne is yield. A difference of over £15 per tonne between the lowest and highest cost quartile groups of producers is evident.

Table 5.1: Difference in Costs and Returns of Farms by Cost Quartile

	Low Cost	s.e.m.	High Cost	s.e.m.
Crop Area (ha)	47.81	(5.87)	48.20	(8.13)
Yield (tonnes/ha clean)	49.88	(1.16)	33.92	(0.93)
Sugar (percent)	17.05	(0.10)	16.06	(0.09)
Yield (tonnes/ha adjusted)	54.70	(1.44)	34.02	(0.96)
	£/ha		£/ha	
Total Output	2215.00	(48.62)	1505.19	(50.76)
Margin over Materials	1860.36	(46.00)	1113.23	(50.53)
Gross Margin	1565.60	(38.89)	876.76	(49.95)
Margin before Overheads	1201.37	(34.27)	419.20	(36.78)
Total Costs	1137.26	(20.85)	1224.80	(23.66)
Net Margin	1058.32	(33.65)	280.39	(35.09)
Cost per Tonne produced (adjusted)	20.79		36.00	

It should be noted that the lowest cost producers may not necessarily be those preferred by British Sugar. British Sugar's concerns include the efficient running of their factories. Therefore in addition to yield which is important for political reasons, factors which British Sugar would take into account in selecting growers for quota removal are those that increase the cost of sugar refining; low beet purity (which tends to be linked to low sugar content); excess tare; and failure to meet contract. It would be fair to argue that growers who continually produce over contract, with low tare and high beet purity will be preferred by British Sugar. Holdings were each ranked by tare, sugar content, contract fulfilment and yield.[1]

[1] Unfortunately beet purity was not collected within the framework of the study. It is therefore impossible to produce a ranking of holdings identical to that undertaken by British Sugar. However, because beet impurity is inversely related to sugar percentage the latter is used as a proxy in this analysis.

The total ranking score was added (implicitly giving each of the component parts equal weight) and the farms were ranked by the final mark. Therefore it is assumed those with the lowest score are the 'preferred' producers. It is interesting to compare these producers with those found to produce at lowest cost. Of the 52 lowest cost producers, 25 (48 percent) would also be ranked in the most preferred quarter. Surprisingly four (7.5 percent) were actually ranked in the least preferred quartile group. [2]

Table 5.2 shows that the difference between average costs of production between those quarters most and least preferred by British Sugar is fractionally under £7 per tonne. This might suggest that if it was left to British Sugar to reallocate quota (based on yields, contract fulfilment, sugar percentage and tare), rather than a market in quotas the savings in sugar beet production costs would not be so great. The gains in profit of the lower cost producers however would be greater because they would not have to pay for their additional quota.

Table 5.2: Difference in Costs Between Quartiles ranked by British Sugar

	British Sugar	
	Preferred	Not Preferred
Crop Area (ha)	42.14	61.63
Yield (tonnes/ha clean)	50.98	34.33
Sugar (percent)	16.48	16.56
Yield (tonnes/ha adjusted)	53.55	36.19
	£/ha	£/ha
Total Output	2192.23	1577.58
Margin over Materials	1809.02	1214.53
Gross Margin	1511.50	990.37
Margin before Overheads	1060.28	596.70
Total Costs	1268.84	1106.85
Net Margin	923.39	470.73
Cost per Tonne produced (adjusted)	23.69	30.58

5.3 National Gains from Quota Transfer

Table 5.1 exaggerates somewhat the gains from reallocating contracts. Low cost producers may have little scope for expansion because of factors such as rotational constraint. To examine the matter further information is required on the capabilities for expansion of the low cost producers. Fortunately, producers supplied a figure for how much more quota they would like, which is taken as an indication of how much extra individual holdings can reasonably grow.

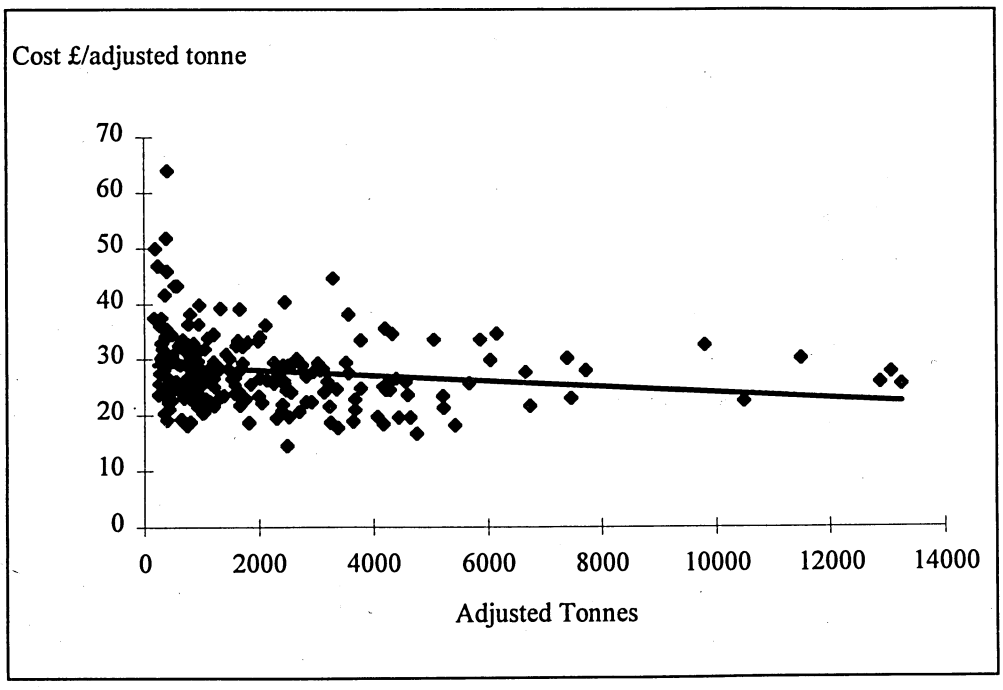
In order to calculate the potential gains from redistributing production, the following method was adopted. Production was transferred from the highest cost farm to the lowest cost farm up to the quantity that the lowest cost farm could deal with (that is

[2] If yield is taken out of the ranking process (leaving tare, sugar percent and contract performance) then the number ranking best in terms of both cost and British Sugars' concerns falls to 29 percent. Whilst the proportion giving the complete opposite ranking rises to 27 percent.

the quantity of extra quota they wanted). The cost saving was then calculated as the difference in production costs between the growers multiplied by the tonnes transferred. An example will illuminate this further: Say the highest cost producer produced at £40 per tonne and produced 500 tonnes and the lowest cost producer produced at £15 per tonne and required an extra 300 tonnes. 300 tonnes would be transferred at a saving of £25 a tonne, giving a total saving of £7500. The remaining 200 tonnes of the high cost grower's production would be transferred to the next lowest cost producer wanting to produce more. The saving this time might be only £20 a tonne, giving a saving of £4000. Therefore the total cost saving of transferring production away from the highest cost producer is £11,500. This process can be repeated until any gains from transfer are eliminated.

Clearly a number of assumptions are required for this analysis. Not least is that of constant costs. This implies that the average costs of production on the farm expanding production do not fall or rise as a result of the expansion. Figure 5.1 examines this contention. Here the number of tonnes produced is plotted against cost per tonne produced. The trendline indicates a slight downward trend and this is statistically significant from zero. However, the reduction in costs is small. For example, an increase in production of 200 tonnes is likely to reduce cost per tonne by only £0.10 per tonne. In most cases moreover the percentage increase in production from quota transfer is small. Hence it is reasonable to assume that overall the expansion will not change unit costs to any significant degree. Of course, the costs within farms are likely to be lower in some cases, but if one considers the case of contract services then costs per hectare grown are likely to be the same.

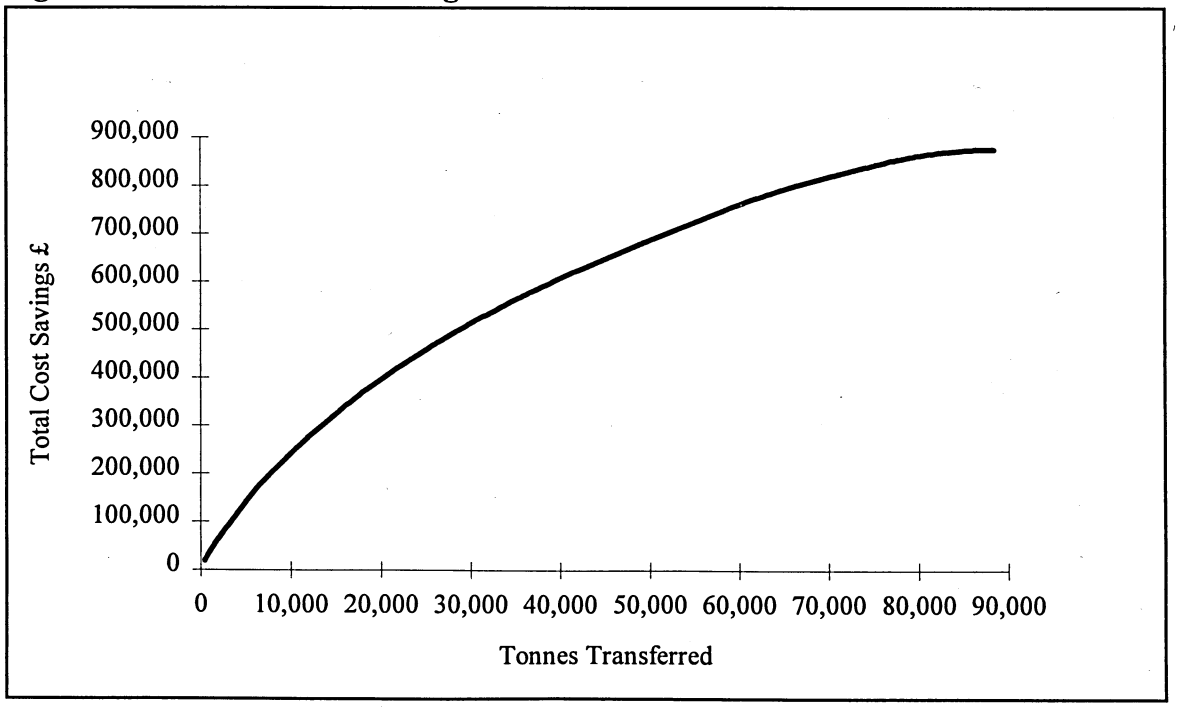
Figure 5.1: Relationship between Costs per Adjusted Tonne and Quantity Produced



The constant cost assumption implies that the marginal cost of producing sugar beet (that is the addition to total costs brought about by the last tonne produced) is equal to the average cost. Therefore average costs are assumed to represent the costs per tonne

of increased production. Figure 5.2 represents, on this assumption, the likely cost savings as production is transferred from the high cost to low cost producers.

Figure 5.2: Potential Cost Savings and Production Transfer



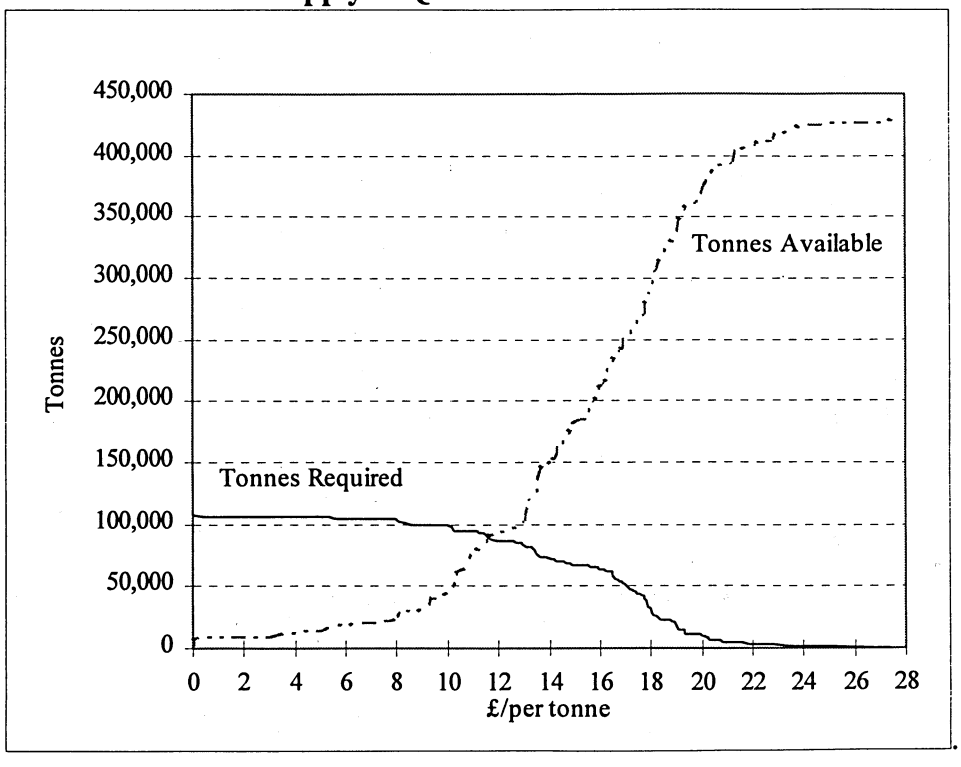
The figure indicates that as quota is initially transferred from the highest to the lowest cost producers the cost savings are large. However as more quota is transferred the gains become smaller as the differences in costs between the recipients and the donors decline. In total around 88,000 tonnes could be transferred at a saving of £876,000, a reduction in costs per tonne of nearly £10 per tonne transferred. Or put another way, 20 per cent of production could be transferred saving 7.38 percent on total production costs. If this is scaled up to the national level then 1.68 million tonnes could be transferred with a total cost saving of £16.5 million pounds. Of course these cost savings are only based on the 1995 results and it is not necessarily the case that they will be of the same magnitude in the future.

The above analysis has not considered the mechanism of transfer. If the quota were marketable then of some considerable interest would be the willingness of producers to pay for the quota. This first analysis uses the available data to establish a leasing price for quota which is then converted into a value for quota. Again a number of simplifying assumptions are made. First, it is assumed the only reason sugar beet is grown is on economic grounds (any other advantages are discounted). Second it is initially assumed that differences in net margin reflect only differences in returns to risk bearing and not in amounts of tenants capital or managerial labour employed. Therefore, a grower would be willing to lease out a tonne of quota if offered more than the net margin per tonne achieved. On the other hand, it is assumed that growers leasing quota in are willing to pay up to their net margin for quota beet.

Figure 5.3 places the findings in diagrammatical form. If quota were free then the total demanded would simply be the total extra tonneage required by producers (just over 110,000 tonnes for the farms surveyed). As the leasing price rises above zero, some initially demanding quota, initially those with the lowest margins but increasingly those with higher margins, begin to supply quota. At a price of around £25 pounds a tonne (the highest margin per tonne achieved) all growers would be willing to lease out quota but no one would be willing to lease in. Equilibrium in the leasing market occurs where the quantity offered is equal to the quantity demanded, at a price around £11.50 per tonne and a quantity traded of 89,000 tonnes. If we assume that the return achieved in 1995 is the expected return, then the figure of £11.50 can be interpreted as a leasing figure for quota. That is the value of one year's use of quota.

The actual purchase value of quota is of course dependent on a number of factors including the length of period that the quota will be expected to be in existence. In the extreme if quota was expected to continue into perpetuity then the cost (assuming a discount rate of 10 per cent) would be as high as £120 per tonne. However, if it is assumed that quotas will not continue beyond the next WTO talks or period of EU enlargement a time horizon of six years would be more realistic. If this is applied to sugar beet then the purchase value of beet quota would be £50.

Figure 5.3: Demand and Supply of Quota based on 1995 Yield



It is clear that the above is based on production data for only one year and is open to all the usual criticisms concerning representativeness. To improve the situation, it is possible to refine the analysis slightly. As 1994 yields were collected for the majority of farms, these could be combined with the 1995 figures and averaged to give a better indication of the normal level of output. The basic approach is to examine what

would have been the returns in 1995 if the grower had an average year rather than that of 1995. Of course, three or four years' data would be preferable but two years' data is an improvement as it is likely to smooth the extreme results.

Sugar beet output is based on the average yield of the two years. With the exception of transport allowance, the other outputs (tops and delivery bonuses) are assumed to be similar to those achieved in 1995. The transport allowance (a payment per tonne) is altered to reflect changes between the average yield and the 1995 yield. Most costs are assumed similar, except those that are charged per tonne, for example contract haulage charges. Own lorry costs are also altered as lower (higher) yields are likely to reduce (increase) costs. It may be argued that some fieldwork costs, such as own harvesting, are likely to increase if yields are higher; however to keep the analysis straightforward fieldwork costs are assumed not to alter. In any case those that use contractors pay per hectare rather than per tonne so differences in the yield will have no effect on the costs.

The averaging of two years' data reduces the extreme performance at either end and pushes supply and demand for quota inwards. This reduces the volume of quota traded by about five per cent to 84,000 tonnes and raises the leasing price by nine per cent to £12.50. For a permanent transfer this leasing price equates with a value per tonne of quota of £54.[3]

5.4 Analysis of Quota Transfer Within Factory Regions

The above figures are derived on the assumption that quota is freely tradeable throughout the country. However, with sugar this is not necessarily going to be practical. The bulky low value nature of sugar beet ensures that transporting over long distances is not profitable. Present factory location therefore reflects this fact and is based on the historic levels of production. Unrestricted beet quota transfer may well lead to a redistribution of production that does not match the capacities of the existing factories. Whilst in the longer run factories can expand or reduce capacity to match the new supply, it could be argued that in the short run factories will need to be kept at full capacity to maintain the UK's apparent advantage in processing. It must be remembered that efficiency in processing is a major advantage of the UK industry, and that this again is an important factor in determining quota allocation within Europe. If the aim were to maintain production at the present levels within regions, this would more certainly be achieved if quota movement were allowed only within factory regions. Table 5.3 shows the potential for quota transfer within factory regions based on 1995 cost differences and the constraints on quota expansion reported by growers. The percentage of production which can be transferred before cost savings are eliminated varies considerably between regions. For example, within the Ipswich region the results indicate that nearly 30 per cent could be reallocated, whereas in the Cantley region the figure is only about six percent. The potential cost saving also varies considerably ranging from 10 percent in the Ipswich Factory region to just 2.2 per cent in the region supplying Cantley. [4]

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[3] Assuming a 10 per cent discount rate and the continuation of quota for six years.

[4] The numbers of holdings surveyed in Ipswich and Cantley are relatively small, under 20 in each. This may have an effect on the above findings.

Table 5.3: Proportion of Production which can be Transferred and Gains by Factory Region

Factory	Output Transferred	Cost Reduction		
		Per cent	Per tonne Transferred	Per Tonne Produced
	per cent	per cent	£	£
York	19.6	4.2	5.5	1.08
Allscott/Kidderminster	15.3	9.0	15.5	2.35
Bardney/Newark	15.1	4.7	8.7	1.32
Ipswich	29.3	10.1	9.7	2.86
Bury	17.9	6.3	10.5	1.89
Wissington	25.8	8.2	8.6	2.23
Cantley	5.8	2.2	8.7	0.50

Of some interest is the difference in potential cost saving between reallocating production simply within regions rather than throughout the country (Table 5.4). There is a 13 per cent difference in the cost saving and a 7 percent difference in the amount of quota transferred. If this difference was scaled up to the national level it would represent a £1.5 million difference in cost savings.

Table 5.4: Differences in Costs Reduction by Method of Production Transfer

Production Transfer	Cost Reduction	Quantity Transferred
Transferability-	£	tonnes
Freely	876,480	88,447
Within Factory Region	777,015	82,570
Difference	99,465	5,877
	per cent	per cent
Percent Difference	13	7

The above differences between region is also reflected in the leasing price that is likely to be paid for quota (Table 5.5). Quota would be most expensive in the York region and apparently least expensive in the Bury area. These leasing figures reflect a number of factors including average profitability, the difference in margins between the low and high cost producers and the ability of producers to expand production within each region. The actual purchase price of quota would obviously vary reflecting the differences in leasing value.

Table 5.5: Estimated Leasing Value by Region based on 1995 Yields

Factory Region	Leasing Value
	£/tonne
York	13.00
Allscott/Kidderminster	9.00
Bardney/Newark	8.30
Ipswich	8.70
Bury	6.20
Wissington	11.80
Cantley	10.00

5.5 Possible Refinements

There are a number of caveats to add to this analysis. First the margin used is based on net margin per tonne. Therefore neither interest charges or the return to management are taken into account. As a foretaste to how the analysis could develop the effect of interest charges on the equilibrium quota price can be considered. An average working capital requirement for sugar beet was estimated using the survey results and information from the Farm Business Survey. On the assumption that a uniform level of capital is employed, interest charges on this working capital would be around £2.80 per tonne produced (assuming an interest rate of ten percent). Taking account of interest charges will shift both the demand and supply curves downwards reducing the price that growers would pay for quota (by the level of the interest charges) but not altering the quantity traded. More detailed analysis would clearly have to take these factors into account. However, what is given here are some estimates of the upper limits of the magnitude of the savings in production costs and the possible value that would be placed on quota.

5.6 Conclusions

This chapter has examined in a simplified manner the potential efficiency gains from a reallocation of production from high cost to low cost producers. At its greatest reallocation would appear to offer a saving of £16.5 million pounds (seven per cent) in the costs of beet production. As the transfer tends also to be from low to high yielding producers, such transfers would raise average yields and productivity releasing land and resources for other uses.

Comparative static analysis would suggest that, on the basis of the 1995 figures alone, the leasing value of quota would average £11.50. Taking an average of the 1994 and 1995 production years the quota value would appear to be around £12.50. If the quota was assumed to be in perpetuity then its value would be around £125 (assuming a discount rate of 10 per cent). However, if its longevity is assumed to be only six years then a figure of around £54 a tonne would appear more reasonable. These are clearly high figures, and it must be remembered that if the financing costs of growing beet were taken into account then the likely leasing value would be reduced by at least £2.80 tonne (the permanent transfer cost would fall to under £100).

This analysis has taken no account of the implications for individual businesses of losing quota. The lack of large advantages in costs by size might give the impression

that sale of quota will not mean a wholesale transfer of quota from small to large farms. However economies of size appear so all pervasive in agriculture it would take a brave person to bet against this being the eventual outcome. If this is the case then the viability of many small farms which depend on root crops to generate enough income from a small total area farmed might be jeopardised. This is particularly the case with the removal of quota for potatoes another high value crop, which is likely to further erode returns to these types of producers. There are clearly some aspects of the effects of quota transfer and therefore the effects on the price of quota that are not able to be studied directly from a cross-sectional enterprise study such as this. These include how the individual businesses will change and the subsequent effects on the costs of production; the impact on the managerial input into the business; the profitability of alternative crops; and the possible change in yields on individual farms as production increases. Further analysis is clearly required into both the possible long term economic and social effects of quota transfer.

Chapter 6 Longitudinal Analysis

6.1 Introduction

This final chapter provides a brief overview of both the changing economic position of sugar beet production as well as its evolving structure. The chapter is based on a series of studies carried out by the Agricultural Economics Unit from 1954, and on research undertaken by members of staff during the period. To study the period in great detail is beyond the scope of this report. However, general trends in the key economic performance indicators and the size distribution of production will be examined. The aim is simply to quantify the level of change that has occurred over the last 40 years.

6.2 Economics of Sugar Beet Production 1954 to 1995

Table 6.1 reproduces the findings of a number of special studies on sugar beet production conducted since 1954. The figures have been converted into money of 1995 purchasing power to ease comparison. Refinements have been continually made to the methodology of sugar beet studies since their inception. However, comparability of the results should not be affected to any great extent.

Figures 6.1 to 6.5 highlight some of the key information from Table 6.1. In Figure 6.1 total output, costs and net margin are compared over the period. The irregular timing of the studies makes it harder to pick out long term trends, because of the effects of factors such as the 1976 drought on the performance of beet producers. However it is possible to see a general downward trend in real costs per hectare. Output clearly fluctuates more than costs, but would appear also to be indicating a slight downwards trend. Net margin, although following the year to year fluctuations of output, has not followed this trend.

The decline in costs per hectare has been fairly consistent, but slow paced. However, when these figures are put on a per tonne clean basis the decline becomes more marked (Figure 6.2). Costs per tonne produced have fallen in real terms from almost £80 in 1954 to just under £30 in 1995. The margin per tonne achieved has been much more stable over the time period (excluding 1957 and 1976), suggesting the change in the real price of sugar beet has kept pace with changes in productivity brought about by technological advances.

The change in real costs per tonne can be linked to technological advances in sugar beet production. Hallam *et al* (1994) plot the effect of new technology on yield. The introduction of precision drilling, the use of herbicides, the development of monogerm seeds, new varieties and altering the spacing between plants have all contributed to increased yields and consequently reduced costs per tonne.

Table 6.1: Output, Costs and Returns from Sugar Beet Production Selected Years 1954 - 1995 (1995 prices)

	1954	1957	1961	1965	1970	1976	1980	1982	1995
Yield (t/ha Clean)	26.6	25.6	37.7	39.4	34.7	31.2	34.4	49.8	42.5
Sugar content (%)	16.6	15.1	15.2	15.6	17.1	13.9	16.9	16.4	16.4
				£ per Hectare					
Output	2422	1932	2700	2632	2247	2058	2217	2476	1885
Material Costs									
Seed	40	36	45	70	86	73	79	81	101
Fertiliser	312	351	291	196	265	302	244	232	119
Sprays	2	16	53	30	84	173	154	164	158
Total materials	353	403	389	296	434	547	478	478	378
Margin over materials	2069	1529	2310	2336	1813	1511	1738	1998	1507
Contract Costs									
Casual Labour	137	102	119	222	73	34	21	17	2
Other Contract	163	174	231	193	205	207	212	221	233
Total variable costs	653	679	739	711	713	789	711	732	636
Gross Margin	1769	1253	1961	1921	1535	1269	1505	1744	1249
Fixed Costs									
Regular labour	670	531	557	315	294	252	231	184	91
Tractor	185	189	196	175	148	267	231	209	98
Other machinery	140	179	137	162	131	176	210	159	87
Rent and drainage	69	127	145	188	194	181	186	181	151
Overhead contribution	288	260	242	240	235	168	187	175	137
Total fixed costs	1352	1287	1277	1080	1003	1043	1045	907	564
Total Costs	2005	1965	2016	1790	1716	1832	1756	1639	1201
Net margin	417	-33	684	842	531	226	461	837	685
Cost per tonne sugar	480	524	369	298	292	428	308	201	172

Source: AEU Cambridge

Figure 6.1: Output, Costs and Net Margin per Hectare Selected Years 1954 to 1995 (Real Prices)

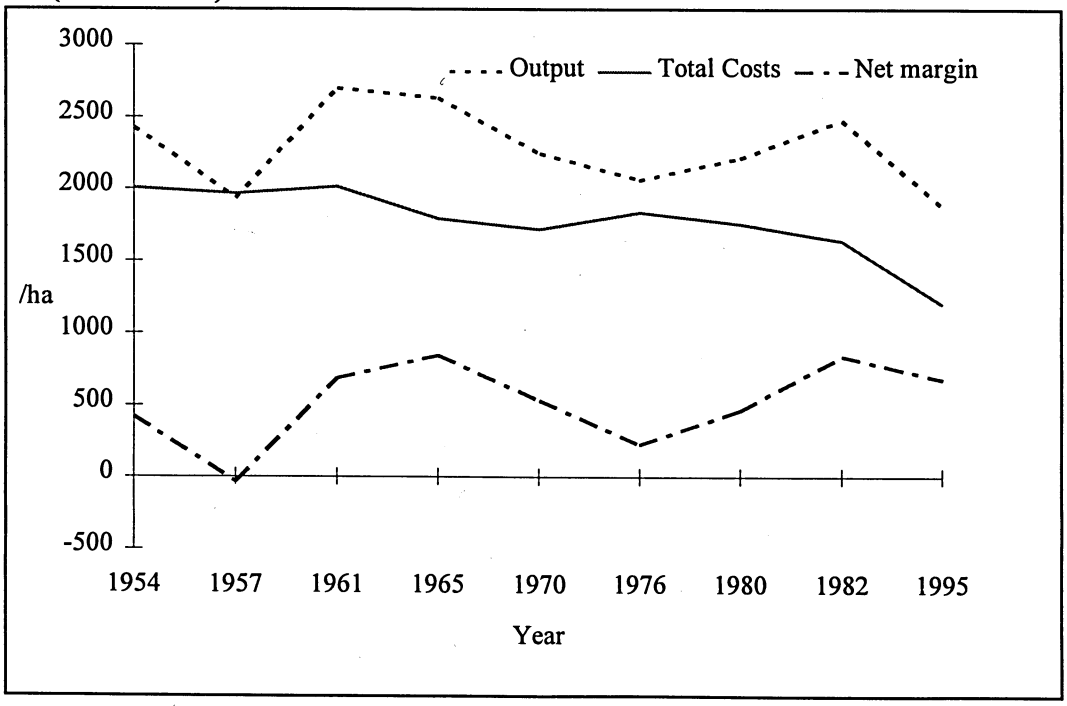
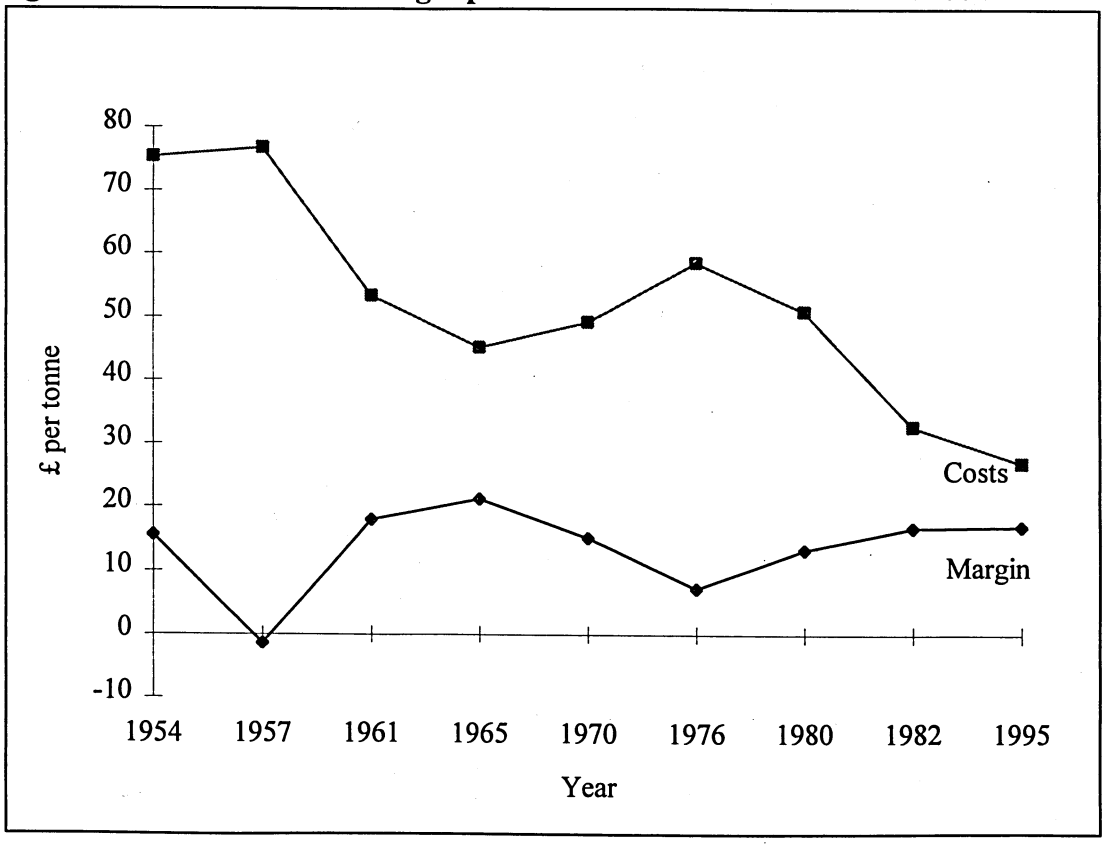
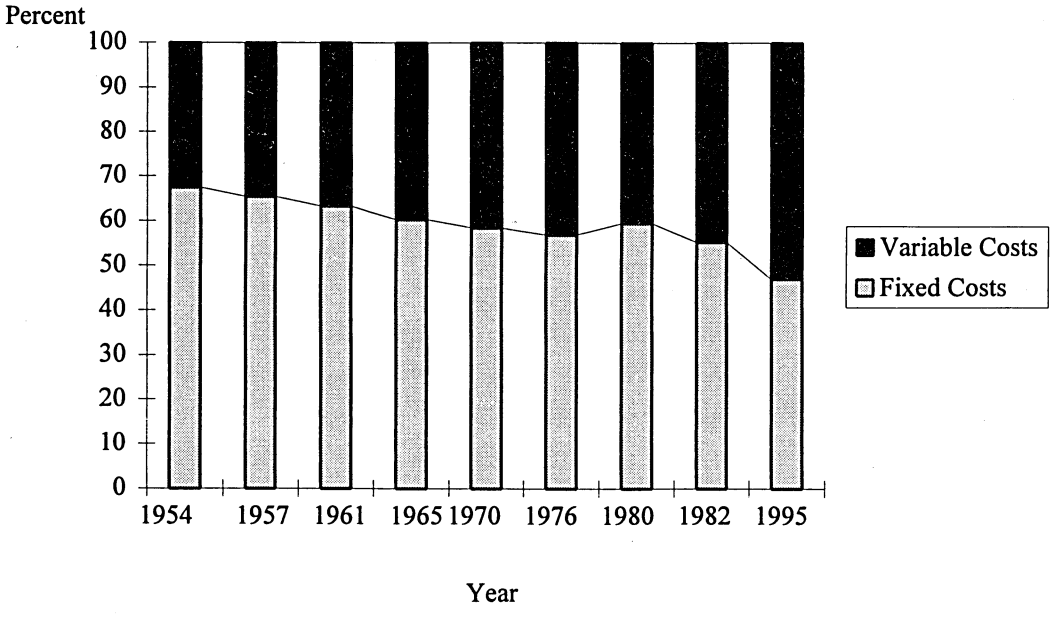


Figure 6.2: Costs and Net Margin per Tonne Selected Years 1954 to 1995



The introduction of new technology has not only reduced real costs, but also altered the composition of costs, because of the consequent substitution between inputs. The share of variable costs share has risen at the expense of fixed costs. In 1954 fixed costs accounted for over two thirds of total costs, but by 1995 their share had declined to a half (Figure 6.3).

Figure 6.3: Composition of Costs Selected Years 1954 to 1995



This change from fixed to variable costs is partly a result of the move to using contractors, but it is also a result of increased use of chemicals to control pests and diseases. Sprays were virtually non-existent as a cost item in the 1954 survey but by 1995 they had become the single largest cost category. The shares of contract costs (including haulage) and crop protection in total costs have risen by 11 and 13 percentage points respectively, over the period. This has been offset by a fall in the use of casual labour due to the virtual cessation of hand hoeing and most other hand work.

Examination of fixed costs tells a different story. Regular labour has fallen from 33 per cent of total costs to around ten per cent.[1] Whilst the greater part of this decline occurred during the 1960's and 1970's, labour costs have continued to fall, albeit at a reduced rate. Clearly some of this labour has been supplanted by labour employed through contractor operations, but this would account for only a small percentage of the fall in regular labour. It might have been expected that costs of machinery (including tractors) would have shown a reverse trend to that of labour. However, although the share of machinery in total cost did rise during the 1970's, by 1995 it had

[1] This decline in labour input is even more marked if we consider the decline in casual labour costs as well. In the 1954 study total labour costs accounted for 40 per cent of costs.

returned to around ten percent of costs. This can be explained by increases in the size of machines, technological advances and increased use of contractors.

Figure 6.4: Selected Variable Costs as a Percentage of Total Costs 1954 to 1995

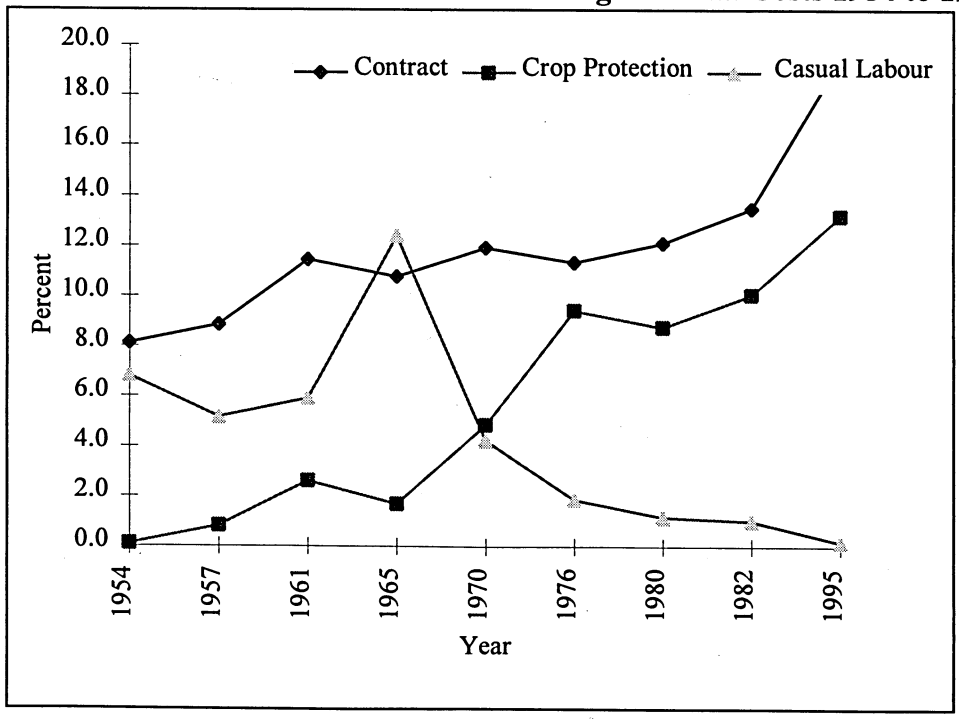
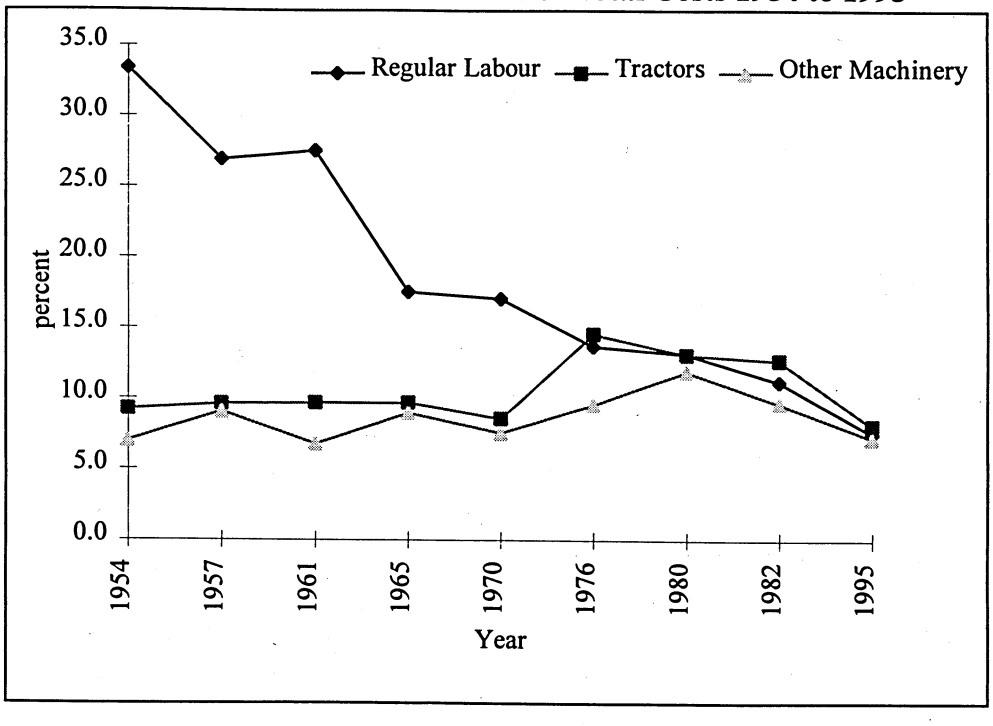


Figure 6.5: Selected Fixed Costs as a Share of Total Costs 1954 to 1995



The above analysis produces a clear picture of the changing economics of sugar beet production. Technological advances have reduced labour to a small portion of total costs whilst capital in all its forms is now dominant. The effects have been to reduce real costs per tonne considerably. However, real prices have also been falling, ensuring that the margins achieved have been much more consistent.

6.3 Sugar Beet Production 1982 and 1995

Earlier in the report, it was stated that differences between regions and size groups had narrowed since the sugar beet study undertaken in 1982. The national average results for the two years have been shown in Table 6.1. This section will compare in more detail results from the two studies concentrating on the findings by size group and by region.

6.3.1 Size Groups

Table 6.2 reproduces some of the key results from the 1982 survey by size group. The figures are presented in terms of constant 1995 purchasing power to allow direct comparison with the 1995 study. In 1982, at both the gross and net margin level, the average returns received by the group of farms over fifty hectares were significantly higher at the ten per cent level than for farms growing less than 20 hectares of beet. The 1995 study indicated no such differences in either gross or net margin, although there were significant differences in the level of total costs.

Table 6.2: Output and Margins 1982 Sugar Beet Study (1995 Prices)

Category	Size Group (ha)		
	<20	20 to 50	>50
		£/ha	
Output	2475.9	2438.3	2498.8
Margin over Materials	2001.1	1960.7	2000.9
Gross margin	1669.1	1713.6	1817.4
Net Margin	722.2	844.2	970.0
		£/t	
Cost per tonne clean	35.9	32.7	30.1

Another indication of the convergence between the largest and smallest beet growers is given by the proportion of output accounted for by costs in the two studies (Table 6.3). Between 1982 and 1995 costs as a proportion of output fell by 5.2 percentage points for farms growing under twenty hectares of beet. In contrast the figure remained virtually unchanged for the largest farms. Consequently the proportion of output that can be deemed 'profit' is now more similar between size groups. This in itself is an interesting finding. The reason may well be that the larger farmers had more fully adopted the available technology by 1982, whilst the smaller ones still had some 'catching up' to do. This is supported by the next figure (6.6) showing that in 1982 the larger farmers were making considerably more use of crop protection

materials. It may also suggest that the rate of technological change has slowed since 1982, so larger farms have not been able to adopt new methods that would restore the gap between them and the smaller farmers. The increased output obtained by those using contractors to harvest their crop in 1995 (discussed in Chapter 3) may also help to explain why the relative position of smaller growers has improved. Small units have overcome some of the diseconomies in size of mechanisation by using contractors.

Table 6.3: Output Composition by Costs 1982 and 1995 by Size

Size Group	1982	1995	Change
	per cent	per cent	percentage points
< 20 ha	70.8	65.5	- 5.2
20 to 50 ha	65.4	63.7	- 1.7
> 50 ha	61.2	60.9	- 0.5

Figure 6.6 highlights, for certain cost and margin categories, the percentage difference between the average results for the smallest and the largest size groups in the two years. Yield can be used to highlight the significance of the figure. In 1995, farms over 50 hectares, on average, had a three per cent lower yield than those growing less than 20 hectares. In 1982 they had a four percent higher yield. In virtually every category there was a larger absolute difference on average between small and large farms in 1982 compared to 1995. Of particular interest is the narrowing of the gap for materials costs. In 1982 there was a huge difference (nearly 20 per cent) between the size groups in costs of crop protection. Evidently, smaller growers were relying more on techniques such as hand hoeing, mainly because labour was the spare resource on the farm. By 1995 the difference in crop protection costs per hectare between the two size groups had fallen to just over five per cent, suggesting a change in management practices on these smaller farms. Overall, these figures support earlier arguments that the techniques used in beet production are now more uniform than in the past.

Figure 6.6: Percentage differences between large and small units in cost and margin components 1982 and 1995 Studies

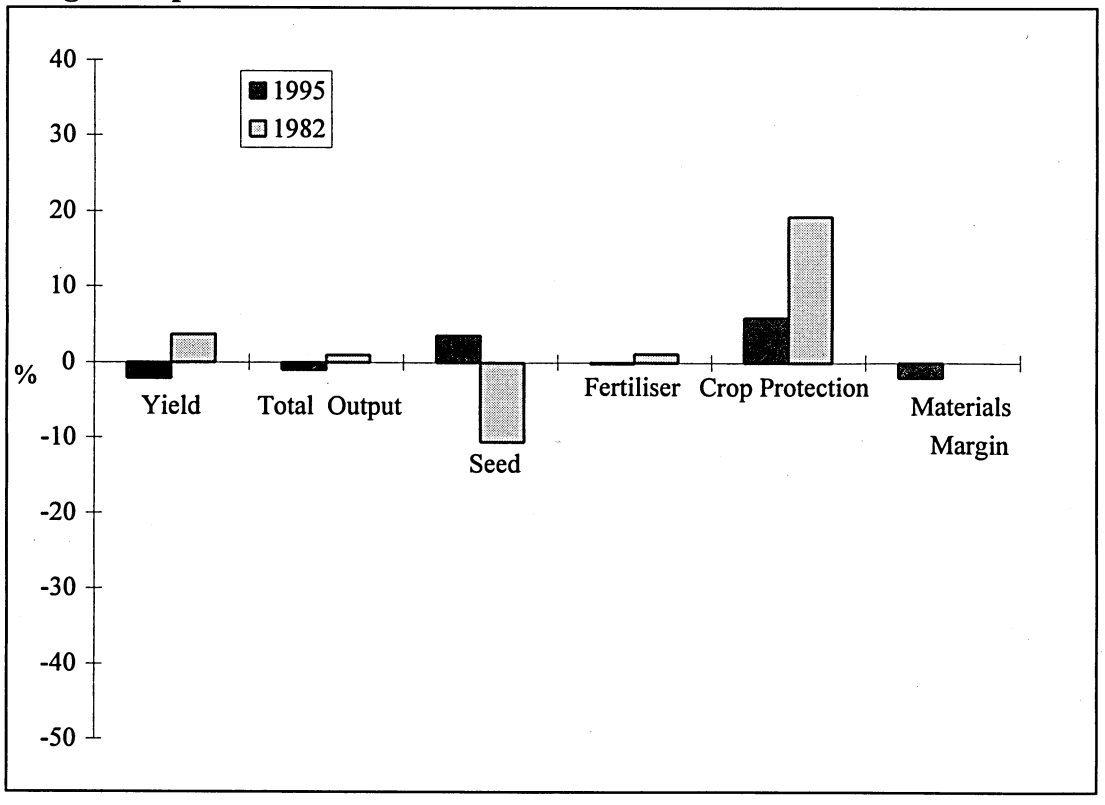
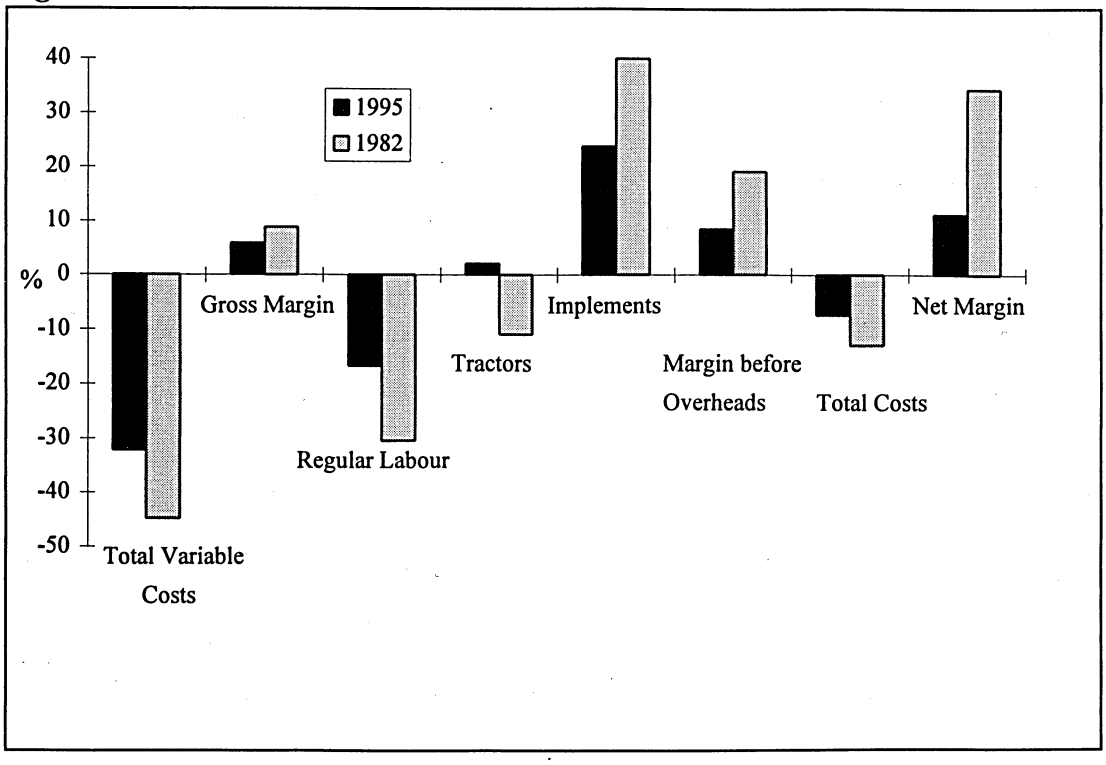


Figure 6.6: continued



6.3.2 Regions

The change in relative performance between regions since 1982 has been less marked than that between size groups. In the 1982 survey the East was performing marginally better per hectare and had the lowest average cost per clean tonne (Table 6.4).

Table 6.4: Output and Margins by Region 1982 Sugar Beet Study (1995 Prices)

Category	Region		
	North	West	East
		£/ha	
Output	2439.5	2423.3	2487.1
Margin over Materials	1950.8	1913.8	2015.2
Gross margin	1618.3	1642.9	1774.0
Net Margin	824.9	796.0	843.2
		£/t	
Cost per tonne clean	33.9	36.1	32.5

Costs as a percentage of output by region are shown in Table 6.5. Farms in both the Northern and Western regions between 1982 and 1995 have reduced the share of output taken up by costs to a greater degree than those in the East. This can explain the fact that although farms in the East had, on average, the highest net margin in 1982 this was no longer the case in 1995.

Table 6.5: Percentage of Total output made up by Costs 1982 and 1995 by Region

Region	1982	1995	Change
	per cent	per cent	percentage points
North	66.4	62.7	- 3.6
West	67.0	62.5	- 4.6
East	66.2	64.0	- 2.2

6.4 Structural Change

In Chapter 2, figures for the numbers of growers and area of beet grown were presented for the last ten years. However this is only part of a continual structural change in sugar beet production. Sturgess (1985) examined changes for the period between 1965 and 1985. Here, part of this work is reported and extended to analyse the period 1985 to 1995. Analysis is restricted to a brief overview of the structural changes rather than a detailed examination of what part of the change was caused through farm amalgamation and what part through specialisation.

Between 1965 and 1975 there was a fall of 44 per cent in the number of growers. Entry of the UK into the EU boosted the profitability of other crops relatively more than sugar beet. This, coupled with some difficult years for harvesting beet, led to a

decline in the popularity of beet production. However the fall in numbers was not matched by a fall in area (area actually increased) due to those choosing to remain in production increasing the area grown considerably. The average hectarage of beet doubled from 6 to 12 over the period. However since this period, the relative performance of sugar beet has improved and the decline in numbers has slowed down. Between 1985 and 1995 there was a fall of only 14.7 per cent in the number of growers. The improved profitability of the crop, coupled with the fact that quotas are not tradeable, can be put forward as reasons for the slow down in the rate of change.

Table 6.6: Numbers of Growers and Area of Sugar Beet and Potatoes 1965 to 1995

Crop	Year				Change		
	1965	1975	1985	1995	1965/75	1975/85	1985/95
	000's				percent		
Sugar Beet Growers	27.9	15.8	11.4	9.7	-43.5	-27.9	-14.7
Sugar Beet Area (ha)	180.5	197.6	204.6	196.0	9.5	3.5	-4.2
Potato Growers	82.7	35.0	24.6	13.7	-57.7	-29.8	-44.4
Potatoes Area (ha)	537.9	401.2	144.5	133.8	-25.4	-64.0	-7.5

For comparative purposes Table 6.6 reproduces figures for potatoes, a crop which has similar requirements in terms of soils and was controlled by quota for the period under consideration. From admittedly a much higher base, the decline in potato growers has been considerably more marked than for sugar beet. Unlike sugar beet, this decline has been accompanied by a considerable fall in area between 1965 and 1985. The most contrasting figures are those highlighting the change between 1985 and 1995. Although potato area did decline slightly more than beet area (by three percentage points) the fall in the number of growers was considerably higher (nearly 30 percentage points). Of course, potato growers face a very different economic climate with no assured prices like those received by sugar beet producers. There is also more scope to achieve economies of size in marketing. Even so, it is nevertheless likely that transferability has facilitated the greater specialisation which has taken place in potato production. Another indication of the decline in the rate of structural change in sugar beet production is given by the course of the share of growers producing more than 20 hectares of the crop (Table 6.7). The table indicates that in 1965 only 6.2 per cent of growers grew more than 20 hectares of beet whereas by 1995 this had risen to 32 per cent. However the bulk of this change was achieved by 1985 with only a 4.5 percentage point increase in the last decade.

Table 6.7: Numbers of Growers producing more or less than 20 ha of Beet 1965 - 1995

Size	1965	1975	1985	1995
		Number		
< 20 ha	26110	12930	8224	6559
> 20 ha	1720	2820	3127	3089
Total	27830	15750	11351	9648
> 20 ha (percent)	6.2	17.9	27.5	32.0

The shares of total area grown by size group are also of interest (Table 6.8). In 1965 for example, 80 per cent of sugar beet was grown on farms growing less than 20 hectares of the crop. By 1995 this had fallen to 30 per cent. At first sight the reduction in share of total area of the smallest units appears to have been taken up by units of over 40 ha, their share of area rising from just 11 per cent in 1965 to 41.2 per cent in 1985. However, a more likely explanation is that small producers were increasing their area and thus moving into the medium size group, whilst the medium sized growers were moving into the large size group. The net effect of such shifts was to leave the share of the middle size group relatively unaltered. Between 1985 and 1995 the share of total area held by the largest farms increased by only one percentage point. However, the smallest size group suffered a 15 per cent fall in share. It was the 20 to 40 hectare group that gained the largest share in this period. It does appear as if the shift upwards in size has been truncated in the last period. The possibility that this was a general change is countered by the fact that the share of potatoes grown on farms growing more than 40 hectares increased by 14 percentage points between 1985 and 1995. A number of possible explanations can be put forward. British Sugar when reallocating quota could have concentrated on increasing the quota of the smaller producers (thus moving them into the middle size group). Growers producing over 40 ha of beet may have been more constrained by rotations and given the general state of agriculture during the period may not have expanded farm area which would have enabled them to take more quota.

Table 6.8: Per cent of Area by Size Group 1965 to 1995

Year	Size Group			
	< 20 ha	20 to 40 ha	> 40 ha	Total
	per cent			
1965	79.9	8.8	11.3	100
1975	57.6	13.1	29.3	100
1985	45.3	13.5	41.2	100
1995	30.4	27.1	42.5	100
Change 1965-75	-22.3	4.3	18.0	
Change 1975-85	-12.3	0.4	11.9	
Change 1985-95	-14.9	13.6	1.3	

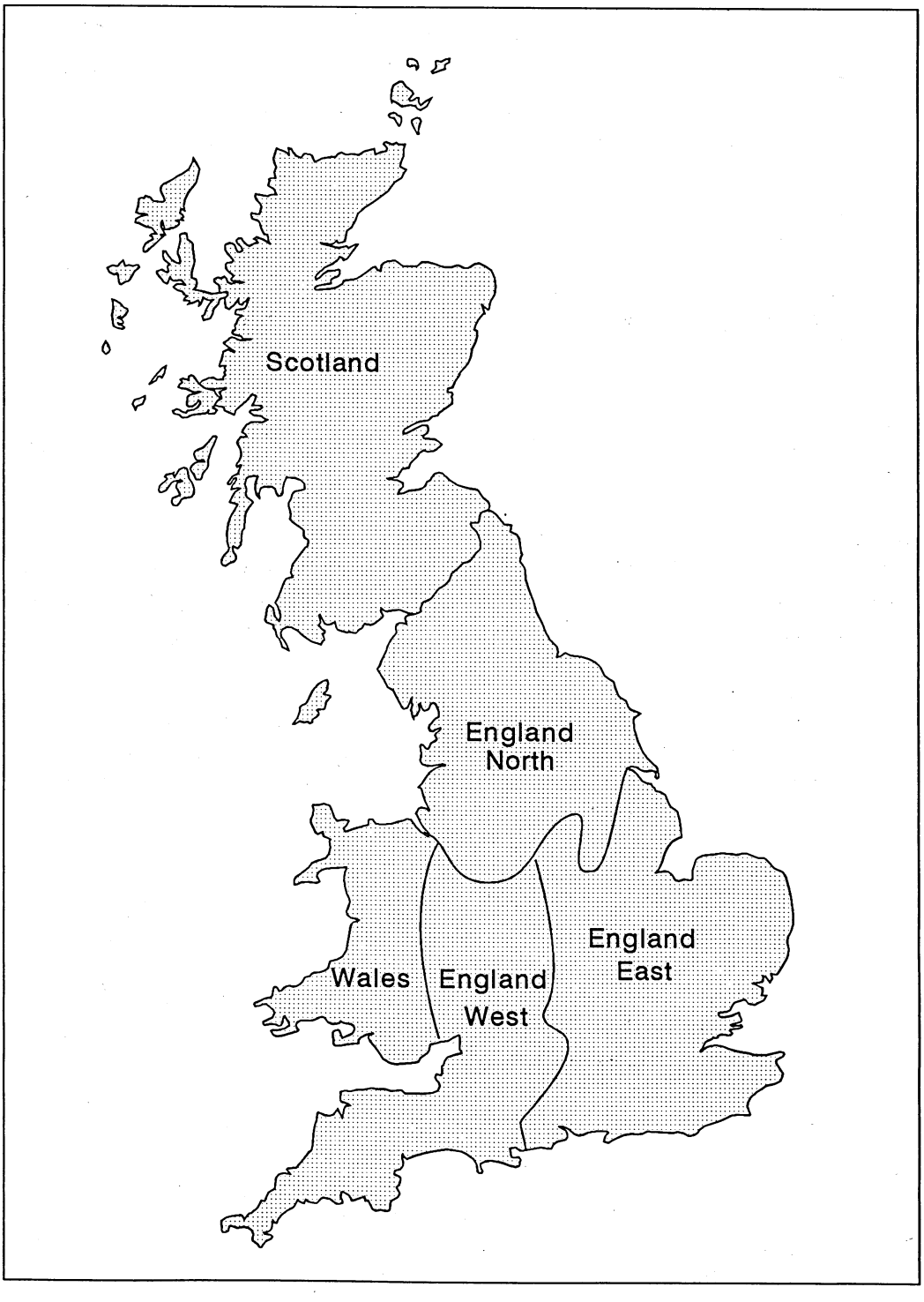
6.5 Conclusions

This chapter has given a brief overview of the changing nature of sugar beet production in the UK. The general increase in efficiency has been highlighted by the continual fall in real costs per tonne produced. Considerable substitution between inputs has been apparent with labour being continually displaced by capital. Differences between growers by size and regions have diminished over the last 13 years. Smaller growers appear to have improved their efficiency (as measured by costs as a proportion of output) whilst the larger growers' performance has hardly altered since 1982. Changes in performance were less marked between regions compared to size groups but nevertheless farms in the North and West have improved their position relative to those in the East.

Considerable concentration of sugar beet production has occurred since 1965 although the rate of this concentration has declined since 1985. In part, this decline can be linked to the profitability of sugar beet in relation to other crops and the fact that quota is not tradable. The share of total area (and therefore production) of the largest growers (over 40 ha) has remained very static since 1985.

APPENDIX A

Figure A.1 The EU Super Regions in Great Britain



APPENDIX B

Conventions for Cost and Margin Calculations

Total Output
This is the sum of the sales of sugar beet, allowance for transport and value of beet tops used for feed.

Material Costs
The cost of inputs which are an essential part of sugar beet production, seed, fertiliser and chemical sprays; a cost likely to be incurred by all sugar beet producers.

Margin over Materials
The value of output less the material costs.

Other Variable Costs
Input costs which are incurred less routinely on sample farms and include contract charges and casual labour.

Gross Margin
This is the value of output less the material and other variable costs which vary in direct proportion to the size of enterprise.

Net Margin
Is the return to management and investment from operating the enterprise. It is the value of the output less material and variable costs, fixed and overhead costs but excludes any interest payments. The methods for calculating fixed and overhead costs are given below

Labour
The hourly cost of labour, to include national insurance, employer's liability insurance and perquisites is calculated from the farmer's wage book. This average hourly rate has been charged to all labour directly applied to the crop whether supplied by the farmer and family, regular or casual staff.

Rent and Rental value
To make land costs comparable between units, the area used to produce sugar beet is assumed to be rented. For tenant farmers the gross rent paid in 1995 has been adjusted to take account of tenant's improvements, buildings charges and rental value of houses and cottages to arrive at a net field rent. For owner-occupied land farmer estimates of rental value based on actual net field rents paid for local land of similar quality, have been used. Where land of widely varying qualities have and use is found on the same farm, the estimate of rent will reflect the value of the arable land.

Machinery Specific to Sugar Beet Production
For each machine specific or largely specific to sugar beet production, depreciation has been calculated by taking 15 or 20 percent of the current 1995 value. To this has been added the annual cost of repairs and the total depreciation and repairs then divided by the area on which the machine operated. Where applicable the per hectare fuel cost was then added.

Tractors and General Machinery
For tractors and machines not specific to sugar beet production, standard costs obtained from MAFF are used.

Overhead Costs

General overhead and machinery overhead costs were derived, by size of enterprise and region, from cereal farms taking part in the Farm Business Survey. For this study overhead labour costs were taken from estimates derived from a pilot study of labour use undertaken by Exeter University.

APPENDIX C

Reports on Special Studies in Agricultural Economics

No 21	Agricultural Contracting in the United Kingdom by J Wright and R Bennet University of Reading August 1993	£8.00
No 22	The Economics of Egg Production by Deborah Roberts and John Farrar University of Manchester September 1993	£10.00
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APPENDIX D

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