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UNIVERSITY OF CAMBRIDGE

CEREALS 1979/80

A study of cereal production and marketing in the United Kingdom

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J. G. DAVIDSON

Agricultural Economics Unit
Department of Land Economy
16–21 Silver Street
Cambridge CB3 9EL

Agricultural Enterprise Studies in England and Wales

Economic Report No.83

Price £3

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FOREWORD

The focus of change in British cereals production has moved from barley in the nineteen-sixties to wheat in the nineteen-seventies. During the second half of the decade the area under wheat has increased by over 50 per cent. This rise has been fuelled by technological advances which have made it possible largely to ignore previous rotational constraints on wheat growing and pushed the yield of wheat upwards faster than that of barley. The capacity to grow wheat has thus become increasingly important as a distinctive feature of profitable cereal production. This is a recurrent theme in this report.

The effect in raising production of the increases in the fraction of the cereal area under wheat, the highest yielding cereal, has been reinforced by increases in yields of all cereals and an expansion in the total cereals area. Consumption of cereals however has been declining so that there has emerged a surplus, first of feed grains, and this year, on balance, of all grains. Surpluses of cereals are also growing in the EEC as a whole. The increasing burden on the Community exchequer for subsidized disposal and storage, combined with greater consumer pressure in a period of low growth in incomes, for lower food prices are likely to lead to further declines in the real level of support prices for cereals. This expectation raises the question of the capacities of cereals units in different regions and of various types to withstand such a further cost: price squeeze. The information assembled and analyses conducted by Geoff Davidson throw considerable light on this question.

I. M. Sturgess
Director

July 1982

ACKNOWLEDGEMENTS

A study undertaken on the scale of the cereal survey clearly needs the help and co-operation of a great many people. At the planning stage the study benefitted from the guidance given by a Working Party, representing a range of interests in cereal production, under the chairmanship of Ian Sturgess, Director of the Agricultural Economics Unit at Cambridge University. The investigation has been a joint effort of the Universities and Colleges of Agriculture at Aberdeen, Aberystwyth, Askham Bryan, Cambridge, Edinburgh, Exeter, Glasgow, London (Wye College), Manchester, Newcastle, Nottingham and Reading, the Department of Agriculture in Northern Ireland, the economics and statistics departments of the Ministry of Agriculture, Fisheries and Food. To all those people involved in the study, too numerous to mention individually, a debt of gratitude is owed. In the analysis of the results at Cambridge Mrs Pat Franks and Mrs Christine Harben undertook much of the preparation and loading of data on to the University computer. A special debt of thanks is due to Faisal Sabbah whose help with the computing and data handling made many varied analyses possible and to Mrs Audrey Banham for deciphering and typing numerous drafts of this report. The support and help of Ian Sturgess in his role as chairman of the working party and more recently in discussion has been much appreciated. Finally thanks are due to the farmers, drawn by random sampling, who have given freely of their time and provided the information which has made this study possible.

Agricultural Enterprise Studies in England and Wales

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.

The departments in different regions of the country conduct joint studies of those enterprises in which they have a particular interest. This community of interest is recognized by issuing enterprise studies reports prepared and published by individual departments in a common series entitled "Agricultural Enterprise Studies in England and Wales".

Titles of recent publications in this series and the addresses of the University departments are given at the end of the report.

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CHAPTER 1 INTRODUCTION

1.1 Introduction

Since 1971 the Agricultural Economics Unit at Cambridge has co-ordinated a series of studies dealing with the production of cereals in England and Wales. The period has been one of substantial change, brought about by the effects of inflation, the introduction of new technology and changes in the system of price support. As a result the studies have needed to adapt to the differing circumstances. For example the original survey in 1971 and 1972 dealt with the production and marketing of all the main cereal crops. In 1975 the scope was restricted to collect information on winter wheat and spring barley, then overwhelmingly the most important cereal crops, and spring oats. It is some measure of the rapidly changing pattern of cereal production in England and Wales that winter barley was not considered of sufficient importance to warrant inclusion in the 1975 study. Whereas by 1979 winter barley in the Eastern region was in terms of area, second in importance to winter wheat, which had previously replaced spring barley as the most widely grown cereal. Thus for this study of the 1979 harvest year attention has been restricted to the production and marketing of winter wheat, spring and winter barley.

A second important change has been an expansion of the area covered by the survey. Thanks to the co-operation of the Colleges of Agriculture in Scotland and the Department of Agriculture in Northern Ireland, it has been possible for the first time, to produce estimates of costs of production and levels of output for the United Kingdom rather than just England and Wales as in previous surveys.

1.2 Objectives, Sampling and Data Collection

As in previous studies the primary objective of the survey was to estimate the costs of and returns from growing cereals, in this case winter wheat, spring barley and winter barley. Within this broad framework the secondary aims were to investigate in more detail certain aspects of cereal production which are of current interest. The first was to consider possible benefits available to producers from the timing and different methods of marketing grain, together with the associated role of grain storage within an overall marketing strategy. The second was to assess the effect of the recent intensification in production and increase in area of winter wheat. The third was to find a more satisfactory method, in the context of an enterprise study, for calculating the overhead or non-allocatable costs involved in cereal production. Finally the scope of the survey, with completed records from 311 farms, has made it possible to examine again differences in production techniques and the disposal of grain between regions and by size of enterprise and intensity of production.

To provide the information necessary to answer the questions posed above, a representative sample of cereal growers was drawn from holdings with ten or more hectares of cereals. The sample was stratified by scale of enterprise to ensure an adequate representation of the larger cereal units. In total thirteen research units, located in Universities, Colleges of Agriculture, and the Department of Agriculture for Northern Ireland took part in the collection of data. A debt of thanks is due to these Units for their help and co-operation in the study.

1.3 Analysis

This survey, in keeping with the previous surveys, has made use of a computerized system for handling and storing data. This system has the added advantage of establishing a data bank, containing information which is available for further analysis in this Department or for use by other interested researchers. Thus whilst the tables produced in this report are based mainly on the data collected on the 1979/80 survey, in certain cases the information collected on surveys over the period 1971 to 1977 is used for the purpose of comparison. When comparing the main samples the tables presented here give the mean of each variable together with the standard deviation of the mean in brackets.[1] In other cases where, for example, the comparison is between sub-samples, analysis of variance has been used to test whether or not the means are significantly different at the 10 per cent level. Significant differences in the means are shown in the final column of these tables.

[1] The standard deviation is used to measure the degree of spread or dispersion of individual observations which go to make up the sample mean. In general 68 per cent of the individual observations will be within the range of one standard deviation above or below the mean, 95 per cent of the observations within the range of two standard deviations above or below the mean.

1.4 Standard Machinery Cost Factors

For certain calculations it has been necessary to use estimated rather than actual values. The standard costs used are shown in Table 1.1.

Table 1.1 Standard Machinery Cost Factors

Tractors		Machinery not specific to cereals	
Category	**£ per hour**	**Category**	**£ per hectare**
Wheeled tractors		Rotovators	7.30
Up to 50 h.p.	2.00	Power-harrows	10.50
from 51 to 60 h.p.	2.40	Reversible ploughs	7.00
from 61 to 70 h.p.	2.70	Mounted ploughs	4.50
from 71 to 80 h.p.	2.90	Cultivators, spring tine and heavy	1.50
from 81 to 100 h.p.	3.50	disc harrows and sub soilers	
from 101 to 120 h.p.	4.90	Mounted disc and light spring tine harrows,	1.00
Over 150 h.p.	10.60	fertilizer distributors	
		Harrows, rolls and trailers	0.40
Crawler tractors	**£ per hour**		**£ per hour**
Up to 80 h.p.	6.00		
from 81 to 100 h.p.	8.10	Lorry used on farm only	5.00
Over 100 h.p.	9.10	Lorry used generally	12.00

1.5 Conventions for Cost Calculations

Machinery specific to cereal production

For each machine specific, or largely specific, to cereal production depreciation has been calculated by taking 20 per cent of the February 1979 replacement value. To this has been added the annual cost of repairs and then this total divided by the area on which the machine was used. Where applicable the per hectare fuel cost was then added.

Labour

The hourly cost for labour, to include national insurance and employers liability insurance, has been taken from the Ministry of Agriculture wages survey. The charge is based on the craftsman grade and estimated as £1.60 per hour for the six-month period ending March 1979 and £1.80 per hour for the six months ending September 1979.

Allocation of overhead costs

This survey has not adopted the previously used practice of adding 15 per cent of both variable and fixed costs to allow for unallocated overhead costs. Instead a substantially different approach has been used to estimate the levels of unallocated overhead costs associated with cereal production. This new approach is discussed in detail below and examples are given of the changes in cost structure which have resulted from the use of the revised methodology.

1.6 The estimation of overhead costs for enterprise studies

In many of the financial tables presented in this report two measures of profitability are shown. The first is a calculation of a gross margin, that is the value of output less the allocatable costs which vary in direct proportion to the size of the enterprise. The charges normally included under this heading are the costs of seed, fertilizers and sprays plus contract charges and miscellaneous costs. The second and final measure of profitability is the calculation of a net margin. Here an attempt is made to allocate a proportion of costs common to the business as a whole to a single enterprise. The costs normally included in this allocation would come under the main headings of labour and machinery costs, rent and overhead charges. This estimate of the proportion of common costs allocated to the enterprise is then deducted from the gross margin to give a net margin.

Clearly the calculation of a gross margin where the variable costs can be readily allocated to the enterprise will, at that point, give an accurate measurement of differences between farms or enterprises. The use of contract services and the allocation of their cost is the possible exception to this rule. In cereal production a minority of farms use contract services and whilst the cost can be easily allocated as a variable cost to the individual enterprise, the use of contract services is likely to have a more direct bearing on the level of fixed or

common costs. At the farm level however the use of gross margins will give an accurate measure of the effect any change in the blend of enterprises will have on the business as a whole. By contrast it is generally agreed that net margins are of very limited value when planning marginal changes to the enterprise blend in a multi-product business. Indeed for the individual farmer the use of net margins to plan marginal changes in the blend of enterprises or land use can be positively misleading.

In view of these likely shortcomings the use of net margins as the second measure of profitability might be questioned. There are however two main reasons why the calculation is made. In the first place for cereal production variable costs are likely to account for only 35 to 40 per cent of the estimated total cost of growing cereals. In any comparative study it would be unrealistic to ignore over half the cost of production. Secondly net margins are of much greater value to Government and the agricultural industry as a method of assessing changes to the relative profitability of different enterprises over a period of time.

When moving from the gross margin to net margin stage the main difficulty is allocating to a single enterprise the correct proportion of those costs which are common to the business as a whole. In only a very few cases is it acceptable to divide a total cost by the total area and allocate this unit cost on a per hectare basis to the enterprise. In most studies an attempt is made to allocate fixed or common costs in proportion to the use the enterprise makes of these resources. For example on cereal surveys the methods used to estimate and allocate fixed costs are briefly as follows. For machinery which is specific to cereal production information on capital cost, repairs and fuel charges and annual use is recorded on the farm from which a per hectare charge is calculated. For machinery which is not specific to the enterprise a per hectare charge is calculated using estimated capital and operating costs based on an average machine life and annual usage. (Examples of the standard costs used on this survey are shown in Table 1.1.) The charges for specific and non-specific machinery are then applied to the enterprise in direct proportion to the time the machine is used for the crop. Information on the availability of labour, both family and hired, is collected on the farm and an estimate of the average hourly cost taken from the government agricultural wages survey. The total labour cost applied to the enterprise is the estimated hourly charge multiplied by the number of man-hours directly employed to produce and market the crop. Rent, or an estimated rental value, is not allocated between enterprises but taken as an average per hectare charge.

There are certain other categories of fixed costs which come under the general classification of 'other overheads'. Although individually these costs are likely to be of little importance on a per hectare basis, collectively they represent a significant item in the total cost of production. On enterprise studies it has not been a normal policy to collect these costs. Rather the practice has been to use the Farm Management Survey results to estimate the likely level of other overhead costs. For example previous cereal surveys have added in a charge for unallocated overhead costs calculated by taking 15 per cent of both variable and fixed costs recorded on the farm.

An indication of how accurate these methods are for allocating the costs of labour, machinery, rents and other overheads can be made by comparing the estimated fixed cost structure on the cereal survey with the results from the Farm Management Survey for the same year. To avoid the complication of possible differences between types of farm and region, the comparison has been made between farms on the cereal survey in the Cambridge region and the mainly cereal farms on the Cambridge Farm Management Survey.[2] A second important estimate has been necessary in making the comparison. The fixed costs recorded on the Farm Management Survey relate to the whole farm whereas the cereal survey attempts to allocate the proportion of fixed costs which relate to the specific enterprise. For this comparison therefore the costs for labour, machinery and power, and other overhead costs recorded on the Farm Management Survey have been allocated in proportion to the contribution which cereals make, in gross margin terms, to the business as a whole. On this basis 69.6 per cent of the total cost of machinery, labour and other overheads has been allocated to the cereals enterprise. As the method of calculating the cost of rent and rates is similar for both surveys, no adjustment has been made to the figure for rent. The results of the comparison are shown in Table 1.2.

The evidence from the table suggests that the methods of allocating fixed costs used hitherto on cereal surveys will give a total fixed cost which is similar to the Farm Management Survey; in 1979/80 the difference was approximately nine per cent. There are however more substantial differences in the component costs which go to make up this total. The cost of labour on the cereal survey is an obvious under-estimate when compared with the charge for labour on the Farm Management Survey. The procedure used to estimate labour costs on the enterprise study of charging the direct labour input at an hourly rate, fails to take account of the non-direct or overhead labour cost which should be charged to the enterprise. This difference is however compensated for in the other overhead costs where the estimates for the cereal survey are more than twice the charge recorded on the Farm Management Survey. By contrast the charges for machinery and power, although

[2] Report on Farming in the Eastern Counties of England 1979/80. M. C. Murphy

suggesting an under-estimate of about 20 per cent on the cereal survey, are more comparable, and as might be expected the figure for the rent and rates, calculated on the same basis for both surveys, shows only a small difference.

Table 1.2 Fixed Cost Allocation (original method) for Cereal Survey and Farm Management Survey Farms (Cambridge Region)

	Cereal Survey W. Wheat Farms	Farm Management Survey Mainly Cereal Farms
Cost of:	£ per hectare	
Labour	20.6	44.7
Machinery and power	73.5	89.4
Rent and rates	66.7	70.3
Other overheads	45.3	20.7
	£206.1	£225.1

Table 1.3 Fixed Cost Allocation (revised methodology) for Cereal Survey and Farm Management Survey Farms (Cambridge Region)

	Cereal Survey W. Wheat Farms	Farm Management Survey Mainly Cereal Farms
Cost of:	£ per hectare	
Labour – direct	20.6	
– overhead	23.7	
– total	44.3	44.7
Machinery and power	73.5	89.4
Rent and rates	66.7	70.3
Other overheads	30.0	20.7
	£214.5	£225.1

This method of adding on a substantial overhead charge to make the total fixed costs on an enterprise study comparable to whole farm costing has obvious drawbacks. In particular the method assumes that the level of unallocated overhead costs will be similar for the whole range of farm types which make up a random sample on a cereal survey. Although by definition all the farms in the sample will grow cereals, there is still likely to be considerable variations in the blend of enterprises which will result in differences in the seasonal demand and opportunity cost for labour. The specialist cereal farm with a peak labour demand during harvest and drilling time, will probably have some surplus labour available during the less busy periods. A proportion of this surplus or overhead labour, not currently recorded on cereal surveys, should be charged to the cereal enterprise. By contrast the type of farm which has a more extensive rotation, possibly including livestock, will have a more regular demand for labour throughout the year and consequently a much smaller overhead labour cost to allocate to the separate enterprises. If, as is probable, this variation occurs between different farm types, then differences are also possible between regions and by scale of enterprise.

This study has therefore adopted different procedures, firstly to calculate a cost for labour which includes a proportion of the unallocated labour overhead, and secondly to estimate a charge for farm overheads.

To calculate the cost of labour the following method was used:

1. During the collection of data on the farm, the total available labour force, including family labour, was allocated between the arable and livestock enterprises.
2. The total number of standard man-days available for the arable enterprises was then compared with the total number of standard man-days required by the arable sector. The calculation took account of differences such as the use of contract services, the availability of casual labour, and variations in the level of direct labour inputs on the recorded cereal enterprises.

3. The factor derived from dividing these totals was then used in conjunction with an hourly cost taken from the wages survey, to calculate for each farm an hourly cost for the total labour input which would include the unallocated overhead labour element. When translated into per hectare terms the labour directly employed on the cereal enterprise multiplied by the average hourly cost taken from the wages survey gives the charge for direct labour. The difference between direct and total labour input is the overhead labour cost per hectare.

The estimates of other overheads was made by:

1. classifying the farms on the cereal survey into the categories used on the Farm Management Survey, and
2. applying to the different categories of farm types the charge for other overhead costs recorded on the Farm Management Survey for the same period as the cereal survey.

The effect these changes in methodology have had on the allocation of fixed costs, again using cereal survey farms in the Cambridge region, is shown and compared with the Cambridge Farm Management Survey results in Table 1.3. Clearly the new procedure has produced levels of fixed costs which match more closely the estimates taken from the Farm Management Survey not only in total, a difference of now only five per cent, but also in the components which go to make up this total. Certain differences still clearly exist, for example where the technique used on the cereal survey appears to under-estimate the cost of machinery and power whilst at the same time over-estimating the charge for other overheads. Despite this the revised methodology is producing an estimate of fixed costs in cereal production which more closely matches the results taken from the Farm Management Survey.

1.7 Comparison of Fixed Cost Estimates

Comparisons of cereal growing by region, size of enterprise and intensity of production are dealt with in the relevant sections of this report. However to consider more fully the effect of the revised methodology on the estimates of fixed costs, in particular the measurement of overhead labour, certain comparisons are repeated here. The values used in the comparisons are based on the spring barley enterprise and in order to put all the farms on a similar basis, exclude the costs of labour and machinery used for straw disposal. In the analyses the cost of labour has been divided into two elements. The first, direct labour, is the total number of man-hours directly employed on the enterprise multiplied by the average hourly cost of labour (£1.72, the weighted average of £1.60 and £1.80 per hour) used on the survey. The second is that share of the overhead labour cost, calculated by the method described earlier in this chapter, and allocated to the cereal enterprise.

The results of a regional comparison, where the counties of England and Wales have been divided into three regions based on the proportion of cereals in the crops and grass area, are shown in Table 1.4. For this analysis those counties with more than 40 per cent of cereals in the crops and grass area form the cereal intensive regions, counties with less than 20 per cent are grouped as a cereal extensive region and the remaining counties classified as intermediate.

Table 1.4 Fixed Cost Allocation, Spring Barley Farms in England and Wales by Region excluding Straw Handling

	England and Wales	Cereal intensive region	Intermediate region	Cereal extensive region
	£	£	£	£
Labour – direct	17.5	16.9	18.8	19.8
– overhead	17.0	19.7	10.2	4.5
– total	34.5	36.6	29.0	24.3
Machinery and power	58.0	58.6	57.1	53.0
Rent and rates	61.2	64.1	55.4	46.1
Other overheads	32.2	31.7	33.5	33.7
Total fixed costs	£185.9	£191.0	£175.0	£157.1
Number of observations	235	170	53	12

In terms of direct labour the lowest cost is found in the cereal intensive counties, a result of the lower man-hour requirement, with direct labour costs in the cereal extensive region about 17 per cent higher. There is

however the compensating effect of the cost of machinery and power, highest in the intensive counties, lowest in the extensive. The inclusion of the overhead labour element substantially changes this cost ranking. Now the cereal extensive region has total labour costs which are 34 per cent lower than the labour costs in the cereal intensive counties, a difference which is reinforced by lower machinery costs.

There are even more marked differences in the levels of overhead labour costs when the sample farms, rather than counties, are grouped by the proportion of cereals in the crops and grass area. The results of this analysis are given in Table 1.5. Again the evidence suggests broadly that as the proportion of cereals in the crops and grass area increases, the input of direct labour declines. (The qualification is that there is an increase in the cost of direct labour for the most intensive producers; it may be that with relatively few other demands for labour rather more time is devoted to the cereal crop.) However relatively small differences in the levels of direct labour input are swamped by a marked increase in the cost of overhead labour as cereals become more specialized so that the total labour cost for the most intensive cereal producing farms is more than 80 per cent higher than for the least intensive growers.

Table 1.5 Fixed Cost Allocation, Spring Barley Farms, U.K. Sample by Intensity of Production, excluding Straw Handling

Group or proportion of cereals in crops and grass area	U.K.	Up to 35 per cent	From 35 to 50 per cent	From 50 to 65 per cent	From 65 to 80 per cent	More than 80 per cent
Area of S. Barley (ha.)	49.9	15.9	48.9	52.7	58.2	56.7
	£	£	£	£	£	£
Labour – direct	17.8	21.5	18.8	16.6	16.9	18.2
– overhead	17.0	6.6	12.6	13.6	21.3	32.8
– total	34.8	28.1	31.4	30.2	38.2	51.0
Machinery and power	57.9	52.4	56.9	58.1	59.3	60.5
Rent and rates	59.3	54.1	57.5	59.2	62.6	60.7
Other overheads	32.2	35.0	36.2	32.8	29.2	28.2
Total fixed costs	184.2	169.6	213.4	180.3	189.3	200.4
Average area all cereals (ha.)	124.6	27.0	98.6	138.9	164.2	126.4
Crops and grass area (ha.)	210.7	109.8	227.8	240.7	230.2	146.3
Cereals as % crops and grass	59.1	24.6	43.3	57.7	71.3	86.4

In a final analysis the sample farms have been re-grouped by size of cereal enterprise and the results of this analysis are given in Table 1.6. It is evident from the analysis that the level of overhead labour compared to direct labour relates more to the proportion of cereals in the crops and grass area rather than the size of the cereal enterprise. Between the size groups the proportions of direct and overhead labour are about the same although there is a noticeable decline in the total cost of labour as the size of the cereal enterprise increases.

Table 1.6 Fixed Cost Allocation, Spring Barley Farms, U.K. Sample by size of Cereal Enterprise, excluding Straw Handling

Group	U.K.	10 up to 40 ha.	40 up to 80 ha.	80 up to 120 ha.	120 up to 200 ha.	200 up to 300 ha.	300 ha. and over
Area of S. Barley (ha.)	49.9	15.5	31.4	47.1	62.0	99.6	108.0
	£	£	£	£	£	£	£
Labour – direct	17.8	21.2	18.9	16.7	15.9	16.2	14.2
– overhead	17.0	18.9	18.8	15.1	16.6	14.7	13.3
– total	34.8	40.1	37.7	31.8	32.5	30.9	27.5
Machinery and power	57.9	50.7	60.1	59.0	62.0	59.6	59.0
Rent and rates	59.3	56.6	59.7	58.3	59.5	63.1	63.0
Total fixed costs	184.2	181.3	190.6	181.3	184.1	185.4	180.1
Average area all cereals (ha.)	124.6	23.4	60.1	97.5	151.7	248.2	379.1
Crops and grass area (ha.)	210.7	63.5	109.6	167.3	238.4	396.6	622.8
Cereals as % crops and grass	59.1	36.9	54.8	58.3	63.6	62.6	60.9

1.8 Conclusion

The overall conclusion to this chapter is that the revised methodology used on this survey has produced estimates for the cost of labour which compare more closely with results from whole farm business costing, as in the Farm Management Survey. The now more obvious differences shown in the per hectare charge for labour between regions and certain groups of farms were not so apparent using the previous method for estimating the charge for labour. Indeed in some cases the trends in labour costs have been reversed.

In view of the scale of these changes in labour costs the question must now be posed whether or not the practice of using standard costs for machinery not specific to cereal production is not also masking more substantial differences in costs than the present estimates suggest. In particular the use of standard costs for tractors which, after combines, are likely to represent the most important investment in machinery. The current method of taking the total annual cost of operating a tractor and dividing this by an estimated number of hours worked to give an hourly charge, assumes that all tractors in a similar category work the same number of hours per year. There is however a noticeable similarity between the number of man-hours and tractor hours required to produce the crop. It seems reasonable to assume therefore that on farms where there is a high level of overhead labour, there is also likely to be a substantial level of overhead tractor costs.

The work that has been undertaken in this analysis to produce, hopefully, more realistic estimates of labour cost should be considered the first stage of a larger investigation into the area of fixed costs.

CHAPTER 2 COSTS AND RETURNS OF WHEAT AND BARLEY PRODUCTION – HARVEST YEAR 1979/80

2.1 Introduction

In Chapter 1 the point was made that this is the first cereal survey which has attempted to collect and collate information from England and Wales, Scotland and Northern Ireland to give estimates of costs and returns from the production of wheat and barley in the United Kingdom. The financial results for the three crops recorded on the survey are given in Table 2.1. For spring barley it has also been possible to show the financial results for the individual countries (Table 2.3). It must be pointed out however that the financial results for the separate countries are not primarily intended to provide national yield and financial comparisons. The sample was designed to be representative of cereal production in the United Kingdom and, as might be expected given the distribution of cereal growing in the United Kingdom, this has resulted in considerable variation in sample size for the individual countries. There are obvious problems when attempting to compare relatively large and very small samples. Furthermore although all three crops were well represented on the sample farms of England and Wales, the five farms from Northern Ireland grew only spring barley, while in Scotland only six farms grew winter wheat and one winter barley. Nevertheless the information collected on the survey does show certain interesting differences in the pattern of cereal production within the countries which make up the United Kingdom.

Table 2.1 United Kingdom Costs and Returns of Winter Wheat, Spring Barley and Winter Barley Production, Harvest Year 1979/80

	Winter Wheat		Spring Barley		Winter Barley	
Yield tonnes per ha.	5.34	(1.1)	4.12	(0.9)	4.66	(0.9)
Value of output	£		£		£	
Grain	520.8	(106.2)	383.2	(85.4)	432.4	(91.1)
Straw	12.8	(13.9)	26.4	(17.9)	23.3	(16.4)
Total	533.6	(106.3)	409.6	(89.0)	455.6	(94.0)
Variable costs						
Seed	30.5	(7.6)	28.5	(8.2)	27.2	(7.3)
Fertilizer	48.0	(14.4)	38.5	(12.1)	47.5	(16.6)
Sprays	35.0	(20.6)	17.6	(12.5)	31.5	(19.6)
Contract	7.1	(14.3)	6.7	(15.4)	5.5	(14.3)
Miscellaneous	1.5	(2.1)	2.4	(3.1)	2.1	(2.2)
Total	122.1	(32.8)	93.7	(26.1)	113.8	(34.9)
Gross margin	411.5	(109.3)	315.9	(92.2)	341.8	(100.5)
Fixed costs						
Labour – direct	21.5	(8.2)	22.0	(8.6)	21.6	(8.1)
– overhead	18.3	(18.8)	17.4	(21.3)	17.0	(17.5)
– Total	39.8	(19.9)	39.4	(22.8)	38.6	(18.3)
Machinery	68.2	(19.5)	65.8	(20.5)	68.9	(19.3)
Rent and rates	62.4	(17.4)	59.3	(19.1)	62.2	(16.4)
Other overheads	31.6	(5.9)	32.2	(6.1)	31.4	(6.1)
Total	202.0	(35.7)	196.8	(39.9)	201.1	(34.8)
Net margin	209.5	(107.5)	119.1	(93.2)	140.7	(100.2)
Cost per tonne	60.7	(17.8)	70.5	(18.2)	67.6	(16.9)
Average hectares of crop	71.0	(69.4)	49.9	(48.9)	32.9	(31.8)
Number of observations	239		279		196	

2.2 Financial Results for the United Kingdom

For the first time since this series of surveys started in 1971 winter wheat has become the most important crop in terms of cereal areas on the sample farms (see Table 2.2). For the United Kingdom 44 per cent of the total cereal area was planted to winter wheat compared with only 36 per cent in spring barley, the second most important crop. In England and Wales the difference was even more marked with almost 47 per cent planted to winter wheat and 32 per cent to spring barley. For England and Wales this is in marked contrast to earlier surveys where spring barley has been the more important crop with a ratio of about 60:40 to winter wheat. Clearly much of the decline in the importance of spring barley is due to the increase in the area now planted to winter barley. For the England and Wales sample the winter barley plantings accounted for almost 19 per cent

of the surveyed area in 1979, compared with less than four per cent of the wheat and barley plantings on the 1971 survey.

The results of the 1979/80 survey confirm the findings of the three previous studies and show that cereal producers have been justified in increasing the proportion of winter wheat in the total cereal area. For despite the higher level of variable inputs needed to grow winter wheat compared with spring barley, the greater average yield and higher selling price have given winter wheat an advantage in terms of gross and net margins over spring barley. In the surveys which have been carried out from 1971 onwards winter wheat has had, on average, a yield advantage of 0.88 tonnes per hectare over spring barley. At the crop cost levels recorded in the 1979/80 survey an extra yield of 0.34 tonnes per hectare would have been sufficient to offset the additional cost of growing winter wheat.

Table 2.2 Average per Farm Cereal and Crops and Grass Areas

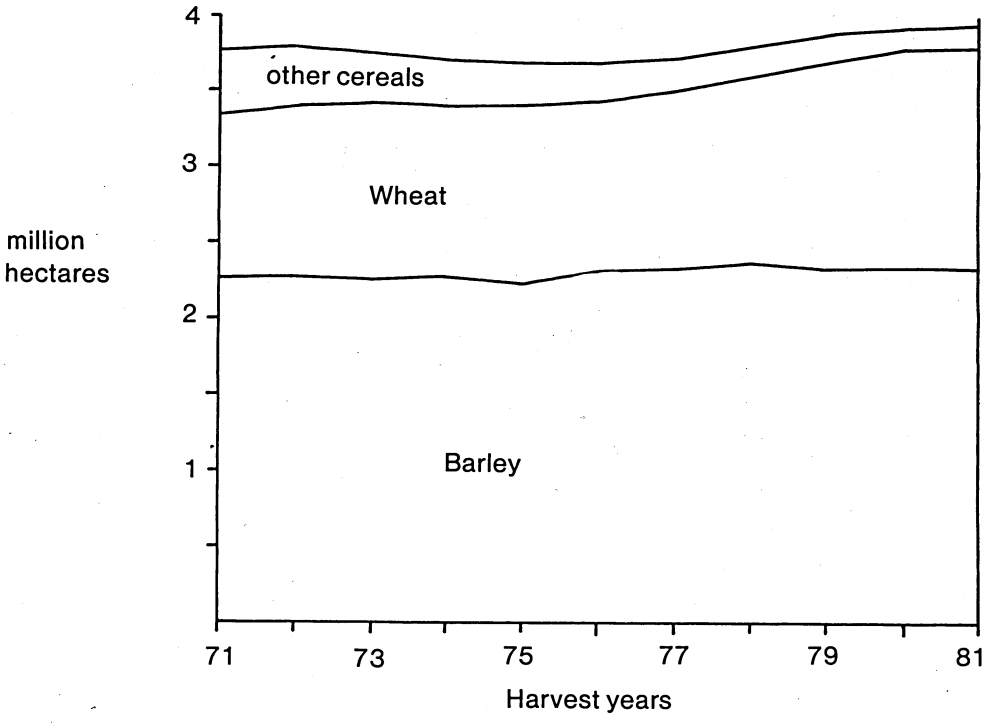
	United Kingdom		England and Wales		Scotland		Northern Ireland	
	ha.	per cent	ha.	per cent	ha.	per cent	ha.	per cent
Winter wheat	54.6	43.9	63.0	47.1	4.4	6.0	—	—
Spring barley	44.8	36.0	42.2	31.5	66.0	89.7	21.8	93.2
Winter barley	20.8	16.7	24.1	18.0	0.19	0.2	—	—
Other cereals	4.3	3.4	4.6	3.4	3.0	4.1	1.6	6.8
Total cereal area	124.5	100.0	133.9	100.0	73.6	100.0	23.4	100.0
Crops and grass area	210.3		222.2		146.1		75.4	
Proportion of cereals in crops and grass area, per cent	59.2		60.3		50.4		31.0	
Total farm area (ha.)	231.5		242.8		172.9		86.2	
Number of observations	311		267		39		5	

A similar but not so dramatic picture emerges when the results of growing spring barley are compared with winter barley production. The cost of variable inputs for the winter sown crop, particularly spray and fertilizer application, are more similar to the levels used for winter wheat than for spring barley. As a result the total variable costs of producing winter barley were £20.1 per hectare higher than the variable costs of the spring sown crop. In 1979/80 these higher production costs associated with winter barley were more than offset by a yield advantage of 0.54 tonnes per hectare or 13 per cent over spring barley. As winter barley has not been regularly included in cereal surveys since 1971 it is difficult to say whether the yield advantage of winter barley in 1979 is normal. However evidence from the Cambridge Farm Management Survey, where winter barley production has been recorded separately over the past decade, shows that on average winter barley has had a yield advantage of about 16 per cent over spring barley, ranging between years from 5 to almost 23 per cent.

2.3 Production by Country

A three year moving average (Fig. 2.1) shows that the total cereal area in the UK has increased by only four per cent from 1971 to 1980, and this increase has only occurred during the latter half of the period. Within the total cereal area there has been a more substantial change in the component crops. For example the wheat area, almost entirely in the form of winter wheat, has increased by one third, in part replacing cereals other than barley, in part representing an increase in the total cereal area. By contrast the area of barley has remained constant, although as shown by the national cereal surveys, and more recently census statistics, winter barley is becoming increasingly important at the expense of spring barley. But as can be seen from Table 2.2, in 1979/80 winter barley was then only of real importance in England and Wales; for in Scotland the area of spring barley has been expanding, in the main replacing oat plantings. Thus despite the overall evidence that spring barley is of declining importance in the UK, it was the only grain crop grown widely enough to allow a single crop comparison of cereal production between the individual countries.

Fig. 2.1 UK areas of wheat, barley, other grains and total cereals (three year moving average)



Source: MAFF Statistics.

For the 1979/80 spring barley crop the highest net margin and lowest unit cost of production was achieved by producers in Scotland (see Table 2.3). This financial advantage is, significantly, more the effect of higher yields rather than any marked saving in inputs compared with the UK average. By contrast the evidence suggests that producers in Northern Ireland had the lowest net margin and highest unit cost of production.

The problem for producers in the Province stems from an unusually high level of fixed costs, in particular the charges for rent and rates, and machinery, which together more than offset any advantage they had at the gross margin stage. In part these high fixed costs may be avoidable where, for example, the significantly higher charges for rent results from the practice of growing barley on land hired on a seasonal basis, normally for eleven months, at prices ranging from £100 to £200 per hectare. It may be much more difficult to avoid the high costs for machinery where this is the result of having only small areas of cereals over which to spread the total cost. The limited scale of cereal growing in Northern Ireland does give producers certain advantages, for example, the enhanced value of straw. The per tonne price advantage for grain however, which might have been expected in a region which needs to import substantial quantities of cereals, was less than expected. The evidence suggests that growers lacked the drying facilities to deliver grain at the contracted moisture content and as a result suffered price reductions.

The per tonne production cost in England and Wales is below that for Northern Ireland, mainly the effect of lower growing costs, but above the levels shown for Scotland where the significantly higher yield of spring barley was achieved with less than average production costs. For England and Wales the above average cost for sprays does not appear to be reflected in higher yields. (The more general question of yields related to inputs is considered in more depth in Chapter 6.)

The financial results for spring barley production on the sample farms in England and Wales generally fall between the range of results shown for Scotland and Northern Ireland. Due largely to a significantly lower yield the net margin in England and Wales is below that for Scotland and the per tonne cost of production higher. In part these slightly poorer results in England and Wales may relate to the declining importance of spring barley. Generally when spring barley and winter wheat are both grown the barley would normally occupy a less favourable position in the rotation. Now with winter barley growing in importance in England and Wales the spring crop may occupy an even less favourable position in the rotation or indeed the production of spring barley may be becoming concentrated on to soils which are less suitable for either winter barley or winter wheat. By contrast spring barley has become increasingly important in Scotland and now, as also in Northern Ireland, is overwhelmingly the most important single cereal crop.

A measure of the economic significance of the differences between the composition of the total cereal crop can be demonstrated by comparing the financial results for winter wheat, spring barley and winter barley aggregated into a combined cereal crop as shown in Table 2.4. As can be seen the previous rankings for spring barley production are now substantially changed. Whereas Scotland had the highest yield of spring barley, England and Wales had the highest combined cereal yield.

Table 2.3 Costs and Returns of Spring Barley Production, Harvest Year 1979/80

	United Kingdom		England and Wales		Scotland		Northern Ireland		Statistically significant differences
Yield tonnes per ha.	4.12	(0.9)	4.09	(0.9)	4.35	(0.7)	3.90	(0.6)	Sc. > EW
Value of output	£		£		£		£		
Grain	383.2	(85.4)	381.1	(88.3)	397.0	(68.3)	375.7	(68.8)	None
Straw	26.4	(17.9)	23.9	(16.2)	34.7	(7.1)	79.9	(43.9)	NI > Sc. EW, Sc. > EW
Total	409.6	(89.0)	405.0	(91.0)	431.7	(69.7)	455.6	(108.5)	NI > EW
Variable costs									
Seed	28.5	(8.2)	27.6	(7.2)	33.9	(11.8)	29.1	(4.5)	Sc. > EW
Fertilizer	38.5	(12.1)	38.4	(12.0)	39.1	(12.9)	36.4	(14.7)	None
Sprays	17.6	(12.5)	19.0	(12.8)	10.7	(8.5)	6.8	(2.6)	EW > Sc. NI
Contract	6.7	(15.4)	5.1	(13.3)	15.7	(21.1)	16.8	(28.9)	EW < Sc. NI
Miscellaneous	2.4	(3.1)	2.3	(2.9)	3.0	(4.1)	2.7	(1.9)	None
Total	93.7	(26.1)	92.4	(24.9)	102.4	(31.9)	91.8	(31.0)	Sc. > EW
Gross margin	315.9	(92.2)	312.6	(93.4)	329.3	(80.4)	363.8	(118.5)	None
Fixed costs									
Labour – direct	22.0	(8.6)	21.6	(8.2)	22.4	(9.1)	36.9	(10.7)	NI > EW, Sc.
– overhead	17.4	(21.3)	17.7	(20.3)	17.4	(27.4)	2.8	(3.0)	None
– Total	39.4	(22.8)	39.3	(21.6)	39.8	(30.5)	39.7	(9.6)	None
Machinery	65.8	(20.5)	65.7	(19.3)	62.5	(23.7)	96.7	(27.3)	NI > EW Sc.
Rent and rates	59.3	(19.1)	61.2	(17.4)	43.3	(16.0)	96.6	(29.0)	NI > EW Sc., EW > Sc.
Other overheads	32.3	(6.1)	32.2	(6.0)	32.5	(6.9)	34.9	(8.1)	None
Total	196.8	(39.9)	198.4	(36.4)	178.1	(44.9)	267.9	(62.6)	NI > EW Sc., EW > Sc.
Net margin	119.1	(93.2)	114.2	(94.1)	151.2	(85.5)	95.9	(59.6)	Sc. > EW
Cost per tonne £	70.5	(18.2)	71.1	(18.3)	64.5	(15.4)	91.3	(11.6)	NI > Sc. EW, EW > Sc.
Average hectares of crop	49.9	(48.9)	47.9	(45.9)	65.6	(64.2)	21.8	(8.2)	Sc. > EW, NI
Number of observations	279		235		39		5		

Table 2.4 Costs and Returns of the Combined Cereal Crop (W. Wheat, S. Barley, W. Barley) Harvest Year 1979/80

	United Kingdom		England and Wales		Scotland		Northern Ireland		Statistically significant differences
Yield tonnes per ha.	4.67	(0.9)	4.72	(0.9)	4.43	(0.8)	3.94	(0.7)	EW > NI Sc.
Value of output	£		£		£		£		
Grain	443.0	(94.5)	449.7	(95.3)	405.8	(80.6)	375.7	(68.8)	EW > NI Sc.
Straw	21.9	(17.0)	19.1	(14.4)	34.1	(6.7)	79.9	(43.9)	Sc. > EW, NI > EW Sc.
Total	464.9	(92.2)	468.8	(93.4)	439.9	(81.0)	455.6	(108.5)	EW > Sc.
Variable costs									
Seed	29.1	(7.2)	28.4	(6.1)	34.3	(11.5)	29.1	(4.5)	Sc. > EW
Fertilizer	43.6	(12.1)	44.3	(11.9)	39.6	(12.5)	36.4	(14.7)	EW > Sc.
Sprays	26.4	(17.9)	29.1	(17.7)	11.0	(8.4)	6.8	(2.6)	EW > NI Sc.
Contract	8.1	(16.2)	6.8	(14.7)	15.7	(21.1)	16.8	(28.9)	Sc. > EW
Miscellaneous	2.1	(2.7)	1.9	(2.5)	3.0	(4.1)	2.7	(1.9)	Sc. > EW
Total	109.4	(29.8)	110.5	(29.6)	103.6	(30.4)	91.8	(31.0)	None
Gross margin	355.6	(90.2)	358.2	(89.8)	336.3	(89.8)	363.8	(118.5)	None
Fixed costs									
Labour – direct	22.0	(8.5)	21.7	(8.1)	22.4	(9.1)	36.9	(10.7)	NI > EW, Sc.
– overhead	18.0	(21.0)	18.3	(20.0)	17.5	(27.5)	2.8	(3.0)	None
– Total	40.0	(22.3)	40.0	(21.1)	39.9	(30.5)	39.7	(9.6)	None
Machinery	66.8	(20.4)	66.9	(19.4)	62.5	(23.7)	96.7	(27.3)	NI > Sc. EW
Rent and rates	60.2	(19.2)	62.0	(17.6)	43.3	(16.0)	96.6	(29.0)	EW > Sc., NI > Sc. EW
Other overheads	32.0	(6.1)	31.9	(5.9)	32.5	(6.9)	34.9	(8.1)	None
Total	199.0	(40.2)	200.8	(37.2)	178.1	(44.8)	267.9	(62.6)	EW > Sc., NI > Sc. EW
Net margin	156.6	(90.7)	157.5	(90.9)	158.2	(91.9)	95.9	(59.6)	None
Cost per tonne	66.0	(15.7)	66.0	(15.5)	63.6	(15.3)	91.3	(11.6)	NI > Sc. EW
Average hectares of crop	110.9		129.2		70.1		21.8		
Number of observations	311		267		39		5		

The advantage the increased yield previously gave producers in Scotland, in terms of unit cost of production and net margin, has virtually disappeared. The sample farms in Northern Ireland, with no wheat or winter barley to boost yields, now have a lower level of output than England and Wales compared with significantly higher levels of output when the comparison is made for spring barley only.

The financial results for the combined cereal crop emphasize the critical importance of winter wheat in England and Wales and the effect this crop is having on cereal production in the UK. The results also highlight the less advantageous position of growers in regions where winter wheat grows less successfully.

CHAPTER 3 COSTS AND RETURNS BY REGION

3.1 Introduction

There is evidence in Chapter 2 to suggest that the small sample of cereal growers in Northern Ireland had lower net margins and higher unit costs of production than the average for the United Kingdom as a whole. This result was in marked contrast to the findings of the 1971 and 1972 surveys when a regional comparison for England and Wales showed relatively few and only small differences in production costs between the intensive cereal growing counties and the mainly grassland counties in the west. The results of this current survey suggest that, for 1979/80 at least, the inclusion of Scotland and Northern Ireland has identified more substantial differences in cereal production than were apparent within England and Wales. To consider the possibility of these differences occurring within countries as well as between them, a regional analysis has been undertaken. For this comparison only England and Wales and Scotland have sufficiently large samples to sub-divide into groups for a regional comparison. Even so there are again difficulties when comparing relatively large sub-samples with small sub-samples.

For the purpose of this analysis England and Wales have been divided into two regions, an intensive region which includes all those counties with 40 or more per cent of cereals in the crops and grass area, whilst counties with less than 40 per cent cereals form an extensive region. For Scotland this method of sub-division was less practicable and the country has been divided by College of Agriculture regions, the Aberdeen sample (see Fig. 3), forming a Northern region and the East and West Colleges (Edinburgh and Glasgow) a Southern region.[1] Following on from Chapter 2, the comparison is made using production costs and levels of output from a combined crop of winter wheat, spring barley and winter barley.

3.2 Financial Results

(a) Regions in England and Wales

The financial results of the analysis are given in Table 3.1, and to show the proportions of each crop which make up the combined cereal crop by region, an average per farm cereal and crops and grass area is given in Table 3.2. Two features of the analysis are immediately apparent; firstly the relatively small differences in levels of output and production costs between the Intensive and Extensive regions of England and Wales and, secondly by contrast the evidence of more substantial differences between the Southern and Northern regions of Scotland.

Whilst in terms of output and margins, both gross and net, the results from the two regions in England and Wales are similar, there are important differences in both the component costs which make up the total and the blend of cereals in the combined crop. In the Extensive region spring barley is the most widely grown cereal crop and winter wheat considerably less important than in the Intensive region.

However this does not give growers in the Intensive region the financial advantage which might have been expected from having a higher proportion of wheat in the cereal area. The main reason is that spring barley producers in the cereal Intensive region have generally lower yields and higher variable costs of production, particularly for sprays and fertilizers, than spring barley growers in the Extensive region. Thus although producers in the Extensive region have an average combined cereal yield which is slightly lower than in the Intensive region, the greater value of straw and a saving in variable inputs has resulted in a gross margin which is virtually identical with the Intensive region.

The Extensive region also has an advantage in total fixed costs. For despite a lower direct labour input in the Intensive region, this the effect of saving less straw, the much higher overhead labour element has resulted in significantly higher total labour costs in these main cereal growing counties. In addition substantially higher rents were recorded in the Intensive region resulting in a higher overall level of fixed costs than in the Extensive region. This higher level of fixed costs in the Intensive region has resulted in a lower net margin and higher unit cost of production.

(b) Regions in Scotland

In Scotland regional differences are more obvious although in this case relating to levels of output and costs of production rather than the components of the combined cereal crop, for in both regions spring barley is overwhelmingly the most important single cereal crop. From the analysis it is clear that the results for the Northern region fall well below the levels achieved by the sample farms in the Southern region. Yield, level of output, gross and net margins are not only significantly lower than the Southern region in Scotland but also for both regions in England and Wales. Nor is there any compensatory effect of lower costs, variable or fixed, to offset the lower yield and as a result the unit cost per tonne of grain at £76.0 per tonne, is 15 per cent higher than the UK average. For the producers in the North of Scotland the margin (to compensate management and investment) on a tonne of grain was only £15.9, little more than half the £29.0 per tonne margin achieved by growers in the Intensive region of England and Wales.

[1] A list of the counties forming the four regions is appended in Table 3.3.

Table 3.1 Costs and Returns of Combined Cereal Production, by Region, Harvest Year 1979/80

Group	United Kingdom	England and Wales: Intensive region 1	England and Wales: Extensive region 2	Scotland: Southern region 3	Scotland: Northern region 4	Statistically significant differences at 10 per cent level
Yield tonnes per ha.	4.67 (0.9)	4.75 (0.9)	4.62 (0.9)	4.74 (0.7)	3.87 (0.6)	1, 3, 2 > 4
Value of output			£ per hectare			
Grain	443.0 (94.5)	455.5 (96.7)	432.9 (89.6)	433.8 (81.5)	355.8 (51.4)	1, 3, 2 > 4. 1 < 2
Straw	21.9 (17.0)	15.7 (13.7)	28.9 (12.0)	34.9 (5.1)	32.8 (9.0)	3, 4, 2 > 1. 3 < 2
Total	464.9 (92.2)	471.2 (94.7)	461.8 (89.8)	468.6 (80.6)	388.6 (52.5)	1, 3, 2 > 4
Variable costs						
Seed	29.1 (7.2)	28.3 (6.1)	28.5 (6.3)	35.6 (12.7)	31.9 (8.9)	3, 4 > 1, 2
Fertilizer	43.6 (12.1)	44.9 (11.5)	42.6 (12.7)	37.7 (13.2)	42.8 (11.0)	1, 2 > 3
Sprays	26.4 (17.9)	31.5 (17.7)	21.9 (15.8)	9.9 (7.7)	13.1 (9.4)	1, 2 > 3, 4
Contract	8.1 (16.2)	6.6 (15.1)	7.6 (13.6)	14.4 (22.9)	18.0 (18.0)	4 > 1, 2. 3 > 1, 2
Miscellaneous	2.1 (2.7)	1.5 (2.1)	3.3 (3.0)	3.5 (4.8)	2.1 (2.4)	3, 2 > 1
Total	109.4 (29.8)	112.9 (29.2)	103.8 (29.8)	101.1 (34.2)	107.9 (22.7)	1 > 3, 2
Gross margin	355.6 (90.2)	358.3 (91.5)	358.0 (85.4)	367.5 (94.5)	280.7 (43.5)	3, 1, 2 > 4
Fixed costs						
Labour – direct	22.0 (8.5)	20.7 (8.2)	24.6 (7.2)	21.2 (8.4)	21.2 (8.4)	2 > 1
– overhead	18.3 (21.4)	21.2 (21.5)	11.1 (14.3)	16.2 (29.3)	21.2 (27.3)	1 > 2
– Total	40.3 (22.3)	41.9 (22.6)	35.7 (15.1)	37.4 (32.5)	42.4 (27.5)	1 > 2
Machinery	66.8 (20.4)	67.3 (19.4)	65.8 (19.3)	63.3 (21.4)	61.1 (28.1)	None
Rent and rates	60.2 (19.2)	64.8 (17.8)	53.8 (14.1)	38.8 (10.6)	51.2 (20.9)	1, 2, 4 > 3. 1 > 4, 2
Other overheads	32.0 (6.1)	31.3 (5.7)	33.6 (6.2)	33.0 (6.2)	31.4 (8.0)	2 > 1
Total	199.3 (40.2)	205.1 (38.0)	188.9 (31.9)	172.5 (44.6)	186.1 (45.8)	1 > 3, 4, 2
Net margin	156.3 (90.7)	153.2 (91.4)	169.1 (89.0)	195.0 (89.7)	94.6 (55.2)	3, 2, 1 > 4
Cost per tonne	66.1 (15.7)	66.9 (15.8)	63.4 (13.9)	57.7 (12.8)	76.0 (13.9)	4, 1 > 3, 2. 4 > 1
Average hectares of crop	110.9	141.9	92.3	63.4	83.4	
Number of observations	311	199	68	25	14	

Table 3.2 Average per Farm Cereal and Crops and Grass Areas

	United Kingdom		England and Wales				Scotland			
			Intensive region		Extensive region		Southern region		Northern region	
	ha.	per cent	ha.	per cent	ha.	per cent	ha.	per cent	ha.	per cent
Winter wheat	54.6	43.9	73.0	50.0	33.7	34.5	6.9	10.2	—	—
Spring barley	44.8	36.0	41.6	28.4	43.9	44.9	56.6	83.6	82.8	99.0
Winter barley	20.8	16.7	27.4	18.7	14.7	15.0	—	—	0.5	0.6
Other cereals	4.3	3.4	4.3	2.9	5.4	5.6	4.2	6.2	0.3	0.4
Total cereal area	124.5	100.0	146.3	100.0	97.7	100.0	67.7	100.0	83.6	100.0
Crops and grass area	210.3		232.8		193.6		143.4		150.1	
Proportion of cereals in crops and grass area, per cent	59.2		62.8		50.5		47.2		55.7	
Total farm area (ha.)	231.5		246.4		232.2		171.7		175.0	
Number of observations	311		199		68		25		14	

Table 3.3 Composition of Regions

1. England and Wales

(a) Intensive region (more than 40 per cent cereals)

Bedford	Cambridgeshire	Essex
Berkshire	Cleveland	
Buckingham		
Hampshire	Leicestershire	Merseyside
Hertford	Lincolnshire	
Humberside		
Norfolk	Oxford	Suffolk
Northampton		
Nottingham		
Tyne and Wear	Warwick	South Yorkshire
	Wiltshire	North Yorkshire (Northallerton)

(b) Extensive region (less than 40 per cent cereals)

Avon	Cheshire	Derbyshire
	Cornwall	Devon
	Cumbria	Dorset
		Durham
Gloucestershire	Hereford and Worcester	Isle of Wight
Greater Manchester		
Kent	Lancashire	North Yorkshire (Harrogate)
		Northumberland
Shropshire		West Midlands
Somerset		West Yorkshire and all Wales
Staffordshire		
Surrey		
Sussex (East and West)		

2. Scotland

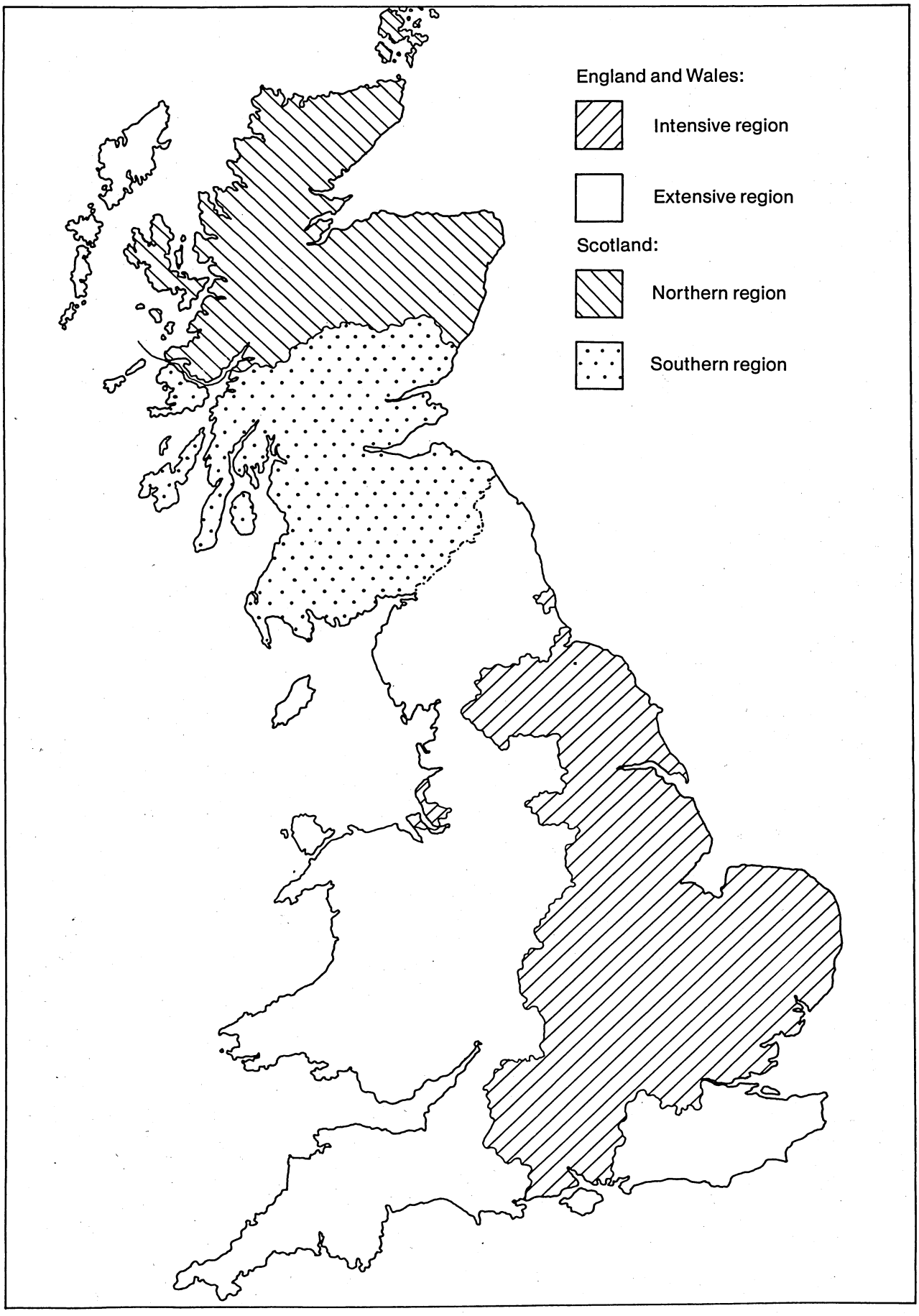
(a) Southern region

Borders	Central	Dumfries and Galloway
Fife	Lothian	Strathclyde and Tayside regions

(b) Northern region

Highland and Grampian regions

Fig. 3.1 Comparative Cereal Regions



CHAPTER 4 SIZE AND INTENSITY OF PRODUCTION

4.1 Introduction

Over the past three decades there has been a marked increase in the degree of specialization in the majority of farm enterprises and a general increase in unit size. In England and Wales it is clear that cereal production has not been excluded from this process. Some examples will demonstrate the extent of the changes which have occurred. Over the period the total number of holdings growing cereals has declined by 40 per cent whilst at the same time the total cereal area has increased by 15 per cent. The effect therefore has been twofold, firstly that the average size of cereal enterprise has doubled, from less than 20 to almost 40 hectares, secondly as the total number of holdings has declined cereal production has become more intensive on the farms which have continued to grow corn crops. To consider the effect of these changes the survey information has been re-analysed into groups based on (a) the size of cereal enterprise and (b) the proportion of cereals in the crops and grass area. The purpose of this chapter is to consider the results of these analyses.

4.2 Financial results by size of enterprise

A comparison by size of cereal unit is also likely to reflect regional differences in the pattern of cereal production. This is because on average the farms in the Eastern counties of England and Wales are larger than farms in the Western counties. In order to reduce this regional bias as far as possible only the sample farms in the Intensive region of England and Wales have been included in the analysis by size of cereal unit. For the comparison the farms have been re-grouped into six categories, details of the size strata are given in Table 4.1.

Table 4.1 Size Strata of Sample Farms

Group number	Cereal area From	To	Group number	Cereal area From	To
	hectares			hectares	
1	10.0	39.9	4	120.0	199.9
2	40.0	79.9	5	200.0	299.9
3	80.0	119.9	6	300.0	and over

The financial results of the analysis by size of cereal unit are given in Table 4.2, and again the comparison is made using a combined cereal crop of winter wheat, spring barley and winter barley. Overall it appears that the three groups of farms with more than 120 hectares of cereals have generally better results than the three groups of farms with cereal units of less than 120 hectares. The advantage for the larger scale producer is mostly the effect of higher yields rather than a saving in costs. In part the yield advantage for producers with more than 120 hectares of cereals results from these groups having a higher proportion of winter wheat and a lower proportion of spring barley in the cereal area (see Table 4.3).

Although the level of variable costs is not significantly different between the groups, physical inputs do change (see Table 4.4) and evidence of an upward trend as the size of cereal unit gets larger. However any tendency for variable costs to increase is more than outweighed by a saving in fixed costs on the larger units. Noticeably virtually all this saving in the level of fixed costs comes from a reduced labour requirement, both direct and overhead, for the large-scale producers.

A previous study showed that whilst the largest and smallest scale producers had similar results, more substantial differences in the levels of output and costs of production occurred between the intermediate groups. In contrast the evidence from this survey suggests that growers with more than 300 hectares of cereals have a substantial advantage over holdings producing less than 40 hectares of cereals. For whilst production costs for these two groups are very similar the large-scale producer has a yield and price advantage which results in a margin (to cover management and investment) of £34 per tonne compared with only £20 per tonne for growers with less than 40 hectares of cereals.

A general conclusion to this part of the analysis is that the large-scale producer appears to have certain advantages over the smaller units. This finding is in contrast to the 1971/72 surveys which suggested that farmers with more than 200 hectares of cereals were starting to show signs of diseconomies of size where in general increased production costs were not offset by higher yields.

4.3 Financial results by intensity of production

A measure of the effect of specialization which has taken place on cereal farms is shown in a further analysis where the sample farms have been re-grouped by the proportion of cereals in the crops and grass area. Again

this analysis is based on the combined cereal crop with details of the average per farm cereal and crops and grass areas shown in Table 4.6 and the financial results given in Table 4.5.

The evidence from this analysis shows that the many relatively smooth progressions which applied to increasing and decreasing size of cereal enterprise are less apparent in the results by intensity of production. In this case the two groups of farms which had on average from 50 to 80 per cent of cereals in the crops and grass area had uniformly better results than the three other groups. The main reason for this is the higher average yield of grain on these farms rather than a below average level of production costs. Those farms growing cereals less intensively, Groups 1 and 2, despite a wide rotation had lower average yields and levels of output, and were unable to balance this with a reduction in production costs. At the other extreme the most intensive producers, holdings with more than 80 per cent cereals, had a significantly lower average yield of grain than Group 4, with no savings in production costs. Overall the most intensive producers had the lowest gross and net margins and the highest unit cost of production.

Table 4.6 provides a partial explanation of the variation in results between the different intensity groups. Here there are similarities with the comparison by size of cereal enterprise where the two most successful intensity groups have the highest proportions of winter wheat in the cereal area. Although this crop requires a higher level of inputs, notably fertilizer and sprays, the individual crop analysis showed wheat to have an advantage over spring barley which more than offset the increased production costs. Several reasons appear to contribute to the less satisfactory results of the most intensive producers. These holdings have proportionately less winter wheat than the farms growing from 50 to 80 per cent cereals in the crops and grass area. Although for this survey the proportion of wheat (39.5 per cent) had increased substantially from the 26.9 per cent recorded in 1971/72. Despite this lower proportion of winter wheat the variable inputs of the most intensive producers (see Table 4.7) are similar to the inputs of the farms with 65 to 80 per cent cereals, whilst the average yield is significantly lower and more in line with less intensive cereal production. Previous cereal surveys have shown inputs of fertilizer and sprays are positively correlated with increasing intensity of production but not with yield.

In terms of fixed costs a high degree of specialization does not appear to give any obvious savings. Indeed the most intensive farms have the highest per hectare charge for labour, due almost entirely to the much higher levels of overhead labour. In total fixed costs are at a high level and on average the most intensive producers recorded the lowest net margin.

Table 4.2 Costs and Returns of Combined Cereal Production, by Size of Enterprise, Intensive Counties of England and Wales

Group... Size of cereal enterprise...	1 10 up to 40 ha.		2 40 up to 80 ha.		3 80 up to 120 ha.		4 120 up to 200 ha.		5 200 up to 300 ha.		6 More than 300 ha.		Statistically significant differences at the 10 per cent level
Yield tonnes per ha.	4.39	(1.0)	4.87	(0.8)	4.50	(1.0)	4.99	(1.0)	4.80	(0.8)	4.92	(0.8)	4, 6, 2, 5 > 1. 4, 6, 2 > 3
Value of output							£ per hectare						
Grain	409.0	(97.3)	465.6	(87.5)	431.3	(107.1)	478.7	(97.7)	461.0	(87.7)	484.1	(81.7)	6, 4, 2, 5 > 1. 6, 4 > 3
Straw	20.5	(13.0)	23.7	(17.9)	15.4	(11.6)	11.4	(10.6)	12.2	(11.5)	9.0	(8.6)	Most
Total	429.5	(96.4)	489.3	(84.6)	446.8	(102.9)	490.1	(98.2)	473.2	(87.5)	493.1	(80.9)	6, 4, 2 > 1, 3. 5 > 1
Variable costs													
Seed	28.7	(7.5)	29.8	(5.9)	26.8	(5.8)	27.7	(5.7)	27.5	(5.4)	29.7	(5.8)	6, 2 > 3
Fertilizer	40.0	(13.3)	43.9	(8.3)	45.1	(11.7)	45.6	(11.2)	48.4	(12.5)	47.4	(11.7)	5, 6, 4, 3 > 1
Sprays	21.7	(18.0)	29.4	(17.4)	30.5	(18.1)	35.8	(18.9)	35.4	(14.6)	36.4	(14.2)	6, 4, 5, 3, 2 > 1. 4 > 2
Contract	16.3	(28.8)	1.9	(3.2)	6.8	(13.0)	7.5	(15.3)	3.6	(5.5)	3.5	(4.1)	1 > 2, 6, 5, 3, 4. 4 > 2
Miscellaneous	2.3	(3.1)	2.2	(2.2)	1.1	(1.4)	0.9	(1.1)	1.5	(2.5)	0.8	(0.9)	1, 2 > 6, 4, 3
Total	109.1	(36.3)	107.2	(21.3)	110.3	(31.5)	117.6	(33.7)	116.5	(25.8)	117.7	(21.0)	None
Gross margin	320.3	(111.2)	382.1	(86.4)	336.5	(94.5)	372.6	(87.8)	356.7	(77.1)	375.4	(74.5)	2, 6, 4 > 1. 2, 4 > 3
Fixed costs													
Labour – direct	25.5	(10.3)	24.3	(8.3)	20.3	(6.9)	17.8	(5.7)	18.6	(8.7)	17.0	(4.7)	
– overhead	31.0	(35.5)	23.8	(26.5)	20.2	(13.9)	18.9	(12.7)	15.3	(13.0)	15.6	(10.3)	
– Total	56.5	(38.3)	48.1	(26.0)	40.5	(13.7)	36.7	(12.3)	33.9	(12.1)	32.6	(11.0)	1, 2 > 6, 5, 4. 1 > 3
Machinery	56.0	(25.8)	76.1	(19.3)	66.6	(14.8)	68.4	(19.0)	66.3	(16.1)	67.1	(14.2)	2 > others. 1 < others
Rent and rates	64.9	(20.9)	63.3	(17.9)	63.7	(20.5)	65.5	(15.7)	64.4	(19.3)	68.2	(11.7)	None
Other overheads	35.2	(4.5)	31.9	(5.9)	31.3	(6.5)	29.0	(4.9)	30.7	(6.1)	30.7	(4.5)	1, 2, 3 > 4. 1 > others
Total	212.6	(55.4)	219.5	(39.9)	202.1	(29.0)	199.5	(32.4)	195.2	(33.9)	198.5	(27.3)	2 > 5, 6, 4, 3. 1 > 5
Net margin	107.7	(98.8)	162.6	(106.9)	134.4	(85.6)	173.1	(83.9)	161.5	(77.5)	176.9	(71.5)	4, 6 > 1, 3. 2, 5 > 1
Cost per tonne	73.3	(16.7)	67.1	(19.7)	69.4	(18.7)	63.5	(12.2)	64.9	(11.7)	64.3	(9.3)	1, 3 > 4, 6. 1 > 5, 2
Excluding straw handling													
Direct labour cost	20.6	(8.7)	20.1	(5.9)	17.4	(5.3)	15.7	(4.9)	16.7	(8.0)	15.1	(3.9)	2 > 6, 4, 5, 3
Machinery cost	47.9	(24.1)	67.0	(18.3)	59.7	(12.5)	63.8	(18.1)	61.5	(15.1)	62.6	(13.6)	Others > 1. 2 > 3
Number of observations	30		39		35		43		28		24		

Table 4.3 Average per Farm Cereal and Crops and Grass Areas – Intensive Counties of England and Wales

Size of cereal enterprise	10 up to 40 ha.		40 up to 80 ha.		80 up to 120 ha.		120 up to 200 ha.		200 up to 300 ha.		More than 300 ha.	
	ha.	per cent	ha.	per cent	ha.	per cent	ha.	per cent	ha.	per cent	ha.	per cent
Winter wheat	7.2	29.6	26.2	42.0	43.3	45.3	79.3	52.0	115.3	46.9	213.6	56.0
Spring barley	12.0	49.4	21.4	34.3	32.8	34.3	42.1	27.6	72.9	29.7	86.6	22.7
Winter barley	4.4	18.1	12.7	20.4	16.6	17.4	26.8	17.6	49.7	20.2	70.5	18.5
Other cereals	0.7	2.9	2.1	3.3	2.9	3.0	4.4	2.8	7.8	3.2	10.9	2.8
Total cereal area	24.3	100.0	62.4	100.0	95.6	100.0	152.6	100.0	245.7	100.0	381.6	100.0
Crops and grass area	52.0		108.9		161.1		228.9		387.5		591.6	
Proportion of cereals in crops and grass area (per cent)	46.7		57.3		59.3		66.7		63.4		64.5	
Total farm area (ha.)	56.0		114.3		169.2		237.5		416.6		628.8	
Number of observations	30		39		35		43		28		24	

Table 4.4 Comparison of Physical Characteristics, Combined Cereal Crop, by Size of Cereal Enterprise, Intensive Counties of England and Wales

Group...	1		2		3		4		5		6	
Size of cereal enterprise...	10 up to 40 ha.		40 up to 80 ha.		80 up to 120 ha.		120 up to 200 ha.		200 up to 300 ha.		More than 300 ha.	
Yield tonnes per ha.	4.39	(1.0)	4.87	(0.8)	4.50	(1.0)	4.99	(1.0)	4.80	(0.8)	4.92	(0.8)
Seed (kg per ha.)	168.5	(20.0)	173.4	(21.7)	165.4	(17.9)	171.4	(21.3)	181.3	(81.0)	169.9	(17.5)
Fertilizer												
Nitrogen (kg per ha.)	92.4	(34.9)	109.9	(24.0)	110.6	(35.2)	121.2	(30.4)	124.0	(33.0)	128.2	(38.7)
Phosphate (kg per ha.)	35.2	(22.7)	39.2	(13.7)	48.1	(21.1)	45.4	(14.9)	46.5	(19.3)	40.4	(16.3)
Potash (kg per ha.)	36.7	(22.1)	36.5	(18.7)	39.8	(18.8)	37.4	(23.1)	43.2	(21.5)	40.1	(25.5)
Per cent of crop area sprayed with												
annual weed herbicides	89.8	(23.7)	78.0	(27.6)	75.6	(28.8)	84.8	(23.0)	70.0	(31.7)	68.8	(32.5)
grass weed herbicides	35.2	(47.8)	56.7	(46.1)	72.6	(60.3)	70.2	(52.6)	74.3	(50.4)	74.5	(41.5)
fungicides	35.9	(42.8)	64.5	(65.2)	63.2	(78.1)	87.0	(67.9)	71.5	(64.4)	80.8	(57.1)
straw shorteners	1.9	(7.2)	22.8	(37.0)	16.7	(30.2)	22.2	(28.2)	14.1	(24.0)	25.4	(29.0)
pesticides	4.0	(21.9)	14.6	(34.7)	5.5	(18.7)	7.6	(18.9)	6.6	(14.3)	21.3	(29.0)
trace elements	—	—	3.0	(11.0)	3.3	(12.6)	1.5	(6.9)	5.3	(19.3)	0.2	(1.0)
Man-hours per ha.												
(a) total	14.8	(6.0)	14.1	(4.8)	11.8	(4.0)	10.3	(3.3)	10.8	(5.1)	9.9	(2.7)
(b) excluding straw handling	12.0	(5.1)	11.7	(3.4)	10.1	(3.1)	9.1	(2.8)	9.7	(4.7)	8.8	(2.3)
Number of observations	30		39		35		43		28		24	

Table 4.5 Costs and Returns of Combined Cereal Production, by Intensity of Production

Group...	1	2	3	4	5	Statistically significant differences at the 10 per cent level
Intensity of production...	Up to 35%	From 35 to 50%	From 50 to 65%	From 65 to 80%	More than 80%	
Yield tonnes per ha.	4.45 (1.0)	4.55 (1.0)	4.70 (0.9)	4.88 (1.0)	4.47 (0.7)	4 > 1, 5, 2
Value of output			£ per hectare			
Grain	412.0 (97.5)	426.2 (102.8)	449.7 (88.1)	465.6 (97.3)	429.8 (73.6)	4, 3 > 1. 4 > 1, 2, 5
Straw	36.2 (21.2)	29.2 (14.8)	22.3 (12.3)	13.6 (14.8)	15.0 (18.6)	Most
Total	448.2 (97.4)	455.4 (99.9)	472.0 (86.0)	479.2 (96.5)	444.8 (76.2)	4 > 5
Variable costs						
Seed	31.5 (9.3)	29.4 (8.2)	29.3 (7.1)	28.1 (6.1)	28.3 (5.8)	1 > 4, 5
Fertilizer	35.9 (13.8)	41.0 (11.9)	45.1 (11.1)	46.5 (10.2)	44.5 (13.8)	4, 3, 5, 2 > 1. 4, 3 > 2
Sprays	14.7 (16.0)	21.2 (15.7)	25.3 (16.4)	34.5 (19.0)	30.2 (15.3)	Most
Contract	19.8 (26.5)	8.5 (16.3)	5.9 (13.2)	5.4 (12.6)	9.2 (14.7)	1 > 4, 3, 2, 5
Miscellaneous	4.6 (3.8)	2.6 (2.5)	2.2 (2.9)	1.0 (1.7)	1.0 (1.2)	Most
Total	106.4 (34.6)	102.8 (30.9)	107.8 (26.5)	115.5 (30.6)	113.2 (27.8)	4, 5 > 2. 4 > 3
Gross margin	341.8 (101.7)	352.6 (93.4)	364.1 (87.9)	363.7 (88.8)	331.7 (81.9)	4, 3 > 5
Fixed costs						
Labour – direct	27.1 (8.6)	24.3 (8.1)	21.0 (7.9)	19.5 (8.1)	20.0 (7.8)	
– overhead	8.8 (20.1)	13.9 (25.4)	14.4 (12.6)	22.6 (18.3)	33.6 (29.3)	
– Total	35.9 (21.4)	38.3 (6.0)	35.4 (14.1)	42.1 (20.1)	53.6 (32.2)	5, 4 > 3. 5 > others
Machinery	65.0 (25.8)	69.5 (21.4)	67.1 (17.6)	65.4 (20.3)	66.2 (20.9)	None
Rent and rates	57.6 (27.0)	58.0 (20.3)	59.6 (16.7)	62.9 (19.6)	61.9 (13.6)	None
Other overheads	34.7 (6.9)	36.0 (6.0)	32.8 (5.3)	29.0 (4.6)	27.8 (4.1)	Most
Total	193.3 (54.6)	201.7 (48.2)	194.8 (28.1)	199.4 (37.4)	209.4 (43.2)	5 > 1, 3
Net margin	148.6 (93.6)	150.9 (104.2)	169.3 (86.0)	164.3 (87.0)	122.2 (76.7)	3, 4, 2 > 5
Cost per tonne	67.3 (17.1)	66.9 (19.2)	64.3 (13.4)	64.5 (15.1)	72.1 (13.5)	5 > 3, 4
Average hectares of crop	25.1	93.1	132.1	161.4	123.5	
Number of observations	32	64	94	85	36	

Table 4.6 Average per Farm Cereal and Crops and Grass Areas

Proportion of cereals in crops and grass area, per cent	Less than 35% cereals		From 35 to 50%		From 50 to 65%		From 65 to 80%		More than 80%	
	ha.	per cent	ha.	per cent	ha.	per cent	ha.	per cent	ha.	per cent
Winter wheat	7.3	27.0	34.9	35.3	65.0	44.8	77.7	47.3	50.0	39.5
Spring barley	14.4	53.2	45.8	46.5	49.3	35.5	48.6	29.6	48.8	38.6
Winter barley	3.4	12.4	12.4	12.6	17.8	12.8	35.1	21.4	24.7	19.6
Other cereals	2.0	7.4	5.5	5.6	6.8	4.9	2.7	1.7	2.9	2.3
Total cereal area	27.0	100.0	98.6	100.0	138.9	100.0	164.2	100.0	126.4	100.0
Crops and grass area	109.8		227.8		240.7		230.2		146.3	
Proportion of cereals in crops and grass area (per cent)	24.6		42.8		57.6		71.9		88.1	
Total farm area (ha.)	119.0		277.7		255.5		243.0		159.4	
Number of observations	32		64		94		85		36	

Table 4.7 Comparison of Physical Characteristics, by Intensity of Production, Combined Cereal Crop

Group...	1		2		3		4		5	
Intensity of production...	Up to 35%		From 35 to 50%		From 50 to 65%		From 65 to 80%		More than 80%	
Yield tonnes per ha.	4.45	(1.0)	4.55	(1.0)	4.70	(0.9)	4.88	(1.0)	4.47	(0.7)
Seed (kg per ha.)	180.5	(24.5)	170.2	(22.1)	172.4	(21.8)	176.6	(49.5)	170.0	(18.0)
Fertilizer										
Nitrogen (kg per ha.)	72.0	(27.4)	92.3	(34.9)	105.4	(34.6)	121.0	(32.7)	110.1	(37.7)
Phosphate (kg per ha.)	38.7	(22.8)	39.8	(15.6)	43.5	(19.1)	43.1	(15.9)	42.8	(15.1)
Potash (kg per ha.)	40.3	(25.4)	38.4	(17.8)	43.3	(21.5)	37.2	(18.9)	39.8	(17.9)
Per cent of crop area sprayed with										
annual weed herbicides	85.6	(32.7)	86.1	(25.7)	78.1	(29.8)	77.0	(29.0)	76.3	(28.9)
grass weed herbicides	16.5	(30.2)	32.0	(44.8)	46.6	(46.1)	72.0	(57.0)	66.8	(52.0)
fungicides	17.3	(37.2)	43.4	(53.5)	53.6	(59.3)	86.0	(82.3)	74.6	(86.8)
straw shorteners	2.7	(10.8)	9.4	(26.5)	14.4	(25.6)	21.2	(29.4)	16.3	(24.7)
pesticides	7.1	(27.1)	3.7	(15.4)	7.8	(19.8)	11.0	(26.5)	3.1	(11.3)
trace elements	2.6	(14.5)	2.3	(12.7)	5.2	(19.5)	1.0	(4.8)	5.0	(16.8)
Man-hours per ha.										
(a) Total	16.2	(5.0)	14.4	(4.7)	12.3	(4.6)	11.4	(4.7)	11.6	(4.6)
Number of observations	32		64		94		85		36	
(b) Excluding contract and straw handling	13.0	(4.6)	11.8	(3.3)	10.1	(3.0)	10.3	(4.0)	12.1	(4.5)
Number of observations	14		33		49		45		16	

CHAPTER 5 MARKETING AND STORAGE

5.1 Introduction

Whilst previous surveys have provided a break-down of grain disposals by the proportion of cereals retained for use on the farm or sold off the farm, they have not been able to examine possible differences in financial returns from the various marketing options open to producers, nor the effect the choice of marketing might have on the final price of grain. This present survey has attempted to examine in greater detail the timing and method of marketing grain. The purpose of this chapter is to consider firstly the disposal of the total grain on the survey farms, secondly the type of outlet used to market grain sold off the farm, and thirdly the possible benefits which may accrue from choosing a particular marketing system.

5.2 Disposals

(a) Retained on farm

The proportions of grain retained on the farm are given as part of a larger table (Table 5.1) showing the break-down of total grain disposals. As can be seen it is only barley which is retained in any substantial quantity for use on the farm. A much smaller proportion of the wheat crop is retained on the farm for consumption by livestock, even though the support system for wheat and barley is on the same basis. This may be partly the effect of reduced livestock numbers in the main wheat growing areas, for example the particular use of wheat in poultry rations and the relatively small number of poultry enterprises on cereal growing farms. It may also be due to the fact that wheat is generally easier to sell than barley when the market is in surplus. For all three cereals retentions for seed make up a very small part of total production.

Table 5.1 Disposal of Grain by Proportions

	Winter wheat		Spring barley		Winter barley	
Used on farm						
for seed	0.6		0.7		0.9	
for feed	3.4		19.2		13.8	
Total used on farm	4.0		19.9		14.7	
Sales to		Average price £		Average price £		Average price £
merchants	79.7	98.8	68.5	94.3	72.5	93.0
co-operatives/groups	16.0	97.4	9.5	92.4	12.2	92.3
other farmers	0.3	95.1	2.1	88.3	0.6	85.5
Total sold off farm	96.0		80.1		85.3	
Total	100.0		100.0		100.0	

(b) Sales of grain

Grain sold off the farm was recorded in three categories, as seed, for human use (in milling or malting), and wheat and barley intended for compounding. The proportions of the three crops sold in each category with the average per tonne prices received are given in Table 5.2. For all three crops, grain sold for seed attracted the uniformly highest price whereas the premiums for milling wheat and malting barley were more variable.

Over the season as a whole milling wheat earned an average premium of almost £4 per tonne and each month the price of milling wheat was consistently higher than the price of feeding wheat. Winter barley had the biggest differential between grain sold for compounding or malting, in part the difference is magnified by a below average price for feed grain. The premium for winter barley sold for malting was again apparent in every month. In contrast to both winter wheat and winter barley, spring barley showed little premium over the season as a whole for grain sold for malting as opposed to feed. There were however more marked fluctuations in the monthly average prices such that in one month spring barley sold for malting earned on average a premium of £9 per tonne whilst during other periods there was little difference in the average prices paid for malting and feeding barley.

The survey estimate of wheat sales to millers (37 per cent) compares closely with the MAFF census data for

1979/80 when 39 per cent of the home-produced wheat crop went for human and industrial use. For the combined barley crop the survey estimate of barley sales for malting (34 per cent) is less comparable with the census figure of 21 per cent. In part this difference may be reduced by the proportion of barley exports, 12 per cent in the survey year, which were as malting barley. There is the further possibility when the prices of low grade malting and feeding barleys are similar, that some sales of barley for malting may have been diverted into compounding without suffering a price reduction or the producer being informed of the change of use.

Table 5.2 Proportions of Quality and Feed Grains Sold, with Prices

Proportions of crops sold for	Winter wheat		Spring barley		Winter barley	
	per cent	£ per tonne	per cent	£ per tonne	per cent	£ per tonne
Milling/malting	37.2	100.3	33.1	93.7	37.5	97.0
Feed grains	57.6	96.7	62.1	93.4	57.9	89.4
Seed	5.2	107.1	4.8	102.8	4.6	102.7
	100.0		100.0		100.0	

The sales of wheat and barley have also been analysed by sales to grain merchants, to co-operatives through farmer organized grain selling groups and as sales to other farmers. The proportions of the three crops sold in each category are shown in Table 5.1. The table also includes the average price received for each of the three crops by marketing outlet.

As can be seen grain merchants provide the most important outlet for grain sold off the farm, and in the survey year sales to the private grain trade produced the highest average price. In contrast the co-operatives or grain marketing groups handled only 16 per cent of the total wheat sales and approximately 11 per cent of the barley crop. Although the prices received by farmers selling through co-operatives were not significantly different to prices in the private sector, they were on average uniformly lower and clearly did not achieve the price advantage which is often claimed by the co-operatives. Some of the difference may be the effect of premiums for quality grain, that is grain used for milling, malting or seed. An analysis of the proportion sold by merchants and co-operatives by qualities is given in Table 5.3. On average merchants handled between 40 and 45 per cent quality grain and 55 to 60 per cent feed grains. For the co-operatives the proportions fluctuate much more widely although for winter wheat the proportions are similar to merchants with only slightly less wheat being used for milling as opposed to compounding.

Table 5.3 The Proportion of Quality and Feed Grains, Merchants and Co-operatives

Proportion of crops sold for	Winter wheat		Spring barley		Winter barley	
	Merchants per cent	Co-ops per cent	Merchants per cent	Co-ops per cent	Merchants per cent	Co-ops per cent
Milling/malting	38.4	33.8	37.2	9.5	36.5	43.0
Feed grains	55.8	66.1	57.2	90.5	58.1	57.0
Seed	5.8	0.1	5.6	0.0	5.4	0.0
	100.0	100.0	100.0	100.0	100.0	100.0

5.3 Timing of sales

Grain can be sold either for immediate delivery to the buyer (spot) or for delivery at some future contracted date. Thus the timing of the negotiation of a contract for a parcel of grain may well follow a different pattern to the physical movement of grain off the farm. For the survey year grain sales have been analysed by both the date of the negotiation of a contract and the date of delivery.

The pattern of sales for wheat, spring and winter barley is shown in Table 5.4. Winter wheat had, on average, the longest period between the date of contract and the time of delivery, with 24 per cent sold spot and 52 per cent either spot or contracts of no more than one month forward. In contrast almost 75 per cent of the barley

crop was sold for delivery in one month or less with spot sales accounting for 40 per cent of the total. In general the prices for wheat tended to rise as the time between the agreement to sell and delivery date lengthened, but for barley, with much smaller quantities sold on longer contracts, forward prices fluctuated more widely.

Table 5.4 Proportions of Crop Sold Spot and Forward Contract, UK

	Winter wheat		Spring barley		Winter barley	
	per cent	Average sale price £	per cent	Average sale price £	per cent	Average sale price £
Spot sales	23.9	97.2	40.0	93.7	41.6	91.9
Sales 1 month forward	28.4	97.5	33.2	94.5	33.5	93.7
Sales 2 months forward	13.7	98.3	9.1	93.8	7.5	92.1
Sales 3 months forward	12.6	95.9	8.6	90.8	6.5	95.8
Sales 4 months forward	6.2	100.4	3.4	95.8	5.2	91.9
Sales 5 to 6 months forward	7.8	99.8	3.2	87.4	3.3	93.2
Sales more than 6 months forward	7.4	101.4	2.5	105.7	2.4	93.0
	100.0		100.0		100.0	

The physical movement of grain off the farm, as opposed to sales, is shown on a monthly basis in Fig. 5.1, and to give a broader picture, grain deliveries are aggregated into three monthly periods in Table 5.5. The deliveries of winter wheat and spring barley, although naturally higher in the winter months, were generally uniform. In contrast over half the winter barley crop had been moved off the farm by the end of September and over 75 per cent by the end of December.

Table 5.5 Grain Deliveries – Proportions moved off the Farm, by 3 month periods

	Winter wheat	Spring barley	Winter barley
	per cent	per cent	per cent
July to September	18.1	24.4	56.6
October to December	25.7	28.3	18.2
January to March	31.1	31.0	12.5
April to June	23.1	15.5	11.4
After June	2.0	0.8	1.3
	100.0	100.0	100.0

The need to maintain a regular cash-flow proved to be overwhelmingly the most important reason for selling grain, accounting for more than 60 per cent of all cereal sales (see Table 5.6). On average less than 20 per cent was sold because the price offered for grain was considered satisfactory in relation to anticipated selling prices. Whilst problems with grain storage, generally lack of suitable capacity, was given as a reason for only 5 per cent of all sales; although noticeably more winter barley was sold because of lack of storage, possibly to make room for other crops, than either winter wheat or spring barley.

Fig. 5.1 Deliveries of Grain off the Farm (U.K.)

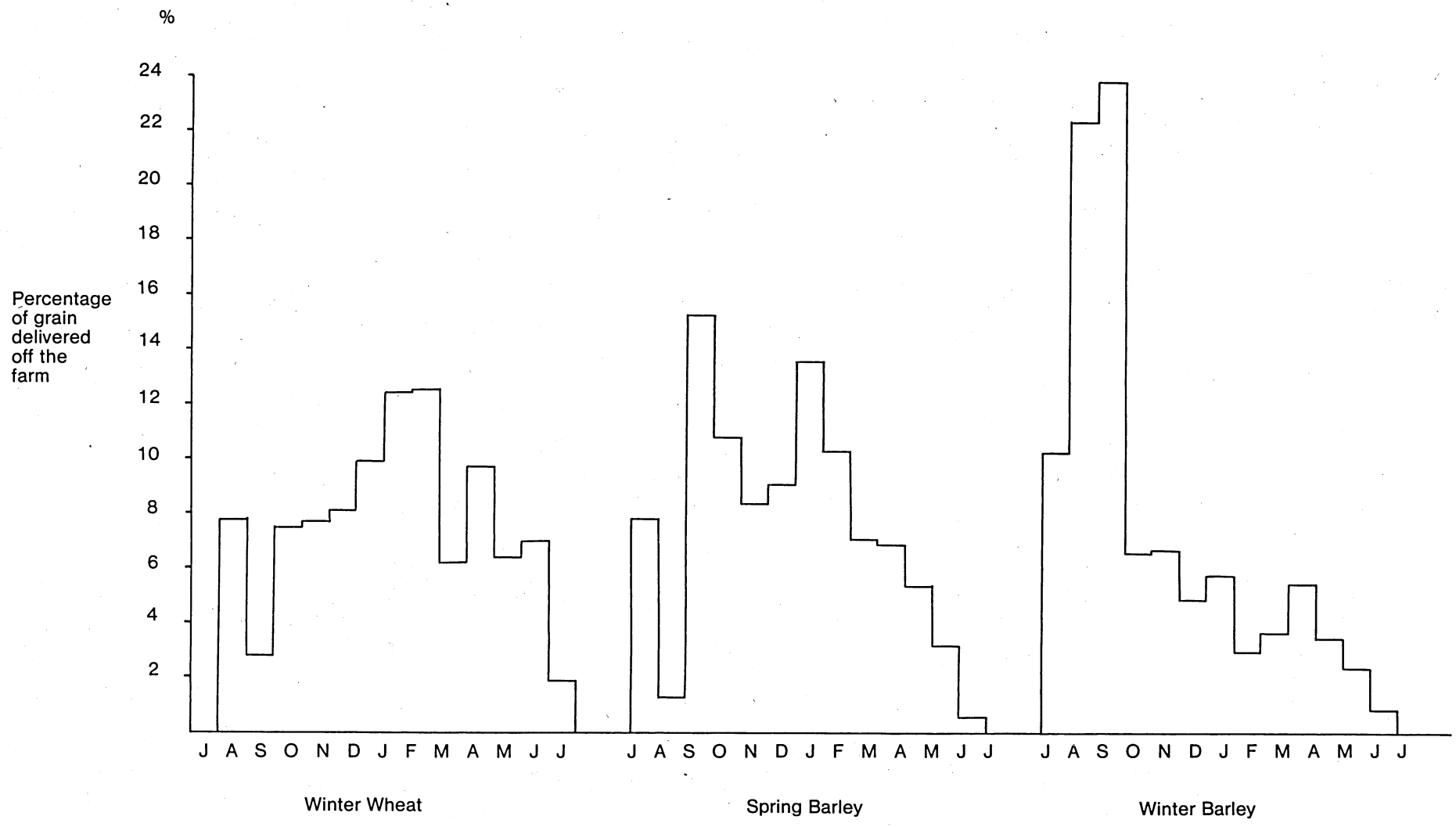


Table 5.6 Reasons for Sales, by Proportions

	Winter wheat	Spring barley	Winter barley	Combined crop
	per cent	per cent	per cent	per cent
1. Necessary for cash-flow	55.5	68.3	67.7	61.2
2. Prices satisfactory cf. production costs	3.3	2.0	5.1	3.3
3. Sale price satisfactory cf. expected price	25.7	11.6	10.9	19.2
4. Storage problems	4.7	4.3	9.2	5.3
5. Cash-flow plus other reasons	8.1	10.6	5.6	8.4
6. Other reasons	2.7	2.8	1.5	2.6
	100.0	100.0	100.0	100.0

5.4 Grain storage

The provision of grain storage solely as an aid to marketing may be difficult to justify, for the market will not necessarily reward, by way of increasing prices over the season, the producer who provides the storage facility. In the survey year the September price for wheat increased by 8.5 per cent by the following July. In the preceding four years the average price rise for wheat September to July was about seven or eight per cent, however the average conceals a price movement which ranged from plus eleven per cent to minus one per cent. For barley the average increase was much smaller, about one per cent, with a range of plus five to minus one per cent. Apart from the marketing function, in technical terms storage and grain handling facilities may now be considered as much an integral part of modern day cereal production as the combine harvester. Clearly nationally there is a need to have the capacity to store a crop which is harvested annually in less than two months and yet consumed over a twelve-month period.

On average the sample farms had 5.1 tonnes of storage per cereal hectare, this capacity relates to a UK average combined cereal yield of 4.67 tonnes per hectare in the survey year. On average the quantity of storage per cereal hectare was evenly distributed by size of cereal enterprise with only the smaller units having a below average capacity (see Table 5.7). This is in contrast to the earlier surveys which showed that at that time, the larger cereal units had a smaller than average capacity. The types of storage recorded on the survey are given in Table 5.8 and a distribution of the age of the on-farm capacity shown in Table 5.9.

Table 5.7 Distribution of Storage Capacity per ha. by size of Cereal Enterprise

Group	Size of cereal enterprise	Tonnes of storage per ha.	
1	10 up to 40 ha.	4.81	(2.82)
2	40 up to 80 ha.	4.65	(2.46)
3	80 up to 120 ha.	5.02	(1.99)
4	120 up to 200 ha.	5.25	(2.72)
5	200 up to 300 ha.	5.11	(1.71)
6	More than 300 ha.	7.00	(7.47)
All farms		5.13	(3.30)

Table 5.8 Grain Storage by Type

	per cent
In bins	33.2
Ventilated on-floor	31.1
On-floor storage	18.2
General purpose buildings	7.3
Converted buildings	7.2
Temporary bins	1.6
Sealed silos	1.3
Merchant or co-operative store	0.1
	100.0

Table 5.9 Age Distribution of On-farm Grain Storage

Date of installation	per cent
Prior to 1955	1.9
From 1955 to 1959	10.1
From 1960 to 1964	12.7
From 1965 to 1969	22.5
From 1970 to 1974	23.3
From 1975 to 1979	29.5
	100.0

While it is relatively simple to give an estimate of the quantity of storage per farm, it is more difficult to precisely define in technical terms, the quality of this capacity. However the evidence from this survey suggests that cereal producers are keeping pace both with the quantity of storage required and maintaining the quality of the capacity. The age distribution shows that almost 30 per cent of the total capacity had been installed from 1975 to 1979. Equally significant 75 per cent of the on-farm storage was 15 or less years old. The evidence from this survey compared with previous studies suggests that the volume of on-farm storage has increased more rapidly from 1975 to 1979 than in the previous five-year period. The indications are that the provision of on-farm storage capacity is following the trend of increased cereal yields and additional cereal area. In terms of quality, 94 per cent of the on-farm capacity recorded on the survey was either in the form of ventilated storage (in bin or on-floor) or consisted of facilities which included a continuous flow or batch drier. An earlier analysis of data from a sub-sample of the survey showed that in England and Wales 23 per cent of the drying capacity, in the form of continuous-flow driers, had been installed in the three years from 1977 to 1979 compared with only 18 per cent in the previous five years. For the same farms over half the recorded cereal area had grain cleaning or dressing facilities and an average out-loading capacity in excess of 20 tonnes per hour.

A final indication of the quality of on-farm storage came from the very small proportion of total grain sales which were rejected by the purchasers for failing to meet the contracted standard and as a result suffered price penalties. In total only 0.3 per cent of all barley sales were rejected for reasons which might be attributed to poor quality or lack of storage. A further 0.2 per cent of barley sales were rejected for failing to meet the agreed standard, a too high nitrogen content being the most usual problem. For wheat only 0.2 per cent of total sales were rejected, none of this the result of inadequate storage but due to low protein, unsatisfactory hagberg readings or admixture.

5.5 Implications

A point to emerge strongly from this section is that the on-farm grain storage capacity is probably of better quality and in greater quantity than estimates given in a recent joint report prepared by Central Council, ADAS and the NFU. Moreover the prices received for wheat and barley by growers who sold through grain merchants were at least as good, if not better than, the prices received by producers who used co-operatives or grain selling groups. There is little evidence from this study to support the present policy of giving a higher level of grant aid exclusively to co-operatives who perform a storage and marketing function whilst excluding merchants who perform similar functions at least as successfully.

CHAPTER 6 FUTURE PROSPECTS FOR CEREAL PRODUCTION

6.1 Introduction

The several analyses undertaken for this report to consider aspects of the pattern of regional production, to assess the impact of size and intensity of production have had, despite many smaller differences, one major factor in common. This is the importance of cereal yield and the substantial effect this one factor has on the net margin or profitability of growing cereals. The results from this survey showed a strong positive correlation between yield and net margin ($\bar{R}2 = 0.74$). Whereas the price received for grain which makes up the second part of the output equation explained only seven per cent of the variation in net margins ($\bar{R}2 = 0.07$). However whilst the survey has been able in part to measure the benefits of high yields it is much more difficult for a study of this type to identify the factors which lead to high yields. There is little correlation, for example, between the total level of variable inputs and yield. Fertilizer usage explains less than one per cent of yield differences whether considered in terms of cash or physical inputs, for example, kilograms of nitrogen per hectare. A more positive, but possibly misleading, correlation was found between the level of spray chemicals applied, particularly fungicides, and the yield of the combined cereal crop. However this relationship is probably best explained by the effect which winter wheat, with a higher average yield and greater inputs of spray chemicals, has on the yield of the combined cereal crop.

It is not the intention here to claim that fertilizer and spray chemicals do not affect cereal yields, for experiments will prove that inadequate applications of these chemicals can result in yield reductions. The point which emerges unequivocally from the survey is that even heavy applications of fertilizer and other chemicals will not guarantee an above average yield, for clearly there are many other factors in the equation, management being overwhelmingly the most important single item.

It is difficult to measure precisely all the factors which jointly contribute to high cereal yields. However one important factor which has affected many of the analyses, both in terms of inputs and output, is the proportion of winter wheat in the cereal rotation. Until relatively recently the proportion of winter wheat in the total cereal area was limited by rotational constraints. The need to include a non-cereal break-crop to help control weed and disease problems associated with monoculture, and to provide an entry for winter wheat was generally accepted. Now the breeding of new varieties of winter wheat suitable for successful continuous cropping, and the development of chemicals to control weed and disease problems have been part of a major technological breakthrough which has enabled producers to grow wheat much more intensively and in some cases to completely ignore the traditional rotational constraints. There are limits as to how far this process can go; soil type and climate are obvious examples.

It is however reasonable to assume that an intensive wheat system, with potentially higher yields but requiring a more sophisticated chemical control of weeds and disease and maintenance of fertility, will need an equally high level of management expertise. The standard of management required would be higher than for say a cropping system which included spring barley at the same intensity in a wider, more traditional, cereal rotation. The ability successfully to include a high proportion of winter wheat in the cereal area will probably give a good indication of management expertise. It could also give a better measure of the relationship between inputs and yield than is apparent from the attempts to correlate single inputs and yield.

6.2 Results by intensity of wheat production

Table 6.1 gives the financial results of an analysis where a sub-sample of farms have been re-grouped by the proportion of winter wheat in the cereal area and compared with those farms which did not grow winter wheat. It is clear that the farms with the highest proportion of wheat in the cereal area have an advantage in yield and output, in gross and net margins over all the other groups. However this difference is most marked when the results of the intensive wheat farms are compared with the results for the farms which did not grow winter wheat. For the group without wheat the savings in total variable costs, in the main a lower spray chemical input, and smaller savings in fixed costs are not sufficient to offset the substantial yield and grain price advantage of the farms with the higher proportion of wheat. As a result it is the farms with more than 70 per cent wheat in the cereal area which have the highest average net margin and lowest average unit cost of production.

Table 6.1 Costs and Returns, Combined Cereal Production, by Intensity of Wheat Production

Group...	1		2		3		4	
Intensity of wheat production...	No wheat grown		Up to 35%		From 35 to 70%		More than 70%	
Yield (tonnes per ha.)	4.15	(0.7)	4.35	(0.8)	4.89	(0.8)	5.56	(1.0)
Value of output				£ per hectare				
Grain	380.4	(67.2)	411.7	(79.3)	467.8	(80.5)	543.4	(95.0)
Straw	34.8	(19.7)	25.1	(16.1)	16.5	(10.9)	8.8	(10.8)
Total	415.2	(74.5)	436.7	(82.2)	484.3	(80.5)	552.1	(96.6)
Variable costs								
Seed	30.5	(10.0)	28.2	(6.5)	28.3	(5.2)	30.8	(7.7)
Fertilizer	39.2	(12.1)	42.3	(11.8)	46.8	(10.1)	44.4	(15.1)
Sprays	13.0	(10.0)	20.6	(10.8)	33.6	(17.9)	40.6	(19.5)
Contract	14.6	(23.2)	4.3	(10.6)	6.0	(11.7)	10.4	(18.2)
Miscellaneous	3.1	(4.0)	2.4	(2.3)	1.7	(2.0)	0.9	(1.5)
Total	100.4	(29.8)	97.8	(21.2)	116.4	(28.0)	127.1	(35.2)
Gross margin	314.8	(85.9)	338.9	(79.6)	367.9	(82.7)	425.1	(93.2)
Fixed costs								
Labour – direct	24.6	(10.1)	24.3	(8.2)	20.0	(6.9)	19.1	(7.7)
– overhead	16.2	(27.2)	16.2	(21.8)	19.0	(17.5)	21.1	(13.3)
– Total	40.8	(28.9)	40.5	(24.5)	39.0	(18.2)	40.2	(14.9)
Machinery	64.4	(25.3)	70.6	(19.7)	65.3	(17.1)	68.5	(20.7)
Rent and rates	52.9	(22.9)	59.0	(18.2)	61.9	(14.4)	70.7	(21.2)
Other overheads	33.6	(6.6)	32.8	(6.2)	30.9	(5.8)	31.0	(5.0)
Total	191.7	(53.4)	202.9	(38.0)	197.1	(31.1)	210.4	(39.5)
Net margin	123.1	(96.2)	136.0	(82.1)	170.8	(80.6)	214.7	(90.7)
Cost per tonne	70.4	(19.9)	69.1	(16.5)	64.1	(12.3)	60.7	(10.9)
Total cereal hectares	54.1		128.7		152.1		160.5	
Number of observations	72		79		120		40	

A second comparison, this time of physical inputs for the combined cereal crop, is given in Table 6.2. In some respects there are relatively small differences between groups, for example, seed rate and the number of man hours required for operations other than straw handling. Other inputs tend to follow the increasing yield pattern, fertilizer and spray chemical applications are the obvious examples. However when crudely related to yield these differences are much smaller than when compared on a per hectare basis. Although an over-simplification, an example of this is where the most intensive wheat producers applied 193 kg 'fertilizer' per hectare or 34.7 kg per tonne compared with the no wheat farms application rate of 151.4 kg 'fertilizer' per hectare or 36.5 kg per tonne. It is evident from the comparison of physical inputs that, on average, farms growing a large proportion of wheat in the cereal area have adopted a production system which could be considered 'high input' when compared with holdings growing no wheat. However at today's cereal prices the higher yields achieved clearly economically justify this increased expenditure on variable inputs.

Table 6.2 Comparison of Physical Characteristics, by Intensity of Wheat Production, Combined Cereal Crop

Group...	1	2	3	4
Intensity of wheat production...	No wheat grown	Up to 35%	From 35 to 70%	More than 70%
Yield (tonnes per ha.)	4.15 (0.7)	4.35 (0.8)	4.89 (0.8)	5.56 (1.0)
Seed (kg per ha.)	176.9 (28.5)	172.9 (51.3)	171.7 (16.4)	175.0 (21.7)
Fertilizer				
Nitrogen (kg per ha.)	71.9 (27.2)	100.7 (31.6)	120.7 (26.9)	118.7 (46.5)
Phosphate (kg per ha.)	38.3 (18.1)	40.0 (15.3)	45.8 (16.3)	41.6 (22.3)
Potash (kg per ha.)	41.2 (19.7)	43.2 (16.8)	39.3 (19.4)	32.7 (27.1)
Per cent of crop area sprayed with annual weed herbicides	88.8 (28.8)	84.7 (23.9)	73.7 (29.3)	74.0 (33.0)
grass weed herbicides	14.2 (26.9)	33.3 (34.9)	70.4 (54.9)	84.4 (53.5)
fungicides	24.8 (38.9)	48.9 (63.1)	75.9 (76.9)	90.2 (78.4)
straw shorteners	— —	6.3 (12.5)	20.5 (27.5)	37.1 (41.0)
pesticides	4.3 (18.4)	1.7 (6.5)	7.9 (20.4)	21.3 (36.7)
trace elements	2.2 (13.0)	7.2 (22.2)	1.6 (9.6)	1.5 (7.1)
Man-hours per hectare excluding straw handling	11.5 (4.6)	11.6 (3.7)	10.0 (3.1)	9.6 (3.4)
Crops and grass area (ha.)	115.3 (96.3)	215.2 (182.4)	247.6 (194.7)	263.3 (179.2)
Total cereal area (ha.)	54.1 (54.8)	128.7 (104.6)	152.1 (116.5)	160.5 (111.0)
Number of observations	72	79	120	40

Table 6.3 Distribution of Sample Farms by Region

Group...	1	2	3	4
Intensity of wheat production...	No wheat grown	Up to 35%	From 35 to 70%	More than 70%
Intensive region E. and W.	16	51	96	36
Extensive region E. and W.	18	23	23	4
Southern region Scotland	19	5	1	0
Northern region Scotland	14	0	0	0
Northern Ireland	5	0	0	0
Totals	72	79	120	40

These findings call into question the position of those farms, which, because the soil type or the climate is unsuitable, are currently unable to grow winter wheat successfully. Between the groups used for this comparison there is a marked regional bias in the distribution of farms by intensity of wheat production (see Table 6.3). Almost 80 per cent of the farms which did not grow wheat are located in the cereal extensive region of England and Wales, in Scotland or in Northern Ireland. As wheat becomes proportionally more important in the total cereal area so the sample farms are increasingly found in the cereal intensive region of England and Wales. So that in marked contrast to the farms without wheat, 90 per cent of the farms with more than 70 per cent wheat are located in the cereal intensive region and indeed half the total farms in this group were to be found in the Eastern region of England.

6.3 Future prospects

Over the period covered by these surveys the yield of wheat has been increasing more rapidly than the yield of barley. With these trends the less favourable position of the farms growing no wheat is more likely to deteriorate than to improve. Starting with 1970 as the mid-point of a three year average the yield of wheat has

increased at the rate of 3.7 per cent per annum ($R2 = 0.6$) compared with only 1.9 per cent for barley ($\bar{R}2 = 0.45$). This marked difference may be reduced if winter barley, which currently has a yield advantage of about 16 per cent over the spring varieties, continues to replace spring barley. However with present trends it does appear likely that the yield advantage which winter wheat currently has over barley will get greater.

Any calculation of the rate of yield increases over the 1970s does of course include the two abnormal drought years of 1975 and 1976. It may well be argued that there is little prospect of two such severe droughts occurring again in consecutive years, and that the yields for those years are biased and as such should be excluded from the calculation. Certainly when these two years are excluded there is on average a more rapid rate of yield increase for both wheat, 4.9 per cent per annum ($\bar{R}2 = 0.89$) and barley 2.5 per cent ($\bar{R}2 = 0.70$).

As cereal yields have continued to rise so has the use of spray chemical and fertilizer increased (see Table 6.4), and production costs, at least in cash terms, have increased also. To measure the likely changes in costs of production for winter wheat, spring barley and winter barley since 1979, estimates of costs for the 1982 crop are given in Table 6.5. The estimates of output are based on a yield projection which excludes the harvests of 1975 and 1976. To consider the changes which have occurred over the period covered by the surveys, Tables 6.6 and 6.7 give the costs of and returns from winter wheat and spring barley production for the five survey years from 1971 to 1979 and compares these in £s of 1982 purchasing power, with the estimates for the 1982 winter wheat and spring barley crops. For each crop comparison two yield projections are given based on an average rate of yield increase which either includes or excludes the 1975 and 1976 yields.

Table 6.4 Average Physical Characteristics of Cereal Growing Enterprises – England and Wales Means of 1971 and 1972 Surveys compared with 1979 Survey

Cereal crop...	Winter wheat				Spring barley				Winter barley			
Survey years...	1979		1971/72		1979		1971/72		1979		1971/72	
Yield (tonnes per ha.)	5.32	(1.1)	4.44	(0.8)	4.09	(0.9)	3.91	(0.7)	4.67	(0.9)	4.05	(0.8)
Seed (kg per ha.)	177.7	(21.4)	188.3	(26.7)	163.8	(24.6)	175.1	(59.0)	174.0	(41.0)	178.3	(31.2)
Fertilizer												
Nitrogen (kg per ha.)	128.3	(38.7)	91.4	(38.8)	87.9	(32.4)	72.1	(29.0)	115.4	(37.3)	89.8	(27.4)
Phosphate (kg per ha.)	44.9	(22.9)	44.3	(29.2)	36.4	(14.7)	38.9	(15.2)	49.0	(24.9)	49.3	(18.9)
Potash (kg per ha.)	40.2	(25.7)	38.9	(24.5)	37.9	(16.3)	39.4	(16.8)	44.6	(28.6)	47.1	(20.0)
Per cent of area sprayed with												
annual weed herbicides	49.1	(57.0)	84.6	(36.1)	43.7	(45.1)	85.7	(31.1)	21.4	(26.7)	89.4	(32.5)
grass weed herbicides	66.0	(91.2)	12.5	—	12.1	(23.7)	12.3	—	25.9	(33.8)	11.8	—
fungicides	67.7	(112.1)	2.9	(15.3)	22.6	(48.0)	8.3	(22.8)	31.4	(69.5)	16.1	(32.6)
straw shorteners	27.8	(51.7)	7.2	(21.8)	0.5	(3.4)	—	—	1.1	(6.2)	—	—
pesticides	13.3	(41.5)	0.5	(5.2)	0.5	(3.6)	—	—	0.7	(4.5)	—	—
trace elements	1.0	(6.5)	—	—	2.5	(12.7)	—	—	0.7	(4.3)	—	—
Area of crop	72.1	(69.9)	53.4	(59.1)	47.9	(45.9)	50.0	(56.3)	33.0	(31.9)	15.0	(11.8)
Number of observations	233		373		235		499		195		128	
Man-hours excluding straw handling	10.7	(3.7)	13.7	(4.9)	10.2	(3.6)	13.9	(6.9)	10.7	(3.8)	—	—
Number of observations	233		224		235		282		195		—	

Table 6.5 Estimated Financial Results for the 1982 Harvest Year

	Winter wheat	Spring barley	Winter barley
Yield (tonnes per ha.)	5.96	4.59	5.20
		£ per hectare	
Value of output	715	528	598
Variable costs			
Seed	39	34	33
Fertilizer	74	55	67
Sprays	60	29	49
Contract	10	8	8
Miscellaneous	2	3	3
Total	185	129	160
Gross margin	530	399	438
Fixed costs			
Labour	57	55	55
Machinery	88	82	89
Rent and rates	98	94	96
Other overheads	45	49	46
Total	288	280	286
Net margin	242	119	152
Cost per tonne	79	89	86

Table 6.6 Real Costs and Returns of Winter Wheat Production, Harvests of 1971 to 1979, with Estimates for 1982

						Estimates		Indices where 1971 = 100						
	1971	1972	1975	1977	1979	1982 (a)	1982 (b)	1971	1972	1975	1977	1979	1982 (a)	1982 (b)
Yield (tonnes per ha.)	4.50	4.27	4.32	4.93	5.34	5.71	5.96	100	94	95	109	118	126	131
Price (£ per tonne)	126.9	131.6	152.6	139.9	138.7	120	120	100	104	120	110	109	95	95
Output (£ per ha.)	576.2	561.8	659.3	688.0	741.0	685	715	100	98	114	119	129	119	124
Variable costs (£ per ha.)	103.5	106.4	144.6	161.0	173.7	185	185	100	103	140	156	168	179	179
Gross margin (£ per ha.)	472.7	455.5	514.6	527.1	567.3	500	530	100	96	109	112	130	106	112
Fixed costs (£ per ha.)	218.9	215.2	248.5	289.3	287.4	288	288	100	98	114	132	131	132	132
Net margin (£ per ha.)	253.0	240.2	266.1	237.8	279.9	212	242	100	95	105	94	111	84	96
Total costs (£ per ha.)	322.4	321.6	393.1	450.3	461.1	473	473	100	100	122	140	143	147	147
Product cost (£ per tonne)	71.0	78.6	91.0	91.3	86.4	83	79	100	111	128	129	122	117	111
Current value of £ in terms of 1982 purchasing power	25.2	26.9	42.4	57.2	70.3	100.0	100.0	100	107	168	227	279	397	397

(a) Yields based on trend line which includes 1975 and 1976 yields.
(b) Excludes 1975 and 1976 yields.

Table 6.7 Real Costs and Returns of Spring Barley Production, Harvest of 1971 to 1979, with Estimates for 1982

						Estimates		Indices when 1971 = 100						
	1971	1972	1975	1977	1979	1982 (a)	1982 (b)	1971	1972	1975	1977	1979	1982 (a)	1982 (b)
Yield (tonnes per ha.)	3.72	4.09	3.44	4.40	4.12	4.39	4.59	100	110	92	118	111	118	123
Price (£ per tonne)	111.2	122.8	148.0	122.4	132.3	115	115	100	110	133	110	119	103	103
Output (£ per ha.)	413.7	502.1	509.2	538.5	545.1	505	528	100	121	123	130	132	122	128
Variable costs (£ per ha.)	97.4	99.2	131.5	122.8	133.3	129	129	100	102	135	126	137	132	132
Gross margin (£ per ha.)	316.3	402.9	377.7	415.7	411.8	376	399	100	127	119	131	130	119	126
Fixed costs (£ per ha.)	226.6	221.6	243.3	268.3	279.9	280	280	100	98	107	118	124	124	124
Net margin (£ per ha.)	89.7	181.3	134.5	147.4	131.9	96	119	100	202	150	164	147	107	133
Total costs (£ per ha.)	324.0	320.9	374.8	391.1	413.2	409	409	100	99	116	121	128	126	126
Product cost (£ per tonne)	87.1	78.4	108.9	88.9	100.3	93	89	100	90	125	102	115	107	102
Current value of £ in terms of 1982 purchasing power	25.2	26.9	42.4	57.2	70.3	100.0	100.0	100	107	168	227	279	397	397

(a) Yields based on trend line which includes 1975 and 1976 yields.
(b) Excludes 1975 and 1976 yields.

Clearly whichever rate of yield increase is used it is apparent that production costs have risen proportionately more rapidly than yields. From 1975 the price of wheat in real terms has been declining and since then any increase in the level of output has been the result of higher than average yields and not cereal prices. Over the period of the surveys variable costs have increased more rapidly than fixed costs, in part the result of increasing the proportion of wheat in the cereal area. Fixed costs appear to be stabilizing after a rapid rise from 1971 to 1977. In total the costs of producing wheat are rising more rapidly than the levels of output and only if the higher rate of yield increase, that is excluding 1975 and 1976, is maintained will the projected net margin for 1982 be comparable with the average net margins achieved since 1971. Indeed using the estimated costs for 1982 a yield of 6.05 tonnes per hectare will be needed to match the net margin for 1971. At the time of writing the prospects are that the 1982 harvest will again produce above average yields. However unless either the long-term trend line now underestimates the true rate of yield increase or the new technology of cereal production has reduced the risk of poor harvests then at some stage below average yields are likely to have a balancing effect.

For barley there is a similar downward trend in the average price in real terms and with yield increasing at a less rapid rate than for winter wheat the position looks less promising. In general the reduced costs of producing spring barley, in the main those of variable inputs, are not sufficient to cancel out a much lower average yield. Since 1971 the variable costs of growing spring barley have increased more slowly than the variable costs for winter wheat production. Nonetheless in 1979 the variable costs for spring barley accounted for 24 per cent of the grain output per hectare compared with 23 per cent for winter wheat. Even at the higher rate of yield increase the prospects for 1982 are less good than for any year since 1971, and the 1971 harvest produced a net margin which was well below the average of the years 1972 to 1979. Using the cost estimates for 1982 it would take a yield of 4.75 tonnes per hectare at a price of £115 per tonne to achieve a net margin equal to the simple average of 1971 to 1979.

When attempting to calculate the rate of cereal yield increases it is becoming more difficult to measure the effect of recent changes in cereal technology. It may well be that the degree of weed and disease control which is now available will significantly reduce the risk of very low yields in a potentially disastrous situation, for example one akin to the breakdown of Joss Cambier wheat in the early 1970s. The effect of climate is obviously much more difficult to control as was apparent in 1975 and 1976. The availability of chemicals to control disease problems in particular may allow more wheat to be grown successfully in areas previously only considered suitable for barley production. The regional comparison gave examples of this changing pattern of cereal production but also highlighted areas of concern. There is evidence of a spread of new technology from the cereal intensive counties of England and Wales to the other regions of the United Kingdom. In England and Wales the main cereal growing area has enlarged as certain adjoining counties have increased the proportion of cereals in the crops and grass area to over 40 per cent and are now classified in this report as cereal intensive counties. The increase in the total wheat area is not confined to the main cereal growing areas but is also the result of increased plantings in less intensive cereal areas of England and Wales. Similarly the higher yielding winter barleys, now in terms of area more important than spring barley in the Eastern region of England, are clearly spreading to other regions. Indeed there is evidence that the winter crop is being increasingly grown in Scotland where previously it was considered 'socially' unacceptable.

The areas of concern must be for those regions where in the main the climate is such that only spring barley can currently be grown successfully and where the opportunities to increase cereal yields are more severely limited. The results of this survey show that growers who have been able to include a higher proportion of wheat in the cereal area have been economically justified, despite an associated move to a high input system. The saving in cost where barley is produced on a more traditional rotational system is unlikely to be sufficient to offset the advantage of higher yields of wheat. In a situation of continuing grain surpluses in Europe and the prospect of cereal prices being further reduced in real terms it is the producer with a soil type and climate advantage, able to grow a high proportion of wheat in the cereal area, who will be best placed to survive the squeeze. With a cereal support system which is paid on a per tonne rather than a per hectare basis, cereal producers in the North of Scotland with lower cereal yields and higher unit costs of production are at a marked disadvantage when compared to cereal producers in the Eastern region of England, who in contrast have higher cereal yields and lower unit costs of production. There is little doubt that a similar comparison could be drawn between the North of Scotland, Northern Ireland and the Paris Basin or Northern Germany.

The opportunities to increase the return to cereal producers by better marketing appear more limited than is often claimed. The results of this survey showed no price advantage in selling co-operatively when compared to selling to private grain merchants. Indeed the prices received by producers selling through co-operatives were on average uniformly lower but not significantly so. Overall the price received for grain explained only seven per cent of the variation in net margins whereas the yield of grain explained over 70 per cent. In the future it would appear that the plant breeder and agro-chemical industry will offer more tangible benefits to the cereal producer than from say co-operative marketing where the possibility of increased returns, as yet largely unproven, appear much more limited.

CHAPTER 7 SUMMARY AND CONCLUSIONS

7.1 Introduction

The section or sections to which the summary points mainly refer are shown in parenthesis after each point.

7.2 Methodology and Objectives

1. The report is based mainly on the findings of a survey undertaken during the period 1979 to 1981 of a representative sample of 320 holdings growing more than 10 hectares of cereals. (1.1).

2. For the first time the Colleges of Agriculture in Scotland and the Department of Agriculture in Northern Ireland have combined with Universities and Colleges of Agriculture in England and Wales to make this a United Kingdom survey. (1.2).

3. The primary objective of the study was to estimate the costs of and returns from the production of winter wheat, spring barley and winter barley. Other main objectives were to consider possible benefits of the different methods of marketing grain and to assess the effect of the recent intensification and increase in the area of winter wheat. (1.2).

4. The scope of the survey has made it possible to examine again differences in production techniques and grain disposal between regions by size of cereal enterprise and intensity of production. (1.2).

5. A method different to that of previous surveys has been used to allocate fixed costs to the cereal enterprise in particular charges for labour and those costs normally classified as 'other overheads'. (1.6).

6. As a result of these changes, the allocation of fixed costs to the cereal enterprise now more closely matches results taken from the Farm Management Survey. (1.6).

7. When applied to comparisons by region the revised methodology has identified more obvious differences than were apparent in previous studies. In some cases the ranking of labour costs has been reversed. (1.7).

8. It is reasonable to assume that the method used to estimate the total charge for labour could also be used to calculate hourly costs which include an overhead element for certain major items of non-specific machinery, for example tractors. (1.7).

7.3 Costs and Returns

9. Winter wheat had the highest per hectare cost of production, spring barley the lowest. The higher level of inputs needed for wheat were more than offset by a higher yield which gave the crop the highest net margin and lowest unit cost of production. (2.1).

10. The production costs for winter barley were £24 per hectare more than for spring barley but again the winter sown crop had a yield advantage (0.54 tonnes per hectare) which more than cancelled out the increased production costs. (2.1).

11. Although for spring barley a lower level of inputs are required, in the survey year the savings were not sufficient to make up for a significantly lower yield. (2.1).

12. In contrast to earlier surveys winter wheat was the most important crop in terms of area, and from the 1971 survey onwards the yield of wheat has been 23 per cent higher than the yield of spring barley. (2.2).

13. As shown by a three year moving average the total cereal area in the UK has expanded by four per cent, all of the increase coming since 1975 as wheat, the area of which has increased by one third. (2.3).

14. For spring barley the highest net margin and lowest unit cost of production was achieved by growers in Scotland. This was more the result of higher yields rather than lower costs. (2.3).

15. The small sample of farms in Northern Ireland had the lowest net margin and a substantially higher unit cost of production. The evidence suggests that producers in the Province have more serious problems than other countries within the UK. (2.3).

16. When the financial results for winter wheat, spring barley and winter barley are aggregated into a combined cereal crop, producers in England and Wales have the highest cereal yields and the apparent financial advantage for growers in Scotland when the comparison is based on spring barley disappears. (2.3).

7.4 Regional Comparison of Costs and Returns

17. The counties of England and Wales were divided into two regions, one cereal intensive, counties with more than 40 per cent cereals in the crops and grass area, the other a cereal extensive region formed by the remaining counties. For Scotland the two regions, Northern and Southern, were based on the College of Agriculture provinces. (3.1).

18. The regional comparison is made by using production costs and levels of output from the combined cereal crop of winter wheat, spring barley and winter barley. (3.1).

19. The financial results showed differences which were smaller than anticipated between the two regions of England and Wales. Evidence from the survey suggested that in the Intensive region the potential advantage of having a higher proportion of wheat in the cereal area was partly cancelled out by the generally lower yields and higher production costs of the spring barley producers. In Scotland the regional differences are more substantial. (3.2).

20. The extensive region of England and Wales had the highest net margin and lowest unit cost of production. The results for the producers in the Northern region of Scotland were uniformly less good than the results for other regions. (3.2).

21. In the cereal extensive region of England and Wales the reduced level of inputs more than compensated for any loss in combined cereal yield. (3.2).

22. When compared with the extensive region the higher level of fixed costs in the intensive region of England and Wales is the result of higher overhead labour costs and substantially higher rents. (3.2).

23. There was more substantial regional variation in Scotland; the results for the Northern region were well below the levels achieved by the sample farms in the Southern region. The problem for producers in the Northern region stems from a significantly lower yield without the compensation of reduced costs. As a result for growers in the Northern region the margin (to compensate for management and investment) per tonne of grain produced was only £16.0 compared with £29.0 for growers in the intensive region of England and Wales. (3.2).

7.5 Impact of Size and Intensity of Production

24. Cereals continue to be grown in increasingly larger units and occupy a larger proportion of the crops and grass area on cereal growing farms. (4.1).

25. The proportion of wheat in the cereal area increased as the size of cereal enterprise became larger. On average the increase in variable inputs which accompanied this trend was more than offset by the higher combined cereal yield. (4.2).

26. The cost of labour per hectare, both direct and overhead, declined as the size of cereal enterprise became larger. (4.2).

27. Overall, holdings with larger cereal enterprises had advantages over the smaller units. In contrast to previous studies, there was no indication of diseconomies on holdings with more than 200 hectares of cereals. (4.2).

28. In the survey year, producers with more than 300 hectares of cereals had a margin (to cover management and investment) of £34 per tonne compared with only £20 per tonne for growers with less than 40 hectares of cereals. (4.2).

29. When regrouped by intensity of production, farms which had on average from 50 to 80 per cent cereals in the crops and grass area had uniformly better results than either the two more extensive groups or the one more intensive group. The main reason for this was a higher yield of grain rather than below average production costs. (4.3).

30. Despite a wider rotation, farms with less than 50 per cent cereals had lower average yields which were not balanced by lower production costs. Similarly holdings with more than 80 per cent cereals had a significantly lower yield than farms with 65 to 80 per cent cereals and no savings in production costs. (4.3).

31. In confirmation of other analyses in the report, the advantage through higher yields of farms with a high proportion of wheat outweighed any additional production costs. (4.3).

32. A high degree of specialization does not appear to give any obvious savings in fixed costs. The most intensive producers (more than 80 per cent cereals) have the highest per hectare charge for labour, the result of much higher levels of overhead labour. (4.3).

7.6 Marketing and Storage

33. Only barley was retained on the farm in any quantity, mainly for feeding to livestock; for all three crops retention for seed make up a very small part of total production. (5.2).

34. Grain sold for seed attracted uniformly the highest price; premiums for milling wheat and malting barley were more variable. For milling wheat the premium was almost £4 per tonne and winter barley for malting earned a premium of over £7 per tonne. Although in one month spring barley for malting earned a premium of £9 per tonne, at certain other periods the prices paid for malting and feeding barley were very similar. (5.2).

35. Grain merchants provided the overwhelmingly most important outlet for grain; co-operatives or grain marketing groups handled only 16 per cent of wheat sales and 11 per cent of barley sales. (5.2).

36. Although not significantly different the prices received by farmers selling through co-operatives were uniformly lower than prices received by producers who sold through grain merchants. (5.2).

37. The share of grain merchants, as opposed to co-operatives, was greater in the marketing of milling wheat and malting barley than of feed grains. (5.2).

38. Almost 75 per cent of the barley crop was sold for delivery in either the same calendar month (spot) or the month following, over half of this in the form of spot sales. For the wheat crop 24 per cent were spot sales and 28 per cent sold for delivery in the following month. (5.3).

39. The need for income to maintain a regular cash-flow was the reason given for the timing of more than 60 per cent of all cereal sales. Less than 20 per cent of sales were made because the price offered was considered satisfactory with anticipated prices. Only five per cent of all sales resulted from inadequate grain storage. (5.3).

40. The sample farms had on average 5.1 tonnes of grain storage per cereal hectare. This capacity related to a UK average combined cereal yield of 4.67 tonnes per hectare in the survey year. (5.4).

41. Thirty per cent of the on-farm capacity had been installed from 1975 to 1979 and 75 per cent of the total on-farm storage was less than 15 years old. (5.4).

42. The evidence suggests that the on-farm capacity had increased more rapidly from 1975 to 1979 than in the previous five-year period. (5.4).

43. Of the on-farm capacity 94 per cent was either ventilated, (in-bin or on-floor) or consisted of facilities which included a continuous flow or batch drier. (5.4).

44. Only 0.5 per cent of barley sales and 0.2 per cent of wheat sales were rejected by purchasers for failing to meet a previously agreed standard. (5.4).

45. A more disturbing implication of these results is that an important plank in the present policy of giving a higher level of grant aid exclusively to co-operative grain stores on the expectation of subsequent higher market prices does not appear to be totally justified. (5.5).

7.7 Future Prospects for Cereal Production

46. An analysis of financial results where the sample farms were re-grouped by the proportion of winter wheat in the cereal area showed farms with the highest proportion of wheat have an advantage in yield, gross and net margins over all other groups. (6.2).

47. Farms growing only barley had a lower yield and the savings in production costs were not sufficient to cancel out the yield and price advantage of holdings with a high proportion of wheat. (6.2).

48. The groupings based on the proportion of wheat in the cereal area showed a marked regional bias. Farms with a high proportion of wheat were mainly located in the major cereal growing areas of England and Wales. (6.2).

49. National statistics show that from 1970 the yield of wheat has increased at the rate of 3.7 per cent per annum; if the low yields of the drought years in 1975 and 1976 are excluded from the calculation the rate of increase in yield has been 4.9 per cent per annum. Over the same period the yield of barley has increased more slowly at the rate of 1.9 per cent per annum or 2.5 per cent when 1975 and 1976 are excluded. With this differential in the rate of yield increase the less favourable position of farms not growing wheat is likely to deteriorate. (6.3).

50. From 1975 cereal prices have been declining in real terms and since that date increases in the level of output have been the result of higher yields. (6.3).

51. Since 1977 fixed costs appear to have stabilized and over the period covered by the surveys have increased less rapidly than variable costs, particularly for winter wheat production. (6.3).

52. Estimates of production costs for the 1982 harvest suggest that the yield of wheat will need to be about two per cent above the higher expectation of yield (excluding 1975 and 1976) if the net margin in 1982 is to be comparable with the 1971 results. On the same basis the yield of barley will need to be 4.75 tonnes per hectare, almost 3.5 per cent above the expected level, at an average price of £115 per tonne to achieve a 1982 net margin similar to the 1971 to 1979 average. (6.3).

53. The opportunities to increase cereal yields are more severely limited and the outlook less promising for producers in areas where, for climatic or other reasons only spring barley can be grown successfully. (6.3).

54. The potential savings in production costs where spring barley is grown in a more traditional rotational system are unlikely to be sufficient to offset the advantage of the higher yields of wheat. (6.3).

55. The decision to include a high proportion of wheat in the cereal area by growers able to do so has been economically justified despite the associated move to a high input system. With the prospect of continuing cereal surpluses in Europe and prices being further reduced in real terms, it is the specialist wheat producers, with a soil type and climate advantage, who will be best placed to survive the squeeze. (6.3).

56. The potential benefits to producers who choose a co-operative through which to market grain as opposed to a grain merchant appear limited. The plant breeder and agro-chemical industry are likely to offer more tangible benefits to producers in the future. (6.3).

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