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# **Farming Systems and the Common Market**

**C S Barnard, H Casey & B H Davey**

*Bull.*

**5**

83p

## THE AGRICULTURAL ADJUSTMENT UNIT

### THE UNIVERSITY OF NEWCASTLE UPON TYNE

In recent years the forces of change have been reshaping the whole economy and, in the process, the economic framework of our society has been subject to pressures from which the agricultural sector of the economy is not insulated. The rate of technical advance and innovation in agriculture has increased, generating inescapable economic forces. The organisation of production and marketing, as well as the social structure, come inevitably under stress.

In February 1966 the Agricultural Adjustment Unit was established within the Department of Agricultural Economics at the University of Newcastle upon Tyne. This was facilitated by a grant from the W. K. Kellogg Foundation at Battle Creek, Michigan, U.S.A. The purpose of the Unit is to collect and disseminate information concerning the changing role of agriculture in the British and Irish economies, in the belief that a better understanding of the problems and processes of change can lead to a smoother, less painful and more efficient adaptation to new conditions.

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The Unit would welcome comments on its publications and suggestions for future work. The Unit would also welcome approaches from other organisations and groups interested in the subject of agricultural adjustment. All such enquiries should be addressed to the Director of the Unit.

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# FARMING SYSTEMS AND THE COMMON MARKET

The Prospects for British Farming in a Common Market  
Environment—a Post-Devaluation Appraisal

C. S. BARNARD, H. CASEY and B. H. DAVEY

Bulletin No. 5

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1968



## FOREWORD

One of the major challenges which the agricultural industry may have to face during the 1970's is the problem of adjusting to the new conditions emanating from British membership of the European Economic Community and acceptance of the E.E.C. Common Agricultural Policy. The purpose of this study is to consider the implications at the farm level of adopting the C.A.P. for a number of typical farming situations.

The study has been undertaken jointly by C. S. Barnard, Lecturer in the Department of Land Economy at the University of Cambridge, H. Casey, Lecturer in Agricultural Economics at the University of Reading and B. H. Davey, Lecturer in Agricultural Economics at the University of Newcastle upon Tyne. Mr. Barnard undertook primary responsibility for the preparation of Sections IV and VI of the Report, whilst Mr. Casey and Mr. Davey jointly prepared the remaining sections. General editorial responsibility has rested with Mr. Davey.

At the time when the project was started in the autumn of 1967, it was of considerable topical interest because of the application for membership of the Common Market which had been made by the Government. The Common Market issue is now of less immediate concern, but the report is nevertheless apposite at the present time not only because it considers optimal plans under current U.K. conditions, but also because of the likelihood that Britain will eventually become part of a wider European Community. The report therefore has a bearing on the longer-term organisation of British agriculture at the farm level in providing farmers with guidance on the optimal allocation of the resources at their disposal.

August 1968

JOHN ASHTON,  
Director  
Agricultural Adjustment  
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## I. INTRODUCTION

In recent years a considerable amount of effort has been expended by universities, government departments, farming organisations and commercial firms associated with the agricultural industry in examining the effects on farming of British membership of the European Economic Community, or of an acceptance of the Common Agricultural Policy within some other form of association. Most of this effort has been concentrated either on macro-economic problems such as the implications of the Common Agricultural Policy for aggregate farm income, the level of farm output, cost of living and balance of payments, or else on interpreting the E.E.C. commodity regulations and assessing the impact of E.E.C. price levels on the profitability of the main sectors of British agriculture, e.g. on milk, beef and sheep production, pig and poultry farming, arable cropping and so on. Very little attention, however, has been paid to the implications of the C.A.P. for individual farming systems and to the effects of the devaluation of November 1967 on the relative merits or otherwise of conforming with the Community. For a number of products, such as milk, devaluation has substantially improved the prospects for U.K. farmers in the E.E.C.

Work in the micro-economic field has usually suffered from the disadvantage that it has been limited simply to repricing existing inputs and outputs on farms at E.E.C. prices, in short to static analyses that assume unchanging farm organisations if Britain should accede to the Common Market. This detracts considerably from their value since it is clear that changes in the relative prices of farming outputs and inputs would evoke a response on the part of farmers, leading, in turn, to changes in the pattern of British farming. Hence a more dynamic form of analysis is required to fill a gap in our knowledge with regard to the micro-economic effects on farming of joining the Common Market.

### **The Analysis**

It was to help fill this gap that the project, whose results are presented in this report, was initiated. The objective was to analyse the impact of entry into the E.E.C. on individual farming systems. Six farms were chosen for analysis, representing some of the more important farming types found in Britain; these farms were subjected to a three-stage analysis as follows:

- (1) The farms were first programmed for maximum profit solutions under current U.K. prices and conditions. This was necessary to provide a basis of comparison for the second and third stages of the analysis, since it is obviously incorrect to compare optimal farm organisations at E.E.C. prices with the current actual organisation which may be sub-optimal.

- (2) Secondly, the optimal solutions at U.K. price were repriced at Common Market prices to assess the impact of entry into the E.E.C. on the profitability of these farms, assuming that no changes in farm organisation were made after entry.
- (3) Finally, the farms were programmed a second time for optimal solutions under E.E.C. prices and conditions. In this way it was hoped to identify the main changes in organisation which would be necessary in order to maximise profits in the Common Market.

The project was basically an exercise using linear programming with the objective of comparing in both physical and financial terms optimal plans at U.K. and E.E.C. prices for the farms selected for analysis.

It was generally assumed that the availability of fixed resources on the six farms would not change as a consequence of entry into the Common Market. Both the U.K. and E.E.C. programmes were drawn up, therefore, on the basis of similar labour and machinery complements and working capital.

### **The Farms**

As already mentioned, six farms chosen to represent, as far as possible, some of the main farming systems in Britain were subjected to the three-stage analysis outlined above. Brief details of the current organisation of these farms are given below.

- (1) *Berkshire Farm.* A farm of 429 acres situated in the Thames Valley a few miles from Reading. The main crops are cereals, potatoes and sugar beet. A herd of 120 Freisian dairy cows is carried, replacements being home-reared. There is also a self-contained flock of some 250 ewes.
- (2) *Lincolnshire (Holland) Farm.* A farm of 350 acres situated a few miles from Spalding. The emphasis is on arable and horticultural cropping. Bulbs and flowers are a major activity on the farm, with output in the form of flowers in the open, bulbs for lifting and forced flowers. The other main crops are wheat, field beans, potatoes, sugar beet, onions and brassicas. No livestock are kept on this farm.
- (3) *Derbyshire Farm.* A farm of 379 acres located in South Derbyshire near Burton-on-Trent. The system of farming is relatively straight-forward with wheat, barley and potatoes and a dairy herd of 80 cows and their replacements. A ewe flock was disbanded in 1964 when the potato enterprise was introduced.
- (4) *Northumberland Farm.* A farm of nearly 650 acres on semi-marginal upland a few miles to the north-west of Morpeth in mid-Northumberland. The farm is currently in the early stages of a development programme with considerable



emphasis on land improvement through drainage. It is a fairly typical Northumberland corn and stock farm, with cereals, a single-suckled beef herd and a flock of breeding ewes as the main activities.

(5) *Essex Farm.* This is a heavy land arable farm of 210 acres located in the north of Essex. The emphasis is on arable cropping based on the production of cereals, sugar beet, potatoes and beans. A few beef cattle are kept to utilise arable by-products and one-year clover leys which are grown for rotational purposes.

(6) *Wiltshire Farm.* A farm of some 600 acres situated in the south of the county a few miles from Salisbury. The farm is fairly typical of the area, the major enterprises being cereals, herbage seeds and sheep. Fuller details about each farm are given in the farm case studies which are described in subsequent sections of the report.

The contents of each case study, in outline, are as follows:

- (1) A description of the farm—its physical environment, resource availability, current organisation.
- (2) The input-output data built into the linear programming matrix for the farm, including the gross margins for all production possibilities at U.K. and E.E.C. prices and the limitations or constraints that must be imposed for rotational, institutional or personal reasons.
- (3) The optimal or maximum profit programme at U.K. prices.
- (4) The optimal U.K. programme repriced at E.E.C. prices, compared with the optimum at U.K. prices.
- (5) The optimal programme at E.E.C. prices and a comparison in physical and financial terms with the optimal plan under U.K. conditions as described at (3) above.

It is necessary to guard against generalising too much from the results of these six case studies. The farms were not randomly selected to represent general situations or conditions, but merely to illustrate the type of adjustments that might be necessary on certain broad types of farming. The results therefore relate to the particular conditions of the farms under examination. Nevertheless, there are certain features of their adaptation to E.E.C. conditions which are common to most, if not all, of the farms and it has been possible, therefore, in the final section of the report to draw some tentative and generalised conclusions about the changing pattern of British farming within the E.E.C. The final section also focusses attention on some of the longer term issues concerning the Common Agricultural Policy which are not raised in the sections dealing with individual farms.

It should be noted that only land-using livestock enterprises have been included in the list of feasible activities on these farms. Intensive non-land using enterprises, particularly pig and poultry production, have been excluded because they can be regarded as being independent of the resources described in the linear programming matrices. For example, a pig and poultry enterprise may be added to a programme to utilise resources, e.g. labour, left unemployed by the other activities. Alternatively, a self-contained one-man unit may be established quite independently of the other enterprises on the farm. In circumstances such as these the adjustment to E.E.C. conditions becomes a simple exercise in budgeting the impact of Common Market prices on the gross margins of the intensive enterprises.

### The Price Assumptions

No special assumptions were made about the output and input prices used in computing the optimal programmes at U.K. prices. However, in order to provide a common basis for comparison the prices used in the U.K. programmes were those actually realised or incurred on the farms during 1966/67.

A number of estimates have been made of U.K. producer prices in the E.E.C. (1) The prices adopted for the main farm products in this study were arrived at by striking a balance between the prices estimated by the Government's agricultural economists and other research workers. However, these estimates were all made before the devaluation of the pound in November 1967. Since the unit of account to which the E.E.C. prices relate is the U.S. dollar it follows that devaluation automatically changed the sterling equivalents of the target and intervention prices for those commodities for which common price levels exist. Hence, the prices to which the U.K. farmer would be adjusting are one-sixth higher than those which ruled before devaluation. Estimates of E.E.C. producer prices before and after devaluation are shown in Table 1 for the main commodities produced on the six farms. Sheep prices were assumed to increase by 17.5 per cent as a consequence of (a) the application of the Common External Tariff of 20 per cent to U.K. imports of mutton and lamb, and (b) the increased prices for beef and pigmeat following the implementation of E.E.C. regulations for these products. In addition, it was assumed that direct enterprise subsidies or production grants would not be paid in the Common Market in view of the E.E.C. regulations on state aids to agriculture which prohibit payments that distort free competition by favouring certain

(1) See, for instance:

The Common Agricultural Policy of the European Economic Community (Cmnd. 3274).

T. K. Warley. *The Cost of Joining the Common Market.*

N.F.U. Information Service. *British Agriculture and the Common Market.*

M. Butterwick and E. N. Rolfe. *Food, Farming and The Common Market.* Oxford University Press, 1968.

Confederation of British Industry. *Britain and Europe, Volume 1, An Industrial Appraisal.*

J. Van Lierde. *Adaptation in European Agriculture and the Common Agricultural Policy. Economic Change and Agriculture.* Oliver and Boyd, 1967.

**TABLE 1**  
COMMON MARKET PRICES—BEFORE AND AFTER DEVALUATION

<i>Commodity</i>	<i>Before Devaluation</i>	<i>After Devaluation</i>
	£	£
Wheat (per ton) .. .. .	35·5	41·35
Barley (per ton) .. .. .	30·5	35·50
Potatoes (per ton) .. .. .	12·0	14·0
Sugar Beet (per long ton) .. .. .	6·2*	7·2*
Milk (pence per gallon) .. .. .	39·1	45·5
Beef (per live cwt.) .. .. .	12·0	14·0

\*This takes no account of the benefit which sugar beet producers would derive from the free return to them of sugar beet pulp.

regions or products at the expense of others. This means, for instance, the loss of the calf subsidy, beef cow subsidy and the hill cow and hill sheep subsidies. Details of E.E.C. price assumptions for other products, e.g. horticultural crops, are discussed in the appropriate sections.

Entry into the Common Market will lead to increases in the prices of farm inputs and requisites, particularly of feed and fertilizers, whilst devaluation will also affect the prices of these and other farm requisites. So far as feedingstuff prices are concerned, the price increases flow mainly from the higher feed grain prices in the Common Market. For example, the price of purchased concentrates for cattle and sheep was estimated to increase by about £8·5 per ton on the basis of a £12 per ton (or over 50 per cent) increase in the price of feeding barley and a 70 per cent inclusion rate in the ration, and after allowing for small devaluation effects on the prices of other ingredients, particularly imported protein feeds. Home-grown concentrates bore the full price increase for feed grains, i.e. £12 per ton.

The price of seeds under Common Market conditions was assumed to change in proportion to the movement in the appropriate product price. The main factor affecting the price of fertilizers in the E.E.C. in the short run will be the removal of the fertilizer subsidy in accordance with Common Market regulations for fair competition. It is estimated that removal of the subsidy would increase fertilizer prices on average by some 30 per cent; in addition post-devaluation increases in the price of raw materials used in the manufacture of fertilizers could increase fertilizer prices by a further 5 per cent. For the purposes of this study, therefore, the price of fertilizers was assumed to increase by about one-third. In the longer run, however, there could be lower net prices for fertilizers as a result of greater competition from E.E.C. countries and, perhaps, cheaper raw materials.

Some changes may also be expected in the prices of fixed inputs. It is difficult, however, to predict with any degree of precision what these changes might be. It follows that any adjustments which are made to labour costs, rent etc., are necessarily rather speculative. For the purposes of this report, therefore, it has been assumed that agricultural wage rates would rise by 10 per cent under E.E.C. conditions, reflecting the higher cost of living, and rent would rise by a percentage equal to three-quarters of the increase in net farm income. (In other words, if net income increases by 100 per cent under E.E.C. conditions, it has been assumed that rent would rise by 75 per cent).

In addition to its impact on feed and fertilizer prices, devaluation will also affect the prices of other imported requisites used in agricultural production, e.g. fuel and imported machinery. Estimates of these price increases were made by taking the import content of agricultural production at pre-devaluation prices, adjusting the cost of imported inputs to take account of devaluation, and expressing the difference as a percentage of the total bill for the item. On this basis, the cost of machinery and miscellaneous inputs might increase by 2 and 7 per cent respectively as a result of devaluation. (This calculation was based on data published by D. Freidman in *British Agriculture and the Balance of Payments—Agriculture's Contribution to Import Saving*, Woolwich Economic Papers No. 9.) These adjustments would have a relatively minor effect on the profitability of the farms. On the other hand, it is not unlikely that entry into the Common Market could lead to lower prices for certain industrial inputs, particularly machinery and equipment, used in agricultural production as a consequence of the full liberalisation of trade in industrial products between member countries. On balance it seems possible that these changes might cancel each other out, thus no adjustments were made to the prices of machinery and other fixed inputs under E.E.C. conditions.

Although these adjustments to the prices of fixed inputs are admittedly rather arbitrary, they do allow for some assessment to be made of the effect of entry into the Common Market on net farm incomes, as well as on the total gross margins, of the six farms.

### **Acknowledgements**

The preparation of this report would not have been possible without the co-operation of a large number of people. Whilst it would be invidious to single out any one person for special mention, the authors would like to thank the farmers who made available information about their farming activities, the many N.A.A.S. advisers who helped in preparing the farm data for analysis, and the colleagues who offered helpful comments and suggestions on the method of analysis and the report. Final responsibility for the report, however, rests with the authors.

## II. THE BERKSHIRE FARM

The farm is situated about four miles from Reading and lies on a northern slope between the River Thames and the A.4 road. Its soils are mainly valley gravels that tend to burn in a dry summer and alluvial silts liable to flooding in winter. Although the farm is best described as a dairy farm, milk sales only account for half the gross output. The farm is 429 acres in size, with a farming system currently based on cereals, potatoes, sugar beet, dairying and sheep. It may therefore be described as a mixed farm.

### Farm Resources and Activities

The layout of the farm is rather inconvenient because the buildings are nearly all in one corner, more than a mile away from the farthest fields. This limits the area which can be effectively grazed by the dairy herd and adds to transport problems. On the other hand, there are piped drinking points in nearly every field and water is available for irrigation on the area of potatoes and temporary grassland.

Eight regular workers are employed, comprising two cowmen, a shepherd/tractor driver, three tractor drivers and two general men. The farm is intensively mechanised with a force of five tractors. Other equipment includes a full range of cultivating implements, reversible ploughs, forage harvester, baler, combine harvester, complete sugar beet mechanisation and irrigation equipment. Facilities for drying and storing up to 480 tons of grain are available.

In recent years, the cropping system has been based on cereals and leys with small acreages of potatoes and sugar beet. About 70 acres of wheat, 140 acres of barley, 13 acres of potatoes and 3 acres of sugar beet are grown. There are 16 acres of permanent pasture and the remaining acreage is in leys.

The livestock enterprises comprise a dairy herd and a ewe flock. The dairy herd, which for many years consisted of 90 Friesian cows milked in a 16-stall, 8-unit herringbone parlour, is being built up and now numbers over a hundred. Feeding of the herd is based on intensively-managed grazing in summer, with high quality silage forming the basis of the winter ration. Some 30 heifer calves are reared annually as herd replacements.

The sheep flock consists of a home-bred and self-contained flock of about 250 ewes. The ewes are housed from January until lambing time in March, the aim being to produce fat lambs off grass. Those lambs not sold fat from the ewes are carried as stores until late Autumn; they are then finished indoors on a mainly cereal ration.

### Production Possibilities and Constraints

Data on the feasible cash crops, the yields postulated for each of the different land types and the limits set in the interest of disease control are summarised in Table 2.

Five land types can be distinguished on the farm, namely (1) alluvium 92 acres, (2) medium loam 76 acres, (3) medium gravel 127 acres, (4) light gravel 118 acres and (5) water meadow 16 acres. As it was foreseen that grain production would predominate on the alluvium and the medium loam soils, additional restrictions were imposed to ensure that this land is rested in grass for at least two consecutive years in every seven.

**TABLE 2**  
FEASIBLE CASH CROPS, YIELDS AND CONSTRAINTS

<i>Soil Type</i>	(1) <i>Alluvium</i>	(2) <i>Medium Loam</i>	(3) <i>Medium Gravel</i>	(4) <i>Light Gravel</i>
Winter Wheat:				
Yield (cwts) .. ..	—	35	28	—
Limit (acres) .. ..	—	20	40	—
Spring Wheat:				
Yield (cwts) .. ..	30	30	—	—
Limit (acres) .. ..	20	20	—	—
Spring Barley:				
Yield (cwts) .. ..	38	32	25	22.5
Limit (acres) .. ..	66	54	80	60
Early Potatoes:				
Yield (£ p.a.) .. ..	120	120	120	—
Limit .. ..	P.M.B. quota of 15 acres constrains this activity under current U.K. conditions.			
Sugar Beet:				
Yield (tons) .. ..	10(a)	8.75(b)	—	—
Limit (acres) .. ..	12	20	—	—

(a) 14 per cent sugar.

(b) 14.5 per cent sugar.

Only one type of grassland—namely irrigated two-year Italian ryegrass ley with medium applications of nitrogen—was considered for land types (1) to (4) in the U.K. plan. Land type (5), comprising 16 acres of water meadow, is suitable only for permanent pasture.

The gross margins of the feasible cash crops and grassland at U.K. and E.E.C. price levels are summarised in Table 3. Negative gross margins indicate the variable costs of the irrigated leys and permanent pasture. The table confirms that a major increase in the profitability of cereal production could be expected under E.E.C. conditions. The gross margin from sugar beet also improves, but there is little change in the gross margin of early potatoes.

TABLE 3

## GROSS MARGINS OF CASH CROPS AND GRASSLAND (per acre)

Activity	At U.K. Prices	At E.E.C. Prices
	£	£
Barley (1) .. .. .	37·5	56·25
Barley (2) .. .. .	29·5	44·3
Barley (3) .. .. .	20·5	31·9
Barley (4) .. .. .	17·5	29·2
Spring Wheat (1) .. .. .	28·5	49·0
Spring Wheat (2) .. .. .	28·5	49·0
Winter Wheat (2) .. .. .	34	58·8
Winter Wheat (3) .. .. .	25	44·3
Early Potatoes (1) .. .. .	99	99·0
Early Potatoes (2) .. .. .	126·5	126·0
Early Potatoes (3) .. .. .	85	84·0
Sugar Beet (1) .. .. .	28	38·6
Sugar Beet (2) .. .. .	22	28·0
Irrigated Ley.. .. .	-11·3	-14·7
Permanent Pasture .. .. .	-3·6	-4·8

The feasible livestock enterprises under both U.K. and E.E.C. conditions are a self-contained dairy herd, from which 27 per cent of the cows are culled annually, and an intensively managed ewe flock with an effective lambing rate of 140 per cent and a 28 per cent culling rate.

So far as the dairy herd is concerned, it was decided to base the enterprise on a herd of January-calving cows since previous work had demonstrated that these gave

TABLE 4

## STRUCTURE OF DAIRY HERD AND GROSS MARGINS AT U.K. AND E.E.C. PRICES

Yield (gallons) .. .. .	1100	900	700
Herd Structure (% of cows in yield group) ..	30	40	30
Margin over concentrates:	£	£	£
U.K. prices .. .. .	161·6	137·1	109·2
E.E.C. prices .. .. .	174·3	149·3	119·4
	<i>U.K. prices</i>	<i>E.E.C. Prices</i>	
	£	£	
Livestock sales per cow per annum .. .. .	13·08	20·0	
Other variable costs per cow per annum ..	15·0	18·5	

a higher margin over concentrates at both E.E.C. and U.K. prices than either October or April-calving cows. The yield structure of the herd and relevant gross margin data is shown in Table 4. On this basis the average gross margin per cow for a self-contained herd with all replacements reared is £136 at U.K. prices and £149 at E.E.C. prices. These gross margins make no allowance for the cost of forage.

The dairy herd is the only cattle enterprise that was considered to be feasible under U.K. conditions. Within the E.E.C., however, where, as a consequence of higher beef prices, the profitability of beef production can be expected to improve relative to dairying, beef could become a feasible activity. It was decided, therefore, to include two systems of beef production in the E.E.C. model to test the hypothesis that under E.E.C. conditions there might be some substitution of beef for milk. These are relatively intensive systems of production, depending for their success on efficient utilisation of grass and grass products. A high standard of management was assumed in constructing the gross margins for these activities in line with current performance with the dairy herd and ewe flock. Whilst it is not claimed that the gross margins postulated would be achieved in every case, they do reflect the scope which exists for competitive beef production at high levels of performance. The physical coefficients for these systems of beef production were based on information prepared by the N.A.A.S. for inclusion in its pamphlet of beef planning data. E.E.C. prices were applied to these coefficients to obtain the gross margins.

For the ewe flock, an intensive system of management with the flock enclosed in paddocks at the rate of 10 ewes to the acre was assumed. Gross margins per ewe under U.K. and E.E.C. conditions were taken to be £5.6 and £6.75 respectively, after deduction of forage costs.

The size of the labour force was not part of the initial specification of the model and the programme was allowed to nominate its requirements. However, the model did specify that the labour force should consist of adult males regularly employed throughout the year. Overtime working was available to meet the unpredictable elements in the demand for labour, but the availability of casual labour was deemed not to be a reasonable assumption.

### **Optimal Plan at U.K. Prices**

Details of the optimal plan at U.K. prices are given in Table 5.

It will be seen that the optimal programme is based on cereals and milk production. Over 60 per cent of the farm is devoted to grassland for the dairy herd; most of the remainder is in corn. The total cereal acreage is 149 acres comprising 55 acres of winter wheat and 94 acres of spring barley. The 272 acres of grassland is utilised by a self-contained herd of 115 dairy cows. Of the feasible activities spring wheat, sugar beet and sheep do not appear in the solution. A small acreage of early potatoes is, however, included as a supplementary enterprise. The plan



thus represents a considerable simplification of organisation compared with the existing system, with concentration on two main lines of production.

**TABLE 5**  
OPTIMAL PLAN AT U.K. PRICES

<i>Activity</i>	<i>Size</i>	<i>Gross Margin per unit</i>	<i>Gross Margin</i>
Dairy Cows .. .. .	115 cows	£ 136	£ 15640
Winter Wheat 2 .. .. .	20 acres	34	680
Winter Wheat 3 .. .. .	35 acres	25	875
Barley 1 .. .. .	66 acres	37.5	2475
Barley 2 .. .. .	28 acres	29.5	826
Early Potatoes 2 .. .. .	8 acres	126.5	1012
Irrigated ley .. .. .	256 acres	-11.3	-2893
Permanent pasture .. .. .	16 acres	-3.6	-58
Buy hay .. .. .	35 tons	-10	-350
Supplement hay .. .. .		-8.82(1)	-309
Sale of straw .. .. .	31 tons	4	124
<b>Total Gross Margin .. .. .</b>			<b>£18022</b>

(1) Price per ton of hay bought.

### U.K. Plan at E.E.C. Prices

Adjustment of the optimal plan to E.E.C. prices leads to an increase of £3315 in the total gross margin for the farm. This is due largely to an improvement of £2800 in the gross margin from cereals; The gross margin of the dairy herd increases by £500 after allowing for higher forage costs. Entry into the Common Market would therefore provide the farmer with a substantial windfall gain merely from following the U.K. plan, since the total gross margin of the plan increases by 18 per cent. Details of the change in margins of the U.K. plan at E.E.C. prices are shown in Table 6.

### Optimal Plan at E.E.C. Prices

The optimal U.K. plan is very stable given E.E.C. prices and when no beef enterprise is considered. Table 7 shows that only marginal changes are made to the number of dairy cows and the acreage of winter wheat. The plan includes an additional 4 acres of wheat and half an acre of potatoes at the expense of 5 acres of grassland. The size of the dairy herd declines from 115 cows to 113. The expectation that cereal production would be substantially increased at the expense of dairying is not realised, due to the relatively low cereal yields obtained on some of the poorer land on the farm; irrigation can, however, enable this land to support an intensive system of grassland management. A change in the relative efficiencies of cereals and dairy cattle could, therefore, give rather different results. These

minor adjustments in plan have little effect on the total gross margin which increases by only £50 compared with the U.K. plan at E.E.C. prices. Seven men—2 cowmen and five general workers—are required to operate both this plan and the optimal U.K. plan. If this seems rather high it should be borne in mind that the system depends on two-year intensive grass leys and that very considerable quantities of silage have to be made. Furthermore, there is no supply of casual labour, not even for the early potatoes.

**TABLE 6**  
U.K. PLAN AT E.E.C. PRICES

Activity	Size	Gross Margin	
		Increase	Decrease
		£	£
Dairy Cows .. .. .	115 cows	1495	
Winter Wheat .. .. .	55 acres	1172	
Barley .. .. .	94 acres	1652	
Potatoes .. .. .	8 acres		4
Ley .. .. .	256 acres		870
Permanent pasture .. .. .	16 acres		19
Hay and supplement .. .. .	35 tons		111
Windfall gain .. .. .			3315
		4319	4319
Total Gross Margin .. .. .			£21337

**TABLE 7**  
OPTIMAL PLAN AT E.E.C. PRICES: BEEF NOT FEASIBLE

Activity	Size	Gross Margin	
		per unit	Gross Margin
		£	£
Dairy Cows .. .. .	113 cows	149	16837
Winter Wheat 2 .. .. .	20 acres	58·8	1176
Winter Wheat 3 .. .. .	39 acres	44·3	1728
Barley 1 .. .. .	66 acres	56·25	3713
Barley 2 .. .. .	28 acres	44·3	1240
Early Potatoes 2 .. .. .	8·5 acres	126·0	1071
Irrigated ley .. .. .	251 acres	-14·7	-3690
Permanent pasture .. .. .	16 acres	-4·8	-77
Buy and supplement hay .. .. .			-770
Sale of straw .. .. .	39 tons	4	156
Total Gross Margin .. .. .			£21384

The inclusion of beef as a feasible activity at E.E.C. prices gives rise to a substantial change in the optimal farm plan and in the total gross margin. Details of the optimal plan with beef feasible are given in Table 8. Moreover, this plan could be handled by a labour force of 6 general workers, i.e. with a reduction of one worker. The employment of a seventh man would not be rewarding.

**TABLE 8**  
OPTIMAL PLAN AT E.E.C. PRICES: BEEF FEASIBLE

<i>Activity</i>	<i>Size</i>	<i>Gross Margin per Unit</i>	<i>Gross Margin</i>
		£	£
Beef-system A .. .. .	21 beasts	59.2	1243
Beef-system B .. .. .	136 beasts	85.7	11655
Winter Wheat 2 .. .. .	20 acres	58.8	1176
Winter Wheat 3 .. .. .	40 acres	44.3	1772
Spring Wheat 2 .. .. .	20 acres	49.0	980
Barley 1.. .. .	66 acres	56.25	3713
Early Potatoes .. .. .	17.5 acres	126.0	2205
Permanet pasture and		Cost included	—
Grassland for beef .. .. .	265.5 acres	in gross margin	—
Sales of straw .. .. .	193 tons	per beast	—
		4	772
<b>Total Gross Margin .. .. .</b>			<b>£23516</b>

This plan shows an increase of £5500 in total gross margin over the optimal U.K. plan, an increase of almost £2200 over the optimal U.K. plan adjusted to E.E.C. prices and a similar increase over the optimal E.E.C. plan where beef is not feasible. The main change is the inclusion of the beef enterprise at the expense of the dairy herd. Not only does this have the effect of increasing the gross margin of the live-stock sector of the farm by £370 compared with the repriced U.K. plan, but it also allows the farm to dispense with the services of one man. Savings are also made by the employment of general workers in place of the more expensive cowmen.

An improvement in the gross margins derived from cash cropping could also be expected, despite a reduction in the total acreage of cereals from 149 to 146 acres. An increase of 5 acres in the area of winter wheat and the inclusion of 20 acres of spring wheat on land type 2 in the plan more than offsets a fall of 28 acres of spring barley. Thus the total gross margin from cereals increases by £500, but mainly on account of increased sales of straw. The acreage of early potatoes increases from 8 to 17.5 acres in the optimal E.E.C. plan with a corresponding improvement of £1197 in the gross margin earned by the enterprise. It may be noted that sheep and sugar beet again do not appear in the optimal plan.

## Net Farm Income

So far the plans have been considered solely in terms of their effect on the total gross margin of the farm. However, by incorporating the fixed costs into the model an assessment of the net farm income of the alternative plans can be made.

The current level of fixed costs incurred on the farm is as follows:

	Total	Per Acre
	£	£
Rent .. .. .	1815	4.2
Labour .. .. .	5850	13.6
Machinery .. .. .	5552	12.9
Other .. .. .	1590	3.7
	<hr/>	<hr/>
	14807	34.5
	<hr/>	<hr/>

The net income which arises when this level of fixed costs is deducted from the gross margins of the four situations discussed above is shown in Table 9.

TABLE 9  
NET FARM INCOME

	1	2	3	4
Organisation .. .. .	U.K.	U.K.	E.E.C.	E.E.C.
Prices .. .. .	U.K.	E.E.C.	E.E.C. (beef not feasible)	E.E.C. (beef feasible)
	£	£	£	£
Gross Margin .. .. .	18022	21337	21384	23516
Fixed Costs .. .. .	14807	14807	14807	13457(a)
Net Farm Income .. .. .	3215	6530	6577	10059
Net Farm Income per acre .. .. .	7.5	15.2	15.3	23.5
Index .. .. .	100	203	204	314

(a) 6 men. Labour bill reduced to £4500.

Net farm income of the U.K. plan more than doubles at E.E.C. prices from £7.5 to £15.2 per acre. A similar improvement in net income occurs with the optimal E.E.C. plan where beef is not feasible. The introduction of beef into the plan at the expense of dairying leads to an even larger increase in net income as a consequence of the larger total gross margin on the one hand and the reduction in labour costs on the other.

It is clear that if such large increases in net income were achieved by this type of farming in practice they would be reflected in higher land charges and hence in rents. In order to make some allowance for the upward movement in rents it has been assumed that rent would increase by a percentage equal to three-quarters of

the percentage increase in net farm income. An increase of 10 per cent in wage rates has also been assumed under E.E.C. conditions. On this basis the net farm income for the four situations is that shown in Table 10.

**TABLE 10**  
NET FARM INCOME—INCREASED FIXED COSTS

	1	2	3	4
Organisation .. .. .	U.K.	U.K.	E.E.C.	E.E.C.
Prices .. .. .	U.K.	E.E.C.	E.E.C. (beef not feasible)	E.E.C. (beef feasible)
	£	£	£	£
Gross Margin .. .. .	18022	21337	21384	23516
Fixed costs .. .. .	14807	16790	16808	16829
Net Farm Income .. .. .	3215	4567	4576	6687
Net Farm Income per acre .. .. .	7.5	10.6	10.7	15.6
Index .. .. .	100	141	143	208

The conclusion to be drawn, therefore, is that even after allowing for the impact of higher fixed costs, the profitability of this farm business would increase substantially under E.E.C. conditions. The improvement in net income would be particularly marked if the farmer was prepared to make a basic shift in policy from dairying to beef production.

### Conclusion

To sum up, the optimal U.K. plan for this farm is based on 149 acres of cereals and a dairy herd of 115 cows, together with a small early potato enterprise. The profitability of this plan would be substantially increased in an E.E.C. environment, even after allowing for increases in rents and wage rates. Even higher profits could be earned in the E.E.C. if intensive systems of beef production from grass were substituted for the dairy enterprise. One may conclude, therefore, that the prospects for this farm within the E.E.C. are favourable.

It is interesting that, in contrast to the situation on some of the other farms included in this study, the high E.E.C. grain prices do not redirect resources from livestock to grain production. This focusses attention on the modest level of cereal yields on this farm compared with the very high standard of grassland management and utilisation that is achieved primarily by irrigation. A fairly small increase in the relative efficiency of cereal production would discourage dairying on this farm within the E.E.C. price regime. On the other hand, it is very unlikely that grain production could be improved sufficiently to warrant any reduction in the beef enterprise that distinguishes the ideal plan for the Common Market environment.

### III. THE LINCOLNSHIRE FARM

The farm is situated a few miles from Spalding in the Holland division of Lincolnshire. It is located, therefore, in the heart of perhaps the most intensive arable area of the country where emphasis is placed on high value cash crops. The farm runs to 350 acres of which 4.5 acres are buildings, roads, waste areas etc.; the effective arable area is thus 345.5 acres. Virtually every farm and field horticultural crop is feasible in the locality; the main enterprises grown on this farm at present are wheat, potatoes, sugar beet, beans, peas, onions, leeks, broccoli and cauliflower, flowers and bulbs. No livestock are kept, although the farmer has yarded about 80 cattle in the past.

#### Farm Resources and Activities

The farm can be divided into five soil categories as follows:

- (a) Light silt: potential arable area 49.5 acres;
- (b) Medium silt: " " " 49 " ;
- (c) Heavy silt: " " " 49 " ;
- (d) Clay: " " " 99 " ;
- (e) Skirt: " " " 99 " .

For the purposes of the present analysis, however, these soil types have been amalgamated into two broad classes, light and heavy. Land type I, comprising 98.5 acres of light land, corresponds to categories (a) and (b) above; land type II, comprising 247 acres of heavy land, corresponds to categories (c), (d) and (e).

Nine regular full-time tractor drivers are employed, together with three regular part-time women. Overtime working is welcomed by the regular staff. In addition, casual labour is available at peak periods; the casual labour force comprises one man available for 30 hours a week, two old men, twelve students and housewives employed specifically for cleaning bulbs and a gang of six Irishmen for potato picking. There is a fairly full range of buildings and machinery for handling the crops which are grown, including grain drying and storage facilities, two potato chitting houses, two packing sheds for flowers and bulbs, sterilizing equipment for the bulbs and a heated glasshouse of 10400 square feet. However, there is no potato store.

Most enterprises can be considered as possibilities on this farm, ranging from dairying on the one hand to the more esoteric horticultural crops such as asparagus and corianda on the other. However, in order to keep the size of the model within bounds, the range of production possibilities is restricted to the crops which are currently being grown on the farm, but with the addition of some of the other major crops grown in the locality. These additional activities include barley, brussels sprouts and autumn and winter cabbage.

The gross margins for all feasible activities at both U.K. and E.E.C. prices are shown in Table 11.

**TABLE 11**  
**PRODUCTION POSSIBILITIES—GROSS MARGINS PER ACRE**

Activity	Gross Margin per Acre		
	U.K. Prices	E.E.C. Prices	
	£	£	
Wheat .. .. .	41·7	65·2	
Barley .. .. .	35·0	57·8	
Peas for vining .. .. .	52·4	52·4	
Spring beans .. .. .	30·0	30·0	
Winter beans .. .. .	35·0	35·0	
Potatoes I .. .. .	115·0	90·8	
Potatoes II .. .. .	95·0	73·3	
Sugar Beet I .. .. .	95·0	104·0	
Sugar Beet II .. .. .	85·0	93·2	
Clover hay .. .. .	16·6	25·0	
Onions .. .. .	115·3	105·0	
Leeks .. .. .	58·5	55·0	
Broccoli and cauliflower ..	55·6	50·0	
Brussels sprouts .. .. .	95·0	90·0	
Autumn and winter cabbage ..	45·0	40·0	
Bulbs and flowers:			
		<i>Optimistic</i>	<i>Pessimistic</i>
(i) Growing: Gladioli ..	325	290	245
Tulips .. ..	265	210	165
Daffodils ..	165	120	90
(ii) Forcing (per round)	4000	3800	3200

In the above table, the gross margins for daffodils and tulips are shown net of gang labour costs of £60 per acre for lifting, cleaning, grading and bagging the bulbs. Similarly the gross margins for potatoes are net of casual labour for picking the potatoes, costing £20 per acre. The sugar beet activity on land type I is split into October-harvested beet, November-harvested beet and December-harvested beet; the sugar beet on heavy land (Type II) must, however, be lifted by the end of October. Similarly, the potato activities are sub-divided into early-harvested potatoes (25th September to mid-October) and late harvested potatoes (mid-October to early-November). The gross margins for the brassica crops assume that they are sold as standing crops to a merchant for harvesting by his own labour. These factors all have a bearing on the labour organisation of the optimal farming system.

So far as the flower and bulb activities are concerned, it is possible for the farmer to hire additional land for bulb growing at a rent of £50 per acre. He is, in fact, intending to do more of this in order to make fuller use of the labour he has available at present. Tulips and daffodils on rented land were therefore added to the list of feasible activities with gross margins of £50 per acre less than those shown in Table 11. The gross margin from forcing flowers is £1000 per quarter acre per

round; four rounds are possible each season so that at U.K. prices the total margin from this activity is £4000 per season.

Little comment is required on the gross margins assumed for U.K. conditions since they are based on the present performance on the farm or, in the case of crops not at present grown on the farm, on the average performance in the area. Similarly, little comment is needed on the gross margins of the farm crops—wheat, barley, potatoes and sugar beet—at E.E.C. prices since they are calculated on the basis of the price assumptions discussed in the introduction.

So far as the leguminous crops are concerned, it is not expected that entry into the Common Market by itself would materially affect the prices which farmers receive for their output. Since fertiliser is not applied to the peas and beans on this farm, no changes need be made to the U.K. gross margins for these activities.

It is rather more difficult to predict what might happen to the profitability of horticultural crops under Common Market conditions because there are as yet no common price levels for horticultural crops as there are for some of the farm crops, e.g. cereals. The E.E.C. has made some market regulations for fruit and vegetables covering such topics as the progressive freeing of trade within the community and the adoption of the common external tariff; the institution of a mandatory system of reference prices, which act as minimum import prices for imports from third countries; and the introduction of a system of support-buying linked to a basic price to which buying-in prices are related. Of the crops grown on this farm, only cauliflowers are subject to the minimum import price and support buying arrangements. The estimation of gross margins at E.E.C. prices for vegetables, flowers and bulbs was therefore related to an assessment of how they might be affected by free competition from within the community. It took into account the existing U.K. tariff and quota restrictions which are applied to the relevant crops and the proportion of our total supplies of these crops which are imported from Common Market countries.

For some horticultural produce the consequences of entry into the Common Market might not be adverse. According to Hinton (1), the prospects for field vegetables are, in fact, quite good since our climate, high yields and large scale mechanised production result in low cost production. In addition, the perishability and high freight charges in relation to the value of these crops give vegetables a natural protection from overseas competition. Moreover, of the crops grown on this farm only onions are imported in any quantity, 15 per cent of total supplies coming from E.E.C. countries. Only small supplies of cabbages and cauliflowers are imported, mostly when the tariff is at its highest. Imports from the Common Market account for only about 7 per cent of our total supplies of broccoli and cauliflowers and only 1 per cent each of our supplies of brussel sprouts and autumn

(1) W. L. Hinton. *British Horticulture and the Common Market*. Journal of Agricultural Economics, Vol. XIX, No. 1 January, 1968.



and winter cabbage. Thus, although some increases in the supply of early vegetables can be expected, this can do little to challenge the bulk of our field vegetable production. Accordingly, only a limited scaling down of the gross margins of these enterprises was assumed under E.E.C. conditions to allow for a slight increase in competition, especially for onions, and higher variable input prices, particularly fertilisers.

For flowers and bulbs, however, the removal of tariffs could be expected to result in increased competition from the Netherlands, France and Belgium and to a reduction in the general level of profitability of U.K. production. According to Hinton (op. cit.), imports of cut flowers, whether grown in the open or under glass, are very limited and increases in the amount imported can only be very slight. On the other hand, bulbs and other nursery material are imported to the extent of 27 per cent of total supplies and although the volume of imports may not increase significantly, removal of the tariff of 2/- per lb could have an adverse effect on prices, even after allowing for the reduced competitiveness of imports following the devaluation of the pound in November 1967. It seems reasonable to assume, therefore, that the bulb growing activities on this farm would suffer more than the forcing activity and that both would have to withstand some reduction in profitability, although it is difficult to predict with any degree of precision just what these reductions might be. In this situation it was decided that an optimistic set of assumptions with a 5 per cent reduction in the gross margin from forced flowers and a 10 per cent reduction for bulb growing should be included in the model, together with a more pessimistic set of assumptions where the margins were reduced by 20 and 25 per cent respectively.

### Constraints and Limitations

There are a number of personal, institutional and rotational constraints which limit the area of any particular crop which may be grown on this farm. The major rotational limitations are shown in Table 12.

TABLE 12  
MAJOR CROPPING RESTRICTIONS

<i>Activity</i>	<i>Land Type I</i>	<i>Land Type II</i>
Bulbs: Daffodils .. ..	2 years in 7	2 years in 8 (max. 14 acres)
Tulips .. ..	1 year in 6	Nil
Onions .. ..	1 year in 6	Nil
Potatoes .. ..	{ 1 year in 8 on 49.5 acres 1 year in 6 on 49 acres	1 year in 6
Sugar Beet .. ..	1 year in 4	1 year in 4 (max. 12.5 acres)

Some comments on these and other restrictions follow below:

(1) *Bulbs.* Daffodils are a two-year crop whereas tulips and onions are in the ground for one year only. The essential point is that there must be a gap of five years between bulbs on the same land. Thus onions can be grown on the 100 acres of light and medium silt, but at least five clear years are necessary before daffodils or tulips can be grown on the same land. Gladioli, if grown, must be near the packhouse for convenience; there are thirty acres of light silt (Land Type I) suitable for this purpose. However, there must be three clear years between gladioli crops and five clear years between gladioli and bulbs or onions. Three acres of gladioli is the maximum which can be grown. As mentioned above, it is possible to hire additional land for growing bulbs at a rent of £50 per acre and the farmer intends to do this to make fuller use of the labour he has available at present. Apart from this the prospects of obtaining more land are limited.

(2) *Cereals.* Wheat after wheat and wheat after barley is not acceptable. Wheat can, however, be grown after gladioli, onions, potatoes, October and November-harvested sugar beet (but not December-harvested beet), peas, beans, clover hay, leeks and catch crop autumn cauliflower. Barley cannot follow behind potatoes, beans and clover hay.

(3) *Potatoes.* The farmer has a quota of 65 acres, but in fact the rotational constraints limit the potato acreage to a maximum of 55 acres. Potatoes cannot follow December-harvested sugar beet, brussels sprouts and autumn and winter cabbage.

(4) *Sugar beet.* A quota restriction of 42 acres has been assumed under U.K. conditions. Two clear years are required after brassicas before sugar beet can be grown on the same land.

(5) *Brassicas.* These crops are restricted to light land i.e. Land Type I. They may only be grown after tulips, daffodils or a failure, for example, of onions. For instance, cauliflowers may be grown as a catch crop after tulips and daffodils. Since harvesting of these crops is a difficult and specialised operation, it has been assumed that they would be sold to a merchant as standing crops for harvesting by the merchant's own labour.

(6) *Legumes.* Peas may be grown a maximum of one year in four.

(7) *Flower forcing.* One-quarter of an acre of glass is available for forcing flowers. It is normal practice to fill the forcing houses four times during the season, commencing in November and finishing in March.

## Optimal Plan at U.K. Prices

In Table 13 the optimal plan for the farm at U.K. prices is shown.

TABLE 13  
OPTIMAL PLAN AT U.K. PRICES

	<i>Acres</i>	<i>Gross Margin per acre</i>	<i>Gross Margin</i>
		£	£
Wheat .. .. .	115	41·7	4796
Vining peas .. .. .	86	52·4	4506
Potatoes I .. .. .	14	115	1610
Potatoes II .. .. .	41	95	3895
Sugar Beet I .. .. .	37	95	3515
Brussels Sprouts .. .. .	15	95	1425
Daffodils I .. .. .	17	165	2805
Daffodils II .. .. .	14	165	2310
Tulips .. .. .	6·5	265	1723
	345·5		
Tulips on rented land .. .. .	11·75	215	2526
Forced bulbs .. .. .	0·25	4000(1)	4000
			33111
Less overtime labour (3397 hours) .. .. .			1189
<b>Total Gross Margin .. .. .</b>			<b>£31922</b>

(1) Four rounds.

Overall, the plan suggests one-third of the farm in wheat, a quarter in peas, one-tenth in bulbs and the remainder in roots and brassicas. The mainstay of the farm is the bulb and flower enterprise which contributes 40 per cent to the total gross margin of £33111, before deduction of the cost of overtime labour. The rest of the total gross margin is divided fairly evenly between wheat, peas, potatoes, and sugar beet; brussels sprouts make only a relatively small contribution to the gross margin. Neither potatoes nor sugar beet reach their maxima as indicated by the institutional constraints described above, but potatoes do reach their rotational limit of 55 acres. The plan includes 11·75 acres of tulips grown on rented land, thus confirming the correctness of the farmer's existing ideas in this direction. Whilst the plan is a comparatively simple one with only seven enterprises in place of the

twelve at present found on the farm, it places a strain on the labour resources since nearly 3400 hours of overtime labour are needed to operate it. Of the crops included in the existing cropping programme, beans, clover hay, onions, leeks, broccoli and cauliflowers are not selected for the optimal plan; no new enterprises are included.

### U.K. Plan at E.E.C. Prices

Table 14 indicates the results that would be obtained by the U.K. Plan at E.E.C. prices.

**TABLE 14**  
CHANGE IN GROSS MARGIN—U.K. PLAN AT E.E.C. PRICES

	Acres	Increase		Decrease	
		Optimistic	Pessimistic	Optimistic	Pessimistic
		£	£	£	£
Wheat .. .. .	115	2702	2702	—	—
Vining Peas .. .. .	86	—	—	—	—
Potatoes I .. .. .	14	—	—	339	339
Potatoes II .. .. .	41	—	—	890	890
Sugar Beet I .. .. .	37	333	333	—	—
Brussels Sprouts .. .. .	15	—	—	75	75
Daffodils I .. .. .	17	—	—	765	1275
Daffodils II .. .. .	14	—	—	630	1050
Tulips .. .. .	6.5	—	—	358	650
	345.5				
Tulips on rented land .. .. .	11.75	—	—	646	1175
Forced bulbs .. .. .	—	—	—	200	800
		3035	3035	3903	6254
Overtime labour (10 per cent) cost increase				119	119
Reduction in total gross margin		987	3338		
		4022	6373	4022	6373

Adjustment of the optimal plan to E.E.C. prices suggests that it would be difficult for the total gross margin of the U.K. plan to be maintained, let alone increased, under E.E.C. conditions. Even with the optimistic set of assumptions regarding the gross margins of bulbs and flowers in the E.E.C., the total gross margin declines by nearly £1000; under pessimistic assumptions the total margin is down by £3338. This decline is due primarily to a reduction in the gross margins of the horticultural crops and particularly to the lower margins of bulbs and flowers. The gross margin of bulbs and flowers declines by £2600 under optimistic

assumptions and by £4950 under pessimistic assumptions. A decline of over £1200 in the gross margin from potatoes may also be expected. These reductions in gross margins of potatoes and bulbs are, however, offset by a small increase in the margin from sugar beet and a substantial improvement of £2700 in the gross margin of wheat production. Indeed, were it not for the Common Market's high price regime for cereals, the total gross margin of this farm would have declined even further. However, the increased profitability of wheat and sugar beet is insufficient to make good the losses on other crops.

### Optimal Plan at E.E.C. Prices

In view of this reduction in the gross margin of the U.K. plan at E.E.C. prices, it is important to see how far adjustments in policy within the E.E.C. would allow the gross margin to be maintained, or even improved. In Table 15, therefore, optimal plans are shown for this farm at E.E.C. prices.

TABLE 15  
OPTIMAL PLANS AT E.E.C. PRICES

Activity	Gross Margin Per Unit		Optimistic Plan		Pessimistic Plan	
	Optimistic	Pessimistic	Size	Gross Margin	Size	Gross Margin
	£	£	acres	£	acres	£
Wheat .. ..	65.2	65.2	173	11280	173	11280
Peas .. ..	52.4	52.4	61	3196	61	3196
Potatoes I ..	90.8	90.8	14	1271	14	1271
Potatoes II ..	73.3	73.3	41	3005	41	3005
Sugar Beet I ..	104	104	37	3848	37	3848
Tulips .. ..	210	165	16.5	3465	16.5	2723
Gladioli .. ..	290	245	3	870	3	735
			345.5		345.5	
Catch crop autumn cauliflower ..	50	50	16	800	16	800
Tulips on rented land .. ..	160	115	2	320	4.5	518
Daffodils on rented land .. ..	70	40	16.5	1155	—	—
Forced bulbs ..	3800	3200	0.25	3800(1) 33010	0.25	3200(1) 30576
Less Overtime ..			2266 hrs.	872(2)	1160 hrs.	477(2) 447
Total Gross Margin .. ..				£32138		£30129

(1) Four rounds.

(2) After allowing for 10 per cent increase in the hourly rate.

These results suggest that, compared with the optimal U.K. plan (see Table 13) the total gross margin could be maintained at much the same level under optimistic E.E.C. assumptions, particularly after deducting the cost of overtime labour required to operate the plan. But under pessimistic assumptions, on the other hand, a reduction in total gross margin of about £1750 would still have to be faced.

Some modifications to the farm organisation are necessary to maximise profits under E.E.C. conditions. The major changes are summarised below:

- (1) There is a substantial reduction in the size of the optimal bulb acreage (including bulbs grown on rented land) from 49.25 acres under U.K. conditions to 38 acres under optimistic E.E.C. assumptions and only 24 acres under pessimistic assumptions. These changes are a reflection of the reduction in the gross margins from bulb growing that has been predicted for Common Market conditions. The reduction in acreage wholly affects daffodils which are the least profitable of the bulb activities; no daffodils are included in the pessimistic plan. The acreage of tulips is increased somewhat under pessimistic assumptions, whilst gladioli are introduced into both the E.E.C. plans.
- (2) No changes are made to the area of either potatoes or sugar beet, despite the relative movement in the gross margins of these crops in favour of beet. Brussels sprouts are, however, deleted from the plans and replaced by an equivalent acreage of autumn cauliflower, which, it may be recalled, can be fitted in as a catch crop after tulip or daffodil bulbs have been lifted.
- (3) As a consequence of the reduction in the area of bulbs grown on the main acreage of the farm and the exclusion of brussels sprouts from the plans, room is made for a substantial increase in the acreage of wheat. This is a crop whose gross margin is much improved at E.E.C. prices and it is reasonable to expect that more wheat would be included in the E.E.C. plans at the expense of those crops whose gross margins are reduced. Thus the size of the wheat enterprise increases from 115 acres in the optimal U.K. plan to 173 acres in the E.E.C. plans, i.e. by 58 acres. In fact, half the farm is down to wheat under E.E.C. conditions. Some of this expansion is at the expense of peas, the acreage of which falls from 86 to 61 acres.

It may be noted that the optimal plans for the farm acreage of 345.5 acres are identical for both optimistic and pessimistic assumptions, with 16 acres of the catch crop being grown after the tulips are lifted. The changes in programme are limited to the bulbs grown on rented land. At pessimistic prices it is less economical to rent additional land for bulb growing so that, whereas 18.5 acres of land are rented for bulbs at optimistic prices, only 4.5 acres are rented at the pessimistic set of assumptions. Moreover, it seems that the E.E.C. plans might be easier to manage than the

optimal U.K. plan since not only do they involve a reduction in the size of the bulb growing enterprise with its stringent demands on management, but they also put less strain on the labour resources of the farm. The amount of overtime labour needed to operate the E.E.C. plans is substantially lower than for the U.K. plan.

The upshot of all these adjustments in plan is to alter substantially the relative contribution of the different enterprises to the total gross margin of the farm. This is illustrated in Table 16.

**TABLE 16**

ENTERPRISE CONTRIBUTIONS TO TOTAL GROSS MARGIN(1)

<i>Enterprise</i>	<i>Optimal</i>	<i>Optimal E.E.C. Plans</i>	
	<i>U.K. Plan</i>	<i>Optimistic</i>	<i>Pessimistic</i>
	<i>per cent</i>	<i>per cent</i>	<i>per cent</i>
Wheat .. .. .	14	34	37
Peas .. .. .	14	10	10
Potatoes .. .. .	17	13	14
Sugar Beet .. .. .	11	12	13
Brassicas .. .. .	4	2	3
Flowers and bulbs .. .. .	40	29	23
<b>Total .. .. .</b>	<b>100</b>	<b>100</b>	<b>100</b>

(1) Before deducting overtime labour.

The major change is a greater dependence upon wheat at the expense of bulbs and flowers, particularly at pessimistic E.E.C. assumptions. Wheat, which is of relatively minor importance at U.K. prices in relation to bulbs, contributes over a third of the total gross margin at E.E.C. prices. The contribution of bulbs, on the other hand, declines substantially. This is a reflection of the shift in the relative gross margins of wheat, bulbs and flowers in favour of wheat, and the consequential expansion of the wheat acreage and contraction of bulbs. Even at pessimistic E.E.C. prices, however, bulbs and flowers rank second in importance to wheat, contributing 23 per cent of the total gross margin.

**Net Farm Income**

Up to now the plans have been considered solely in terms of gross margins. When fixed costs are incorporated into the analysis, the net farm income of the various

plans can be calculated. The current level of fixed costs on the farm is as follows:

	Total	Per Acre
	£	£
Labour .. ..	9210(1)	26.3
Machinery .. ..	6209	17.7
Rent .. ..	3501	10.0
Miscellaneous ..	2448	7.0
	<hr/>	<hr/>
	21368	61.0
	<hr/>	<hr/>

(1) 9 men @ £850 per annum; 3 women @ £520.

The net farm incomes arising when this level of fixed costs is deducted from the gross margins in the five situations previously discussed are shown in Table 17.

**TABLE 17**  
NET FARM INCOME—U.K. AND E.E.C. PLANS

Organisation ..	..	(1)	(2)	(3)	(4)	(5)
		U.K.	U.K.	U.K.	E.E.C.	E.E.C.
Prices .. ..	..	U.K.	E.E.C.	E.E.C.	E.E.C.	E.E.C.
			Optimistic	Pessimistic	Optimistic	Pessimistic
		£	£	£	£	£
Gross Margin ..	..	31922	30935	28584	32138	30129
Fixed Costs ..	..	21368	21368	21368	21368	21368
		<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
Net Farm Income		10554	9567	7216	10770	8761
Net Farm Income						
per Acre .. ..	..	30.2	27.3	20.6	30.8	25.0
Index .. ..	..	100	90	68	102	83

The figures illustrate how difficult it would be for this farm to maintain its income under E.E.C. conditions. The net income of the U.K. plan falls substantially at E.E.C. prices. Even under the optimistic assumptions, readjustment of the farm programme to the new prices only increases net income by 2 per cent, whilst net income falls by almost a fifth at the pessimistic set of assumptions. However, the comparison between columns (2) and (4) and (3) and (5) of Table 17 shows how the optimal E.E.C. plans yield a higher net income than the repriced U.K. plans.

This is the situation before allowing for any increases in fixed costs under E.E.C. conditions. Whilst it is unlikely that the results postulated above would lead to any significant changes in land charges for this type of farming, the farm would be exposed to the impact of the higher wage rates which may be presumed to apply right across the board of British farming. If wage rates, and hence the farm labour bill, increase by 10 per cent in the E.E.C., then the situation shown in Table 18 would apply.



**TABLE 18**  
NET FARM INCOME WITH INCREASED WAGE RATES

Organisation Prices .. ..	(1)	(2)	(3)	(4)	(5)
	U.K.	U.K.	U.K.	E.E.C.	E.E.C.
	U.K.	E.E.C.	E.E.C.	E.E.C.	E.E.C.
		Optimistic	Pessimistic	Optimistic	Pessimistic
Gross Margin ..	£ 31922	£ 30935	£ 28584	£ 32138	£ 30129
Fixed Costs ..	21368	22289	22289	22289	22289
Net Farm Income	10554	8646	6295	9849	7840
Net Farm Income					
Per Acre .. ..	30.2	24.7	18.0	28.2	22.4
Index .. ..	100	82	60	93	75

The higher wage rates that might be expected within the Common Market make the labour-intensive crops less attractive and a new policy with regard to the employment of labour is indicated. Further linear programming shows that the net farm income can be improved by reducing the regular labour force to seven men. This size of staff appears to be ideal for either set of price expectations and the same cropping plan is projected both for the optimistic and pessimistic set of prices. The cropping plan is virtually the same as that given in Table 15 except that no land is rented-in for bulb growing and the bulb forcing is slightly reduced. The effects on the financial results are given in Table 19.

**TABLE 19**  
NET FARM INCOME FROM THE SEVEN-MAN PLAN PROMPTED BY  
THE HIGHER WAGE RATES

	Price Expectation	
	Optimistic	Pessimistic
Gross Margin .. ..	£ 29008	£ 27702
Fixed Costs .. ..	18703	18703
Net Farm Income .. ..	10305	8999
Gain resulting from this re-organisation .. ..	456	1159

The seven-man plan is more harassing for the management than the E.E.C. plans shown in Tables 15 and 18 because it relies more heavily on the employment of casual and overtime labour. A total of 3655 working hours is provided in this way in addition to the gang labour for picking potatoes and sorting bulbs. The

advantage of this re-organisation is more clearly established when the price expectations are pessimistic.

To sum up, the prospects for this farm within the E.E.C. are not favourable. If the farmer pursues his present plan he would be faced with a substantial fall in net farm income. This is also the case if he adopts the plan best suited to the new conditions, assuming the more pessimistic set of prices for flowers and bulbs to obtain. In the event of his realising the more optimistic set of prices, the decline in net farm income is quite small, provided he undertakes the series of adjustments in plan that have been outlined.

### **Conclusions**

This analysis shows that the major changes in plan that would be brought about by a changeover to E.E.C. prices and conditions are a reduction in the size of the bulb growing enterprise with a concomitant expansion in wheat. This reflects changes in the relative gross margins of these two enterprises. As a consequence, the contribution of bulbs to total gross margin falls from 40 per cent in the optimal U.K. plan to around 25 per cent in the E.E.C. plans, whilst the contribution of wheat to total gross margin increases from 14 per cent in the U.K. plan to over a third in the Common Market plans.

Despite these shifts in the pattern of cropping, it seems that this farm would have difficulty in maintaining net income in the E.E.C. on the basis of the gross margins used in the linear programme. This is, perhaps, a rather surprising conclusion to reach since it is frequently argued, for instance by the Government (1), that those parts of the country which are predominantly arable in character could expect to do better in the Common Market than areas concentrating on other lines of production. Whilst this may be a valid conclusion for those areas where the cropping emphasis is on cereal production, it may not hold for other regions where more intensive and horticulturally orientated cropping systems are practised.

On the other hand, these conclusions are based on rather speculative gross margins for the horticultural crops, particularly for the bulb and flower activities, and a better than expected performance from these crops could lead to rather different conclusions.

For instance, the results for this farm suggest that the high E.E.C. prices for grain will redirect resources on these farms away from horticulture to grain production and hence give rise to a diminution in the home-produced supply of horticultural produce. If the reduction in home production resulted in higher price levels than would be the case if it continued at its present level—perhaps because of a consumer preference for the domestic production—then the interaction of supply and demand could lead to the equilibrium price settling down at higher than current U.K. price levels. In such a situation as this the profitability of these

(1) See the Common Agricultural Policy of the European Economic Community (Cmnd. 3274) page 17.

crops in relation to alternative activities would not deteriorate as much. Moreover, in an area such as the one in which this farm is located, the range of feasible activities is so wide that farmers may be able to maintain—or even increase—their incomes under Common Market conditions by a more fundamental change in policy. For example, they might place greater emphasis on the production of cereals, and even introduce livestock into their farming systems, thereby enabling reductions in fixed costs, particularly of labour, to be achieved. The testing of hypotheses such as these were, however, beyond the scope of this study which was concerned with analysing the effects of entry into the Common Market on existing farming systems. The prospects for more fundamental shifts in organisation and increased profits remain to be tackled by individual farmers in the light of their own circumstances.

It seems likely, however, from the evidence of this farm that if they continued for any length of time, the high E.E.C. grain prices and higher wage rates would encourage the concentration of holdings into larger units. This conclusion is drawn from the advantages that can be seen to accrue to the adoption of the seven-man plan. For it follows from this result that the existing regular labour force of twelve employees would be more profitably deployed on a larger area of land with an even higher proportion of non-intensive crops than has been projected hitherto. Such a trend would hasten the decline in the labour-intensive crops unless the decline was self-regulating in response to higher prices stimulated by a fall-off in the supplies of horticultural produce from the home producer.

#### IV. THE DERBYSHIRE FARM

Although arable cropping is mainly associated with the drier eastern side of the country, this does not mean that it has no part to play in farming systems further to the west. With a higher rainfall, however, grazing livestock become of increasing importance, forcing arable crops into a secondary role. Such an area of mixed farming is to be found on the heavy loams of West Leicestershire and South Derbyshire—where the farm under review is situated—with livestock contributing some two-thirds and cash crops some one-third of total output. The latter consists almost entirely of cereals, potatoes and sugar beet, yielding respectively some 75 per cent, 20 per cent and 5 per cent of cropping output. Milk production is the most important of the livestock activities, making up 75 per cent of all livestock output. (1) It follows, therefore, that the main impact of E.E.C. prices will be felt through changing gross margins for milk and cereals.

##### **Farm Resources and Activities**

The farm—fairly typical of the organisation described but above average in size—

(1) See 'Farming in the East Midlands' F.R. No. 162, University of Nottingham, Department of Agricultural Economics.

totals 379 acres altogether, of which 360 acres are in arable crops, 14 acres in permanent pasture and 5 acres in roads, buildings and so on. Half of the arable land is at present devoted to growing fodder for a herd of 80 dairy cows and their replacements while the other half produces cereals and potatoes. There is a labour force of five men—the farmer, two cowmen (one of whom spends about sixty per cent of his time in summer on arable work) and two tractor drivers. Cereals are bulk handled, harvest being by an 8' 6"-cut tanker-combine; there is ventilated floor storage for 320 tons of grain. Potatoes are harvested by hand, a gang of 14–16 women casuals being employed for picking, with indoor storage for 200 tons. In summer the cows graze mainly on three-year leys, undersown in barley. In winter, kale is cut and carted to them until about mid-January when they go on to self-feed silage. The main labour peaks occur at spring-drilling, cereal harvest, and potato harvest and wheat drilling.

The dairy herd—Ayrshire being graded over to Friesian—is milked in a 16-stall, 8-unit herringbone parlour. There is building capacity for up to 130 cows; this, however, is reduced by some 15 cows for every 10 replacements reared. The farmer is quite prepared to purchase replacements; indeed, he has purchased a proportion in the past. An average herd life of five years is assumed.

From the rotational aspect barley may be grown continuously, two wheat crops may follow three-year leys but only one may follow one-year break crops. There is a potato quota of 20 acres which the farmer is not prepared to exceed because of increasing difficulty in obtaining casual labour at harvest. He is not willing to grow sugar beet, partly because of the lack of casual labour for singling and partly because the latter would clash with silage-making. On the other hand, he is willing to grow field beans as a cash crop and sell hay off either one-year or three-year leys.

The gross margins and variable costs relating to the farm are shown in Table 20.

TABLE 20  
GROSS MARGINS AT U.K. AND E.E.C. PRICES

<i>Activity</i>	<i>U.K. Prices</i>	<i>E.E.C. Prices</i>
	£ per acre	£ per acre
Winter wheat (stored) .. .. .	34.9	61.5
Spring barley (stored) .. .. .	35.2	56.0
Winter beans .. .. .	26.0	25.1
Main-crop potatoes .. .. .	84.0	74.9
Hay (1 or 2 cuts from 1 or 3 year leys) .. .. .	5.1 to 15.4	7.05 to 20.0
Grazing & silage (from PP, 1 or 3 year leys) .. .. .	-5 to -7	-6 to -9.1
Kale .. .. .	-10	-13
	£ per head	£ per head
Dairy cow(1) .. .. .	128.5	147.2
Dairy replacement: reared(1) .. .. .	-27	-31.8
purchased .. .. .	-120	-130

(1) Forage requirement 1.5 acres per head.

## Optimal Plan at U.K. Prices

The plan that brings in the highest gross margin at U.K. prices is shown in Table 21.

TABLE 21  
OPTIMAL PLAN AT U.K. PRICES

<i>Activity</i>	<i>Acres</i>	<i>Gross Margin per acre</i>	<i>Gross Margin</i>
		£	£
Wheat .. .. .	58	34.9	2024
Barley .. .. .	116	35.2	4083
Potatoes .. .. .	20	84.0	1680
Dairy Cows (130 head) .. .. .	180	67.3	12120
Total gross margin .. .. .			£19907

Just over half the acreage (52 per cent) is devoted to cash crops, while the remainder produces grazing and winter keep for the dairy herd which is at the maximum of 130 cows. The total gross margin is £19907, equivalent to £52.5 per acre, a very high average level. The proportion of total gross output arising from crops and livestock—36 per cent and 64 per cent respectively—conforms closely to the general pattern for the district, and this is also true of the division of cropping output between cereals and roots—72 per cent and 28 per cent respectively.

The plan is based on obtaining the highest return to land, for labour is not completely exhausted at any time of the year. The smallest surplus of labour is 18 hours at cereal harvest. Activities are thus selected in descending order of effective gross margin per acre as follows:

<i>Activity</i>	<i>Effective Gross Margin per Acre</i>	<i>Acreage</i>	<i>Constraint</i>
	£		
Potatoes .. .. .	84	20	Quota
Dairy Cows .. .. .	67.3	180	Accommodation
Wheat .. .. .	35.5	58	Rotation
Barley .. .. .	35.2	116	Land

Potatoes are selected first because they have the highest gross margin per acre. Because of the quota they cannot, however, rise above 20 acres. Dairy cows, with a gross margin £67.3 per acre made up as below, are selected next up to the limit of available accommodation.

	<i>Herd</i>		<i>Per Cow</i>	
	£	£	£	£
<i>Gross Margin before deducting fodder variable costs</i>				
Dairy cows—130 at £128·5 .. ..	16705		128·5	
Dairy replacements (purchased)— 26 at £120 .. ..	3120		24·0	
		<hr/>	<hr/>	
		13585		104·5

*Fodder and Litter Variable Costs*

<i>Acres</i>				
14	Permanent Pasture × £5 .. ..	70		
130	3 year ley × £7 .. ..	910		
36	Kale × £10 .. ..	360		
	Straw .. ..	125	1465	11·3
			<hr/>	<hr/>
<i>Gross Margin</i> .. ..		12120		93·2
		<hr/>		<hr/>

*Gross Margin per acre:* £12120 ÷ 180 acres = £67·3 per acre.

Two points are of particular relevance. Firstly, the herd occupies 180 acres of land giving a stocking rate of 1·38 acres per cow. This is an improvement on the current stocking rate of 1·5 acres per cow, and is obtained by breaking-up the leys late in the autumn instead of early in July as at present. Although, in consequence, less wheat can be grown because all the leys are not ploughed up in time for wheat drilling, this is not a point of much significance as barley gives almost the same gross margin as wheat. Secondly, all heifer replacements are purchased, thus enabling the entire area of fodder to be devoted to milk production. To many, this may seem a doubtful policy—indeed, all farmers could not change over to purchasing their replacements because there would be a shortfall of suitable stock—but it is justified in this case for two reasons. One is that the farmer is prepared to purchase heifers and the other is that at the assumed purchase price of £120 per heifer, there seems no valid reason why he should not be able to obtain animals of a quality comparable to those of his own rearing. Furthermore, because of the high value of land in alternative uses, a price of up to £162 per head could be paid before it becomes a matter of indifference whether heifers are purchased or home-reared. If all replacements are reared, herd size falls from 130 to 100 cows.

Wheat is selected next, up to the limits imposed by the requirement that it must follow break crops. The effective gross margin of £35·5 per acre—£0·6 higher than that shown in the tables—arises because the higher yield of wheat straw compared with barley straw means that less has to be purchased than if barley replaces wheat.(1)

(1) As sufficient straw is not produced on the farm, 17 tons has to be purchased. An extra ton would be required for every 8 acres transferred from wheat to barley at a net cost of £4·8.

Finally, barley, with a gross margin of £35.2 per acre, fills up the rest of the available land. As the gross margins of wheat and barley are similar, it is not financially of great significance what proportion of the cereal acreage is under each. Technically, flexibility is gained in that the farmer can drill as much wheat as autumn conditions permit, filling the remainder of the cereal shift with barley.

One outstanding feature of the suggested plan is that there are only two major activities—cereals and dairy cows—that together account for 95 per cent of the croppable area and 92 per cent of the total gross margin.

TABLE 22  
STABILITY OF U.K. PLAN

	<i>Lower Limit</i>	<i>Present Value</i>	<i>Upper Limit</i>	<i>Lower Limit</i>	<i>Present Value</i>	<i>Upper Limit</i>
	£	£	£	per cent	per cent	per cent
<i>Gross Margin per Acre</i>						
Cereals .. ..	30	35	64	86	100	183
Potatoes .. ..	55	84	no limit	65	100	no limit
Dairy Cows ..	41	67	no limit	61	100	no limit
<i>Purchase Price per Beast</i>						
Dairy Heifers ..	0	120	162	0	100	135

Another is that the plan is very stable to price changes, considering single activities at a time, and assuming that all other prices do not change. The range in individual values over which no change in plan is warranted is shown in Table 22. Cereals are considered together so that substitution between wheat and barley can be ignored. The present gross margin of approximately £35 per acre from cereals can fall by £5 or rise by £29, representing a percentage change of from minus 14 per cent to plus 83 per cent without changing the optimal plan. Similarly the gross margin of potatoes can fall to £55 per acre from their present level of £84 per acre. As potatoes are already being grown at the maximum, the upward rise in gross margin is unlimited, although if a large rise were to occur the farmer would naturally consider whether the present limitation should be raised. The gross margin of dairy cows can fall by £26 per acre while the upward rise is again infinite as dairy cows are also at the maximum that present resources—in this case buildings—allow. As already noted, the price of purchased heifers can rise by £42 (to £162) before it starts to become financially advantageous to rear rather than to purchase dairy replacements. Conversely their price can fall to zero (or more correctly it can fall infinitely) for if it is better to purchase heifers when they cost £120, it is even more attractive to do so if stock of the same quality can be obtained for less than this.

The implication of this stability of individual products in the face of price changes is that E.E.C. conditions are unlikely to cause the plan to change markedly.

However, before turning to that aspect, the effect of applying E.E.C. prices to the U.K. plan is discussed.

### U.K. Plan with E.E.C. Prices

The gross margins of the activities included in the plan at U.K. and E.E.C. prices are compared in Table 23.

**TABLE 23**  
GROSS MARGINS PER ACRE—U.K. AND E.E.C. PRICES

	U.K. Prices	E.E.C. Prices	Difference E.E.C.—U.K.	Proportional Change E.E.C. over U.K.
	£	£	£	per cent
Wheat .. ..	34.9	61.5	+26.6	+76
Barley .. ..	35.2	56.0	+20.8	+59
Potatoes .. ..	84.0	74.9	-9.1	-11
Dairy Cows* .. ..	67.3	76.8	+9.5	+14

\*Including share of cost of purchased heifer which rises by 8 per cent from £120 to £130.

While cereal gross margins rise substantially, that of dairy cows rises only modestly and that of potatoes falls. It is immediately apparent, however, that E.E.C. prices imply a large windfall gain because potatoes—where the change is unfavourable—utilise only 5 per cent of the total farm acreage. The extent of the gain is shown in Table 24. The total gross margin rises by £5481, an increase of 27.5 per cent and now runs at the very high level of £67 per acre. The major part of the gain comes from the cereals, whose percentage contribution to total gross margin rises by 9 per cent from 31 to 40 per cent.

**TABLE 24**  
U.K. PLAN WITH E.E.C. PRICES

Activity	Acres	Gross Margin per acre	Total Gross Margin	Changes in Gross Margins	
				Increase	Decrease
		£	£	£	£
Wheat .. ..	58	61.5	3567	1543	
Barley .. ..	116	56.0	6496	2413	
Potatoes .. ..	20	74.9	1498		182
Dairy Cows .. ..	180	76.8	13827	1707	
Total .. ..	374		25388	5663	182
Net gain from E.E.C. prices					£5481



### Optimal Plan at E.E.C. Prices

A comparison of the differences in gross margins at U.K. and E.E.C. prices (Table 23) with the differences necessary to warrant a change in the level of individual products in the plan (Table 22) makes it clear that there is unlikely to be a better allocation of resources than that already suggested in the U.K. plan. Cereal gross margins can rise by 83 per cent before a change is necessary, whereas the actual rise at E.E.C. prices is 76 per cent for wheat and 59 per cent for barley. The gross margin for potatoes can fall by 35 per cent, but the actual fall is only 11 per cent. Dairy cows are already at the maximum imposed by the building constraint, so the improvement in their gross margin must leave their numbers unchanged.

Such, indeed, proves to be the case, for replanning with the E.E.C. gross margins gives precisely the same solution as was obtained at U.K. prices (Table 21) with the same balance between the major enterprises and the same organisation within them. Thus there is no substitution between wheat and barley, the distribution of fodder crops is unchanged and heifers continue to be purchased. In consequence, Table 24 also shows the financial results for the optimal plan at E.E.C. prices. Since no change has been assumed in the balance of fixed resources, selection is as before to land, but with the slight difference that dairy cows now precede potatoes. The basis of selection for the optimal E.E.C. plan is shown below.

Activity	Effective Gross Margin			Acreage	Constraint
	..	..	per Acre		
Dairy Cows .. ..	..	..	76.8	180	Accommodation
Potatoes .. ..	..	..	74.9	20	Quota
Wheat .. ..	..	..	62.5*	58	Rotation
Barley .. ..	..	..	56.0	116	Land

\*Including the advantage accruing to wheat straw.

In consequence, all the gain of 27.5 per cent in total gross margin is due to price changes and none to changes in plan.

### Net Farm Income

Fixed costs on the farm at present are just over £10000, or £27 per acre, and fall into the following broad categories.

	Total	Per Acre
	£	£
Labour .. ..	3600	9.5
Machinery and Power	3450	9.1
Rent .. ..	2274	6.0
Miscellaneous ..	920	2.4
	<hr/>	<hr/>
	10244	27.0
	<hr/>	<hr/>

The net farm incomes achieved when fixed costs are deducted from the total gross margins at U.K. and E.E.C. prices are shown in Table 25.

**TABLE 25**  
NET FARM INCOME

	<i>U.K. Prices</i>	<i>E.E.C. Prices</i>	<i>E.E.C. Prices Adjusted Fixed Costs</i>
	£	£	£
Gross Margin .. ..	19907	25388	25388
Fixed Costs .. ..	10244	10244	11570
Net Farm Income .. ..	9663	15144	13818
Net Farm Income per acre	25.5	40.0	36.5
Index .. ..	100	157	143

Even with U.K. prices farm income runs at the generous level of £25.5 per acre; this is not, however, uncommon on the better organised farms. E.E.C. price assumptions raise net income by over half to the very high level of £40 per acre, assuming no changes in fixed costs. However, if it is assumed that rent increases by 42.5 per cent (three-quarters of the percentage increase in net farm income) and labour costs by 10 per cent, the fixed costs become £30.5 per acre:

	<i>Total</i>	<i>Per Acre</i>
	£	£
Labour .. ..	3960	10.5
Machinery and Power	3450	9.1
Rent .. ..	3240	8.5
Miscellaneous ..	920	2.4
	<u>11570</u>	<u>30.5</u>

As the last column of Table 25 shows, net income is, in consequence, damped down to £36.5 per acre, an increase of 43 per cent, which is still a very high level.

### Conclusions

It is quite apparent, therefore, even allowing for errors of estimation, that the type of farm under consideration—milk and cereal production—will be in a favourable position in the Common Market. Although the cereal acreage (174) is not large enough to reap the full economies of scale that modern equipment allows, it is nonetheless considerably more than that on many other cereal farms. At the same

time, even with current resources, the dairy herd can attain a size where it is in a very competitive position with other herds.

The strength of the system, however, rests more fundamentally—as has already been seen—on its resistance to price changes. It cannot be doubted that in the longer term the price relationship between different commodities in the European Economic Community must change if there is not to be serious over-production of certain products, particularly cereals and dairy products. Whatever such changes may be, the optimal plan for this farm will be very resistant to them.

This is not to imply a rigid and unchanging system under E.E.C. conditions for, over time, certain developments might be considered involving modifications to the fixed resources and constraints. For example, whereas with U.K. prices the gross margins of wheat and barley are much the same, with E.E.C. prices the gross margin for wheat is over £5 per acre higher than that of barley. In consequence, there might be some relaxation of the rotational constraints on wheat—always providing that yields do not suffer unduly—so that extra wheat could substitute for some of the barley.

Again, with increasing pressure on labour, it might become necessary to run the farm with one man less. As has already been seen, the present labour force of five men is able to deal with the suggested cropping and stocking quite comfortably. With only four men, difficulties arise at cereal harvest, particularly as all the straw is baled and carted, and later in the autumn. The shortfall of labour in the latter period could be solved by switching 33 acres of winter wheat into spring barley. In the cereal harvest period it could be tackled either by purchasing more straw instead of baling it on the farm or else by the acquisition of a higher-capacity combine harvester. The cost of these changes would be more than offset by the saving of a man's wages.

It might also appear that potatoes should be sacrificed, as they make a relatively small contribution to total gross margin. Nonetheless, providing sufficient casual labour can continue to be obtained, they should be retained, for their sacrifice would entail a reduction in gross margin of about £1000.

In the still longer term the farm might logically develop into a single-product unit, concentrating on milk production alone and carrying a herd of about 250 cows with heifer replacements reared under contract. Such a development is indicated both by the high level of technical expertise with which the existing dairy herd is run and the relatively favourable natural conditions in the area for milk production.

In summary then, this is a system of farming that should enable the farmer to view the future with confidence whether faced with U.K. or E.E.C. prices.

## V. THE NORTHUMBERLAND FARM

In previous sections, the impact of entry into the European Economic Community on farming systems in the south, east and midland areas of the country have been discussed. In this section, attention is switched to the problems of adaptation on a farm in the county of Northumberland in the north of England.

The area in which the farm is situated might be described by some observers as one of marginal farming, bordering as it does the huge moorland expanse of the Northern Pennines and the Cheviot Hills. Indeed, the farm under study falls within the limits of eligibility for the Hill Cow Subsidy on part of its acreage and lies at an altitude of some 500 feet above sea level. Traditionally, the area has been farmed with the more extensive systems of husbandry, the farming economy being largely based on the production of store sheep and store cattle which move away to lowland areas, both in Northumberland and elsewhere, for finishing.

In recent years, however, an intensification of farming systems has been taking place in the area, quite often in response to the impact of higher land prices and rental values. Thus there has been a trend away from the rearing of store livestock towards the production of fat lambs and fat cattle and, more particularly, an increase in the acreage of cereals. Taking the county as a whole the total cereal acreage increased by about 60 per cent in the six years between 1961 and 1967. Most of the increase has been concentrated on barley since the lateness of the harvest—September is the main harvest month in Northumberland—tends to impose a limit on the acreage of wheat that can be grown. Yields are quite satisfactory even at an altitude of 500 feet and in 1966 yields on this particular farm averaged 33 cwt per acre for wheat and 31 cwt per acre for barley.

It would seem, therefore, that a Northumberland corn and stock farm is eminently suitable for assessing the impact that entry into the Common Market would have on a farming system where emphasis is placed on the production of cereals and grazing livestock other than dairy cows. Moreover, it would seem that the outlook for such a system is quite favourable within the E.E.C. in view of the increased prices for the major commodities produced on this farm—cereals, beef and sheep—under the Common Market regime. The results presented in this section confirm the validity of this hypothesis.

### **Farm Resources and Activities**

The farm is located about 10 miles to the north-west of Morpeth and runs to 647 acres, of which 23 acres are taken up by buildings, woodland, roads, etc. Some of the land is poorly drained and at the present time there are 144 acres of wet and unploughable permanent pasture. The farmer has embarked on an extensive field drainage programme and when this has been completed it will be possible to take

the plough round the whole farm. For the purposes of the present analysis, therefore, a potential arable area of 624 acres has been assumed.

The system of farming currently practised is the now well-established one for the area with emphasis on the production of store and fat lambs, suckled calves and cereals. The farm has been managed very extensively in the past. For instance, the cropping and stocking in 1966/67 was based on 100 acres of cereals, 100 beef cows and a flock of about 300 breeding ewes. However, the farmer has recently embarked upon a policy of intensification linked to the improved drainage referred to above. The intention is to increase the acreage of cereals while holding the stock at about their present level. Thus by 1968 the cereal acreage had been increased to about 200 acres.

So far as the availability of fixed resources are concerned, there are no major differences in soil types on the farm and the land can, therefore, be treated as one block of 624 acres. Generally speaking the soils of the area can be described as medium loams with variable drainage. A labour force of five regular full-time men is available. The farm is equipped with a full range of machinery and equipment for cultivations and grass conservation, but one peculiarity of the present system is that the cereals are harvested by contract labour. Since there are ample contracting services available in the area this facility has been incorporated into the model. The buildings required for the present system of farming are relatively minimal. Unlimited grain storage capacity is available, a continuous drier and floor storage installation having been erected a year or two ago. Yarding facilities for cattle are available up to a limit of 100 head at any one time. There are no facilities on the farm for housing sheep.

The range of feasible activities for the farm and their gross margins at both U.K. and E.E.C. prices are shown in Table 26. As can be seen, the livestock activities have been confined to beef and sheep, since, although a dairy herd is technically feasible, the model was designed to test the impact of entry into the Common Market on a farming system where emphasis is placed on the production of meat from grazing livestock. Moreover, the personal preferences of the farmer are opposed to the introduction of a dairy herd into the farming system.

The table illustrates how the profitability of beef, sheep and especially cereal production could be expected to increase under E.E.C. conditions. From the rotational point of view the only restrictions relate to the acreage of cereals that can be grown. A rotation of four cereal crops followed by a 3-year ley has been assumed in order to keep disease problems on the cereal acreage well under control. Hence an upper limit of 350 acres has been placed on the total cereal acreage. Wheat must generally follow the ley break, although it is possible for up to two wheat crops to be grown in succession. The remainder of the cereal shift consists of barley. Inclusion of the maximum acreage of cereals in any farm plan would imply an intensive level of cereal production by local standards.

**TABLE 26**  
GROSS MARGINS AT U.K. AND E.E.C. PRICES

<i>Activity</i>	<i>U.K. Prices</i>	<i>E.E.C. Prices</i>
<i>Crops</i>		
	£ per acre	£ per acre
Wheat .. .. .	30.0	58.25
Barley .. .. .	29.5	45.1
Temporary Grassland—grazing	-6.5	-8.4
conservation (hay) .. .. .	-7.5	-9.5
Permanent pasture .. .. .	-4.5	-6.0
Forage roots for sheep .. .. .	-10.0	-12.7
Contract combine harvesting .. .. .	-3.5	-3.5
 <i>Beef Cattle (Suckler herd)</i>		
	£ per head	£ per head
Suckled calves—cows inwintered .. .. .	49	52
cows outwintered .. .. .	44	47
Fat cattle—12 months } .. .. .	61	66
18 months } Cows inwintered .. .. .	71.3	82.4
Store cattle—12 months } .. .. .	56.3	60.4
 <i>Sheep</i>		
	£ per ewe	£ per ewe
Fat lambs—2 ewes per acre .. .. .	7.5	8.4
3 ewes per acre .. .. .	7.1	7.9
4 ewes per acre .. .. .	6.5	7.25
Purchased store lambs .. .. .	1.6	1.7

So far as the beef cattle are concerned, the activities have been limited to systems based on a herd of spring-calving suckler cows, the traditional cattle enterprise in the area. At present the farmer sells the progeny of his cows in the suckled calf sales which are held annually in the autumn. The computer programme, however, allows for a range of alternative outlets for the cattle, either as finished beasts or older stores. In addition, a variation in the traditional suckled calf enterprise is to allow the herd to be in or outwintered; the lower gross margin when the cows are outwintered reflects the lower price which the poorer quality calves produced from such a system might be expected to fetch in the auction ring. All the other systems require that the cows should be inwintered in order to obtain a more suitable calf for rearing and fattening. It may appear that the gross margins for the suckled calves at U.K. prices are unusually high. This is because the farm is eligible for Hill Cow Subsidy of £14 per cow on half its acreage; beef cow subsidy is payable on the remaining acreage, whilst all calves are eligible for the normal calf subsidy.

The sheep activities are based mainly on the production off grass of fat lambs from a self-contained flock of breeding ewes. The programme is given the choice of a high gross margin per ewe at a low stocking rate or lower gross margins per ewe at higher stocking rates. An effective lambing percentage of 150 is assumed in all

cases. In addition, a supplementary sheep enterprise of fattening purchased store lambs on roots during the winter is also included in the list of production possibilities.

### Optimal Plan at U.K. Prices

The optimal plan chosen for this farm at U.K. prices is shown in Table 27.

TABLE 27  
OPTIMAL PLAN AT U.K. PRICES

<i>Activity</i>	<i>Size</i>	<i>Gross Margin per Unit</i>	<i>Gross Margin</i>
		£	£
Single-suckled calves, cows outwintered ..	75	44	3300
Fat cattle at 18 months, cows inwintered ..	50	71.3	3565
Wheat after grass .. .. .	90 acres	26.5	2385
Wheat after wheat .. .. .	90 acres	26.5	2385
Barley .. .. .	169 acres	26	4394
Leys—for grazing .. .. .	233 acres	-6.5	-1514
for hay .. .. .	42 acres	-7.5	-315
			14200
Cost of overtime labour (124 hours in September, i.e. 25 hours per man) .. .. .			50
Total gross margin .. .. .			£14150

The total gross margin of £14150 is equivalent to a gross margin of £22.7 per acre over the whole farm. Although the gross margins for the beef enterprises may seem high when viewed on a per head basis, it should be remembered that they are gross of forage costs; the gross margin per acre from the grassland is a modest £18.3, about the level one expects from these more extensive systems of beef production.

As Table 27 shows, the optimal plan is based entirely on beef cattle and cereals. Cereals are included in the plan at their maximum limit of 350 acres (349 acres to be precise). Two 90-acre blocks of wheat are grown in succession with 169 acres of barley making up the remainder of the cereal acreage. A fat cattle enterprise based on the production of fat beasts at 18 months of age from a herd of inwintered beef cows is included up to the number imposed by the limit on yarding space, i.e. 100 head of yarded cattle, comprising 50 cows and 50 fattening cattle. The rest of the grassland is utilised by a herd of 75 outwintered beef cows producing calves for sale as sucklers in the autumn calf sales.

One surprising feature is the exclusion of sheep from the plan, since they are an integral part of the system on virtually every farm in the area. A possible reason for

the absence of sheep in the plan might have been a labour bottleneck in the spring due to a clash between spring drilling of cereals and lambing. However, by allowing overtime working at all seasons of the year in order to eliminate any artificial labour bottlenecks, it does seem that, on the basis of the relationship specified above in Table 26, sheep simply do not compete successfully with cows. For instance, the outwintered suckler enterprise and the 18 month old fat cattle realise gross margins per acre of £15.25 and £21.6 respectively at U.K. prices, whereas sheep at the most intensive level of stocking—4 ewes per acre—earn only £19.5 per acre. Confirmation of this conclusion is given by the fact that inclusion of sheep in some of the sub-optimal plans left considerable areas of land unused. Full utilisation of the farm area was not warranted unless the numbers of cattle could be increased.

It is sometimes suggested that beef and sheep are complementary enterprises on this type of farm and that sheep are an essential part of any farm plan in the interests of efficient grassland management. However, in view of the indications that sheep are unable to compete with beef in strictly economic terms one may pose the question as to whether the mowing machine might not take the place of the ewe as a vehicle for effective utilisation of grass.

#### U.K. Plan with E.E.C. Prices

A comparison of the gross margins at U.K. and E.E.C. prices in Table 26 suggests that the farmer could expect to reap a substantial windfall gain in the Common Market, merely by continuing to follow the U.K. plan. This proves to be the case, as Table 28 quite clearly demonstrates.

TABLE 28  
U.K. PLAN AT E.E.C. PRICES

Activity	Size	Gross Margin	
		Increase	Decrease
		£	£
Suckler calves .. .. .	75	225	
18 month beef .. .. .	50	555	
Wheat .. .. .	180 acres	5084	
Barley .. .. .	169 acres	2636	
Grassland .. .. .	275 acres		527
Overtime labour (10 per cent increase) ..			5
Windfall gain .. .. .			7968
		8500	8500

Thus the total gross margin rises by almost £8000, or 56 per cent, from £14150 (£22.7 per acre) at U.K. prices to £22118 (£35.4 per acre) at E.E.C. prices. This is mainly on account of the increased gross margins for cereals, particularly that of



wheat which doubles on a per acre basis at E.E.C. prices, whereas the gross margin per acre for barley increases by a little over 50 per cent. The beef enterprises make only a small contribution—£253—to the increase in gross margin after allowing for the additional costs of grassland.

### Optimal Plan at E.E.C. Prices

The optimal U.K. plan includes cattle and cereals up to the limits imposed by the buildings and by the rotational constraints set in the interests of good husbandry. It is not surprising, therefore, that this plan should have a high degree of stability at E.E.C. prices, notwithstanding the relative movement in gross margins at E.E.C. prices in favour of cereals. In fact, as Table 29 shows, there is no difference between the optimal plans at U.K. and E.E.C. prices.

TABLE 29  
OPTIMAL PLAN AT E.E.C. PRICES

<i>Activity</i>	<i>Size</i>	<i>Gross Margin per unit</i>	<i>Gross Margin</i>
		£	£
Single-suckled calves, cows outwintered .. .. .	75	47	3525
Fat cattle at 18 months, cows inwintered .. .. .	50	82.40	4120
Wheat after grass .. .. .	90 acres	54.75	4927
Wheat after wheat .. .. .	90 acres	54.75	4927
Barley .. .. .	169 acres	41.60	7030
Leys—for grazing .. .. .	233 acres	-8.40	-1957
for hay .. .. .	42 acres	-9.50	-399
			22173
Cost of overtime labour (plus 10 per cent)			55
<b>Total gross margin .. .. .</b>			<b>£22118</b>

Sheep are no more competitive at E.E.C. prices than they are at U.K. prices and, as mentioned above, cereals and beef cattle are included up to the maxima imposed by the rotational and building limitations. But even though the plan is unchanged there is an increase in total gross margin from £22.7 per acre at U.K. prices to £35.4 per acre at E.E.C. prices, most of which reflects the increased gross margins of wheat and barley at E.E.C. prices.

Two points in these results would seem to be worthy of comment. Firstly, there is a significant change in the contribution of cereals and cattle to the total gross margin at E.E.C. prices. Cereals, which contribute 65 per cent to the total gross margin of the U.K. plan, now contribute 76 per cent to the gross margin of the E.E.C. plan. The contribution of the beef cattle on the other hand falls from 35 per

cent in the U.K. plan to 24 per cent in the E.E.C. plan. So yet again, as on the other farms, cereals assume a more important role in the E.E.C. plan.

The second major point is to consider the implications of releasing the rotational constraints which limit the total cereal acreage on the farm to a maximum of 350 acres. The reason for imposing these constraints is to control the influx of cereal diseases which can often follow the introduction of intensive cereal growing into a farming system. For although the intensity of cereal production in the optimal plans for this farm, at 56 per cent of the crops and grass acreage, is not high by modern standards, it should be noted that the average intensity in the area is only 20 to 30 per cent and also that the spread of cereal diseases has so far been kept in check in Northumberland.

In the absence of these rotational constraints some substitution of cereals for beef could be expected because of the substantially greater improvement in the gross margins from cereal production when the enterprises are re-appraised at Common Market prices. A comparison is made below of the relative improvement in the gross margins of beef and cereals. The figures show the per cent change in the gross margins per acre and are net of the variable costs of grazing and forage in the case of the beef enterprises and contract combining costs in the case of cereals.

	<i>U.K. Prices</i>	<i>E.E.C. Prices</i>	<i>Per Cent Change</i>
	£	£	
Suckled calves (2 acres per head) . . . . .	15·4	15·00	-2·5
Fat cattle at 18 months (2·5 acres per head) . .	21·8	24·30	+11·5
Wheat . . . . .	26·5	54·75	+106·0
Barley . . . . .	26·0	41·60	+60·0

Improvements of this order in cereal gross margins could persuade the farmer to modify his rotation and include more cereals at the expense of grassland and hence beef, although he might be able to maintain the beef enterprise at the same level by means of better grassland management. However, the straight substitution of cereals for beef is considered here.

The implication of the relative movement in gross margins is that it would pay the farmer to increase his acreage of cereals even if this meant accepting a lower yield. For instance, there is a difference in gross margin per acre at E.E.C. prices of £17·3 between barley and fat cattle at 18 months old. This is equivalent to 9·75 cwts of barley at the E.E.C. price for barley of 35/6d. per cwt. Thus it would pay the farmer to substitute barley for fat cattle even if yields were to fall by as much as 9 cwts per acre. An even larger reduction in yields—up to 15 cwts per acre—could be profitably absorbed if the substitution was barley for suckled calves.

Assume, therefore, that in the light of this incentive the farmer is prepared to move away from his present rotation of four corn crops followed by a 3-year ley to a more intensive system of four corn crops and a 1-year ley. In other words, the

farm would be operated in five blocks, each of 125 acres, and the rotation would be wheat-wheat-barley-barley-1-year ley. This enables the farmer to grow a total of 500 acres of cereals, the additional 150 acres being substituted for the herd of 75 overwintered suckler cows which, coincidentally, use up 150 acres of grassland. The one-year ley is utilised through the same herd of 50 beef cows producing fat beasts at 18 months which, again coincidentally, require 125 acres of grass for grazing and hay. On this basis the total gross margin of the farm at E.E.C. prices is that shown in Table 30.

**TABLE 30**  
AMENDED E.E.C. PLAN—INTENSIVE CEREALS

<i>Activity</i>	<i>Size</i>	<i>Gross Margin per Unit</i>	<i>Gross Margin</i>
		£	£
Fat cattle at 18 months—cows overwintered	50	82.4	4120
Wheat .. .. .	250 acres	54.75	13687
Barley .. .. .	250 acres	41.60	10400
Grass—for grazing .. .. .	75 acres	-8.40	-630
for hay .. .. .	49 acres	-9.50	-465
Total gross margin .. .. .			£27112

This plan yields a total gross margin of £27112, or £43.5 per acre, representing an increase of almost £5000 or nearly 23 per cent compared with the optimal E.E.C. plan shown in Table 29. This extra margin is available to meet the cost of any overtime labour which might be required and also any extra fixed costs that might arise. Table 30 has been constructed on the assumption that cereal yields are maintained at their current level of 33 cwt per acre for wheat and 31 cwt per acre for barley. Even if yields fall by as much as 3 and 6 cwt per acre respectively, an extra £750 is still added to the total gross margin.

### Net Farm Income

As a final stage the implications of entry into the E.E.C. for net farm income is now considered. These comments are, however, limited to the net farm incomes of the optimal U.K. and E.E.C. plans shown in Tables 27 and 29.

The present level of fixed costs on the farm is shown below:

	<i>Total</i>	<i>Per acre</i>
	£	£
Rent .. .. .	3177	5.1
Labour (5 men) .. .. .	4105	6.6
Machinery .. .. .	2287	3.7
Other .. .. .	1239	2.0
	10808	17.4

This is a very modest level of fixed costs by present day standards. However, survey data shows that the average level of fixed costs on typical Northumberland cropping and stocking farms in 1966/67 were £18.7 and £12.9 per acre respectively. Moreover, it must be remembered that this farmer is able to save on machinery costs because of the ability to have his cereals harvested by a contractor.

On the basis of this level of fixed costs the net incomes of the optimal U.K. and E.E.C. plans are shown in Table 31.

**TABLE 31**  
NET FARM INCOME

Organisation .. .. .	U.K.	E.E.C.
Prices .. .. .	U.K.	E.E.C.
	£	£
Gross Margin .. .. .	14150	22118
Fixed Costs .. .. .	10808	10808
Net Farm Income .. .. .	3342	11310
Net Farm Income per acre .. .. .	5.0	18.1
Index .. .. .	100.0	338.0

It is obvious that net farm income increases very substantially in the Common Market without the need for any changes in farm policy.

It is equally clear that if such large increases in net income are achieved in practice, there would be a consequential rise in land values, and hence in rents, for this type of farm. Thus if it is assumed as mentioned in the introduction, that rent increases by a percentage equal to three-quarters of the percentage increase in net farm income and that wage rates rise by 10 per cent, the following level of fixed costs would apply in the Common Market:

	<i>Total</i>	<i>Per Acre</i>
	£	£
Rent .. .. .	8837	14.2
Labour .. .. .	4515	7.2
Machinery .. .. .	2287	3.7
Other .. .. .	1239	2.0
	16878	27.1

The net farm income of the E.E.C. plan at this level of fixed costs is reduced to £5240 or £8.4 per acre. This still represents a not inconsiderable increase in net income compared with the U.K. plan; the increase is in fact 57 per cent. It is reasonable to infer, therefore, that the prospects for this farm in the Common Market would be extremely favourable.

## Conclusion

To sum up, the optimal plan for this farm is based on beef cattle and cereals. Within the beef enterprise two systems of management—the production of suckled calves and fat cattle at 18 months old from a herd of single-suckler cows—are practised. The plan at U.K. prices is very stable due largely to the technical constraints peculiar to this farm; thus no changes in plan are envisaged at E.E.C. prices. Nevertheless, the farm could expect to benefit substantially from entry into the Common Market since net income increases by more than half, even after allowing for the impact of higher fixed costs. The improvement is due almost entirely to the increased gross margins of cereals which increase their relative contribution to the total gross margin of the farm. Moreover, there would be few, if any, problems of adaptation to the new regime as a result of the stability of the plan.

It has already been mentioned that this stability is closely related to the technical constraints which were written into the programme for the farm. It is interesting, therefore, to speculate on the implications of lifting these limitations, and particularly the rotational restrictions on the maximum acreage of cereals that may be grown on the farm. It can be shown that an expansion in the cereal acreage, and the consequent substitution of cereals for beef, adds considerably to the total gross margin of the farm within the Common Market price environment. Furthermore, it would still be profitable to make this substitution even if it means accepting a reduction in yields following the intensification of cereals in the rotation. The current rotational constraints have, no doubt, a sound basis in husbandry; one cannot help wondering, however, whether the greatly increased gross margins for cereals at E.E.C. price levels might not lead to a weakening of these husbandry arguments. Certainly, the evidence for this farm seems to offer farmers a substantial economic incentive to think about their rotation afresh, and to consider the inclusion of an increased proportion of cereals in their cropping programmes.

## VI. THE ESSEX FARM

The cradle of English arable farming lies on the drier eastern side of the country, with wheat, barley, sugar beet and potatoes the predominant crops. On the greater proportion of farms livestock occupy a subsidiary role; indeed, not infrequently there are no stock at all. It follows, therefore, that for this type of farming, E.E.C. conditions will have their main impact on farm organisation and incomes through changing price relationships for cereals and root crops.

Much of the region consists of heavy loam and clay soils, while the arable system lends itself to farms of above average size. One of the commonest types of farming is that where grain and root crops are both important with the former, however, taking precedence in both acreage and output. A concentration of such

farms occurs in the boulder clay area of North-West Essex, where the farm under study is situated.

### Farm Resources and Activities

The farm is 210 acres in size with a regular labour force of two hired men and the farmer. The 200 acres available for cropping support a four-year rotation of break crops (potatoes, sugar beet, clover ley and beans)—wheat—barley—barley. Wheat may also follow oats as the latter are fairly resistant to soil-borne fungal diseases in the eastern side of the country.

Cereal production is mechanised, harvest being by tanker-combine, and drying and storage is available for 150 tons of grain. The sugar beet harvest is also mechanised but, because of the heavy nature of the soil, the potato harvest is dependent on a gang of casual workers for hand-picking. Sugar beet singling is also carried out by hand. A limited amount of casual labour is available in the district if required. Cereals may be grown for up to four shifts in succession, with wheat confined mainly to the first shift after the break. Clover is cut for hay—and for seed in propitious seasons—while beans, financially a more favourable crop than in the past due to improved techniques, are harvested by combine and are of the stock-feed variety. The only livestock activity is the fattening in winter of up to thirty yarded beef stores, largely on arable by-products.<sup>(1)</sup> The relevant gross margins for this system at both U.K. and E.E.C. prices are shown in Table 32.

TABLE 32  
GROSS MARGINS AT U.K. AND E.E.C. PRICES

Activity	U.K.	E.E.C.	Difference	Proportional change
	Prices	Prices	E.E.C.—U.K.	E.E.C. over U.K.
	£	£	£	Per cent
<i>Crops</i> (per acre)				
Wheat (a) .. ..	37.5	63.5	+26.0	+69
Barley (a) .. ..	30.9	47.7	+16.8	+54
Oats (a) .. ..	32.5	43.7	+11.2	+34
Beans .. ..	29.1	28.0	-1.1	-4
Clover .. ..	22.5	24.9	+2.4	+11
Sugar Beet (b) .. ..	83.4	86.1	+2.7	+3
Potatoes .. ..	84.8	60.4	-24.4	-29
<i>Beef Cattle</i> (per beast) (c)	14.8	24.3	+9.5	+64

(a) Assuming stored. The gross margins are somewhat lower if the grain is sold off the combine.

(b) £13 per acre less if singled by casual labour.

(c) Before deducting variable costs of fodder and litter.

(1) In practice, pigs are often included on this type of farm. However, as mentioned in the introduction, it has been thought preferable to exclude the possibility of keeping pigs so that the effect of E.E.C. conditions on a predominantly cropping system may be assessed.

## Optimal Plan at U.K. Prices

The plan that brings in the highest gross margin at U.K. prices is shown in Table 33. Apart from land, the major constraints on overall organisation are the amounts of labour available in spring and autumn. In the former period labour is fully occupied in preparing a seed-bed for drilling spring-sown crops and in the latter with the root harvest and the cultivations and drilling of winter wheat. Some autumn ploughing is undertaken by a contractor to ease the pressure of work at that time.

TABLE 33  
OPTIMAL PLAN AT U.K. PRICES

<i>Activity</i>	<i>Size</i>	<i>Gross Margin per unit</i>	<i>Gross Margin</i>
		£	£
Wheat (stored) .. ..	19	37.5	712
Barley (stored) .. ..	78	30.9	2410
Oats (not stored) .. ..	10	27.5	275
Beans .. ..	50	29.1	1455
Sugar Beet .. ..	25	83.4 (regular singled) 70.4 (casual singled)	1955
	10		
Potatoes .. ..	18	84.8	1526
Beef Cattle .. ..	30	8.5(1)	255
			8588
Less contract ploughing (66 acres)			165
<b>Total Gross Margin .. ..</b>			<b>£8423</b>

(1) Net of forage costs.

Overall, the plan puts approximately half the acreage in cereals and half in roots and legumes, with grain crops contributing about three-fifths of the cropping gross margin and roots two-fifths. The mainstay of the cereal acreage is barley, with wheat running at what may appear a surprisingly low level in view of its favourable gross margin. This, however, is due to the calls made on autumn labour by the 43 acres of root crops. Beans, although their gross margin is a little below that of barley, nevertheless rise to the maximum permitted (50 acres) because they are valuable in helping to spread the spring work load. Other crops running at their maxima are sugar beet—25 acres being the contract limit—and oats, where 10 acres is as much as the farmer is prepared to grow because of their greater sensitivity to critical timing in sowing and harvesting compared with the other cereals. In addition, 30 head of beef cattle are included for, although adding only £255 to

total gross margin, they do not compete directly for resources with the other activities. The total gross margin of this plan is £8423, equivalent to £40 per acre over the whole farm acreage.

### U.K. Plan with E.E.C. Prices

A comparison of the gross margins that would obtain under the E.E.C. price regime with those for U.K. prices (Table 32) shows that the cereal gross margins rise very substantially, whilst those for sugar beet and beans stay almost unchanged. The potato gross margin, on the other hand, falls heavily. The gross margin of beef cattle rises markedly in spite of a rise in variable costs due to higher feed-grain prices. As cereals cover over half the arable acreage in the U.K. optimal plan, while potatoes make up less than one-tenth, it is clear that the favourable changes far outweigh the unfavourable ones. In short, the farmer can anticipate a windfall gain under E.E.C. conditions merely by continuing to follow the U.K. plan. The amount of this gain may be calculated by balancing the increases in gross margins with the decreases; this has been done in Table 34.

TABLE 34  
CHANGES IN GROSS MARGIN—U.K. PLAN AT E.E.C. PRICES

Activity	Size	Gross Margin	
		Increase	Decrease
		£	£
Wheat .. .. .	19	494	
Barley .. .. .	78	1310	
Oats .. .. .	10	132	
Beans .. .. .	50		55
Sugar Beet .. .. .	25	68	
Potatoes .. .. .	18		439
Beef Cattle .. .. .	30	450(1)	—
Windfall gain .. .. .			494
			1960
		2454	2454

(1) In addition to the gain shown in Table 32, sugar beet pulp is assumed free to the grower. This adds another £165 to gross margin.

On balance the total gross margin rises by £1960 (23 per cent) to £10383 or £49.4 per acre, mainly as a result of the increase in cereal and beef margins, which more than offset the lower margin from potatoes.



## Optimal Plan at E.E.C. Prices

In spite of the extent of this increase in gross margin it is evident that there is a further potential gain to be had by a change in plan. It should be possible, by moving to a new plan, to take greater advantage of the favourable price changes while at the same time reducing the impact of the unfavourable ones.

This is particularly true of the relationship between wheat and roots. In the U.K. plan, potatoes and sugar beet—giving better returns to land than wheat—utilise most of the autumn labour and so restrict wheat to a relatively small acreage, although, in fact, wheat gives a better return to labour than either potatoes or sugar beet. Under E.E.C. prices, while the potato gross margin declines, that of wheat improves dramatically so that it now exceeds that of potatoes. In short, wheat is now better than potatoes and may therefore be expected to expand at their expense.

The changed relationship between the gross margins of cereals and beans is also significant. At U.K. prices the gross margin per acre from beans is nearly as good as that of cereals, but with the improvement in cereal gross margin, coupled with a slight decline in that of beans at E.E.C. prices, this is no longer the case. Thus beans are also likely to be sacrificed. As wheat, however, mainly follows the break crops which include beans and potatoes, reducing the acreage of these crops also reduces the maximum acreage of wheat that can be grown, and it is this factor which limits the rise in the wheat acreage.

The optimal plan, given these new price relationships, is shown in Table 35. Cereals rise by 46.5 acres at the expense of beans and potatoes. Otherwise the plan is unchanged.

TABLE 35  
OPTIMAL PLAN AT E.E.C. PRICES

<i>Activity</i>	<i>Size</i>	<i>Gross Margin per Unit</i>	<i>Gross Margin</i>
Wheat (stored) .. ..	56	£ 63.5	£ 3556
Barley (47 per cent stored) ..	87.5	46.04	4028
Oats (not stored) .. ..	10	40.7	407
Beans .. .. .	9	28.0	252
Sugar Beet .. .. .	25 { 15	86.1 (regular singled) }	2023
	{ 10	73.1 (casual singled) }	
Potatoes .. .. .	12.5	60.4	755
Beef Cattle .. .. .	30	23.5	705
			11726
Less contract ploughing (72 acres)			179
<b>Total gross margin .. .. .</b>			<b>£11547</b>

The additional cereal acreage is made up of 37 acres of wheat and 9.5 acres of barley; the acreage of beans falls by 41 acres and the potato acreage by 5.5. The reduction in the acreage of potatoes provides the autumn labour required by the additional wheat acreage. Any further expansion of cereals at the expense of beans and potatoes is prevented by two factors. Firstly, wheat is limited because it has mainly to follow the break. Secondly, barley is limited because spring labour is fully used.

In spite of this relatively small shift in plan, total gross margin rises by £3124 (£11547—£8423), or 37 per cent over the optimal plan at U.K. prices (Table 33). In view of the considerable windfall gain of £1960 accruing to the original U.K. plan at E.E.C. prices, this is not unexpected. However, by changing the plan to take advantage of the favourable price changes and reduce the impact of the unfavourable ones, the farmer can add another £1164 (£3124—£1960) to the total gross margin. This demonstrates that it would certainly pay the farmer to change his organisation in response to a changed price situation.

### Net Farm Income

So far the plans have been considered purely in terms of their gross margins. It is now time to incorporate the fixed costs so that the net farm incomes of the alternative situations may be calculated. Currently, the fixed costs on this farm are £25 per acre, made up as follows:

	<i>Total</i>	<i>Per Acre</i>
	£	£
Labour .. ..	1575	7.5
Machinery .. ..	2100	10.0
Rent .. ..	1050	5.0
Miscellaneous .. ..	525	2.5
	<hr/>	<hr/>
	5250	25.0
	<hr/>	<hr/>

The net farm incomes arising when this level of fixed costs is deducted from the gross margins of the three situations previously discussed are shown in Table 36.

TABLE 36  
NET FARM INCOME

Organisation Prices .. .. .	(1) U.K.	(2) U.K. E.E.C.	(3) E.E.C.
Gross Margin .. .. .	8423	10383	11547
Fixed Costs .. .. .	5250	5250	5250
	<hr/>	<hr/>	<hr/>
Net Farm Income .. .. .	3173	5133	6297
Net Farm Income per acre .. .. .	15.1	24.4	30.0
Index .. .. .	100	162	198

Net farm income nearly doubles—from £15.1 to £30 per acre—as one moves from the optimal U.K. plan to the optimal plan at E.E.C. prices. If such large potential increases were realised in practice, it is certain that rental values would also increase, due both to more intense competition amongst farmers for land and to landlords seeking matching increases in the return to their capital investment. In order to make some allowance for the upward movement in rental values, which would tend to lag behind increases in farm income, it has been assumed as elsewhere that rent rises by a percentage equal to three-quarters of the percentage increase in net farm income, that is by 46 and 74 per cent respectively—to £1537 and £1826—for situations 2 and 3 in Table 36. At the same time, it has been assumed that, because of increased costs of living, wage rates rise by 10 per cent, so that the farm labour bill increases by £157 from £1575 to £1732. In consequence, total fixed costs rise by £644 and £933 for situations 2 and 3 respectively. The effect of these changes on net income is shown in Table 37.

TABLE 37

NET FARM INCOME WITH INCREASED FIXED COSTS

		(1)	(2)	(3)
Organisation	.. .. .	U.K.	U.K.	E.E.C.
Prices	.. .. .	U.K.	E.E.C.	E.E.C.
		£	£	£
Gross Margin	.. .. .	8423	10383	11547
Fixed Costs	.. .. .	5250	5894	6183
Net Farm Income	.. .. .	3173	4489	5364
Net Farm Income per acre	.. .. .	15.1	21.3	25.5
Index	.. .. .	100	142	169

Although the rise in net income has naturally been damped down somewhat, it is still at an impressive level. The farmer receives a bonus of over 40 per cent of his original net income merely by carrying on as before and one of nearly 70 per cent if he changes to the new plan.

**Conclusions**

Although it is impossible to make fully accurate forecasts and errors of estimate are inevitable, the increased margins under E.E.C. conditions are of such magnitude that they clearly indicate that arable farming of the type in question would be in a favourable position in the Common Market.

It is interesting to compare the relative importance of the different enterprises in

the U.K. and E.E.C. plans. In the optimal U.K. plan, the largest proportion of both the acreage and the total gross margin is made up of cereals, as shown in Table 38.

**TABLE 38**  
DISTRIBUTION OF ACREAGES AND GROSS MARGINS

Activity	Acres	U.K. Plan			E.E.C. Plan			
		Gross Margin	Acres	Gross Margin	Acres	Gross Margin	Acres	Gross Margin
		£	per cent	per cent		£	per cent	per cent
Cereals ..	107	3397	53.5	39.5	153.5	7991	76.8	68.1
Beans ..	50	1455	25.0	16.9	9	252	4.5	2.2
Sugar Beet ..	25	1955	12.5	22.8	25	2023	12.5	17.3
Potatoes ..	18	1526	9.0	17.8	12.5	755	6.2	6.4
Beef Cattle ..	—	255	—	3.0	—	705	—	6.0
Total .. ..	200	8588	100	100	200	11726	100	100

The E.E.C. plan increases this emphasis so that cereals become of outstanding importance, occupying over three-quarters of the land and contributing over two-thirds of the total gross margin. Nevertheless, simplification of the farm programme by the elimination of enterprises is not suggested in the E.E.C plan, for they remain at their previous level of five—cereals, beans, sugar beet, potatoes and beef cattle. However, whereas in the U.K. plan the non-cereal cropping enterprises are all of about equal importance in their contribution to total gross margin, in the E.E.C. plan only sugar beet is of any real significance.

Admittedly such continuing diversification has some merits in terms of keeping the farmer in touch with up-to-date techniques of handling crops that it might be desirable to expand at some future date. But if the E.E.C. price regime were to continue more or less unchanged, simplification might come about by eliminating the minor enterprises—potatoes and beans—and concentrating on cereals and sugar beet(1). Wheat is the obvious cereal to expand because of its higher gross margin per acre, while the elimination of potatoes would provide sufficient labour in autumn to handle the extra acreage. However, as already mentioned, the technical difficulty with this policy is that it entails at one and the same time an increase in the wheat acreage and a reduction in the potato crop which wheat normally follows. However, the large increase in the gross margin for wheat is certainly justification for rethinking the position of wheat in the rotation in relation to soil-borne fungal diseases and weeds such as wild oats and blackgrass. If two wheat crops in succession after a one-year break can be countenanced, allowing

(1) Excepting beef cattle which is largely a supplementary enterprise not in direct competition with arable crops.

oats as a break crop, potatoes could be eliminated and beans reduced to five acres, giving a five-year rotation of break crops—2 wheats—2 barleys as below:

Oats 10 acres      Beans 5 acres      Sugar Beet 25 acres  
                     Wheat 30 acres      Barley 10 acres  
                                     Wheat 40 acres  
                                     Barley 40 acres  
                                     Barley 40 acres

In this rotation wheat is assumed to be able to follow only 60 per cent of the sugar beet acreage, because the whole crop could not be lifted in time to permit wheat to be drilled. The 40 per cent not followed by wheat is instead followed by spring barley.

The farm plan resulting from this change in rotation is shown in Table 39. Gross margin rises by £284 (£11831—£11547) compared with the optimal E.E.C. plan shown in Table 35.

**TABLE 39**  
**FARM PLAN AT E.E.C. PRICES AFTER ELIMINATION OF POTATOES**

<i>Activity</i>	<i>Size</i>	<i>Gross Margin per Unit</i>	<i>Gross Margin</i>
Wheat (stored) .. ..	70	£63.5	£4445
Barley (30 per cent stored) ..	90	45.5	4098
Oats (not stored) .. ..	10	40.7	407
Beans .. ..	5	28.0	140
Sugar Beet .. ..	25	86.1 (regular singled)	2036
	{ 9	73.1 (casual singled) }	
Beef Cattle .. ..	30	23.5	705
Total gross margin .. ..			£11831

Cereals now occupy 85 per cent of the arable acreage and contribute 76 per cent of the total gross margin. The easing of the labour load following the elimination of potatoes permits contract ploughing to be dispensed with in the autumn, as well as an acre less of beet singling by casual labour in early summer. If such a plan is adopted it is also likely that additional grain storage facilities would have to be erected, for the present capacity permits only about 60 per cent of the expanded grain output to be stored. The costs of providing this additional grain storage would have to be set against the increase in gross margin.

If five additional acres of sugar beet were to be grown, beans could also be eliminated and the total gross margin would rise by another £130, after allowing for the extra costs of singling by casual labour and for contract ploughing. The

system would then be both simple and profitable, namely, cereals and sugar beet with beef as a sideline, making a gross margin of £57 per acre.

Clearly then, the prospects for this farm in the Common Market are favourable. The farmer could expect to receive a substantial increase in his net income merely by continuing to follow the optimal U.K. plan. A larger increase in profitability could be achieved by adapting the plan to derive the benefit from the new price relationships. This improvement would be all the greater if the farmer was able to overcome the technical constraints relating to wheat in the rotation, thus simplifying his plan by concentrating on the more profitable crops—cereals, particularly wheat, and sugar beet—and eliminating the less profitable beans and potatoes. The substantially higher gross margins for cereals in the E.E.C. could be just the incentive to bring about the necessary change in attitude to cereals in the rotation.

## VII. THE WILTSHIRE FARM

This assessment of the impact of entry into the Common Market on typical farming systems would be incomplete without a representative of that broad belt of chalkland farming which sweeps across England from the downs of Dorset and Wiltshire in the south to the Yorkshire Wolds in the north. The farm chosen to represent this type of farming is in fact situated in the south of Wiltshire on the fringes of Salisbury Plain and a few miles to the west of the city bearing that name.

Cereals are an important part of the farming economy in South Wiltshire, but the farms in this area can be divided into two broad groups according to the presence—or absence—of a dairy herd. Dairying is an integral part of the organisation on about half the farms in the area. On the others, the farming system is usually based on the production of cereals, beef and sheep, although on some farms the main livestock enterprise is that of rearing dairy herd replacements. Another important—and expanding—enterprise on this type of farm is the production of herbage seeds as part of the break from cereals. The farm programmes are therefore based on cereals and dairying, cereals, beef and sheep or heifer rearing, with herbage seeds sometimes included as a subsidiary enterprise. Thus in order to cover the full range of alternatives open to farmers on this system of farming six basic models were tested.

The six models are as follows:

1. With cows, with herd replacements, without herbage seeds.
2. With cows, with herd replacements, with herbage seeds.
3. Without cows, without herd replacements, without seeds.
4. Without cows, without herd replacements, with seeds.
5. Without cows, with herd replacements, without seeds.
6. Without cows, with herd replacements, with seeds.

## Farm Resources and Activities

The farm which forms the basis of the analysis runs to 600 acres of arable land. Of this, 400 acres is on chalk where there is an upper limit of 300 acres of cereals. The remaining 200 acres is a black puffy soil on chalk on which a maximum of 150 acres of cereals can be grown. Six cereal crops, including wheat, may be grown in succession on the chalk, but on the black puffy land only barley, up to four crops in succession, is allowed. The feasible break crops are field beans, oil seed rape and herbage seeds for direct sale, or grass leys utilized through grazing livestock.

The present system as practised on this farm is based on cereals, herbage seeds and sheep. The labour force is composed of four men, the fourth man being a maintenance worker who also acts as a tractor driver at peak periods. The peak demands for labour are in spring, early summer and autumn. The cereal and herbage seed crops are fully mechanised and adequate facilities are available for drying and storing all the grain that can be produced. The winter feed policy for dairy cows is based entirely on silage, but the other classes of stock can be fed on herbage seed hay, supplemented by appropriate levels of concentrates, or silage. A five-year herd-life for the dairy herd has been assumed.

The relevant gross margins at U.K. and E.E.C. prices for all production possibilities are shown in Table 40.

**TABLE 40**  
GROSS MARGINS AT U.K. AND E.E.C. PRICES

<i>Activity</i>	<i>U.K. Prices</i>	<i>E.E.C. Prices</i>
	£ per acre	£ per acre
Winter Wheat .. .. .	30.0	49.8
Barley(1) .. .. .	28.3 to 23.3	41.9 to 33.1
Beans .. .. .	28.0	26.6
Rape .. .. .	18.0	45.0
Herbage Seeds: S.22 .. .. .	25.0	22.4
Timothy—1st year .. .. .	30.0	28.0
2nd year .. .. .	34.0	31.8
S.23— 1st year .. .. .	35.0	33.1
2nd year .. .. .	19.0	16.6
Two-year ley .. .. .	-5.5	-6.8
	£ per head	£ per head
Dairy cows (per cow) .. .. .	85	106
Herd replacements (per replacement unit) .. .. .	60	66.5
Sheep (per livestock unit) .. .. .	33.5	35.5
Single suckled beef (per cow) .. .. .	38	45
18 months beef from week-old calves .. .. .	30	50

(1) Assuming a reduction of 1 cwt per acre with successive cereal crops.

The gross margins for livestock are before deduction of the variable costs of grazing and conserved forage crops. The models make provision for the stock to be

fed silage, herbage seed hay supplemented by concentrates, or grass hay again supplemented by concentrates; this supplementation is designed to bring the hay up to the nutritive value assumed for the silage. As was pointed out above, a silage based diet is specified for the dairy cows.

It is perhaps necessary to comment briefly on the gross margins assigned to herbage seeds and to rape at E.E.C. prices. It has been assumed that there would be no increase in the prices received by farmers for herbage seeds under Common Market conditions. On the contrary, there might be some reduction in prices as a result of competition from continental suppliers, particularly the Dutch and also the Danes, assuming the latter join the Common Market at the same time as the U.K. On balance, however, a situation of 'no change' has been adopted since the domestic producer might continue to receive a form of protection in the form of plant health regulations. The reduced gross margins for herbage seeds, therefore, reflect only the higher costs of fertilizers. So far as rape is concerned, the very substantial increase in gross margin is the result of the high price of some £80 per ton for this crop in the Common Market, compared with the current U.K. price of £40 per ton. The margins at E.E.C. prices for the other enterprises are based on the same assumptions that were adopted for the five other farms.

Finally, it is necessary to outline the upper limits which were applied to the various enterprises in the interest of good husbandry and in respect of the limitations of the available buildings. Consideration had to be given also to the maximum quantities of the different strains of herbage seeds that could be marketed. All these factors are taken into account in the limitations summarised in Table 41.

**TABLE 41**  
MAXIMUM ENTERPRISE SIZE

<i>Activity</i>	<i>Chalk Soil</i>	<i>Black Puffy Soil</i>	<i>Overall Limitation</i>
	(acres)	(acres)	(acres)
Cereals .. .. .	300	150	
Beans .. .. .	100	50	100
Rape .. .. .	100	50	100
S.22 .. .. .	200		
Timothy .. .. .			50
S.23 .. .. .		100	
Herbage seeds .. .. .			300
			(Numbers)
Dairy cows .. .. .			100
Sheep .. .. .			200
Single-suckled beef .. .. .			100
18 months beef .. .. .			150

The stocking rate assumed for the livestock is equivalent to 1.5 acres per livestock unit.



## Optimal Plans at U.K. Prices

The optimal plans for all six models at U.K. prices are summarised in Table 42.

TABLE 42  
OPTIMAL PLANS AT U.K. PRICES

Model	(1)	(2)	(3)	(4)	(5)	(6)
Cows .. .. .	Yes	Yes	No	No	No	No
Replacements .. .. .	Yes	Yes	No	No	Yes	Yes
Herbage Seeds .. .. .	No	Yes	No	Yes	No	Yes
<i>Cropping (acres):</i>						
Wheat .. .. .	—	112	100	100	200	78
Barley .. .. .	399	77	350	100	100	76
Beans .. .. .	100	100	100	100	100	100
S.22 .. .. .	—	188	—	200	—	195
Timothy .. .. .	—	50	—	50	—	50
S.23 .. .. .	—	—	—	50	—	—
Grass .. .. .	101	73	50	—	200	101
<i>Stocking (numbers):</i>						
Dairy cows .. .. .	45	92	—	—	—	—
Herd replacements .. .. .	19	17	—	—	118	169
Single-suckled beef .. .. .	—	—	34	48	—	—
18 months beef .. .. .	—	—	—	13	—	—
Total Gross Margin (£) ..	17555	21950	15871	19377	16918	21427

It is clear from these results that the highest gross margins are obtained when herbage seeds are included in the plans. It is also apparent that better results are achieved when dairy cows are included rather than herd replacements (as a separate enterprise) or beef. It is interesting that, as in the case of the Northumberland and Berkshire farms, sheep do not appear in any of the solutions, so it again seems that sheep are unable to compete economically with alternative livestock enterprises. It is also significant that the rearing of dairy replacements seems to be a more profitable enterprise than beef production, at least on the basis of the relationship specified in Table 40.

Table 42 shows how the highest gross margin—£21950 or £36.6 per acre—is obtained by a system based on dairy cows, herbage seeds, cereals and beans, whilst

the lowest margin—£15871 or £26·4 per acre—is given by a combination of cereals, beans and beef. The six plans can be ranked in order of their total gross margins as follows:

<i>System</i>	<i>Model</i>	<i>Gross Margin</i>	
		<i>Total</i>	<i>Per Acre</i>
		£	£
Cereals, herbage seeds, cows .. .. .	2	21950	36·6
Cereals, herbage seeds, herd replacements ..	6	21427	35·7
Cereals, herbage seeds, beef .. .. .	4	19377	32·3
Cereals, cows .. .. .	1	17555	29·3
Cereals, herd replacements .. .. .	5	16918	28·2
Cereals, beef .. .. .	3	15871	26·4

It should be noted that all systems include beans running at their maximum of 100 acres. Cereals only reach their maximum in the third model. Timothy runs at its maximum of 50 acres in all three herbage seed models, but only in the fourth model is the overall maximum of 300 acres of herbage seeds reached. None of the livestock activities run at their maximum in any of the models.

It may be concluded, therefore, that provided farmers have sufficient management skill and expertise to handle the crop efficiently, better results are obtained on this type of farm from a farm programme which includes herbage seeds as a major enterprise. The best results are achieved if the farmer also includes a dairy herd in his programme, but he can obtain a total gross margin of only £500 less by rearing dairy replacements as his only livestock activity. Livestock systems based on the production of beef have a much lower total gross margin than these alternative systems.

### **U.K. Plans at E.E.C. Prices**

Further examination of Table 40 shows how the gross margins of the cereal and livestock activities on this farm all increase markedly at E.E.C. prices and that these increases should be sufficient to more than offset the reductions in the gross margins of beans and herbage seeds. It may be expected, therefore, that entry into the Common Market will bring large windfall gains for all the six plans discussed above.

The gains and losses for the U.K. plans at E.E.C. prices are summarised in Table 43.

TABLE 43

U.K. PLANS AT E.E.C. PRICES—CHANGES IN ENTERPRISE GROSS MARGINS AND WINDFALL GAINS

Model Change in Gross Margin	(1)		(2)		(3)		(4)		(5)		(6)	
	+	-	+	-	+	-	+	-	+	-	+	-
	£	£	£	£	£	£	£	£	£	£	£	£
Cereals .. .. .	5286	—	3322	—	6410	—	2577	—	5320	—	3265	—
Beans .. .. .	—	140	—	140	—	140	—	140	—	140	—	140
Herbage seeds .. .. .	—	—	—	732	—	—	—	612	—	—	—	594
Grass, forage etc. .. .. .	—	131	—	—	—	65	—	463	—	276	—	149
Dairy cows .. .. .	945	—	—	—	—	—	—	—	—	—	1932	—
Herd replacements .. .. .	124	—	—	—	—	—	1099	—	767	—	111	—
Beef .. .. .	—	—	596	—	238	—	—	—	—	—	—	—
Overtime labour (1) .. .. .	—	61	—	31	—	34	—	43	—	25	—	72
Windfall gain .. .. .	6023		3015		6409		2418		5646		4353	

(1) 10 per cent cost increase.

TABLE 44

## U.K. PLANS AT E.E.C. PRICES—RELATIVE CHANGES IN GROSS MARGINS

System	Gross Margin of U.K. Plan		Increase in Gross Margin		Index of farming systems(1)	
	At U.K. Prices	At E.E.C. Prices	(Actual)	(Per Cent)	At U.K. Prices	At E.E.C. Prices
	£	£	£			
Cereals, seeds, cows	21950	26303	4353	19·8	100	100
Cereals, seeds, heifers	21427	23845	2418	11·3	97·6	90·7
Cereals, seeds, beef	19377	22392	3015	15·6	88·3	85·1
Cereals, cows ..	17555	23578	6023	34·3	80·0	89·6
Cereals, heifers ..	16918	22564	5646	33·4	77·1	85·8
Cereals, beef ..	15871	22280	6409	40·4	72·3	84·7

(1) Highest gross margin rated as 100.

Table 43 confirms that large windfall gains are to be had in the Common Market merely by continuing to follow the U.K. plans. This is almost entirely due to the increased gross margins from cereal production. However, the interesting feature of this table is not so much the gains themselves as their relative effect on the different plans and, in consequence, the narrowing differential between the best and worst plans. This becomes clear from a study of Table 44, which shows that the systems without seeds achieve a greater relative increase in gross margin at E.E.C. prices.

The interesting point about this table is that although the ranking of the plans changes in only two respects—the cereal and cows and the cereal and heifer systems move up to third and fourth places respectively—the relationship between the systems changes considerably. The cereal, herbage seeds and cow system remains by far the most profitable, but the differential between the other plans narrows so that there is now much less to choose between them. This is a reflection of the relative shifts in the gross margins of herbage seeds, heifers and beef.

### Optimal Plans at E.E.C. Prices

The implication of Table 44 is that some changes in plan could profitably be made to maximise total gross margins at E.E.C. prices. For example, the relative changes in gross margins shown in Table 40 suggest that it would pay to expand cereals at the expense of herbage seeds, to use rape rather than beans as a break from cereals, and, perhaps, to substitute beef for herd replacements. In the following paragraphs the optimal plans at E.E.C. prices, and the changes in organisation that they imply, are discussed.

The details of the six optimal plans at E.E.C. prices are set out in Table 45.

TABLE 45  
OPTIMAL PLANS AT E.E.C. PRICES

Model	(1)	(2)	(3)	(4)	(5)	(6)
<i>Cropping (acres)</i>						
Wheat .. .. .	100	158	133	200	133	135
Barley .. .. .	350	118	283	103	283	100
Rape .. .. .	100	100	100	100	100	100
S.22 .. .. .	—	192	—	128	—	178
Timothy .. .. .	—	—	—	—	—	—
S.23 .. .. .	—	—	—	—	—	—
Grass .. .. .	50	32	84	69	84	87
<i>Stacking (numbers)</i>						
Dairy cows .. .. .	22	71	—	—	—	—
Herd replacements .. .. .	10	—	—	—	—	51
18 months beef .. .. .	—	8	79	150	79	150
Total Gross Margin (£)	25420	28680	25006	27490	25006	27456

It is quite apparent that the new price relationships call for substantial changes in plan and also that further increases in total gross margin are obtainable over and above the repriced U.K. plans. For instance, rape replaces beans as a cereal break; Timothy and single-suckled beef no longer feature in the solutions; the acreage of cereals expands and there is greater emphasis on cropping at the expense of livestock.

The main changes in plan and in the relative composition of the total gross margin are shown in Tables 46 and 47 respectively. Table 48 gives details of the proportionate use of land by the different crops in the U.K. and E.E.C. plans.

**TABLE 46**  
COMPARISON OF OPTIMAL U.K. AND E.E.C. PLANS  
CHANGES IN CROPPING AND STOCKING

Model	(1)	(2)	(3)	(4)	(5)	(6)
<i>Cropping (acres)</i>						
Wheat .. .. .	+100	+46	+33	+100	-67	+57
Barley .. .. .	-49	+41	-67	+3	+183	+24
Total Cereals .. .. .	+51	+87	-34	+103	+116	+81
Beans .. .. .	-100	-100	-100	-100	-100	-100
Rape .. .. .	+100	+100	+100	+100	+100	+100
Herbage Seeds .. .. .		-46		-172		-67
Grass .. .. .	-51	-41	+34	+69	-116	-14
<i>Stocking (numbers):</i>						
Dairy cows .. .. .	-23	-21				
Replacements .. .. .	-9	-17			-118	-118
Single-suckled beef .. .. .			-34	-48		
18 months beef .. .. .		+8	+79	+137	+79	+150

There are several interesting features that emerge from these tables. The main points are as follows:

- (1) Generally speaking, cereals assume a much larger role in the farm plans (with the exception of plan 3) as a consequence of the improvement in cereal gross margins. The acreage of cereals included in the optimal plans increases, in two cases by over 100 acres, with the emphasis on wheat rather than barley. This reflects the widening differential between the per acre gross margins of wheat and barley under Common Market conditions. As a consequence, cereals make a proportionately greater contribution to the total gross margin, quite apart from the effects of price changes alone. In only one E.E.C. situation, however, (plan 1) is the maximum permitted acreage of cereals included in the plan.

**TABLE 47**  
**COMPARISON OF OPTIMAL U.K. AND E.E.C. PLANS**  
**PERCENTAGE COMPOSITION OF TOTAL GROSS MARGIN(1)**

<i>Model</i>	(1)		(2)		(3)		(4)		(5)		(6)	
	<i>U.K.</i> <i>Plan</i>	<i>E.E.C.</i> <i>Plan</i>	<i>U.K.</i> <i>Plan</i>	<i>E.E.C.</i> <i>Plan</i>	<i>U.K.</i> <i>Plan</i>	<i>E.E.C.</i> <i>Plan</i>	<i>U.K.</i> <i>Plan</i>	<i>E.E.C.</i> <i>Plan</i>	<i>U.K.</i> <i>Plan</i>	<i>E.E.C.</i> <i>Plan</i>	<i>U.K.</i> <i>Plan</i>	<i>E.E.C.</i> <i>Plan</i>
Wheat .. .. .	—	19	15	27	19	26	15	35	35	26	11	24
Barley .. .. .	61	53	10	17	58	45	14	15	16	45	10	15
Beans .. .. .	15	—	12	—	17	—	14	—	16	—	13	—
Rape .. .. .	—	17	—	15	—	18	—	16	—	18	—	16
Herbage seeds .. .. .	—	—	28	15	—	—	40	10	—	—	30	14
Dairy herd (2)(3) .. .. .	24	10	35	24	—	—	—	—	—	—	—	—
Herd replacements (3) .. .. .	—	—	—	—	—	—	—	—	32	—	37	10
Beef (3) .. .. .	—	—	—	1	6	12	11	22	—	12	—	21
Miscellaneous .. .. .	—	—	—	2	—	—	5	1	—	—	—	1
Total .. .. .	100	100	100	100	100	100	100	100	100	100	100	100

(1) Before deducting cost of overtime labour.

(2) Including replacements.

(3) Livestock are shown net of forage costs.

N.B. Because of rounding the figures in this table may not always add up to 100.

**TABLE 48**  
**COMPARISON OF OPTIMAL U.K. & E.E.C. PLANS**  
**CROPPING PATTERNS—PERCENTAGE OF TOTAL ACREAGE**

<i>Model</i>	(1)		(2)		(3)		(4)		(5)		(6)	
	U.K.	E.E.C.	U.K.	E.E.C.	U.K.	E.E.C.	U.K.	E.E.C.	U.K.	E.E.C.	U.K.	E.E.C.
Wheat .. .. .	—	17	19	26	17	22	17	33	33	22	13	22
Barley .. .. .	66	58	13	20	58	47	17	17	17	47	13	17
Total cereals .. .. .	66	75	32	46	75	69	34	50	50	69	26	39
Beans .. .. .	17	—	17	—	17	—	17	—	17	—	17	—
Rape .. .. .	—	17	—	17	—	17	—	17	—	17	—	17
Herbage Seeds .. .. .	—	—	40	32	—	—	50	21	—	—	40	30
Grass .. .. .	17	8	12	5	8	14	—	12	33	14	17	14



- (2) In the plans where herbage seeds are barred from selection, the expansion in the cereal acreage is at the expense of grass. In the other three plans, however, cereals substitute not only for grass but, more particularly, herbage seeds. The acreage of herbage seeds in fact declines quite dramatically so that its contribution to total gross margin is much reduced. Moreover, within the herbage seed enterprise itself, the emphasis is now entirely on the production of S.22; neither Timothy nor S.23 are included in the optimal E.E.C. plans. The relative decline in importance of herbage seeds is a consequence of their lower gross margins relative to alternative enterprises, and particularly cereals, at Common Market prices.
- (3) Finally, to complete the picture on the cropping side, beans are entirely replaced by rape as a cereal break in the E.E.C. plans. It is quite apparent why this should be so—the gross margin for rape more than doubles at E.E.C. prices, whilst that of beans declines slightly.
- (4) So far as livestock are concerned, there is again an interesting story to be told. In the two plans where dairying is a feasible activity, the size of the dairy unit contracts as a consequence of the expansion in the cereal acreage. The other four plans all feature an expansion of beef production. In plans 3 and 4 an expansion in the acreage of grass allows the beef enterprise to increase substantially, with the 18-months beef system substituting for the less profitable single-suckled enterprise. In plans 5 and 6, the expansion in beef production is at the expense of herd replacements; moreover in these plans some land resources are freed for cash cropping with cereals. In two instances, plans 4 and 6, the 18-months beef system now runs at its maximum of 150 head. In the dairy systems, the contribution of livestock to total gross margin falls in the E.E.C. plans; indeed, only in plans 3 and 4 does the contribution of livestock to total gross margin show any increase.

Overall, therefore, the situation is one of greater emphasis on cereals and beef. The former expands at the expense of herbage seeds and/or grass and hence livestock. Within the livestock sectors of the plans, there is some contraction of dairying; an expansion of beef is made, in two cases at the expense of the rearing of dairy herd replacements.

Finally, it is useful to consider the relationship between the six plans in terms of their relative overall profitability as measured by their total gross margins. In Table 49 the optimal U.K. plans (at U.K. prices) and the optimal E.E.C. plans have been ranked in order of total gross margin.

TABLE 49

## OPTIMAL PLANS AT U.K. &amp; E.E.C. PRICES—COMPARATIVE PROFITABILITY

Order of Profitability	Model	U.K. Plans		E.E.C. Plans		
		System —see Key	Gross Margin	Model	System —see Key	Gross Margin
			£			£
1	2	C, HS, DC	21950	2	C, HS, DC	28680
2	6	C, HS, HR	21427	4	C, HS, B	27490
3	4	C, HS, B	19377	6	C, HS, HR, B	27406
4	1	C, DC	17555	1	C, DC	25420
5	5	C, HR	16918	3 & 5	C, B	25006
6	3	C, B	15871			

Key: C, Cereals; HS, herbage seeds; DC, dairy cows; HR, herd replacements; B, beef.

The interesting point here is that the system based on cereals, herbage seeds and dairying continues to have the highest gross margin at Common Market prices. However, E.E.C. systems that include herd replacements become less profitable than those that include beef, and in plan 5, where herd replacements are a feasible activity in the model, beef is preferred to heifers.

The improvements in total gross margin that are obtained from the modifications in plan outlined above are summarised in Table 50.

TABLE 50

## IMPROVEMENTS IN GROSS MARGINS RESULTING FROM E.E.C. PRICES

Model	System —see Key below Table 49	Total Gross Margin			Per cent Increase	
		U.K. Plan at U.K. Prices (1)	U.K. Plan at E.E.C. Prices (2)	E.E.C. Plan (3)	Col. 3 over Col. 1	Col. 3 over Col. 2
		£	£	£		
1	C, DC	17555	23578	25420	44·8	7·8
2	C, HS, DC	21950	26303	28680	30·7	9·0
3	C, B	15871	22280	25006	57·6	12·2
4	C, HS, B	19377	22392	27490	41·9	22·8
5	C, HR	16918	22564	25006	47·8	10·8
6	C, HS, HR	21427	23845	27406	27·9	14·9

It has already been shown (Tables 43 and 44) that this farm benefits from substantially better gross margins under E.E.C. conditions merely by continuing to follow the U.K. plans. The last column of Table 50 indicates the further improvements in gross margin that are obtained from a change in plan designed to derive the full benefit from the changed price relationships in the E.E.C.

## Net Farm Income

Hitherto the optimal U.K. and E.E.C. plans have been discussed purely in terms of their implications for the total gross margin of the farm. By bringing the fixed costs into the analysis, however, it is possible to estimate the net farm incomes appropriate to the alternative situations discussed above.

The current level of fixed costs on this farm is shown below:

	Total	Per Acre
	£	£
Rent and rates ..	1800	3.0
Labour (4 men at £850)	3400	5.7
Machinery .. ..	5266	8.8
Miscellaneous ..	1200	2.0
	<hr/>	<hr/>
	11666	19.5
	<hr/>	<hr/>

On this basis, the net farm incomes of the range of situations are shown in Table 51.

**TABLE 51**  
NET FARM INCOME (per acre)

Model	(1)	(2)	(3)	Per cent Increase	
	Organisation U.K. Prices U.K.	U.K. E.E.C.	E.E.C. E.E.C.	Col. 2 over Col. 1	Col. 3 over Col. 1
	£	£	£		
1	9.8	19.8	22.9	102	134
2	17.1	26.3	28.3	54	65
3	7.0	17.6	22.2	152	217
4	12.8	17.8	26.3	39	105
5	8.7	18.1	22.2	108	156
6	16.2	20.3	26.2	25	61

These figures indicate how this type of farming benefits from the Common Market price regime. Substantial increases in net income are obtained in the E.E.C., particularly by those systems that do not include any herbage seeds.

Adjustments of the fixed costs along the lines already fully discussed in preceding sections of the report give rise to the net income situation shown in Table 52. Briefly the adjustments are to increase rent by a percentage equal to three-quarters of the percentage increase in net farm income and to increase wage rates by 10 per cent.

**TABLE 52**  
NET FARM INCOME—INCREASED FIXED COSTS (per acre)

<i>Model</i>	<i>Organisation</i>	(1)	(2)	(3)	<i>Per cent increase</i>	
		<i>U.K. Prices U.K.</i>	<i>U.K. E.E.C.</i>	<i>E.E.C. E.E.C.</i>	<i>Col. 2 over Col. 1</i>	<i>Col. 3 over Col. 1</i>
		£	£	£		
1		9.8	16.9	19.3	72	97
2		17.1	22.5	26.2	32	53
3		7.0	13.6	16.7	94	138
4		12.8	16.3	23.3	27	82
5		8.7	15.1	18.1	73	108
6		16.2	19.1	24.2	18	49

This naturally damps down the increases in net income in the E.E.C. However, there are still substantial improvements in net income to be had merely by continuing with the U.K. plan, whilst even larger increases are obtained from a change in plan.

### Conclusion

The objective of this analysis has been to examine the impact of entry into the Common Market on the range of alternative opportunities facing a farmer on a typical South Wiltshire chalk farm. Cereals are a common feature of all six situations under examination, but varying emphasis is placed on the other major production possibilities—dairy cows, herd replacements, beef, herbage seeds.

The results of the analysis suggest quite clearly that this is a type of farming which might expect to derive major benefits from Common Market conditions. Substantial windfall gains are obtained in the E.E.C. by all six optimal U.K. plans merely by following the programme suggested for U.K. prices. The improvements in net income are greatest in the situations where herbage seeds are not included as a production possibility, and remain substantial even after allowing for the higher rents and wage levels which it is assumed would apply under the changed conditions of the Common Market.

Even greater advantages are derived by adjusting the plans to take account of the effect of entry into the E.E.C. on the relative gross margins of cereals, seeds, beans, rape, cows, herd replacements and beef. The main change is a greater emphasis on cereals, particularly wheat, in the light of the greatly increased gross margins from cereals at E.E.C. prices. The expansion in the cereal acreage is at the expense of grass and herbage seeds, the gross margins of the latter enterprise declining slightly at E.E.C. prices. Also rape is entirely substituted for beans as a break from cereals in the E.E.C. plans, again reflecting a substantial shift in the relative gross margins of these two crops. On the livestock side, the main implications of the E.E.C.

plans are a contraction of dairying and the substitution of beef for the rearing of replacements for the dairy herd.

In conclusion, therefore, it may be stated with confidence, notwithstanding any errors of estimation, that since the improvements in total gross margin and net farm income are so striking, this is a type of farming which will prosper under the E.E.C. regime.

### VIII. COMMENTARY

In this final section, the main intention is to draw together the various strands of argument from the six farm case studies to see if any common pattern emerges. Firstly, the changes in net incomes and farm organisations are summarised for the six farms assuming entry into the Common Market or an acceptance of the Common Agricultural Policy on some other basis. Secondly, these results lead on to a more general discussion on the impact on farming of entry into the Common Market.

#### Changes in Net Income and Farm Plan.

The changes in net income in the E.E.C. for all situations on all six farms are summarised in Table 53. The table shows the difference in net income between the optimal U.K. plans and (a) the U.K. plan adjusted to E.E.C. price levels and (b) the E.E.C. plan, in both cases after allowing for the impact of higher fixed costs.

**TABLE 53**  
CHANGE IN NET FARM INCOME IN E.E.C. ON SIX FARMS  
A COMPARISON WITH THE OPTIMAL U.K. PLAN GIVEN U.K. PRICES

Farm	System	Prices	
		U.K. Plan Given E.E.C. Prices	E.E.C. Plan
Berkshire .. ..	Dairy cows, cereals, potatoes .. ..	per cent	per cent
	Beef, cereals, potatoes .. ..	+41	+43
Lincolnshire (Holland) .. ..	Flowers and bulbs,		
	potatoes, wheat, Optimistic	-18	-7
	peas, sugar beet Pessimistic	-40	-25
Derbyshire .. ..	Dairying, cereals, potatoes .. ..	+43	+43
Northumberland .. ..	Cereals, beef .. ..	+57	+57
Essex .. ..	Cereals, sugar beet, potatoes, beans, beef .. ..	+42	+69
Wiltshire .. ..	Cereals, cows .. ..	+72	+97
	Cows, herbage seeds, cereals .. ..	+32	+53
	Cereals, beef .. ..	+94	+138
	Herbage seeds, cereals, beef .. ..	+27	+82
	Cereals, heifers .. ..	+73	+108
	Heifers, herbage seeds, cereals .. ..	+18	+49

Of the six farms studied, only the Lincolnshire farm does not benefit financially from entry into the E.E.C. All the other farms receive substantial windfall gains in net income merely by continuing with the optimal U.K. plan. Further gains can be made by adapting the farm organisation to the E.E.C. price relationships.

It could be argued for several reasons that this analysis gives an unduly favourable impression of the prospects for farming in the E.E.C. In particular, the farms are above average in size, as pointed out in the introduction the solutions are normative ones, and cereals—the enterprise most favoured by Common Market prices—are common to all of them.

In the first place, however, it is not the absolute amount of change that is of importance, but its relative size. In five cases out of six there is, relatively, a considerable improvement in net farm income under E.E.C. prices, which no more than confirms the commonly held belief that many sectors of farming have nothing to fear in the Common Market, at least in the shorter term.

Admittedly, the farms studied tend to be above average in size compared with other farms in their respective regions. Much of the advantage shown, however, would accrue proportionately to smaller farms. At the same time, they serve to underline the benefits of scale that exist in farming in this country compared with the Common Market countries.

Again, if some of the increases in income seem rather substantial, it must be remembered that the solutions are normative ones, namely, they show what the farmers in question ideally should do given the various constraints applying to their individual farms. Normative i.e. optimal, solutions at E.E.C. prices have been compared with normative solutions at U.K. prices. In consequence, changes in net incomes are not boosted as would be the case if sub-optimal plans at U.K. prices had been compared with optimal plans at E.E.C. prices.

Yet again, although all the farms grow cereals where price increases are particularly marked, one, at least, suffered a decline in net income. Moreover, examination of the per unit gross margins for grazing livestock in the farm sections shows how these may also be expected to improve at E.E.C. prices. In every instance a proportion of the windfall gain that is derived from continuing to follow the optimal U.K. plan in the E.E.C. can be attributed to the grazing livestock sector. Admittedly, the livestock usually account for only a small proportion of the gain, but it seems that all-grass systems based on grazing livestock might derive some benefit from the Common Market. This was not always expected before devaluation.(1)

To illustrate this point, a possible situation on the Derbyshire farm can be mentioned. It was pointed out in Section IV that in the long term a feasible policy for this farm might be to concentrate solely on milk production, carrying a dairy herd of about 250 cows and with heifer replacements reared under contract. (An

(1) For example, the Government (Cmnd. 3274) expected that whilst there could be some increase in the profitability of beef and sheep production, that of milk production would probably fall.

alternative would be to purchase all replacements.) The total gross margin of such a system, assuming replacements are purchased and with the stocking rates achieved in the optimal solutions, is summarised in Table 54. These stocking rates permit a herd of 270 cows.

**TABLE 54**  
DERBYSHIRE FARM—ALL GRASS DAIRYING SYSTEM

		<i>U.K. Prices</i>		<i>E.E.C. Prices</i>	
<i>Gross Margin before forage:</i>					
Dairy Cows	.. .. 270	@ £128.5	£34695	@ £147.2	£39744
Replacements	.. .. 54	@ £120	6480	@ £130	7020
			28215		
<i>Forage and litter variable costs:</i>					
Permanent Pasture	.. 14 acres	@ £5	70	@ £6.8	95
3 year leys	.. .. 285 acres	@ £7	1995	@ £9.1	2594
Kale	.. .. 75 acres	@ £10	750	@ £13	975
Straw	.. .. 354 tons	@ £5.1	1805	@ £8.6	3044
			4620		
<i>Total gross margin</i>			23595	26016	
<i>Index</i>			100	110	

Continuation of this plan in the E.E.C. leads to an improvement of £2421, or 10 per cent, in total gross margin, out of which any increases in fixed costs can be met. Thus, although the improvement is less than that for the system that includes cereals, this all-grass system of dairy farming derives some benefit from the adjustment to Common Market price levels. Moreover, it would return a higher total gross margin than the cropping and dairying plan described in Section IV, particularly at U.K. prices. Examination of per unit gross margins for beef cattle and sheep also suggest that, at least in lowland areas, systems of beef and sheep farming could usually achieve higher total gross margins at E.E.C. prices.

It is also constructive to look at the various changes in organisation suggested for the six farms in the E.E.C. as a whole rather than individually. This is done in Table 55. Whilst it is not claimed that general conclusions can be drawn regarding the likely overall changes in the pattern of British farming within the E.E.C. from the results for these six farms, there is sufficient agreement on a number of the changes in plan. It is possible, therefore, to identify one or two pointers for the future, but in interpreting the table the assumptions regarding the availability of fixed resources, especially capital, must always be borne in mind.

TABLE 55

## SUMMARY OF CHANGES IN OPTIMAL FARM ORGANISATION AT E.E.C. PRICES

Enterprise	Berkshire		Lincolnshire		Derbyshire	Northumberland	Essex	Wiltshire					
	Beef not Feasible	Beef Feasible	Optimistic Assumptions	Pessimistic Assumptions				(1)	(2)	(3)	(4)	(5)	(6)
Cereals .. ..	+	-	+	+	n.c.	n.c.	+	+	+	-	+	+	+
Field Beans .. ..							-	-	-	-	-	-	-
Peas .. .. .			-	-									
Rape .. .. .								+	+	+	+	+	+
Potatoes .. ..	+	+	n.c.	n.c.	n.c.		-						
Sugar beet .. ..			n.c.	n.c.			n.c.						
Bulbs and Flowers			-	-									
Brassicas .. ..			+	+									
Herbage seeds ..										-		-	-
Grassland .. ..	-	-			n.c.	n.c.		-	-	+	+	-	-
Dairy Cows .. ..	-	-			n.c.			-	-				
Dairy Heifers ..								-	-			-	-
Beef Cattle .. ..		+				n.c.	n.c.			+	+	+	+

Key: + Increase.  
 - Decrease.  
 n.c. No change.



The main feature of the table is its suggestion of an increase in the production of cereals, more or less across the board, as a consequence of the greatly increased gross margins from cereals in the E.E.C. Within the cereal enterprise there could be a greater emphasis on wheat production than at the present time, reflecting the widening differential in the gross margins of wheat and barley at Common Market prices. It is difficult to make any generalised remarks about the other cropping enterprises, apart from grassland. Root crops—potatoes and sugar beet—could perhaps hold their own, but there might be some decline in the more traditional leguminous break crops. Not only could the increase in the profitability of cereal production cause farmers to rethink their ideas on the place of a break crop in the rotation, but the different price relationships in the E.E.C. could lead to the introduction of new break crops, such as the substitution of rape for beans. It seems clear, however, that expansion of the cereal acreage could put pressure on the acreage of grassland available for utilisation by grazing livestock, thus necessitating an improvement in stocking rates if livestock populations are to be maintained.

Turning to the livestock sector, there could be some increase in beef production assuming present resource patterns, e.g. affecting building accommodation, do not change. This reflects shifts in the relative gross margins of milk and beef. So far as sheep are concerned, it is difficult to see a place for them on any of these farms; sheep were included as feasible activities on the Berkshire, Northumberland and Wiltshire farms, but in no instance did they appear in the optimal plans either at U.K. or E.E.C. prices. It seems, therefore, that lowland sheep could come under increasing pressure from alternative activities, and this would have serious repercussions for the agricultural economy of the more remote hill and upland areas where sheep are—and will almost inevitably continue to be—an integral part of the farming system.

### **General Comments**

This project has been concerned with assessing changes in optimal farm organisation within the E.E.C. for six typical farming situations. It has not been concerned with changes in production methods within individual enterprises. However, entry into the Common Market is likely to lead to changes taking place within enterprises as well as in the balance between them. For instance, the impact of higher feed costs will vary between different livestock production systems. The effect will be greatest on those systems—like intensive beef or winter milk production—where diets are based on high levels of concentrate feeding. Thus, a shift over from these methods of production to alternative systems where the diet is based more on grass and grass products can be expected. In other words there could be a move towards less intensive systems of beef production and a change in emphasis from winter to summer milk production. This latter change would also be encouraged by the lack of a marked seasonal pattern for milk prices in the Common Market.

There would be a number of problems associated with changes such as these. A shift from winter to summer milk production, for example, would mean incurring some costs in terms of loss of production—and hence output—as the calving pattern of the herd is altered; during the changeover a higher proportion of the cows would be barren at any one time due to the lengthening of the period between calvings. A move to grass-based systems would also impose an additional pressure on the area of grassland available for utilisation by grazing livestock. It has already been suggested that a contraction of the grass acreage might occur in the E.E.C. as the acreage of cereals increases. If, at the same time, livestock are to become more dependent for their nutrition on grass and grass products, a substantial improvement in the average level of grassland management and utilisation will be needed. Entry into the Common Market could, therefore, be just the incentive needed to obtain the improvement in grassland management which has been technically feasible—but not generally taken up by farmers in the current economic climate—over the last decade.

Additional confirmation of the likely shift from concentrate-based to grass-based systems of livestock production is provided by an examination of the different relationship between the prices of final products and feedingstuffs at U.K. and E.E.C. prices. On the Derbyshire farm, for instance, the milk/concentrates price ratio falls from 3.85:1 at U.K. prices to 3.7:1 at E.E.C. prices; this is a ratio of the price of one gallon of milk to the cost of the concentrates needed to produce that gallon of milk. Similarly, the ratio between the price of one hundredweight of beef and one hundredweight of concentrates on the Northumberland farm falls from over 9:1 at U.K. prices to about 7.5:1 at E.E.C. prices.

A second general point concerns the time scale of the adjustment to E.E.C. conditions. In the immediate short-run the main impact of entry into the Common Market would be borne by the existing organisation, with the results shown for the U.K. plans adjusted to E.E.C. prices. In the medium run, farmers would tend to respond to the new conditions by modifying their policies to accord with the optimal E.E.C. plans. They would also be making the type of adjustments within each enterprise which have just been discussed. However, the situation is much more fluid in the longer term, since everything can change; for instance a long-run change in the availability of labour and capital has obvious implications for the optimal organisation of individual farm businesses.

More particularly, in the Common Market context, is the problem of maintaining in the longer term the real level of E.E.C. prices in the face of rising production. These prices were set at high levels, when the Common Agricultural Policy was first drawn up, for social and political reasons. It was foreseen at that time that this could lead to problems in the long run due to the uneconomic expansion of production that would be encouraged by the high prices and, in consequence, the high costs of supporting farmers that would have to be borne by Community

Funds. The validity of this prognosis has been confirmed by the recent developments in the market for dairy products in the E.E.C., but so far the Commission's attempts to reduce the price of milk, and hence stem the flow of milk from the farms, has met with little success in the face of opposition from the farm lobby and its political allies. It is not too difficult to envisage a similar situation developing in the grains sector over the next two or three years. In the longer term, therefore, one can expect to see the emphasis in the development of the C.A.P. moving away from measures of direct price and income support to non-price methods of agricultural support. These would include such measures as improvements in farm and marketing structure, regional development programmes, and supply management or control.

To take an optimistic view, it is possible that the prices paid to farmers in the E.E.C. might not fall in money terms, but they would decline in real terms due to inflation. On the other hand, a reduction in money prices does seem quite likely for a number of products in which the British farmer has a major interest, not the least for milk. Falling real producer prices in the E.E.C. could lead to rather different optimal farm plans in the long run, particularly if an effort is made to change the price relationships between different products, as was recently tried for milk and beef.

The analysis described in this report has not been concerned with these longer term issues. Whilst entry into the E.E.C., followed by the increases in income that many farmers could expect to receive, could postpone the changes to the structure of British farming that are necessary in the long run, it is certain that eventually the day of reckoning will come, particularly for those farmers on smaller acreages for whom entry into the Common Market would only be a stay of execution. The long-term adjustment of British agriculture to changing economic conditions is, therefore, inevitable whether we enter the Common Market or not.

Finally, one of the most interesting features of two of the six case studies has been the incentive to farmers to modify some of their longstanding views on crop rotations and husbandry methods that would be provided by entry into the Common Market. For example, whilst the Essex and Northumberland farms derive substantial financial benefits in the E.E.C. on the basis of existing rotational practices, the benefits are greater if these constraints can be eased. This is a factor related primarily to the acreage of cereals and the desirability of including suitable break crops in the rotation. The incentives are such that farmers could benefit from a radical re-thinking of their rotational practices. Thus British entry into the Common Market, as well as presenting farmers with the challenge of a new economic environment, could also present the various technical services serving farming with the challenge of providing farmers with the necessary means to take full advantage of the opportunities available to them.



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