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Barley - Cost of prod. 0.5.
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BARLEY PRODUCTION IN THE EAST OF SCOTLAND, 1960

by

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**THE EDINBURGH SCHOOL OF AGRICULTURE
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Publications

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Hill Sheep Farms	}	Reports for the years 1948-49 to 1959-60
Stock-Rearing Farms		
Stock Raising and	}	Reports for the years 1948-49 to 1959-60
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B. Enterprise Studies :-

Milk Production (Annual Reports)
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Oats, Potatoes and Sugar Beet Costs
Etc.

C. Miscellaneous

Piece-Work Potato Gathering
Hill Farming During the Post-War Period
Some Notes on Reseeding Old Grassland on Hill and Upland Farms, 1955-57
Diesel Tractor Costs and Performance in the East of Scotland, 1956-57
Some Notes on Grain Drying - 1957 Harvest
Report on Grain Drying - 1958 Harvest
Organisation of Hill and Upland Farming in Selkirkshire
Economic Aspects of Tractor Work, 1957-58
Some Notes on the Depreciation and Repair Costs of Farm Machinery
Hill and Upland Sheep Production Costs.

Copies of these publications may be obtained on request to the
Secretary of the College or the Advisory Economist.

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FOREWORD

This report discusses the costs of growing 55 crops of barley in 1960. For some years now barley has been grown more extensively in Scotland in place of the oat and, to a lesser extent, the wheat crops. This has been particularly so in the area served by the East of Scotland College of Agriculture where, in terms of sale crops, barley is now the most important cereal crop. The increased attention given to barley has been stimulated both by the improved techniques employed in growing and harvesting the crop and by the current economic circumstances which, together, have made it a more attractive proposition than the other two major cereals.

The report focusses attention on the more significant features of the costs incurred in growing the crop and brings out the importance of the change in harvesting methods which has taken place in recent years. The question of yields is also, of course, of considerable importance and may be affected by such factors as the place in the rotation and the levels of manuring, both of the preceding crops and the barley crop itself. These are factors which can be adjusted to some degree at least by the farmer himself in the light of his own conditions but the available information suggests that careful thought should be given to them if maximum yields are to be obtained. The farmer also has a wide choice of variety to suit the conditions of his own farm and this may partially explain the fact that the average yields for most of the varieties tested did not differ greatly from the overall average of $35\frac{1}{2}$ cwt. per acre.

The credit side of the picture is a reflection of three factors - the yield, the market price, which averaged out at 20s.0d. per cwt., and the deficiency payment system, which provided an additional income of £10:8:6d. per acre. The latter acts as a stabilising influence and without it the market price alone would not, in many cases, permit this crop to make an adequate contribution to farm incomes.

In the circumstances of the year under review it may be claimed that the growing of barley in this area was, in the main, carried out reasonably efficiently and left a fair measure of profit behind. The study is being continued for the 1961 crop and this should permit a more comprehensive review to be made.

J. D. NUTT.

Advisory Economist.

I. INTRODUCTION

The popularity of barley as a cereal crop in Great Britain has increased so greatly in recent years that the country is now almost self-sufficient. Barley is widely grown in Scotland and in the East of Scotland in particular. Cereal crop acreage statistics for Scotland and this province covering the period 1938-60 are given in Appendix II.

These figures show that the total cereal acreage in Scotland reached a peak during the war and has since fallen slowly to a little above the pre-war level. The rate of fall in the East of Scotland has been less than that of the national average.

Although the present total cereal acreage is about the pre-war level, the barley acreage has increased by $2\frac{1}{2}$ times since 1938; in the East of Scotland the acreage has increased by as much as three times. In Scotland as a whole this increase has been largely at the expense of the oat crop; in the East the wheat acreage has dropped also, but only slightly. The position now is that in this province barley is grown nearly as extensively as oats, making up 37% of the cereal acreage as opposed to 46% for oats.

II. THE SAMPLE OF FARMS

Forty-two farms provided information on the 55 crops of barley discussed in this report. The farms ranged in size between 150 acres to three of over 1000 acres. Of the total farm acreage 45% of the land was used for cereal growing of which nearly two-thirds was devoted to barley production. It can only be claimed that the sample is representative of the larger arable farms.

TABLE I. DISTRIBUTION OF THE SAMPLE

County	Number of Farms	Average Farm Size (acres)	Average Cereal Acreage	Average Barley Acreage	Number of Crops Costed	Total Acreage Costed	Average Acreage of Costed Crop
Angus	6	423	185	100	9	326	36.2
Berwick	5	723	281	208	7	273	39.0
East Lothian	3	541	289	165	4	108	27.0
Fife	9	363	141	96	11	332	30.2
Midlothian	1	364	152	86	5	86	17.0
Perth (East)	6	320	106	82	6	185	30.8
Roxburgh	9	768	357	214	10	680	68.0
Selkirk	1	432	196	92	1	26	26.0
West Lothian	2	422	236	108	2	34	17.0
All Farms	42	509	229	141	55	2050	37.3

A glance at a contour map of East Scotland gives a good idea of where the farms are situated. Most of the farms are to be found in the coastal strip running from Montrose down to Berwick and in two inland areas, Strathmore, which runs north of a line between Perth and Montrose, and Tweedsdale, the broad basin drained by the river Tweed.

The farmers' descriptions of the soils in which the crops were grown fall evenly into the broad categories of light, medium and heavy soils.

About half the costed barley acreage was grown after a cereal or pulse crop; on just over one-third of the acreage the crop was preceded by a root crop. The remaining crops followed grass.

The /

The general weather conditions from the autumn of 1959 to the close of the 1960 harvest should be mentioned. The late autumn of 1959 and the spring of 1960 saw cultivations and drilling impeded by dull weather and poor drying conditions. April was dry, May brought prolonged sunshine and June, while still warm, tended to be dull. The harvest period was marred by above average rainfall and below average sunshine. Many crops were harvested at a very high moisture content.

III. COSTS, RETURNS AND MARGINS

TABLE II. COSTS, RETURNS AND MARGIN PER ACRE AND PER CWT. FOR 55 CROPS IN 1960

	Per Acre	Per Cwt.
	£ s. d.	£ s. d.
Average Value of Grain	35:16: 5	1: -: -
Deficiency Payment	10: 8: 6	-: 5:10
Total Returns (excluding Straw)	46: 4:11	1: 5:10
Total Costs - Straw Credit (1/7 of Cost)	19: 5: 9	-:10: 9
Margin	26:19: 2	-:15: 1
Deficiency Payment as % of Returns	22.5%	
Deficiency Payment as % of Margin	38.7%	

The crops referred to in the above summary table were all combined, contractors only being employed in one or two cases to help out.

The average total cost of growing the crops was £22:10:1d. per acre; the straw value has been treated as a credit rather than as a return to facilitate the per cwt. calculations. Allowing for this credit the average cost per acre of growing the crops was £19:5:9d.

The table illustrates the importance of the deficiency payment to farmers' returns and margins, despite the average yield of 35.8 cwt. which is above the national average. Without the deficiency payment the profit margin would have averaged £16:10:8d. per acre; one crop would have been grown at a loss.

In the following statement of costs "Labour and Power" accounts for just over half of the total direct cost. It may be seen that "Machinery Depreciation and Repairs" amounts to £4:12:7d. per acre. This high figure is explained by the facts that the 42 farms owned 63 combines and 45 balers, while 29 of them possessed drying and storage equipment. For these 29 farms the average charge per acre for drying and storage equipment was £2:12:2d.

TABLE III. /

TABLE III. THE AVERAGE COST PER ACRE OF GROWING BARLEY
IN 1960, 55 CROPS, 2050 ACRES

	£ s. d.	%
LABOUR AND POWER		
<u>Pre Harvest</u>		
Labour	1: 2: 2	
Tractor	1: 1: -	
Contract	-: 1: 3	9.9
<u>Harvest and Barn Work</u>		
Labour (a) Harvest	1: 2: 7	
(b) Post Harvest	-: 4: 7	
Tractor	-:10: 3	
Contract	-: 5: 6	9.5
<u>Other Fuel</u>	-: 4:11	1.1
<u>Machinery, Depreciation and Repairs</u>		
Harvest Equipment	2:19: 7	
Drying and Storage Equipment	1:13: -	20.6
TOTAL LABOUR AND POWER	9: 4:10	41.1
SEED	2: -:10	9.1
MANURES	2:19: 7	13.2
RENT	1:18: -	8.4
MISCELLANEOUS COSTS	1: 1: 1	4.7
TOTAL DIRECT COST	17: 4: 4	76.5
MANURIAL RESIDUES b/f. +	3: 6:11	
MANURIAL RESIDUES c/f. -	1: 4: 2	9.5
OVERHEADS	3: 3: -	14.0
TOTAL COST	£22:10: 1	100.0

It is interesting at this stage to make a brief comparison with the last study of barley costs made in this area in 1952. Of the 55 crops costed at that time 25 were harvested by binder, and of the 30 combined crops 14 were harvested by hired machines. The average total cost per acre was £24:3:7d. compared with last year's £22:10:1d.

Despite considerable wage increases the labour charge has fallen by about £1 per acre. The contract charges have fallen by a similar amount, and tractor costs are lower by 10s. an acre. However, the total cost of labour and power in 1960 was just over £1 per acre higher than that of 1952. This is because the high charges for depreciation and repairs on harvesting, drying and storage equipment at the present time have /

have more than offset the lower costs mentioned above. Most of the drying and storage equipment on the farms participating in the 1960 investigation was under six years old.

Total costs per acre for 1960 have fallen by 7% compared with those for 1952; total returns on grain have increased by 1½% and the overall margin has risen by just over 8½%

TABLE IV. DISTRIBUTION OF COSTS

COST PER ACRE						
£15-£17½*	£17½-£20	£20-£22½	£22½-£25	£25-£27½	£27½-£30	£30-£32½
8	7	12	14	5	8	1

* £15-£17½ = £15-£17:9:11d.

The limits in the above distribution table were a minimum cost of £15:-:4d. and a maximum of £31:3:4d. Twenty-seven crops cost less than £22:10s. per acre to grow and 28 crops cost £22:10s. or over. Twenty-six costs were between the limits of £20 and £25.

A. ANALYSIS OF INPUTS

Labour and Power

Labour and power together made up 53.7% of the direct costs and 41.1% of the total costs. Labour alone was responsible for 11.0% of the total costs. This figure is creditably low, especially when one considers the weather conditions of the past year, but it has been achieved at the cost of a high degree of mechanisation.

TABLE V. LABOUR AND TRACTOR HOURS AND COSTS PER ACRE

	LABOUR		TRACTOR	
	Hrs.	£ s. d.	Hrs.	£ s. d.
Ploughing	2.3	-:10: 5	2.3	-:10: 9
Cultivating	0.4	-: 1:10	0.3	-: 1: 5
Harrowing	0.8	-: 3: 7	0.8	-: 3: 9
Rolling	0.3	-: 1: 4	0.3	-: 1: 5
Drilling and Appl. Fertiliser	0.9	-: 4: 1	0.6	-: 2: 9
Spraying	0.2	-: -:11	0.2	-: -:11
Sub Total	4.9	£1: 2: 2	4.5	£1: 1: -
Combining	1.0	-: 4: 6	0.1	-: -: 6
Baling	0.8	-: 3: 7	0.6	-: 2: 9
Carting	3.2	-:14: 6	1.5	-: 7: -
Sub Total	5.0	£1: 2: 7	2.2	£ -:10: 3
Drying	0.6	-: 2: 9		
Dressing and Bagging	0.4	-: 1:10		
TOTAL	10.9	£2: 9: 4	6.7	£1:11: 3

Tractor /

Tractor work made up 6.9% of the total cost. Tracklaying tractors accounted for only 0.12 hours out of the total of 6.7 hours per acre; this type of tractor was used for ploughing on three farms, and for other cultivations on three other farms.

The small amount of tractor usage in combining was accounted for by three tractor-drawn combines and four crops which were cut and swathed before being combined. In six cases the straw was not collected; in one of these the straw was sold off the ground, in the remaining cases it was chopped and ploughed in.

Contract services were little used. In two cases spraying was done by contractors and in a third the sprayer was hired. One man had his drilling done by contract. Hired combines were used on three crops to assist the farmers' own machines, while the grain from three crops was dried by contractors.

Depreciation and repairs of specialised equipment was by far the biggest single item of cost being 20.6% of the total cost. The 63 combines harvested an average of 143.4 acres each, which was equivalent to 14.2 acres per foot of cutter-bar. The areas cut by individual combines ranged from 60 to 248 acres. For the 45 balers used, the average acreage baled by each machine was 200 acres of which 27 acres were hay. The areas dealt with by individual balers varied between 15 and 363 acres. The average cereal acreage on the 29 farms with drying and storing facilities was 245 acres; several of these farmers dried grain from other farms. Spraying was carried out on 75% of the costed acreage, mostly with M.C.P.A.

Seed

Seed comprised 9.1% of the total cost. The average seed rate used was 1.49 cwt. per acre; 58% of the seed used was purchased and 42% home grown. Individual rates of seeding ranged from 1.17 to 2.00 cwt. per acre but the great majority used 1.5 cwt. Three farmers used original Danish or Swedish seed ranging in price from 70s. to 85s. per cwt. in the hope of producing a sample fit for sale as seed. One of these farmers received a malting price, the other two achieved seed prices but their yields failed to reach normal expectations giving them no better than average returns.

Varieties used and yields recorded are discussed in the section on returns.

Fertiliser Usage and the Place in the Rotation

The cost of manuring, allowing for manurial residues, was £5:2:4d. and accounted for 22.7% of the total net cost. The average cost of the manures actually applied to the barley was £2:19:7d. per acre, 13.2% of the total cost, the remaining portion was the net cost of residues.

Almost all of the manure used was in the form of compounds. Lime was applied in 5 cases, basic slag and F.Y.M. in one each. Of the 27 crops following roots, 2 received no fertiliser, 1 potassic supers only and 2 ammonium sulphate only. Only one crop was top dressed. The overall amount of fertiliser used was approximately equal to a dressing of 3 cwt. per acre of a compound having the analysis N 10%, P_2O_5 13%, K_2O 12%.

TABLE VI. /

TABLE VI. AVERAGE FERTILISER USAGE

Barley Grown After	No. of Crops	Units* of Fertiliser per Acre		
		N	P ₂ O ₅	K ₂ O
Cereals	16	37.9	51.5	43.7
Roots	27	27.6	31.5	34.8
Grass	8	20.2	33.1	27.6
Overall Average		30.1	38.8	36.7

* 1 unit of fertiliser = 1/100th of 1 cwt.

The four crops not accounted for in Table VI were grown on land which had previously been extensively split cropped. It will be noticed in comparing Tables VI and VII that while half the barley crops were grown after roots, in terms of acreages this is reduced to about one-third; in the case of barley after grain crops the proportion correspondingly increases from under one-third to about half.

TABLE VII. THE CROPS PRECEDING BARLEY - 1960

Preceding Crop	Acres	%
Barley	653	31.9
Wheat	148	7.2
Peas	103	5.0
Oats	<u>95½</u>	<u>4.7</u>
	999½	48.8
Sugar Beet	240	11.7
Turnips	239	11.7
Other Root and Green Crops	<u>125½</u>	<u>6.1</u>
Potatoes	<u>117½</u>	<u>5.7</u>
	722	35.2
Grass	328½	16.0
TOTAL	2050	100.0

In Fife 65% of the barley acreage was in its traditional place in the rotation, although the definition of roots in this case includes potatoes. In Roxburgh 58% of the barley acreage was a second grain crop; in East Perth and Angus 70% and 60% of the barley acreages respectively followed another cereal crop or peas.

From the very limited information available it would appear that the barley following roots slightly outyielded that grown after cereals, which in turn was a little better than the barley after grass.

Rent

The average rent at £1:18s. was 8.4% of the total cost. Individual rents ranged between 13s.7d. and £4 per acre.

B. FACTORS INFLUENCING RETURNS AND MARGINS

(i) Returns

Yields and grain quality are the obvious factors affecting the level of returns and these, in turn, are governed by the farmers' choice of varieties, their management practices and the conditions under which they farm.

TABLE VIII. BARLEY VARIETIES GROWN, YIELDS PER ACRE, PRICES PER CWT. AND RETURNS PER ACRE

Variety	Total Acreage Costed	No. of Crops or Part Crops	% of Total Acreage	Average Yield per Acre	Average Price Received per cwt.	Average Returns per Acre Excluding Deficiency Payment
					s. d.	£ s. d.
Ymer	1060	29	51.7	35.1	19: 8	34: 8: -
Drost	345	3	16.8	36.6	19: 4	34:18: 5
Freja	217	10	10.6	36.3	20: -	36: 6: 6
Rika	112	4	5.4	35.9	21: -	37:19:10
Maythorpe	98	3	4.8	34.4	21: 1	35: 8: 1
Mentor	88	5	4.3	38.2	21: 5	40:10: 6
Beorna	55	4	2.7	34.5	21:10	37:13: 6
Ingrid	53	4	2.6	36.0	20: 2	36: 6: 2
Carlsberg	12	1	.6	44.0	19: 6	42:18: -
Bonus II	10	1	.5	36.5	15: 5	28: 3: 4
Average				35.8	20: -	£35:16: 5

Almost all of the grain harvested was sold; a few farmers retained small quantities for seed or feeding. All of the barley for sale was cleared by early April of 1961. Apart from barley of the highest quality, prices fell steadily immediately following the harvest period but varied very little from November onwards. Individual prices received ranged from 14s.7d. per cwt. up to 25s. per cwt.

TABLE IX. DISTRIBUTION OF BARLEY YIELDS

Yields in Cwt. per Acre						
15-20*	20-25	25-30	30-35	35-40	40-45	45+
1	3	1	18	19	11	2

* 15-20 = 15-19.9

Sixty-seven per cent of the yields per acre fell between the limits of 30 - 39.9 cwt. per acre; the extremes were a minimum of 19 cwt. and a maximum of 48 cwt. per acre.

Since yield is an important factor determining returns and margins and as the level of manuring is within the farmer's control, it is interesting to see whether above average yields have, in fact, been influenced by above average fertiliser application.

In Table X the sample has been split at a yield level of 37 cwt.

TABLE X. /

TABLE X. YIELDS AND THE LEVEL OF MANURING PER ACRE

Yield Level	No. of Crops	Average Yield	Net Manurial Cost Charged*	Current Fertiliser Application			
				Cost	- - U N I T S - -	N	P ₂ O ₅
cwt.		cwt.	£ s. d.	£ s. d.			
+ 37	24	40.4	5:13: 1	3: 8: 2	32.4	46.6	36.1
- 37	31	32.2	4:14: -	2:13: -	28.3	32.6	37.1

* Includes adjustments for manurial residues

At first sight the usual conclusions might be drawn; both the net manurial cost charged and the cost of fertilisers actually applied to the "+ 37 cwt." crops were well above those of the remaining crops. While the cost of the fertiliser applied was greater, only the phosphate level was markedly higher. To account for the difference in yields a greater difference in the level of nitrogen applied might have been expected. This brings one to a consideration of the nebulous subject of manurial residues. Of the 24 crops in the above average group, 15 were grown after roots, 3 after a long ley, and the remaining 6 after a cereal crop. The average residual fertiliser value brought forward for this group was £3:12:6d. as opposed to £3:2:7d. for the lower yielding group.

It was stated earlier that barley grown after roots appeared to have yielded more heavily than that grown after either grass or cereals and Table VI showed that less fertiliser had been used following roots than following cereals. Since 15 crops which were preceded by roots appear in the "+ 37 cwt." group in Table X and the overall level of manuring here is somewhat higher than that applied to all barley crops grown after roots, it is interesting to examine the treatment given to the remaining crops preceded by roots. These crops appear as the "- 37 cwt." group in Table XI.

TABLE XI. YIELDS AND THE LEVEL OF MANURING
FOR BARLEY PRECEDED BY A ROOT CROP

Yield Level	No. of Crops	Average Yield	Net Manurial Cost Charged	Current Fertiliser Application				
				Cost	- - U N I T S - -	N	P ₂ O ₅	K ₂ O
cwt.		cwt.	£ s. d.	£ s. d.				
+ 37	15	40.7	5:11: 5	2:16: 2	33.9	36.3	36.2	
- 37	12	33.1	5:15: 4	1:18: 2	19.8	25.4	33.1	

In Table XI it will be seen that the net manurial costs charged were approximately equal but considerably more fertiliser was applied directly to the higher yielding group. The residual fertiliser values brought forward were £3:15:2d. per acre for the higher yielding group and £4:11s. for the remainder.

The scope and size of this survey makes it impossible to draw firm conclusions, attention can only be drawn to results as they stand. Ignoring inherent soil fertility and varying management practices, one has to fall back on to the value of manurial residues to account for the yield differences when /

when considering the complete sample. However, when considering only the crops preceded by roots, it would seem that the current fertiliser application was more effective than the fertiliser residues thought to be present in the soil. These statements are contradictory, the more so when it is remembered that the "+ 37 cwt." group in Table XI makes up 63% of the same group in Table X.

Straw

Estimates of the straw yield were obtained from 26 samples. Yields ranged from 12 cwt. per acre to 40 cwt., the average being 23.7 cwt. per acre. It was valued at the empirical 1/7th of the total cost, which in this survey was probably not too far wide of the mark and, if anything, an underestimate since straw is valued for bedding.

TABLE XII. DISTRIBUTION OF RETURNS

RETURNS PER ACRE							
£30-£35*	£35-£40	£40-£45	£45-£50	£50-£55	£55-£60	£60-£65	£65-£70
1	4	7	17	17	7	-	2

* £30-£35 = £30-£34:19:11d.

The returns in the above table include the values of grain, straw and the deficiency payment. Thirty-four crops yielded returns which were between £45 and £55 per acre. The extremes in the above distribution were a minimum of £32:16s. and a maximum of £67:-:1d.

(ii) Margins

A major factor affecting margins and, to a much lesser extent, returns is the use of productive inputs or costs in growing the crop. These comprise fixed and variable costs. Fixed costs are bound to be paid whether barley is grown or not; in the event of barley not being grown these resources would be used in some other enterprise and are not disposed of. These fixed costs would be rent, overheads, labour, tractor work and a depreciation and repairs allowance on specialised machinery and equipment. In growing barley the extent of the labour and tractor costs will depend upon conditions on the farm and on management. The charge per acre for the depreciation and repair of special equipment will depend entirely upon how extensively the equipment is used. The other fixed costs are not subject to such variations.

The most important of the variable costs are seed and manures. The former cost will vary according to the quality and the quantity of seed drilled; the latter cost, if manures are used at all, depends on type and quantity used.

The wide differences in total cost between individual crops has already been mentioned. Since such disparities do occur, it is interesting to compare the levels of the fixed and variable costs in the two groups of high cost and low cost crops.

TABLE XIII. /

TABLE XIII. A COMPARISON OF THE COSTS AND FINANCIAL RESULTS
OF 15 LOW COST AND 15 HIGH COST BARLEY CROPS

	Low Cost Crops	High Cost Crops
<u>Fixed Costs</u>	£ s. d.	£ s. d.
Labour	2: -: 2	2:13: 9
Tractor Work	1: 4: -	1:12: 3
Depreciation and Repairs :		
Harvest Equipment	2:13: 8	3: 3: 9
Drying and Storage Equipment	1: 4: -	2:14: 3
Rent	1:12: -	1:19: 5
Overheads	2:11:10	3: 6: 7
Manurial Residues b/f.	1:13: 8	5: 8: 5
 TOTAL FIXED COSTS A	 £12:19: 4	 £20:18: 5
<u>Variable Costs</u>		
Seed	1:10: 5	2:19: 6
Manures applied	2:14: 6	3:12: 9
Manurial Residues c/f.	- -:17: -	- 1: 5:11
Fuel	-: 5:11	-: 5:11
Contract	-: -: 4	-: 8: 6
Miscellaneous	-:18: 5	1: -:10
 TOTAL VARIABLE COSTS B	 £ 4:12: 7	 £ 7: 1: 7
 TOTAL COST A + B	 £17:11:11	 £28: -: -
Return per Acre from Grain Sales	34: 1: -	39:14: 3
Margin per Acre from Grain Sales	16: 9: 1	11:14: 2
Yield per Acre	34.3 cwt.	37.8 cwt.

It will be noticed that the biggest difference between single cost items was that caused by the high value of manurial residues brought forward for the high cost crops, these cost £3:15s. more than those of the low cost crops.

In accounting for the difference between the depreciation and repairs charges for specialised equipment an immediate pointer is a comparison of the average sizes of the farms concerned, 583 acres for the low cost crops as opposed to 381 acres for the high cost crops. Only 9 of the large, low cost farms had drying and storage equipment as opposed to 11 of the small, high cost farms. The average amounts of capital originally invested in such equipment were £4500 and £4000 respectively. Dividing these figures by the grain acreages, which measure the potential throughput of the equipment, the investment per acre of grain was £15 for the low cost farms and £20:10s. for the high cost farms. Similarly, the combines and balers on the low cost farms were each expected to harvest 176 and 233 acres respectively, as against 149 and 165 acres on the high cost farms. The depreciation and repairs charge on harvesting and grain handling equipment for the low cost crops was £3:18s. per acre compared with £5:18s. for the high cost crops.

Far more home grown seed was used in the production of the low cost crops to give an average cost little more than half that of the high cost group. In the case of this latter group the direct application of fertilisers was heavier, and therefore more costly.

Higher /

Higher average prices per cwt. were received for the high cost crops. At this higher average price an extra 4.5 cwt. (a 12% increase, making a yield of 42.3 cwt. per acre) would be needed to give a margin equal to that of the low cost crops. If the price received were only equal to that paid on average for the low cost crops, a yield of 44.8 cwt. would be needed to make the margins equal.

Within rational limits, in order to maximise margins, attention should be devoted firstly to minimising costs, secondly to maximising yields and thirdly to grain quality. On a given field it may be impossible to improve the yield but costs can almost always be reduced, particularly if better use can be made of existing equipment. Many farmers, of course, are deliberately over-equipped as an insurance against such contingencies as bad weather or mechanical failure.

(iii) The "Break-Even" Yield

In addition to the value of the grain the farmer received £10:8:6d. per acre as a deficiency payment. The difference between the cost, £22:10:1d., and the deficiency payment was the value of the grain which had to be harvested before the farmer broke even on his costs. In this case the total value was £12:1:7d. which was equivalent to 12.1 cwt. at the average price. Any grain produced above this quantity per acre represented the farmer's margin. Straw values have not been considered as straw is entirely incidental to the primary object of grain production, although some farmers value it highly.

In Table XIV costs per acre of £17:10s., £22:10s. and £27:10s. have been selected; the differences between these costs and the deficiency payment amounted to £7:1:6d, £12:1:6d and £17:1:6d. per acre to be met by the grain produced.

Dividing these latter figures by various prices will give the yields required to cover the costs of growing the crops; yields in excess of these levels will represent the farmers' margins.

TABLE XIV. BREAK-EVEN YIELDS AT DIFFERENT PRICES TO COVER COSTS OF £17:10s., £22:10s. AND £27:10s. PER ACRE

Cost per Acre	£17:10s.	£22:10s.	£27:10s.
Deficiency Payment	<u>10: 8: 6d.</u>	<u>10: 8: 6d.</u>	<u>10: 8: 6d.</u>
Difference	£ 7: 1: 6d.	£12: 1: 6d.	£17: 1: 6d.

£17:10s. Cost per Acre		£22:10s. Cost per Acre		£27:10s. Cost per Acre	
Yield cwt.	Price per cwt.	Yield cwt.	Price per cwt.	Yield cwt.	Price per cwt.
8.3 at 17s.)		14.2 at 17s.)		20.1 at 17s.)	
7.9 " 18s.)		13.4 " 18s.)		19.0 " 18s.)	
7.45 " 19s.)	= Difference	12.7 " 19s.)	= Difference	18.0 " 19s.)	= Difference
7.1 " 20s.)	£7:1:6d.	12.1 " 20s.)	£12:1:6d.	17.1 " 20s.)	£17:1:6d.
6.7 " 21s.)		11.5 " 21s.)		16.3 " 21s.)	

It has already been mentioned that no crop in this survey was produced at a loss. The lowest margin was £9:10s. and the next lowest was £15:3s. per acre.

TABLE XV. DISTRIBUTION OF MARGINS

MARGINS PER ACRE							
£5-£10*	£10-£15	£15-£20	£20-£25	£25-£30	£30-£35	£35-£40	£40-£45
1	-	6	14	17	12	3	2

* £5-£10 = £5-£9:19:11d.

The highest margin in the survey was one of £43:7:9d. The grouping is similar to that seen in the returns distribution.

IV. SUMMARY

1. Cereal acreages in Scotland and the East of Scotland in 1960 were 4% and 14% greater respectively than in 1938.
2. The barley acreage increased greatly with the advent of war; after the war the acreage was maintained, but the last four years have seen further increases in the acreage, largely at the expense of the oat crop.
3. In the East of Scotland barley is now nearly as important as oats in terms of the acreage grown.
4. The sample was made up of 55 crops on 42 farms, the total acreage costed was 2050 acres. All of the crops were combined.
5. Conditions for early cultivations and sowing were poor in many areas; harvesting conditions were very bad.
6. Total returns, grain plus straw averaged £49:9:3d. per acre and the average total cost was £22:10:1d. leaving an average margin of £26:19:2d. per acre. The average yield was 35.8 cwt. per acre.
7. The largest cost items were "net manures" and the depreciation and repair charges for specialised equipment, together making up 43% of the cost.
8. Ymer was the most widely grown variety, comprising 52% of the acreage costed.
9. The lowest costs in the survey were associated with the larger farms, which made better use of expensive equipment.

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Grateful acknowledgment must be made of the help and hospitality of all those farmers who provided the information on which this report is based. Mr. A. S. Horsburgh, now of the West of Scotland College of Agriculture, was responsible for much of the field work for this investigation.

APPENDIX ICOSTING METHODManual Labour

All labour, including that of the farmer, was charged at the hourly rates ruling on the farm.

Tractor Work

Wheeled Tractors	4s.6d. per hour
Tracklaying Tractors	12s. " "

Other Fuel

This includes fuel used by combines, balers and for drying.

Machinery Depreciation and Repairs

A charge of 20% was made on the initial cost of specialised machinery such as combines, balers, drying and storage machinery. For structures such as storage bins, pits and buildings housing drying and storage plant the charge was 8%

Seed

Purchased	at cost
Home Grown	12s. per cwt., excluding dressing.

Manures and Manurial Residues

- (a) Dung was charged at 17s. per ton plus the cost of application.
- (b) Artificial manures were charged at cost.
- (c) Manurial residues brought forward and carried forward were calculated in accordance with the recommendations in "Residual Values of Fertilisers and Feeding Stuffs", the twelfth report of the Scottish Standing Committee.

Rent

Rent was charged at the average rental for arable land on the farm.

Miscellaneous Costs

These included such items as spray costs, twine and sack hire.

Overheads

Overheads were charged at the rates agreed by the Scottish Conference of Agricultural Economists. No charges have been made for interest on tenant's capital or for the farmer's managerial work.

Averages

Throughout this report simple averages have been used.

APPENDIX II

TABLE I. CEREAL ACREAGES IN SCOTLAND 1938-1960
(Wheat + Barley + Oats Only)

	1938	1944	1948	1952	1956	1960
	-	-	-	-	-	-
	- Acres -					
Scotland	989,177	1,377,856	1,219,711	1,167,667	1,092,575	1,029,381
East of Scotland Province	356,956	514,850	455,069	447,427	426,798	405,807
% of Scotland	36.1%	37.4%	37.3%	38.3%	39.1%	39.4%
	-	-	1938 Acreage = 100		-	-
Scotland	100	139	123	118	110	104
East of Scotland Province	100	144	127	125	120	114
	Cereal Acreage as % of Crops and Grass Acreage					
Scotland	21.7	31.1	27.6	26.6	24.9	23.8
East of Scotland Province	23.3	34.2	30.3	30.2	28.8	27.7

TABLE II. BARLEY ACREAGES IN SCOTLAND 1938-1960

	1938	1944	1948	1952	1956	1960
	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -
	- Acres -					
Scotland	98,928	236,185	179,734	199,028	197,059	254,252
East of Scotland Province	51,377	123,720	112,586	126,980	128,666	151,495
% of Scotland	51.9%	52.4%	62.6%	63.8%	65.3%	59.6%
	- - - - -	- - - - -	1938 Acreage = 100		- - - - -	- - - - -
Scotland	100	239	182	201	199	257
East of Scotland Province	100	241	219	247	250	295

TABLE III. RELATIVE IMPORTANCE OF THE BARLEY CROP 1938-60

	1938	1944	1948	1952	1956	1960
	-	-	Per Cent of Crops and Grass Acreage			-
Scotland	2.2	5.3	4.1	4.5	4.5	5.9
East of Scotland Province	3.4	8.2	7.5	8.6	8.7	10.3
	-	-	Per Cent of Wheat + Barley + Oats Acreage			-
	SCOTLAND					
Wheat	9.4	11.1	7.1	5.6	7.0	9.2
Barley	10.0	17.1	14.7	17.0	18.0	24.7
Oats	80.6	71.8	78.2	77.4	75.0	66.1
	EAST OF SCOTLAND PROVINCE					
Wheat	20.9	23.1	15.2	11.8	13.8	16.2
Barley	14.4	24.0	24.7	28.4	30.1	37.3
Oats	64.7	52.9	60.1	59.8	56.1	46.5
	-	-	1938 Acreage = 100			-
	SCOTLAND					
Wheat	100	165	94	71	83	102
Barley	100	239	182	201	199	257
Oats	100	124	120	113	103	85
	EAST OF SCOTLAND PROVINCE					
Wheat	100	160	93	71	79	88
Barley	100	241	219	247	250	295
Oats	100	118	118	116	103	82

APPENDIX IIISTANDARD APPENDIX

The figures in this Appendix are based on 55 records, on 2050 acres, on 42 farms.

TABLE I. SUMMARY OF AVERAGE COSTS PER ACRE

ITEM OF COST				£ s. d.
	HOURS			
	Men	Youths	Females	
Regular Labor	10.3	0.5	0.1	2: 9: 4
Casual and Gang Labour	-			-
Power : Tractor	6.7			1:11: 3
Horse	-			-
Machinery Depreciation and Repair Allowance				6: 7: 2
Contract Services				-: 6: 9
Other Fuel				-: 4:11
Materials : Seed				2: -:10
Fertilisers and Manures applied				2:19: 7
Sundries				1: 1: 1
Rent				1:18: -
TOTAL DIRECT COSTS				£18:18:11
Share of General Farm Expenses				1: 8: 5
Adjustment for Residual Manurial Values				2: 2: 9
GROSS COST				£22:10: 1
Credit Value of Straw				3: 4: 4
NET COST				£19: 5: 9

TABLE II. SUMMARY OF AVERAGE YIELDS AND RECEIPTS

	Quantity per Acre	Receipts per Cwt.
	cwt.	s. d.
Barley used on farm	0.8	18: 9
Barley sold	35.0	20: $\frac{1}{2}$
Deficiency Payment	£10:8:6d. per acre	

TABLE III. SUMMARY OF AVERAGE QUANTITIES OF MATERIALS PER ACRE

Material			Overall Average per Acre
			cwt.
Seed : Purchased			0.86
Home Grown			0.63
			<u>1.49</u>
Fertilisers and Manures :	Area Dressed Only		
	Acres	Cwt. per Acre	
F.Y.M.	12.0	120.0	0.7
Lime	139.5	39.0	2.7
Artificial : Straights -			
Nitrogenous	69.0	2.0	0.1
Potassic	-	-	-
Phosphatic	37.0	10.0	0.2
Compounds	1946.0	3.7	3.5

