UNIVERSITY OF MANCHESTER

FACULTY OF ECONOMIC AND SOCIAL STUDIES

DEPARTMENT OF AGRICULTURAL ECONOMICS

The 1954 Wheat Crop

Economic Results from Forty-seven Crops in the North-West

by

T. W. GARDNER and T. KEMPINSKI

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Acknowledgements

We wish to express the Department's sincere appreciation of the help given by co-operating farmers in the provision of data for the present report. In his own copy of the report each farmer will find his results entered in Table 3.

For the cover photograph of wheat harvest we are indebted to the "Farmers Weekly".

SUMMARY

(1) The report deals with financial results from forty-seven wheat crops harvested in 1954 in the North-West.

(2) The average results per acre were:

Net Cost	£19	0	8
Return for Grain (including Deficiency Payment)	£37	12	7
Yield of Grain	24.8 cwt.		

(3) The average results per ton of grain were:

Net Cost	£16	11	4
Return (including Deficiency Payment)	£30	9	3

(4) Labour (manual, tractor, horse and contract) accounted for 41 per cent. of the Net Cost. It was lower in Shropshire than in Cheshire and Lancashire, chiefly because of less reliance on contract work for combining and of larger acreages worked by each farmer.

(5) The use of combines was associated with a saving of £1-7-1d. per acre on harvesting and subsequent operations, compared with crops cut by binder.

(6) Relationships between inputs and yields were not clear or consistent, perhaps because of the very wet season. Some association was, however, observed between yield and (a) Net Manure Cost, (b) total Net Cost.

(7) The average yield was higher for Winter wheat than for Spring wheat (25.8 and 21.6 cwt. per acre respectively).

THE 1954 WHEAT CROP

Economic Results from Forty-seven Crops in the North-West.

1. INTRODUCTION

This report is based upon a study of wheat production on forty-four* farms in the North-West during the 1953-54 cropping season. Wheat is perhaps the most reliable of the cereal crops in this part of the country and it is certainly one from which most growers expect to obtain a good cash return - whether this return is measured in relation to acreage or to the costs of producing the crop. Wheat, however, is only one of the crops grown and occupies but a small part of the total farm area (less than 15 per cent. in this group). In the systems followed on most of these farms there are other uses of land (e.g. land devoted to cattle fattening, or leys for hay production) from which the return is much smaller than from wheat. These other uses of land are regarded as essential to the maintenance of fertility and the well-being of the farm as a whole. From this point of view, therefore, wheat profits are exaggerated and it would be better for all costs and all profits to be shared over the whole farm rather than to be allocated to separate enterprises. Nevertheless, studies of individual crops can be extremely valuable for the information they yield about alternative practices. All such studies carried out with conventional accounting methods throw up in addition some cost of production figures.

Thus, whilst establishing the average cost structure, it was intended to investigate the relationship between different items of input and the return from the crop with a view to indicating the most successful methods of production. However, no very clear conclusions have emerged on these matters. Generally speaking, yields did not seem to bear any definite relation to manuring, cultivations or seed cost. It appears likely that the exceptionally wet summer of 1954 played havoc with growers' intentions and both high and low yields occurred at similar levels of expenditure.

In view of this the present report is mainly concerned with presenting a broad picture of costs and returns rather than the results of a detailed but inconclusive analysis.

One point, however, that the results seem to emphasise is the economic advantage of combine harvesting. Probably the combine, with its ability to deal quickly with the crop, is particularly well suited to a wet harvest season when efficient operations are only possible during brief spells of good weather.

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* From the 44 co-operating farmers, particulars of 47 separate wheat crops were obtained.

2. THE COSTED FARMS

Of the forty-four co-operating farms nineteen were in Cheshire, eight in Lancashire, sixteen in Shropshire and one in Staffordshire. For the purpose of regional comparison Cheshire and Lancashire were grouped together; it was thought that there were too few Lancashire farms in the sample for them to be treated as a separate group. The one Staffordshire farm was included in the Shropshire group.

Table 1 presents a general picture of the cropping in the two regions and shows that, on the average, the Shropshire farms were much larger and had considerably greater arable, cereal and wheat acreages than those in Cheshire and Lancashire. The proportion of the land devoted to arable and cereals was somewhat higher in the Shropshire group but the proportion under wheat was a little lower than in the northern group.

Table 1 — Average Farm Size and Land Use

Region	Cheshire and Lancashire	Shropshire	All Counties
No. of Farms	27	17	44
	- - - - - - - - - - acres - - - - - - - - - -		
Farm Size	138	327	211
Crops and Temporary Grass	99	254	154
All Cereals	43	104	64
Wheat	20	42	29

The number of crops (or lots) of wheat costed separately was forty-seven. Their territorial distribution and acreage are shown in Table 2.

Table 2 — Number of Crops and Acreage Costed

Region	Cheshire and Lancashire	Shropshire	All Counties
No. of Crops	30	17	47
	- - - - - - - - - - acres - - - - - - - - - -		
Total Area	499.5	708.0	1207.5
Average (per crop)	16.6	41.7	25.7
Range	3.7 - 59.0	6.5 - 243.5	3.7 - 243.5

2. COSTS, RETURNS, MARGINS, AND YIELDS

Table 3 sets out average costs, returns, margins, and yields per acre for each of the two regional groups as well as for the whole sample, and shows how the cost of production was distributed between the various items.

Table 3 — Average Cost, Return, Margin, and Yield per Acre

	Cheshire & Lancashire	Shropshire	All Counties	Your Farm
No. of Crops	30	17	47	
	£ s d	£ s d	£ s d	£ s d
1. Seed	3 12 0	4 1 10	3 15 7	
2. Manure Costs:				
F.Y.M.	4 4	8 0	5 7	
Lime	5 5	1 9	4 3	
Fertilisers	1 10 9	1 8 9	1 9 10	
Residues b/f	4 13 9	4 4 8	4 10 5	
Less Residues c/f	3 4 7	2 15 9	3 1 4	
NET MANURE COST	3 9 8	3 7 5	3 8 9	
3. Other Materials & Miscell.*	7 4	10 2	8 5	
4. Manual Labour	3 8 5	2 14 4	3 3 5	
5. Tractor and Horse Labour	2 4 0	2 1 8	2 3 0	
6. Contract	3 0 0	1 11 3	2 9 7	
7. Machinery Deprec. & Repairs	1 18 10	2 0 7	1 19 5	
8. Share of Gen. Farm Expenses	17 5	14 10	16 8	
9. Rent	3 4 7	2 6 9	2 18 2	
Gross Cost	22 2 3	19 8 10	21 3 0	
Credit value of straw (10%)	2 4 3	1 18 11	2 2 4	
Net Cost of Grain Product'n	19 18 0	17 9 11	19 0 8	
Return for Grain	36 4 8	40 2 2	37 12 7	
MARGIN	16 6 8	22 12 3	18 11 11	
Yield of Grain per Acre (cwt)	24.7	24.8	24.8	

* "Other Materials and Miscellaneous" include Twine (average for All Counties = 5/7 per acre), Drying and Storage Charges (average for All Counties = 1/4 per acre), Seed dressing, Sprays, Sacks, Straw for thatching, Petrol for elevators and Hire of Baler.

Labour, including contract work, accounted for 41 per cent. of the Net Cost ("All Counties"). It was the most important group of costs and is discussed in a separate section.

Higher labour cost and rent are the main reasons for the Gross Cost being higher in Cheshire and Lancashire than in Shropshire. Yields of grain offered no compensation, for the group averages in 1954 were almost identical. The northern farmers were able to sell some of their straw; 175 tons from seven farms brought between £2-10-0d. and £5-11-8d. per ton. These prices were greater than the 10 per cent. share of cost debited to the straw. Such sales, however, gave a profit on straw, rather than reduced the cost of producing grain. Overall, they helped to narrow the gap in profitability between the groups for the whole wheat crop.

Among the items making up the Net Manure Cost the "Residues brought forward" is the highest in value, showing that the farmers relied mainly on the previously accumulated fertility for providing the wheat with its plant food.

The average quantities of seed used and of manures applied per acre were:

Seed	1.61 cwt.	Fertilisers:	
		Nitrogenous	0.62 cwt.
Lime	4.01 "	Phosphatic	0.21 "
		Potassic	0.03 "
F.Y.M.	8.81 "	Compound	1.10 "

In calculating these averages the totals were divided by the number of crops in the whole sample. In fact, some of the farmers did not use any fertilisers or lime for the wheat crop, and farmyard manure was spread before the wheat on six farms only. The total area dunged was 40.5 acres, and the average application on this area was 9.8 tons per acre.

"Return for Grain" includes wheat deficiency payments. The average return is higher in the Shropshire group than in the Cheshire and Lancashire group, mainly because the Shropshire farmers sold more of their grain for seed (so reaping the advantage of a higher price), but also because they retained a lower proportion of their wheat for livestock feeding than did the Cheshire and Lancashire farmers.

The margin per acre achieved by the Shropshire farmers was £6-5-7d. (or over one-third) higher than that realised by the other group. Higher returns contributed to this difference more than did lower costs.

The following results <u>per ton of grain</u> are averages of all the crops costed:

Net Cost	£16-11-4
Return	£30- 9-3
Margin	£13-17-11

4. LABOUR

Labour requirements and costs for the different phases of operations are shown in Table 4.

Table 4 Average Times and Costs of Labour per Acre (47 Crops)

	Pre-harvest Operations	Harvest	Threshing and Subsequent Operations	Total
	hrs. mins.	hrs. mins.	hrs. mins.	hrs. mins.
Time (excluding Contract Work)				
Manual	7 24	10 0	4 12	21 36
Tractor	5 48	3 12	0 8	9 8
Horse	0 36	- -	- -	0 36
	£ s d	£ s d	£ s d	£ s d
Cost (excluding Contract Work)				
Manual	1 1 7	1 10 0	11 10	3 3 5
Tractor	1 6 2	15 5	7	2 2 2
Horse	10	- -	- -	10
CONTRACT COST	6 3	1 0 2	1 3 2	2 9 7
TOTAL LABOUR COST	2 14 10	3 5 7	1 15 7	7 16 0

These results emphasise the high manual labour requirement at harvest time, though this would probably be lower in a more normal season. On some farms stooks had to be re-made because of the unusual amount of wind and rain.

When contract costs are added to those of the other forms of labour, harvest is seen as the most expensive of the three phases of operation. The total labour cost of harvest and subsequent work was nearly double that of all preceding operations.

It can be seen from Table 5 that both contract and other labour costs were lower for the Shropshire than for the Cheshire and Lancashire group in each phase of operations. The reason for these regional differences becomes obvious if we refer to the acreage particulars given in Table 1. The Shropshire farmers, with their relatively large cereal acreages, are in a better position than their northern counterparts to invest in combine harvesters and balers, thus dispensing with that group of contract services which, in terms of cost per acre, is the most expensive one in wheat growing. In fact, only one out of the six "combined" crops in Shropshire was harvested by contract, whereas in the Cheshire and

Lancashire group there were seven crops "combined" by contract and only two harvested by the farmers' own combines.

Table 5 Regional Comparison of Average Labour Costs per Acre

Operations	Regions	Contract Cost			Other Labour Costs			Total Labour Cost		
		£	s	d	£	s	d	£	s	d
Pre-Harvest Operations	Ches. Lancs.		8	0	2	12	0	3	0	0
	Shropshire		3	5	2	2	5	2	5	10
Harvest	Ches. Lancs.	1	7	0	2	6	0	3	13	0
	Shropshire		8	0	2	4	7	2	12	7
Threshing and Subsequent Operations	Ches. Lancs.	1	5	0		14	5	1	19	5
	Shropshire		19	10		9	0	1	8	10
Total Labour Cost	Ches. Lancs.	3	0	0	5	12	5	8	12	5
	Shropshire	1	11	3	4	16	0	6	7	3

For the cost of operations carried out by the farmers' own labour force there is a smaller difference in favour of the southern group. It must not be forgotten, however, that the Shropshire farmers carried out a greater proportion of all operations with their own labour than did the northern group. With their larger arable acreage and generally larger fields, Shropshire farmers were probably able to carry out cultivations for the different crops with less interruptions, thus achieving higher speeds per acre. Similarly, their larger wheat (and total corn) acreage would tend to increase the average speed for harvesting and subsequent work. These savings, however, did not amount to as much as those effected through the use of farmers' own combines and balers instead of contract services.

5. COMBINES VERSUS BINDERS

In view of the relatively high cost of harvesting and subsequent operations it is interesting to note what economies can be achieved by the use of combine harvesters instead of binders and threshing machines. To make the comparison as complete as possible the cost of materials, miscellaneous expenses, and machinery depreciation were calculated, as well as the cost of labour. The materials included twine for the binder, sacks, petrol for the elevator and straw

for thatching. Miscellaneous expenses consisted of the cost of grain drying and storage, and hire of baler.

The results of these calculations can be seen in Table 6. Six crops had to be omitted from the comparison as each of them was partly combined and partly cut by binder.

Table 6 Average Costs per Acre of Harvest and Subsequent Operations

Harvesting Method	No. of Crops	Labour	Materials & Miscell.	Machinery Depreciation	Total
		£ s d	£ s d	£ s d	£ s d
Binder	26	5 15 5	8 9	14 11	6 19 1
Combine:					
All Combined crops	15	4 7 10	6 0	18 2	5 12 0
Own Combine	7	2 19 2	11 0	1 9 6	4 19 8
Contract	8	5 12 10	1 8	8 2	6 2 8

The average saving, compared with the crops cut by binder, was £1-7-1d. per acre for all the combine-harvested crops included. The saving was greater for those farmers who owned their combines than for those who relied on contract work; but these figures may beless representative because of the small number of crops in each group.

Whilst it is true that farmers operating with combines are able to harvest grain crops more cheaply than those using binders, this does not mean that all farmers should purchase combine harvesters. The smallest type of tractor-drawn machine costs approximately £600 and a self-propelled combine with 8½ foot cut costs close on £1,400. Before making the change a farmer must consider (i) whether the necessary capital is available and (ii) what the cost of its use in this manner will be. If a farmer has the purchase money available, he must weigh the loss of interest on this against the saving effected by combining. If he has to borrow, the saving must be set against the interest on the loan. At 7 per cent., the smallest machine needs to save £42 per year and the self-propelled £98 per year: these probably correspond to needs for grain crops of at least 30 and 70 acres respectively, before the purchase of a combine is economically justified.

6. FACTORS AFFECTING YIELD

Margin per acre is probably the most important measure of economic success for any crop enterprise from the farmer's point of view. It was mentioned in section 3 that the greater margins in Shropshire seemed to be the result of high returns rather than of low costs. Although the market price and the rate of deficiency payment at the time of sale do affect the return, yield per acre is an important factor and one which, at least to some extent, can be controlled by the farmer.

As it was impossible to obtain accurate particulars of the yield of straw from all the co-operating farmers, only grain yield is considered here. These yields varied from 11.4 cwt. to 46.6 cwt. per acre. Further details of the yield range are given in Table 7.

Table 7 — Range of Yields of Wheat Grain per Acre

Range of Yield per Acre	No. of Crops	Average Yield per Acre
11.4 and under 16.0 cwts.	6	13.6 cwts.
16.0 " " 21.0 "	9	19.7 "
21.0 " " 26.0 "	12	22.8 "
26.0 " " 31.0 "	13	27.6 "
31.0 " " 46.6 "	7	37.9 "

The total cost of production might be expected to correlate with yield, since it includes harvesting and subsequent costs (such as threshing) which themselves partly depend on the yield. To illustrate this relation the range of Net Costs and the corresponding yields are given in Table 8. An examination of the Table shows that there is a tendency for higher yields to be associated with rising costs per acre. This increase in costs is more than would result purely from harvesting and handling the somewhat heavier crops. Within each net cost group, however, there is a very wide range of yields, indicating that increased expenditure is not of itself adequate to ensure good yields.

Since one exceptional result in relatively small groups can influence the average considerably, the range of costs and yields is given for each group in Table 8. From these it appears that there is a rise in minimum yields as net expenditure increases. It is also clear that, provided farmers obtained the survey average of just over 30/- per cwt. for their grain, only growers of low yielding crops in the highest cost range could suffer a substantial deficit on their wheat. In fact, none of the forty-seven crops reviewed resulted in a loss.

Table 8 — Net Cost and Wheat Yields per Acre

Crops in Group	Net Cost per Acre									Wheat Yield per Acre			
	Range						Average			Range			Average
No.	£	s	d		£	s	d	£	s	d	cwts.		cwts.	cwts.
12	11	14	2	to	16	15	8	14	19	2	11.4	to	40.0	22.6
12	16	18	0	—	18	16	9	17	15	0	12.0	-	34.8	22.2
12	18	18	0	-	21	14	7	20	4	0	15.6	-	46.6	26.2
11	21	17	11	-	27	6	7	23	15	6	14.4	-	43.0	27.6

Finally, with reference to cost and yield relationships, it is pertinent to remark that increased outlay is only economically justified if it results in a larger increase in receipts. The results shown in Table 8 hardly stand up to this test; but it would not be justifiable to assume that the ratio of outlay increases to yield achieved in so inclement a year as 1954 is valid for all growing seasons.

Yields did not show any consistent relationship with the total "Growing" Cost (i.e. Pre-harvest Labour + Seed + Net Manure Cost) possibly because on many farms the exceptionally wet season counteracted normal good husbandry practices. The range of the "Growing Cost is shown in the diagram (page 12).

Furthermore, the quantity of manures actually applied in 1953-54 to these wheat crops did not seem to have any consistent influence on the yields. It is possible that the abnormally high rainfall largely nullified the effect of these fertilisers - especially of the more soluble ones. Yields, however, do seem to have been related to Net Manure Cost (i.e. the value of all manuring available to the wheat crops during the season: see Table 9).

It is not possible to show this effect of net manure costs on yields free from the influence of other factors such as soil type, variety of seed, rate of seeding and local weather differences. No doubt it is these other factors which account largely for the wide range of yields in each sub-group. The evidence from Table 9 is somewhat tentative because of this wide range of yields. Although it seems likely - other things being equal - that yields increase initially as net manure costs rise, the correlation of these two variables is insufficiently close in these results for definite conclusions to be drawn. In any event, it is important that the return from additional yields should more than cover the cost of extra fertilisers. In 1954 the receipts for approximately $\frac{2}{3}$ cwt. of additional grain covered an extra £1 of net manure cost per acre.

RANGE OF "GROWING" COST PER ACRE

(Average = £9-19-2)

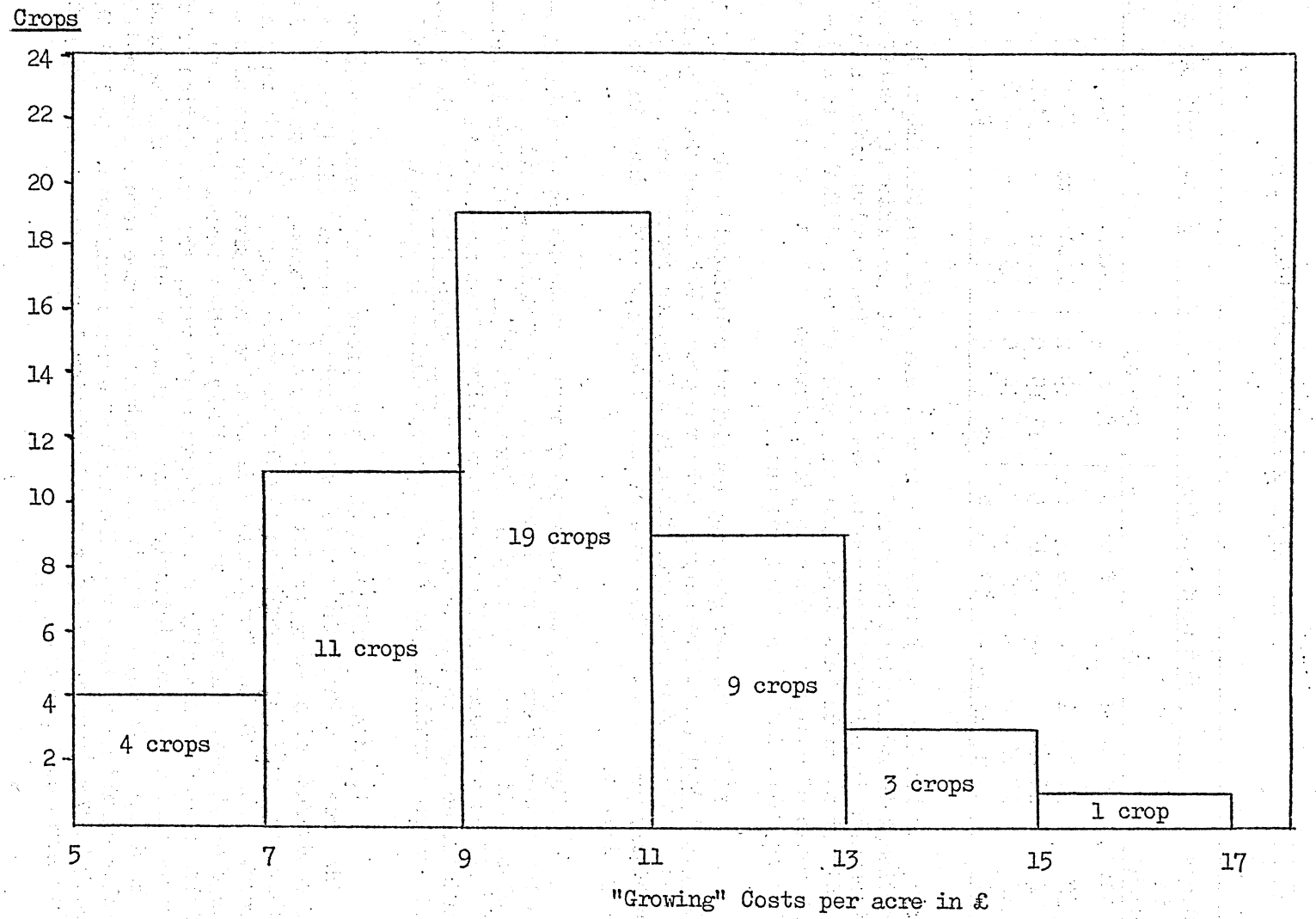

Table 9 Net Manure Costs and Wheat Yields per Acre

Crops in Group	Net Manure Costs per Acre		Yield of Grain per Acre	
	Range	Average	Range	Average
No.	s.	s.	cwts.	cwts.
8	under 30	16.0	11.4 to 28.0	19.0
8	30 & " 60	45.8	15.0 " 34.8	24.6
7	60 & " 72	64.9	19.4 " 46.6	25.2
8	72 & " 84	77.3	19.6 " 40.0	25.0
8	84 & " 108	95.0	14.4 " 43.0	27.0
8	108 and over	128.8	18.2 " 38.0	26.8

Statistical analysis on a small group of farms growing winter wheat and chosen for the completeness of their data seems to indicate a possible correlation between yields and certain factors which are not necessarily reflected in the cost of production. This analysis appears to confirm the widely held belief that wheat yields tend to be better on heavier soils. It also appears to indicate that farmers using between approximately one and two cwt. of seed per acre gain no advantage in yield from higher seed rates within this range; in fact, the lower seed rates seemed to be associated with higher yields. It is possible that results would have been different in a more normal season.

7. WINTER WHEAT AND SPRING WHEAT

Average results from winter and spring wheat crops are compared in Table 10. On two of the co-operating farms the data on the two kinds of wheat could not be separated; these farms, therefore, had to be omitted from the comparison.

The final cost of producing a grain crop includes the charges for harvesting and subsequent handling, and these charges depend largely on the method used (binder or combine) and the yield of the crop. A statement of actual costs for winter and spring sown crops would introduce these harvesting influences which are irrelevant to the comparison. Therefore, Table 10 shows the average of actual growing costs and an imputed figure for subsequent costs based on harvesting by binder. (Subsequent costs are assumed to be £6-18-0d. for a crop of 25 cwts. per acre, with a variation of 4s. 6d. for each cwt. per acre change in yields.) Rent is entered at a standard average and unallocated expenses are calculated as for the costs shown in Table 3. Differences between

winter and spring wheat in the final cost are almost entirely attributable to heavier harvesting charges for the bigger yield from the winter sown wheat.

Table 10 Comparison of Winter and Spring Sown Wheat Averages per Acre

	33 Winter Wheat Crops			12 Spring Wheat Crops		
	£	s	d	£	s	d
Actual Growing Cost per acre	10	0	7	9	17	7
Imputed Subsequent Costs per acre	7	1	8	6	2	8
Average Rent per acre	2	18	2	2	18	2
Unallocated Expenses per acre	2	18	6	2	13	6
Assessed Standard Gross Cost per acre	22	18	11	21	11	11
Credit Straw (10%)	2	5	11	2	3	2
Assessed Net Cost of Grain	20	13	0	19	8	9
Returns per acre for Grain	40	5	7	36	2	9
Receipts per ton, Milling Grain	32	0	4	32	3	11
Yield per acre (cwts)	25.8			21.6		
Percentage of Milling Grain (%)	76.1			74.6		

Table 10 shows that winter wheat produced, on the average, a higher yield and return* per acre. It is possible that the spring wheat, with its shorter growing season, was affected by the bad summer weather more than the autumn-sown wheat.

Although the percentage of grain sold for milling was slightly lower for the spring than for the winter wheat, the average price paid by millers was somewhat higher for the spring wheat.

* The average return for winter wheat is based on 29 crops only. Grain from four winter crops was used entirely for stock feeding on the grower's farm, so that returns were taken to be equal to costs and were not comparable with the returns from the other crops.

8. CONCLUSION

If it is a cliché to say that no season is "normal" in farming, it may still be permissible to emphasise here that the 1954 harvest season was positively abnormal. Nevertheless, the farmers who struggled to provide records for this study as well as to combat the elements must be said to have done well. Their yields on the average were above the national normal level;* those who sold their grain were able to do so profitably, and those who fed it produced grain - even in small quantities - rather more cheaply than they could have bought it. There is every reason, therefore, why these farmers, and others like them, should face the prospect of wheat growing with confidence.

Whilst the conditions of the season and the nature of the enquiry precluded the discovery of new economic factors in wheat growing, accepted beliefs were on the whole supported by this study - abnormal year though it was. This study suggests that some of the main ingredients for successful wheat growing are, fairly strong soil, a generous but not extravagant supply of manures, a careful rate of seeding, and an area of crop large enough to justify combine-harvesting. Ultimate success, of course, depends upon the skill with which farmers employ the resources to hand. This study indicates that such skill is widespread in the North-west.

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* For this reason alone it would be unwise to read into the figures quoted in this report any more than they actually are - an analysis of 47 crops scattered over the Province.

APPENDIX: DEFINITION OF TERMS

Manual Labour. The minimum fixed wage per hour was 2/7d. for males over 21 years old during the greatest part of the period under investigation. The cost charged per hour consisted of the actual wages paid by each farmers, with the addition of 3d per hour for men over 21 and 2d per hour for other categories of workers, to cover the cost of National Insurance and Holidays with pay.

For the purpose of Table 4 female and youth labour hours were converted into "Man Equivalent Hours" in accordance with the wage rates paid in each case.

Tractor Labour was charged at 4/6d. per hour. The hours run by self-propelled combines were included in the tractor hours but charged at 8/6d. per hour. *

Horse Labour was charged at 1/3d. per hour.

F.Y.M. was valued at 15/- per ton.

Machinery Depreciation. The rate used was 12/- per hour for combine harvesters,* and 4/- per tractor hour and 1/- per horse hour for all other implements.

Share of General Farm Expenses is calculated as 6d. per £1 of all expenses recorded and 10 per cent. of direct manual labour cost.

Net Cost is Gross Cost less value of straw. Straw has been valued at 10 per cent. of Gross Cost.

"Growing" Cost. Pre-harvest Labour + Seed + Net Manure Cost.

Return for Grain includes receipts from sales and the Deficiency payment plus the value of head and tail corn retained for feeding (charged at the cost of production).

Margin. Return for Grain minus Net Cost.

Averages. All the average results quoted in this report are simple (or "per crop") averages.

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* These figures were calculated on the basis of combine-harvesting costs given in Bristol II Agricultural Economics Report No. 81.