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Wheat - Cost of production

Farmers' Report No. 139

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Winter Wheat Costs In Yorkshire
1955-6

by

C. J. BLACK

THE UNIVERSITY OF LEEDS

DEPARTMENT OF AGRICULTURE: ECONOMICS SECTION

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Price Three Shillings

F O R E W O R D

This report is based on records collected by visiting farmers in two districts of Yorkshire and relates to their experiences in growing the wheat crop harvested in 1956. There is reason to expect that the record of work done, yields and receipts from each farm are accurately recorded. The assumptions which have to be introduced into costs of this nature make it less easy to be satisfied about the final result. Some warnings are given in the text on the interpretation of enterprise costs. Although these assumptions limit the authority of the costs they do not detract from their usefulness in throwing valuable light on the economics of wheat growing.

The original information was collected by Messrs E.Dawson and D.W.McInnes the latter of whom was responsible for the tabulation of the records until he was prevented by illness. The writing of this report has been done by Mr.C.J.BLACK. To them and to the farmers who provided the information the thanks of the Department are due.

Everyone who knew him will be
grieved to know that Mr.D.W.McInnes
died on April 15th.

W.HARWOOD LONG
Principal Agricultural Economist

WINTER WHEAT COSTS

1955-6

COSTS AND RETURNS FROM GROWING WINTER WHEAT IN TWO DISTRICTS OF YORKSHIRE

Farmers in two districts of Yorkshire co-operated with Leeds University in this investigation into the cost of growing winter wheat. This particular report covers the first of the two years of the enquiry. The two districts concerned were, first, the Vale of York between Thirsk in the north and Doncaster in the south and, second, the southern slopes of the North Yorkshire Moors, most of the farms lying between the Pickering-Helmsley-Oswaldkirk road and the 500 foot contour. This latter district is, for convenience, referred to here as the Helmsley area.

The farms in the Vale of York, in the main, followed an intensive system of cash cropping, having as large a proportion of land as possible under sale root crops. Grain was always a major enterprise and around 40 per cent of the farm acreage would be devoted to it. In the Helmsley area most of the farms followed a system of mixed farming based on arable cultivations. The usual rotation on the light brashy soils of the Corallian limestone was a five course with cereals as the important cash crop. Although sheep were considered the most important livestock enterprise, 80 per cent of the co-operating farmers had dairy herds.

Altogether 71 records were provided from 34 farms in the Vale of York and 40 records from 32 farms in the Helmsley area. The farms ranged in size from 30 acres to over 500 acres in the Vale and from 50 acres to over 500 in the Helmsley area. Despite the similarity of range the average size of farm was smaller for the Helmsley group, as might be expected. Two-thirds of the Helmsley farms were 150 acres or less whereas only half the farms in the Vale of York group came in this category⁺

The year 1956, the harvest year of this report, will long be remembered for its rainfall which, after a warm sunny May, scarcely ceased until September. Grain crops were reported to be heavy but there were also reports of shedding of wheat and fields laid before harvesting became possible. In many cases fields were too wet to take the weight of tractors and combines and it was only the fine dry autumn that allowed the harvest to be gathered. Grain quality was considered the lowest for years and this must have affected the prices received in the open market.

⁺ Details are given in the appendix, Table A.

Some of the records show that costs were inflated by the expense of a difficult harvest. Laid and damaged fields undoubtedly were the cause of some of the very low yields recorded. The average of the costs can therefore be considered to be somewhat high, though £1 an acre should be sufficient allowance for the additional burden of harvesting. Yields and returns must likewise have suffered. Average yields were not high; that for the Vale of York group was 23 cwts of headcorn per acre and even less, $18\frac{3}{4}$ cwts, for the Helmsley group. How much should be allowed for the season it is difficult to judge. Comparison can be made with other years, at least for the Vale, and most surprisingly this comparison does not show 1956 as a particularly bad year. The average yield for this harvest on those (Vale) Cash Root farms co-operating with this University in the Financial Accounts Scheme was $22\frac{1}{2}$ cwts per acre, which was slightly higher than the 5 year average⁺ for these farms of 22 cwts.

For the above yields the average production costs per acre of wheat when the harvesting was done with a binder were £27.14.0. for the Vale of York and £26 for the Helmsley group. The details are set out in Table I. In the Vale of York a sufficient sample was also available for harvesting by combine and this group produced an average cost of £25.18.0. per acre (Table II).

The initial comparison of costs was made on the basis of harvesting by binder because a large proportion of the costed crops were harvested by this method: 85 per cent of the Helmsley records came within this category and even in the Vale of York the percentage was over 60. This was directly connected with the size of farm supplying the records. In the Helmsley area over half the co-operating farms were under 150 acres and many of the larger farms would have a restricted acreage of grain crops available for harvesting by combine since oats and oat straw for feeding would be important products of the arable land. Similarly in the Vale of York half the co-operating farms were under 150 acres in size and only one of these had found it desirable to invest in a combine. In addition some farmers in the Vale who had combines harvested one field with a binder because they needed straw for the potato pie.

A word of warning is perhaps necessary on the interpretation of these average costs of growing winter wheat. They are costings of one individual crop out of a complex of farm enterprises and in order to achieve this separation certain customary and necessary assumptions have been made. Each hour of work by man, tractor or implement must be assumed to be of equal cost to the farmer, although this is obviously

+ Five year average including the 1956/7 financial year which was the 1956 harvest year.

TABLE I.
AVERAGE COST PER ACRE OF GROWING WINTER WHEAT⁺
BINDER HARVESTING

	<u>VALE OF YORK</u>	<u>HELMSLEY</u>
	£. s. d.	£. s. d.
<u>Cost of Materials</u>		
Seed	3. 2. 0.	3. 4. 4.
Farmyard Manure	14. 1.	4. 11. 8.
Artificial Fertilizer	2. 5. 4.	2. 3. 11.
Sprays	12. 7.	3. 9.
	<hr/> 6. 14. 0.	<hr/> 10. 3. 8.
<u>Cultivations</u>		
Applying F.Y.M.	6. 7.	1. 16. 0.
Ploughing	1. 0. 10.	17. 10.
Cultivating, Harrowing, etc.	1. 3. 2.	1. 1. 2.
Drilling Seed & Fertilizer	10. 3.	11. 3.
Applying Top Dressing	4. 0.	2. 4.
Looking & Spraying	6. 9.	2. 2.
Other Operations		6.
	<hr/> 3. 11. 7.	<hr/> 4. 11. 3.
<u>Harvesting and Threshing</u>		
Opening out	3. 5.	2. 7.
Cutting	16. 3.	1. 1. 0.
Stooking (incl. Righting)	17. 1.	10. 2.
Leading (incl. Raking)	2. 2. 5.	1. 14. 4.
Thatching	10.	11.
Threshing and Baling	2. 17. 4.	2. 10. 4.
Sundries: Twine & Nets	12. 1.	12. 0.
Sack Hire	1. 8.	1. 6.
	<hr/> 7. 11. 1.	<hr/> 6. 12. 10.
<u>Other Costs</u>		
Rent	1. 19. 9.	1. 10. 10.
General Farm Expenses	2. 9. 6.	3. 1. 0.
Implement Depreciation & Repair	1. 4. 0.	1. 4. 0.
Net Manurial Residues:		
Add	4. 4. 2.	
Deduct		- 1. 4. 0.
<u>TOTAL NET COST</u>	<hr/> 27. 14. 1.	<hr/> 25. 19. 7.

+ Cost of Materials, Cultivations and Other Costs

Vale of York: 71 records covering 697 acres

Helmsley: 40 records covering 286 acres

Harvesting and Threshing

Vale of York: 42 records covering 321 acres

Helmsley: 34 records covering 239 acres

TABLE II.

AVERAGE COST PER ACRE OF GROWING WINTER WHEAT ⁺
HARVESTING BY FARMER'S COMBINE AND BALER

<u>Harvesting and Drying</u>	<u>VALE OF YORK</u>		
	£.	s.	d.
Combining and Leading	1.	2.	4.
Baling and Leading	18.	6.	
Drying Grain	12.	4.	
Fuel: Combine and Baler	4.	7.	
Grain Drier	7.	4.	
Sundries: Twine or Wire	4.	10.	
Sack Hire	3.	3.	
Special Implement Depreciation & Repair:			
Combine and Baler	1.	6.	8.
Grain Drier		15.	6.
	<hr/>		
<u>TOTAL HARVESTING</u>	5.	15.	4.
<u>CULTIVATIONS</u>	3.	11.	7.
<u>COST OF MATERIALS</u>	6.	14.	0.
<u>OTHER COSTS</u>	9.	17.	5.
	<hr/>		
<u>TOTAL NET COST</u>	25.	18.	4.
	<hr/>		

+ Vale of York:

Harvesting: 24 records covering 340 acres
 Cost of Materials, Cultivations and Other Costs
 from Table I.

at variance with reality. It must also be assumed that each farmer runs his tractors with average efficiency and that the many overhead expenses of the farms follow a standard pattern. Similarly for purposes of comparison somewhat arbitrary assumptions must be reached on the value of farmyard manure and on the residual values of artificial manures to be carried over from one crop to the next.

Provided the limitations are appreciated these costings supply a useful measure, in money terms, of the time and resources used by farmers in wheat growing and so they assess the contribution made by the crop to the economy of the farms. Certain things do not follow from the costings. A lower use of labour on wheat will achieve a lower cost on paper but the farmer will not save money unless he discards the worker or uses the hours more profitably elsewhere on the farm. Looking at this the other way round, greater efficiency in tractor maintenance may be an important way of lowering costs on a farm but the gain will not be recorded in these formal costings. Similarly variations in the basic assumptions with regards to manures, as shown elsewhere in this report, must produce a different final cost though the cost to the farmer will not have changed. These are warnings. They do not in any way detract from the use of the costings in throwing valuable light on the economics of the crop.

As a final note to this section it may be of nostalgic interest to compare the costs per acre given above with those obtained from the same two areas 5 years previously. Binder harvesting was by far the commonest method then and the production costs are fairly directly comparable. In 1950-1 the costs per acre for growing wheat and harvesting by binder were £16.18.2. and £16.10.9. for the Vale of York and the Helmsley area respectively and the yields of headcorn were only 1 cwt less than the yields for the corresponding groups in 1955-6. It must also be of interest to note in relationship to the much lower costs of production that the guaranteed prices received for the 1950-1 crop averaged 29s.9d. per cwt.

C O S T S A N A L Y S I S

S E E D

It was a sign of the time that the great majority of the co-operating farmers bought their wheat seed instead of using seed of their own growing. The commonest rate of sowing for both areas corresponded to the national average of $1\frac{1}{2}$ cwt (12 stones) per acre and the average costs of seed were similar at around 3 guineas an acre. There was nevertheless considerable variation within the groups in the amount of seed used, in some cases 2 cwts or more were sown on an acre. The higher rates did not correspond with late sowing; which suggests that the farmers were meeting local requirements or individual preferences.†

Heines 7 was sown on almost half the recorded fields in the Helmsley area and this variety together with N.59, Banco, King II and Little Joss, in that order of importance, accounted for 85 per cent of the sowings. In the Vale of York Heines 7 again topped the list and together with Cappelle Desprez accounted for over half the acreage sown. Other varieties appearing on three or more costs were Scandia, Hybrid 46, Pilot, N.59 and Minister in that order of number of records.†

+ Some further details are given in the Appendix, Table B.

FARMYARD MANURE

Several farmers in the Helmsley group, providing 19 out of the 40 records, applied dung directly to the wheat land. This is a common practice in the area, wheat generally following either oats or barley. The average dressing applied, according to the farmers' own estimates, was 10 tons to the acre. In the Vale of York the system is completely different. Farmyard manure is applied to the important cash root break and half the costed wheat crops followed after roots which had received heavy applications of dung and artificial manure. This difference was reflected in the costings. Both groups had a heavy charge for farmyard manure but in the Helmsley group it appeared directly in the costs and was partly offset by manurial values carried forward to the following crop, whilst in the Vale of York group the charge was contained in the balance added for manurial residues.

The average gross charge for farmyard manure applied to the wheat for the 40 fields of the Helmsley group was £6.8. , of which £4.12. was for the dung itself, valued at £1 per ton. This gives some idea of incidence of this cost on the total. It might of course be argued that it is not necessary either to charge for dung or to bring and carry forward manurial residues. The gist of this case is that farmyard manure is a by-product of the farming and has no production cost, that it is applied to the most convenient crop in order to maintain the general fertility of the land even more than to benefit that particular crop and that the farmer, whilst planning his rotation and cropping to obtain the maximum benefit from previous manuring, is growing the wheat with the thought that the previous crop has paid for the previous manuring. In other words he would not have varied his previous manuring or his dung application if he had intended to grow some other crop than wheat as the following crop.

Whether this argument is agreed or not the result of ignoring both net manurial residues and the cost and application of farmyard manure is most interesting. It would have reduced the production costs for wheat in the Helmsley area by £7.17.7. an acre and on the Vale of York by £6.15.3. an acre! The net cost of growing wheat by binder harvesting would then have fallen from £25.19.7. to £18.2.0. and from £27.14.1. to £20.18.10. for the above areas respectively. This does give a completely different picture of the costs of production of winter wheat.

ARTIFICIAL FERTILIZERS

The records showed a remarkable diversity of manurial policies in both the Helmsley and the Vale of York groups. For example, in the Vale of York after Roots approximately equal numbers of fields had received one of the following combinations:

- 1) a basic and a top dressing
- 2) only a basic dressing
- 3) only a top dressing and, lastly,
- 4) no manure at all

Even when wheat followed another corn crop almost every possible combination of basic artificial manure, top dressing and farmyard manure was provided to one crop or another and in one case no manure of any kind was supplied. (see Table III)

It is likely that the farmers concerned were following the sensible and time-honoured course of adapting their manuring to the individual needs of the land and the crop. All the same the very diversity of practice must leave some room for the feeling that the manurial policy for the wheat crop might not have received sufficiently close attention, otherwise, why are the average yields so low? The 5 year average yield for the Cash Root farms of the Vale, already quoted, was only 22 cwts per acre compared with 25½ cwts for both the Wold and also the Holderness groups of the Farm Accounts Scheme. Sandy soil may account for some of the difference but it scarcely provides the whole answer.

TABLE III
MANURING OF WHEAT ACCORDING TO PREVIOUS CROP
DISTRIBUTION BY NUMBER OF RECORDS

V A L E O F Y O R K

Manures applied to wheat	Previous Crop			
	Corn	Ley & Fallow	Roots	Peas
Basic + Top Dressing + F.Y.M.	-	1	-	-
Basic + Top Dressing	9	5	10	-
Basic Dressing + F.Y.M.	1	-	-	-
Basic Dressing only	4	-	6	-
Top Dressing + F.Y.M.	4	-	-	-
Top Dressing only	4	1	10	1
No Manuring	1	-	11	3
Total Records	23	7	37	4

H E L M S L E Y

Manures applied to wheat	Previous Crop			
	Corn	Fallow	Roots	Beans
Basic + Top Dressing + F.Y.M.	3	-	-	-
Basic + Top Dressing	7	2	-	1
Basic Dressing + F.Y.M.	5	-	-	-
Basic Dressing only	6	1	2	-
Top Dressing + F.Y.M.	7	-	-	-
Top Dressing only	1	-	-	-
F.Y.M. only	1	3	-	-
No Manuring	1	-	-	-
Total Records	31	6	2	1

A similar complexity was apparent for the Helmsley group. Wheat generally followed a corn crop and much of it was dunged. Half the wheat that received farmyard manure in such circumstances was drilled with a basic dressing of artificial manure and half was not. Again, for two-thirds of the fields, whatever the previous crop, a basic dressing of artificials was considered essential but for the remaining one-third, all cases where wheat followed corn or fallow, no artificials were supplied for the early growth; and more surprisingly not all these fields had received farmyard manure. In this case too the question arises: Was too much artificial manure applied in some cases or was too little in others?

It is probably the very diversity of practice in the two areas, as already noted, that has produced such unexpected similarity in the average expenditure on artificial fertilisers. Whilst the averages were £2.4. and £2.5. per acre, the expenditure varied from nothing to £4.11. in the Helmsley group and from nothing to £5.14. per acre in the Vale of York.

It is obvious from the records that there was no unanimity of opinion on the benefits of top dressing. The practice was commonest in the Vale of York group. Two-thirds of the fields there received such treatment, the average dose being $2\frac{1}{2}$ cwts of nitro-chalk per acre. In the Helmsley group only just over half the costed fields received a nitrogenous top dressing and the average quantity was much smaller at $1\frac{1}{2}$ cwts of nitro-chalk per acre. Yet the majority of the varieties of wheat grown (Heines 7 and Cappelle being the most popular) had the inherent capacity and stiff straw necessary for response to relatively heavy dressings of nitrogen.

It is worthwhile contrasting the above figures with the best advice arising from a considerable basis of experimental work. Crowther and Yates* in their wartime survey of plot experiments since 1900 showed the worthwhile response of wheat to top dressings of nitrogen and, most important in the present context, saw that the response was not altered by the presence or absence of dung. Reviewing the latest N.A.A.S. experiments with the top dressing of wheat Beesley and Bullen reported in "Experimental Husbandry" No.1 that "with stiff-strawed varieties... 2 to 3 cwts of Sulphate of Ammonia.. has in almost every case given a profitable return, irrespective of locality, fertility level, soil type or previous cropping." Two to three hundredweights of sulphate of ammonia are equivalent to 3 to 4 cwts of nitro-chalk which was the fertilizer commonly applied to the recorded crops. This is considerably more than the average figures for these Yorkshire farms, indeed, only once did the records show the high dressing of 3 cwts sulphate of ammonia (4 cwts nitro-chalk) per acre. In fact the averages were below the level recommended for cereal top dressings by Crowther and

* Fertilizer Policy in Wartime,
Empire Journal of Experimental Agriculture,
Vol.9. 1941.

Yates⁺ in 1941 - 2 cwts sulphate of ammonia (= 2½ cwts nitro-chalk) per acre - for the relatively weak-strawed varieties of that date!

In an economic report on wheat growing an additional note is necessary on the costs and returns from top dressings as shown by the experimental results. It would be even more satisfactory if the evidence could be provided from the recorded data under examination. Unfortunately that was not possible, probably because there were too many variable factors involved, some of which were known and some of which were not; in addition to which in this year (1955-6) at least there was the difficult harvest weather that reduced some good yields to medium or poor values. There was also no guarantee that the nitrogen was put on to increase yields rather than to save a crop that had wintered badly or for that matter that the top dressings were applied at the correct phase of growth, a factor which is known with certainty in experimental work.

The experimental work produces the evidence that 3 and 4 cwts of nitro-chalk give an average response of 5 and 5½ cwts of grain respectively. In 1955-6 the most common price for nitro-chalk on the farm was £13.6.8. per ton whilst the lowest total return per cwt was just over 25 shillings. Taking these two prices, a top dressing of 3 - 4 cwts of nitro-chalk per acre would on the average have provided £6.5.0. to £7.3.9. of additional income for the expenditure of £2 to £2.13.4. per acre. And on many farms the value per cwt of the grain was not "just over 25/-" but more than 30/-.

S P R A Y S

More farmers in the Vale of York group, compared with the Helmsley group, spent money on top dressing their wheat; 63 per cent compared with 55 per cent of the records. The difference was even more marked for spraying. 72 per cent of the Vale fields were sprayed as against only 25 per cent of those in the Helmsley area. This would seem to mark not only a different approach to weed clearance, the corn crop becoming the cleaning crop instead of the root break, but also a greater confidence in the Vale of obtaining the additional production available from a small increase in costs. It has to be remembered, in addition, that spraying would not constitute "a small increase in costs" to many of the Helmsley farmers. Although the cost of sprays themselves were relatively low, 9 to 21 shillings per acre, few small farmers have or can be expected to have a sprayer of their own. The cost of contract spraying varied from 25 to 70 shillings per acre, which was a not inconsiderable item of cost, this range of charges requiring an increase of yield from the spraying of the order of 1 cwt to 3 cwts of wheat per acre.

+ Fertilizer Policy in Wartime,
Empire Journal of Experimental Agriculture,
Vol.9. 1941.

CULTIVATIONS

Several of the items responsible for the difference of £1 per acre in the estimated cost of cultivations and similar operations up to harvesting have been dealt with in the preceding paragraphs. The Helmsley group had the higher charge of £4.11. because of the inclusion of the cost of applying the dressings of farmyard manure. This was partly offset by higher costs in the Vale of York for spraying and the application of top dressings. There was one further item where the Vale group received the higher charge and that was for ploughing. This was because more of the Vale of York fields were either deep ploughed or ploughed twice and there were therefore longer hours for ploughing - despite the fact that many Helmsley farmers were ploughing in dung. It must be recalled however that the soils of this latter area were shallow in most cases and deep ploughing would be impossible.

HARVESTING

For binder harvesting the average costs per acre were higher for the Vale of York group (£7.11. compared with £6.13.) The difference of 18 shillings per acre is not perhaps surprising. The Vale farms were on better land, as was reflected in the higher rents (40 shillings compared with 31 shillings per acre), and the yields were higher. The additional bulk of the crops demanded a greater amount of work in both stooking and leading the sheaves, and possibly also for the threshing and baling. In contrast the Helmsley group had the higher cost for cutting the crop. This was found to be due, not to a general trend of more difficult harvesting in that area, but to the presence of four fields where the cutting was exceptionally protracted. In one case the cost worked out at over £5 per acre! "When things are bad they are very bad" might be the summing up of the hazards of grain harvesting in this higher area.

Combine harvesting has the principle advantage of saving labour and reducing manual labour from an average of $13\frac{1}{2}$ hours (excluding threshing) to $7\frac{3}{4}$ hours.+ This advantage was shown in the present costings for the average cost of labour, tractors and fuel for combining, baling and leading came to £2.5. per acre compared with £3.9. for merely getting the grain into the stack by binder harvesting. The reduced labour use is obtained by capital investment and it has already been mentioned that only the larger farms in the Vale of York group had considered it practicable.

+ The Use of Labour in Yorkshire Farming,
University of Leeds.1956.

All the Vale farmers who had their own combine also owned or had part-ownership of a baler, whilst in all but 5 cases out of 24 the grain was dried in the farmer's own drier. The extent to which these investments entered into the costs depended on the age of the equipment and the acreage of grain harvested in the year. It was therefore not surprising to obtain considerable variation in the depreciation charges. For combine and baler together the estimates for depreciation and repairs ranged from 13 to 64 shillings an acre and for driers from 4s.6d. to 55 shillings per acre. On the average these charges came to £2.2.0. per acre out of a total harvesting cost of £5.15.0. Two-thirds of the charges for these special harvesting depreciations and repairs fell between £1 and £2 per acre but, as if to show how heavy these charges could be, 3 records had figures of more than £5 per acre!

In the Helmsley group only 3 records were obtained for harvesting by the farmer's own combine. These costs worked out at between £5.13. and £7.12. per acre for total harvesting. This compares with a range for the corresponding Vale group of £2 to £10 per acre. Combines are, therefore, not out of place in the Helmsley area but they may meet with difficult conditions in a bad harvest. Some indication of this was given by the fact that all these three combines took longer to harvest an acre than all but one of the machines in the Vale of York.

Hiring a combine to do the harvesting is sometimes a useful solution to the problem of reducing labour requirements without incurring heavy capital commitments. Five of the records in the Vale of York and three in the Helmsley group were for this method of harvesting. The contract charges per acre varied from £2.10.0. to £3.14.0. for the combine alone and from £4.5.0. to £5.5.0. for combine and baler. It may have been due to lack of experience in dealing with bales but in each instance where the hired baler was used the time spent leading in the bales was unusually long. Only three out of the eight farms dried the grain before selling and the contract charge for this varied from 14s.3d. to £3.6.0. per acre! The total harvesting costs were also very varied, the range being from £2.18. per acre, where the straw was left to rot in the field, to £9 per acre where there were heavy drying costs. The average was £6.10.6. per acre.

YIELDS AND RETURNS

The average market price received for wheat by growers in England and Wales for the 1956 crop+ varied from 23 shillings, if it was marketed during the harvest months, to a peak of 25s.5d. during the winter period of December to February. After that the price declined fairly rapidly to under 20 shillings in May and June. The market price failed, therefore, to provide a return for storage after the end of February. Compensation was provided by the deficiency scheme with its graded standard price rising from 27s.6d. at harvest to 32s.6d. in May-June. It guaranteed a worthwhile premium for storage - provided of course that there was no loss or deterioration in storage and that a market was available for the quality of wheat in store.

TABLE IV
AVERAGE YIELD OF WHEAT & RETURN PER ACRE

	<u>Vale of York</u>	<u>Helmsley</u>
Yield per Acre	23 cwt	18½ cwt
Sale Price of Headcorn	£25. 9.11.	£20. 2.3.
Deficiency Payment	<u>8.18. 1.</u>	<u>7.12.0.</u>
Total Return	<u>£34. 8. 0.</u>	<u>£27.14.3.</u>
Sale price per cwt	22s.2d.	21s.5d.
Total return per cwt	30s.0d.	29s.7d.

The weighted average price for wheat sold as millable for this harvest year as calculated from the Ministry's returns was 22s.10d. per cwt. The average sale prices obtained by the Yorkshire farmers co-operating in this investigation were somewhat lower, the Vale of York average being 22s.2d. and the Helmsley average 21s.5d. When deficiency payment was taken into account the Yorkshire growers were nearer to the national average. Obviously many farmers in both of the co-operating groups had benefited by storing the grain in stack or in silo so that they were able to sell in the March-June deficiency periods. The national average price received for wheat, including deficiency payment, was 30s.2d. per cwt: for the Vale of York group the average was 30s and for the Helmsley group 29s.7d. per cwt.

+for further details see Appendix, Table E.

Whilst the Vale of York farms benefited from the slightly higher price of grain, they obtained far more benefit, compared with the Helmsley farmers, from their higher average yields. They received an average return (Table IV) of £34.8 per acre compared with £27.14 for the Helmsley group and a large share of the £6.14 difference in returns must be credited to better yields. The averages, of course, hide a considerable degree of variation within the groups. The Vale of York fields had yields from 7.3 to 35 cwts of headcorn per acre, but only 10 out of the 71 records lay outside the range of 20 to 30 cwts per acre. Variation for the Helmsley area was not so great, with yields in general at a lower level. The lowest here was 10.3 cwts and the next-to-the-highest 24.7 cwts per acre. The one exception was a field yielding 30 cwts per acre. In terms of total returns for wheat growing half the Vale of York records fell between £35 and £45 per acre but there was a very long tail reaching down as low as £11 per acre. The Helmsley group showed less range and lower returns. Thirty-five of the forty records came between £20 and £40 per acre.+

It is clear from this that many of the farms in both areas had not achieved a rewarding return from wheat growing. Take the Vale of York costings. The estimated share of farm expenses to be set against wheat growing averaged between £26 and £28 per acre,++ according to method of harvesting. If this is accepted, until wheat returns exceeded this level the average field was not making a fair contribution to farm income.

Looking at the individual Vale records, one-sixth of the fields failed to provide any margin above their estimated costs and 7 out of every 10 fields gave a positive margin of less than £15 per acre.+++ The corresponding analysis for the Helmsley group showed that here almost half the fields failed to give a return equal to the estimated costs and the other "half" provided margins of less than £16 per acre.++++

+ See also Appendix Tables H & J.

++ See Tables I and II on pages 3 and 4.

+++ See Appendix Table L for details of distribution

++++ Under the section headed "Farnyard Manures", page 6 a possible alternative interpretation of costs was explained which cancelled out the allowances for manurial residues and the charges for farnyard manure. If this latter interpretation of costs had been used the margins in the Vale of York group would, overall, have been increased by slightly over £5 per acre, leaving the relative distribution much the same. In the Helmsley group this adjustment would have removed many of the higher costs and provided margins concentrated between a negative of £5 per acre and a positive of £18, there remaining the one exception noted overleaf.

There was one exception, the field already mentioned as yielding 30 cwts of grain per acre. The crop in this case was drilled after grain with a basic dressing, sprayed and combined harvested with the farmer's own equipment for the fairly low cost of £18 per acre. It was stored and marketed in the March-June periods to provide a margin of £28 over costs: The highest for this and the Vale group!

The margin by which the average total returns exceeded the average total costs was barely 35s for the Helmsley group and even for the Vale of York came only to £6.14. and £8.10. , according to the method of harvesting. Both these figures were less than the deficiency payment which averaged £8.18. per acre. The relatively low yields seem to have been the main cause of the not too healthy returns.

Confirmation of the importance of yields was gained by comparing yield per acre with market price received per acre, thus cancelling out the effect of variations in the deficiency payments. Despite the fluctuations in sale price during the year high yields went with high returns and almost three-quarters of the variance in returns was explained by yield.+ High yields from the improved varieties grown in the area would seem to be of prime importance for profitable wheat growing in Yorkshire.

For this reason it was considered worthwhile to look closer at the records in order to support the evidence on what promotes heavier yields as already deduced from experimental husbandry. Looking at the Vale of York farms, it appeared at first sight as though the use of the combine harvester was associated with a higher range of yields. Closer examination showed that this was not a valid conclusion. Most of the "farmer-owned" combines were on farms over 200 acres in size. When the results for farms over 200 acres were separated out and examined there was little difference in the range of yields for the combine group and for the binder group. There was however a definite tendency[†] for farms over 200 acres to have a higher range of yields than those under 200 acres, regardless of the method of harvesting. This was for the Vale of York group. In the Helmsley group there was not the same tendency for higher yields to be associated with the larger farms.

+ Table N of Appendix gives details of the distribution.

++ Within the 2% level of probability For distribution see Appendix Table P

From this starting point, in the Vale group at least, it was expected that there might be some relationship shown in the records between yields and general manurial policy, or previous cropping, or variety of seed. The results showed a complete absence of relationship, a position that had been found previously for nitrogenous top dressings. There were however some indications from the records of the reasons why the larger farms had on the whole obtained more satisfactory results.

Looking at top dressing again, in the Vale two-thirds of the fields on the larger farms had received such a dressing and a slightly lower proportion on the smaller farms but whilst over a third of the fields on the larger farms had received at least 3 cwts per acre of nitro-chalk only 4 out of 38 fields on the smaller farms had received an equivalent dressing. The position was much the same for the basic fertilizer application given with the sowing. In almost all cases where the previous crop was a grain crop the larger farmers had provided artificial manure but only half the fields in the smaller size group had received this dressing. After roots over half the fields in the larger size group had been given a basic manuring whilst less than a third of the fields in the corresponding group had so benefited. Similarly a higher percentage of fields in the larger farm group had been sprayed to control weeds and of the fifteen fields that were either cross-ploughed or deep ploughed all but two were on the larger farms.+

The implication of this is not necessarily that the larger farmers were more efficient at wheat growing than smaller farmers but that more attention to detail did in the general run of things give higher yields and higher yields gave higher returns. Admittedly more manuring and more cultivating did result in higher costs but there was every sign that the margin between costs and returns tended to follow the same pattern and to be better on the group of farms where more attention was given to the crop.++

+ Appendix Table Q gives exact percentages

++ Details of distribution are given in
Table R of Appendix

CONCLUSIONS

Five years previously a yield of 23 cwts per acre for wheat and a corresponding total return of £35 per acre could have been regarded as eminently satisfactory. This report for the harvest year 1956 concentrates attention on the known fact that most costs of production have increased. The point has now been reached when the Vale of York average yield of 23 cwts per acre can be considered only a minimum target for a satisfactory profit. Yet, over a quarter of the fields recorded in the Vale of York and almost two-thirds of those in the Helmsley group failed to produce a yield of 20 cwts per acre. It is difficult to conceive that these fields provided the farmers with an adequate return for their inputs of labour, fertilizer, fuel, machinery and so on.

If 1956 was indeed as poor a harvest year as the reports current at the time supposed, in a normal season the position of wheat growers in the Helmsley and Vale of York areas should be better than this present report at first sight suggests. It was disturbing, however, to find that the evidence from the Financial Accounts Scheme for the Vale of York showed for 1956 an average rather than a low yield for wheat. It is hoped that a verdict on this point will become available when the material from the second year of this investigation, 1956-7, has been analysed.

High yields at the minimum of cost must be the recipe for profitable wheat growing. That does not mean that costs should be cut regardless of the consequences but that additional inputs and financial returns should be carefully balanced. Here the apparent disagreement over manurial policies suggests that this matter requires further attention. The sort of questions that came to mind in preparing this report were as follows: Is the best use being made of the supplies of farmyard manure in the Helmsley area by dressing the wheat crop?; Does wheat require a basic dressing of phosphate and potash after a well-manured root crop?; Can wheat as the second corn crop yield heavily without the provision of a basic dressing of artificials?; To what extent does a dressing of farmyard manure reduce the requirement of wheat for artificials?

Finally, experimental work has proved pretty conclusively that well-timed top dressings of nitrogen do increase the grain yield without causing the lodging of healthy varieties of modern wheat. The applications of nitrogen top dressings in the Vale of York and more particularly in the Helmsley area were below the maximum dressings advised on the basis of the research. Heavier use of nitrogen should be carefully considered for if it gives higher yields it also gives higher profits.

A P P E N D I X

TABLE A.

SIZE OF FARMS IN INVESTIGATION
DISTRIBUTION BY NUMBER OF FARMS

	Farms in Group	Acres Crops and Grass +							Median Acreage of Group
		1 -50	51 -100	101 -150	151 -200	201 -300	301 -500	Over 500	
Vale of York	34	3	8	6	5	8	2	2	152
Helmsley	32	1	8	12	5	4	1	1	118

+ Rough Grazing converted to equivalent acres crops & grass

TABLE B.

I. QUANTITY OF SEED SOWN PER ACRE
DISTRIBUTION BY NUMBER OF RECORDS

	s t o n e s								Total Records
	10	11	12	13	14	15	16	17	
Vale of York	3	4	34	2	13	1	5	9	71
Helmsley	2	6	18	5	2	2	5	-	40

II. VARIETY OF SEED SOWN
DISTRIBUTION BY NUMBERS OF RECORDS

<u>Variety</u>	<u>Vale of York</u>	<u>Helmsley</u>
Als	1	1
Banco	-	4
Cappelle	14	1
Heines 7	23	19
Holdfast	1	-
Hybrid 46	6	1
King II	-	3
Little Joss	-	3
Masterpiece	2	-
Minister	3	-
N.59	4	6
Pilot	4	-
Redman	2	-
Scandia	9	1
Welcome	1	1
Yeoman	1	-

TABLE C.
COSTS OF HARVESTING BY BINDER
DISTRIBUTION BY NUMBER OF RECORDS

I. TOTAL HARVESTING COSTS +

++	£ per acre											Total Records
	1	2	3	4	5	6	7	8	9	10	11	
Vale of York	-	7	15	9	5	2	2	2	-	-	-	42
Helmsley	2	12	10	3	4	-	1	-	1	-	1	34

II. CUTTING BY BINDER

++	Shillings per acre											Total Records
	Less than 10	10	20	30	40	50	60	70	80	90	100	
Vale of York	10	17	12	3	-	-	-	-	-	-	-	42
Helmsley	9	17	4	-	1	-	1	-	1	-	1	34

III. STOOKING SHEAVES +++

++	Shillings per acre						Total Records
	Less than 10	10	20	30	40	50	
Vale of York	13	22	5	1	-	1	42
Helmsley	24	9	-	1	-	-	34

IV. LEADING SHEAVES

++	Shillings per acre											Total Records
	Less than 10	10	20	30	40	50	60	70	80	90	100	
Vale of York	-	4	8	7	10	8	4	-	-	-	1	42
Helmsley	1	4	11	9	2	5	1	1	-	-	-	34

++ £1 = from £1 to £1.19.11.
20/- = from 20/- to 29/11

+ including thatching but excluding threshing
Average cost per acre = £4.8.2.

+++ excluding re-stooking or righting

TABLE D.

COST OF HARVESTING BY COMBINE
DISTRIBUTION BY NUMBER OF RECORDS

I. TOTAL HARVESTING COSTS

+	£ per acre										Total Records
	2	3	4	5	6	7	8	9	10		
Vale of York	1	3	8	4	3	2	-	2	1		24

II. COMBINING, BALING & DRYING
RUNNING COSTS ONLY

+	£ per acre						Total Records
	1	2	3	4	5	6	
Vale of York	1	3	13	5	1	1	24

III. DEPRECIATION & REPAIRS FOR
COMBINING, BALING & DRYING

+	£ per acre						Total Records
	Less than 1	1	2	3	4	5	
Vale of York	1	16	4	-	-	3	24

+ £1 = from £1 to £1.19.11.

TABLE E.
WHEAT PRICES & DEFICIENCY PAYMENTS 1956-7
(England and Wales)

Period	Av. Price per Cwt. s. d.	Standard Price s. d.	Def. Payment per cwt. s. d.	Quantity Sold (million cwts)	Total Def. Payment £ million
July-Sept	22.11.7	27. 6.	4. 6.3	8.8	2.0
Oct-Nov	22.11.5	29. 0.	6. 0.5	16.1	4.9
Dec-Feb	25. 5.3	30. 8.	5. 2.7	10.4	2.7
Mar-Apr	22. 6.8	32. 1.	9. 6.2	7.2	3.4
May-June	19.10.	32. 6.	12. 8.	9.6	6.1

Source: Ministry of Agriculture, Food and Fisheries. Press Notice.

TABLE F.
TOTAL NET COST OF GROWING WINTER WHEAT +
DISTRIBUTION BY NUMBER OF RECORDS

+++	£ per acre								Cost + Average £ per acre
	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50	
Vale of York	1	6	14	27	20	3	-	-	27
Helmsley	-	14	4	10	8	2	1	1	26

+ Vale of York - 71 records
 Helmsley - 40 records

TABLE G.
TOTAL ADJUSTED⁺ COST OF GROWING WINTER WHEAT⁺⁺
DISTRIBUTION BY NUMBER OF RECORDS

+++	£ per acre					Cost Average £ per acre
	10-15	15-20	20-25	25-30	30-35	
Vale of York	1	22	36	12	-	22
Helmsley	-	22	13	3	2	21

+ Adjusted to remove any charge for farmyard manure and its application and also allowing no manurial residues brought or carried forward.

++ Vale of York - 71 records
 Helmsley - 40 records

TABLE H
YIELD OF HEADCORN PER ACRE
DISTRIBUTION BY NUMBER OF RECORDS

++ +	cwts per acre							Total Records
	5-10	10-15	15-20	20-25	25-30	30-35	35-40	
Vale of York	1	3	16	30	15	5	1	71
Helmsley	-	7	18	14	-	1	-	40

+ 5-10 = 5-9.99 or £5 - £9.19.11.

TABLE J
TOTAL RETURN PER ACRE FROM WINTER WHEAT
DISTRIBUTION BY NUMBER OF RECORDS

	£ per acre										Total Records
	10-	15-	20-	25-	30-	35-	40-	45-	50-	55-	
+	15	20	25	30	35	40	45	50	55		
Vale of York	1	3	7	10	11	22	14	2	1		71
Helmsley	1	3	9	10	11	5	-	1	-		40

TABLE K
MARKET PRICE PER ACRE FROM WINTER WHEAT
DISTRIBUTION BY NUMBER OF RECORDS

	£ per acre										Total Records
	5-	10-	15-	20-	25-	30-	35-	40-	45-	50-	
+	10	15	20	25	30	35	40	45	50		
Vale of York	1	2	9	26	16	11	5	-	1		71
Helmsley	-	5	16	13	5	1	-	-	-		40

TABLE L
MARGIN BETWEEN TOTAL NET COST & TOTAL RETURN
DISTRIBUTION BY NUMBER OF RECORDS

	Deficiency					Credit					Total Records
	£ per acre										
	20-	15-	10-	5-	0-	5-	10-	15-	20-	25-	
+	15	10	5	0	5	10	15	20	25	30	
Vale of York	-	2	8	2	14	16	19	7	3	-	71
Helmsley	1	3	5	10	6	6	6	2	-	1	40

+ £10-£15 = £10 to £14-19-11.

TABLE M.

MARGIN BETWEEN TOTAL ADJUSTED+ COST & TOTAL RETURN
DISTRIBUTION BY NUMBER OF RECORDS

	Deficiency		Credit						Total Records
	£ per acre								
	10	5	0	5	10	15	20	25	
	- 5	- 0	-5	-10	-15	-20	-25	-30	
Vale of York	2	2	9	15	14	16	11	2	71
Helmsley	-	9	6	9	11	4	-	1	40

+ Adjusted to remove any charge for farmyard manure and its application and also allowing no manurial residues brought or carried forward.

++ £10-£15 = £10 to £14.19.11.

TABLE N.

RELATIONSHIP BETWEEN YIELDS & RETURN PER ACRE AT MARKET PRICE
DISTRIBUTION OF NUMBER OF RECORDS BY YIELD & RETURN

VALE OR YORK & HELMSLEY

		YIELD in cwts per acre						
		5-10	10-15	15-20	20-25	25-30	30-35	35-40
<u>RETURN</u> <u>IN</u> <u>£</u> <u>PER</u> <u>ACRE</u>	45-50							1
	40-45							
	35-40					2	3	
	30-35				1	8	3	
	25-30			1	15	5		
	20-25			12	27			
	15-20		3	21	1			
	10-15		7					
	5-10	1						

$r^2 = .7322$

N = 111

+ £5-£10 = £5-£9.19.11.

5-10 cwts = 5-9.99 cwts

TABLE P.

DISTRIBUTION OF YIELDS BY SIZE OF FARM

VALE OF YORK

Size of Farm (acres)	+ Yield in cwts per acre							Number of Records
	5-10	10-15	15-20	20-25	25-30	30-35	35-40	
Over 200	-	-	3	19	6	4	1	33
Under 200	1	3	10	9	10	1	-	34

Difference in distribution significant at 2% level of probability
 + 5-10 cwts = 5-9.99 cwts

TABLE Q.

INCIDENCE OF CERTAIN TREATMENTS ACCORDING TO SIZE OF FARM

VALE OF YORK

Size of Farm Group (acres)	PERCENTAGE OF RECORDED CROPS						Total Records in Group
	after GRAIN receiving Basic Fertilizer	after ROOTS Dressing	Top Dressing	RECEIVING 3 cwts or more NITRO-CHALK	Spray	Deep or Double Ploughing	
Over 200	87.5	58.8	66.7	36.4	69.7	39.4	33
Under 200	46.7	30.0	60.5	10.5	52.6	5.3	38

TABLE R.

DISTRIBUTION OF MARGINS BETWEEN TOTAL NET COSTS AND
TOTAL RETURNS BY SIZE OF FARM

VALE OF YORK

Size of Farm Group (acres)	Deficiency			Credit						Total Records in Group
	£ per acre									
	+15 -10	10 - 5	5 -0	0 -5	5 -10	10 -15	15 -20	20 -25	25 -30	
Over 200	-	1	2	4	8	10	6	2	-	33
Under 200	2	7	-	10	8	9	1	1	-	38

+ £0-5 = £0 to £4.19.11.

TABLE S.

DISTRIBUTION OF MARGINS BETWEEN TOTAL ADJUSTED COSTS⁺⁺
AND TOTAL RETURNS BY SIZE OF FARM

VALE OF YORK

Size of Farm Group (acres)	Deficiency			Credit						Total Records in Group
	£ per acre									
	+10 - 5	5 - 0	0 - 5	5 -10	10 -15	15 -20	20 -25	25 -30		
Over 200	-	-	2	8	6	8	7	2	33	
Under 200	2	2	7	7	8	8	4	-	38	

+ £0-5 = £0 to £4.19.11.

++ Adjusted to remove any charge for farmyard manure and its application and also allowing no manurial residues brought or carried forward.

Notes on Methods Used in the Calculation of Costs

Manual Labour

Work done by adult men was charged at 3s.3½d. per hour for the ploughing and sowing, at 3s.6d. for the spring work and at 3s.8d. for harvesting and subsequent work, the charge covering wages paid, insurance, allowance for absence through illness, etc.

Other labour was charged at corresponding rates and casual labour at actual rates paid.

Tractors

Tractors were charged at a variable rate according to the type of tractor and its annual use on the farm. The rate varied from 3s.2d. to 6s.6d. for wheeled tractors and averaged 4s.6d. per hour. This charge includes fuel, maintenance, repairs and depreciation.

Combine Harvesters, Balers, Driers.

Depreciation was taken as 15 per cent of the written down value and to this was added the average cost of repairs over recent years and the estimated cost of fuel used. This total cost for the harvest year was divided for combines and balers by the total acreage of all crops (grain and grass) harvested by them in the year to arrive at a cost per acre; for the driers the cost was derived from the tonnage of grain dried during the season.

Residual Manurial Values

Farmyard manure was charged at £1 per ton and a third of this charge and of the cost of application was carried forward to the next crop. For potash and phosphate manures a third of the cost was credited to the following crop and for compound manures a quarter. No manurial residues were allowed for nitrogen.

General Farm Expenses

These were charged on the basis of 12/- per acre plus 8/- in the £ on direct manual labour costs.

Implement Depreciation and Repairs

For farm machinery other than specialised machinery (combines, balers, driers) a standard charge was used of 24s.0d. per acre.

Standard Appendix

The figures in this Appendix are based on 111 records, on 983 acres,
on 66 farms.

Table I. Summary of Average Costs per Acre

	Item of Cost			£.	s.	d.
	H o u r s					
	M e n	Y o u t h s	F e m a l e s			
Total Labour	26.2	0.36	.162	4.	17.	1.
Power: Tractor	8.7			1.	19.	3.
Horse	.325					6.
Machinery depreciation and repair allowance				1.	13.	6.
Contract Services				1.	6.	3.
Other Fuel					2.	8.
Materials: Seed				3.	3.	0.
Fertilisers and Manures applied				5.	11.	4.
Sundries					19.	4.
Rent:				1.	16.	4.
Transport and marketing costs					1.	9.
Total Direct Costs				21.	11.	0.
plus Share of General Farm Expenses				2.	13.	9.
				24.	4.	9.
adjustment for Residual Manurial Values				+ 2.	4.	3.
Gross Cost				26.	9.	0.

Table 2. Summary of Average Yields & Receipts

	Quantity per Acre	Receipts per Cwt
	cwts.	s. d.
Grain sold	21.41	22. 0.
Deficiency Payment Receipts		7. 10.

TABLE 3. Summary of Average Quantities of Materials
per Acre

M a t e r i a l		Overall Average per acre	
			cwts.
Seed: purchased			1.7
<u>Fertilisers and Manures:</u>	<u>Area Dressed only</u>		
	<u>Acres</u>	<u>Cwts.per acre</u>	
F.Y.M.	160½	134.8 188.0	3.3 42.0
Line	-	-	-
Artificials: straights:			
nitrogenous	628¾	2.0	1.2
potassic	-	-	-
phosphatic	116¾	8.2	.74
compounds	515½	2.9	1.44
Yield of Grain: head corn			21.4 cwts

