ECONOMIC ASPECTS OF CO-OPERATIVE GRAIN DRYING, STORAGE AND MARKETING

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ECONOMIC ASPECTS OF CO-OPERATIVE GRAIN DRYING, STORAGE AND MARKETING

WITH SPECIAL REFERENCE TO NORTHUMBERLAND

B. H. DAVEY and G. ROSS

A report of a study undertaken on behalf of
the West Cumberland Farmers Trading Society Limited
and made possible by a grant from the Agricultural
Market Development Executive Committee

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FOREWORD

This Report is based on a study of the desirability, feasibility and commercial viability of co-operative arrangements for the handling and marketing of grain, with special reference to Northumberland. In this investigation the relevant merits of on-farm drying and storage were compared with centralised drying and storage. Consideration has also been given to the factors affecting possible locations of centralised facilities in relation to the main cereal growing areas in the county and outlets for grain.

The investigation was undertaken on behalf of the West Cumberland Farmers' Trading Society Limited by the Agricultural Adjustment Unit of this University, and was made possible by financial assistance from the Agricultural Market Development Executive Committee. Under the terms of this grant a summary of the report is available from West Cumberland Farmers. Because of the wide current interest in the subject, however, a decision was taken to publish the full report.

The Agricultural Adjustment Unit would like to thank West Cumberland Farmers for providing the opportunity to undertake the investigation, and A.M.D.E.C. for its financial support. The Agricultural Adjustment Unit also wishes to acknowledge the generous assistance which was afforded by the many people, representing a wide range of interests within the field of grain production, marketing and utilisation, who rendered assistance during the course of investigation.

April 1968

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I. SUMMARY AND CONCLUSIONS

1. The Agricultural Adjustment Unit has carried out an investigation into the desirability, feasibility and commercial viability of organising co-operative grain marketing facilities in Northumberland.

The Pattern of Wheat and Barley Production in Northumberland

2. There have been considerable increases in the cereal acreage over the past 10 years with a major expansion in barley, a lesser increase in wheat and some contraction of acreage in the case of oats and mixed corn.

3. It is likely that there will be further expansion over the next 5 years to, say, 200,000 acres by 1970/71, giving a production of around 350,000 tons compared with 231,000 tons in 1966/67.

4. The wheat and barley acreage is located mainly in the eastern half of the county, with the main concentrations being to the north of Alnwick (55,000 acres), and in the coastal area north of the Tyne (21,000 acres). There are lesser concentrations between Morpeth and Alnwick (13,000 acres), west and south of Morpeth (9,000 acres) and along the Tyne Valley as far as Chollerton.

Adequacy of Existing Grain Drying and Storage Facilities

5. The adequacy of existing facilities on farms is of obvious importance in assessing the scope and need for centralised grain drying and storage facilities. Existing statistics regarding such on-farm facilities suggest that they may be adequate for current levels of grain production in the county. The results of the field survey carried out as part of the investigation tended to confirm this conclusion.

Trade in Wheat and Barley in Northumberland

6. Virtually all the wheat produced is sold off farms, whereas about 20 per cent of the barley and up to 60 per cent of the oats are retained on farms. Almost all the grain sold is handled by merchants.

7. The main outlets for Northumberland grain are the millers and compounders in Newcastle, Glasgow, Leith and as far south as Yorkshire. There has been a growing traffic by sea, mainly from Amble, Berwick and Blyth. Inter-farm sales are a relatively minor outlet.

8. The impact of transport costs is important and it seems that except under the most favourable circumstances additional transport costs of several shillings per ton are likely to be involved with central drying and storage.

9. No evidence was found to confirm the existence of general price premiums for large parcels of grain, but there are some marketing advantages in offering large lots, e.g. an ability to control quality.

10. Future marketing prospects have been examined, in particular the uncertain future of the barley export trade and the possibility of greater local offtake of Northumberland grain by processors and livestock farmers.

Grain Drying and Storage Systems

11. An analysis of alternative grain drying and storage systems has been undertaken to identify and assess any economies of scale in the different systems with respect to both capital and operating costs.

12. It appears that with floor drying and storage there are no economies of scale to be obtained above a capacity of some 500 tons. The scope for achieving scale economies is somewhat greater for continuous drying and floor storage, but most of the economies have been achieved at about 2,000 tons capacity. With continuous drying and bin storage most of the economies of scale have been achieved at a capacity of 3,000 tons. In both cases the costs per ton remain more or less constant above these capacities.

13. The advantages to a farmer in joining a grain drying and storage syndicate depends on the scale of his operations. At tonnages of less than 250 the savings in both capital investment and operating costs might be considerable, particularly on farms where there is little scope for adapting existing buildings into a floor store. Above 250 tons the cost savings in joining a syndicate are rather smaller and may be more than offset by other costs such as land charges and extra transport costs. In addition, central storage could interfere with harvesting operations.

Farmer Reaction

14. Seven of the 43 farmers interviewed in the field survey showed interest in joining a grain drying and storage syndicate. A higher proportion of farmers, however, showed interest in collective grain marketing arrangements. Thirty-two farmers said they would be willing to enter into a contract to market grain through a central organisation.

Conclusions

15. The provision of co-operatively-owned grain drying and storage facilities on any significant scale in Northumberland would not seem to be justified at the present time.

16. A stronger general case exists for co-operative action to improve and encourage the more orderly marketing of grain since an expansion in grain production over the next few years is likely to increase the pressure on outlets. Farmer reaction to a cereal marketing organisation for Northumberland, as revealed by the farm survey, was favourable.

II. INTRODUCTION

In recent years, farmers throughout the country have shown considerable interest in the possibility of co-operative action to improve the drying, storage and marketing of their grain. About 40 grain drying and storage syndicates have been established in England and Wales. Also, a number of co-operative grain marketing organisations have been formed to sell grain on behalf of their members, probably the best known of these marketing groups being East Kent Cereal Growers Limited. Agricultural Central Trading Limited (A.C.T.) have recently provided a grain marketing service for A.C.T. members.

In July 1967, following recommendations from its Eastern Area Advisory Committee, the West Cumberland Farmers' Trading Society Limited (W.C.F.) asked the Agricultural Adjustment Unit at the University of Newcastle upon Tyne to undertake a study on the provision of co-operative grain drying, storage and marketing facilities in Northumberland with the aid of an A.M.D.E.C. grant.

Terms of Reference

The terms of reference for the study were:

'to investigate the desirability, feasibility and commercial viability of organising co-operative grain marketing facilities in Northumberland.'

Specifically, the investigation was to provide information on the advantages of centralised facilities, supported by contracted farmer members of W.C.F. in respect of feeding barley and milling wheat. It was to include such matters as the following:

(a) The merits of on-farm drying and central storage facilities, compared with,
(b) Central drying and storage facilities combined.
(c) A farm survey to ascertain the demand for such facilities.
(d) Examination of the desirability of the central facilities being located at a port or in relation to the geographical distribution of the interested farmers.
(e) The most desirable location for such a unit if proximity to farms is considered most economical.
(f) The preparation of a broad financial budget for such a unit.
(g) Recommendations as to the storage system to be adopted.

The Unit was asked as part of the study to review the currently available literature on syndicate schemes which have already been established to undertake grain storage and drying.

Method of Investigation

The marketing of grain in the narrow sense of matching supplies with outlets and the economics of particular methods are, of course, distinct from the ancillary questions of storing and drying grain, but this report deals with the former, i.e. marketing methods, only in so far as a study of the present pattern of marketing in Northumberland is relevant to the question of the desirability of alternative forms of drying and/or storage.

It was considered that some analysis of recent trends in the production of wheat and barley in Northumberland, with emphasis on location and size of enterprise, as well as probable developments in the future was necessary to place any comments on alternative methods of storage and drying in a realistic framework.

One question of obvious importance in considering the justification for investment in additional facilities is the adequacy of existing plant, including that on farms and, in order to obtain information on this point, as well as farmers' views as to the type of facilities they consider most suitable, a sample survey of approximately 40 farmers was carried out.

Information was obtained from people within the grain trade and from other expert sources on the technical and economic aspects of alternative methods of storing and drying grain, taking into account the capital and operating costs of plants of various sizes and such related topics as transport costs, having regard to the location of central facilities in respect of where the grain would be produced and the probable market outlets.

In comparison with these costs of drying and storage, some data have been presented on seasonal prices for grain in Northumberland, on the Home Grown Cereals Authority's Bonus Schemes and on the storage premiums included in the Cereal Deficiency Payments Scheme. The relevance of these grain price bonus payments to the subject under study is obvious as it is from these receipts that the grower expects to recoup the costs of drying and storing his grain.

Some consideration has been given in an Appendix to the legal and organisational aspects of establishing co-operative grain storage, drying and marketing facilities. Finally some conclusions have been drawn on the need at present for such facilities in Northumberland.

It needs to be recognised that the analysis, particularly that relating to marketing and transport, has been carried out on the basis of the existing institutional framework, within which grain producers and consumers operate.

III. THE PATTERN OF WHEAT AND BARLEY PRODUCTION IN NORTHUMBERLAND

This section reviews current trends in the acreages, yields and production of wheat and barley in Northumberland and indicates the location, intensity and size structure of production in the county. These data have been supplemented in Appendix II by information on the distribution of wheat and barley acreages by types of farming and size of business and by crop size groups in the Northern Region as this information is not available on a county basis. Some predictions of future production possibilities have been made.

Production of Wheat and Barley

Total production of cereals in Northumberland in 1966/67 was 231.4 thousand tons. Of this, wheat accounted for less than 30,000 tons; barley was the predominant cereal with production at 171.9 thousand tons, which as Table 1 shows, represented an increase of 36 per cent over the previous three years.

TABLE 1

Production of Cereals in Northumberland ('000 tons)

	1964/65	1965/66	1966/67
Wheat	30.1	39.3	28.0
Barley	126.4	136.1	171.9
Oats and Mixed Corn	37.1	30.5	31.5
Total Cereals	193.6	205.9	231.4

Source: M.A.F.F.

The growth of cereal production in Northumberland over the past decade has been due to an expansion in the total acreage of cereals (see Table 3) and to improvements in average yields. The increase in the yield of cereals over the last 10 years is shown in Table 2.

TABLE 2

Average Yield of Cereals in Northumberland

(Cwts. per acre)

Crop	1954/56	1964/66	% Change
Wheat	26.1	34.5	+ 32
Barley	28.3	31.1	+ 10
Oats	25.3	28.7	+ 13

Source: M.A.F.F.

Trends in Acreages

The trends in cereal acreages in the county over the last 10 years have been similar to those in the country as a whole. Between 1956 and 1967 the cereal acreage in Northumberland increased by over 60 per cent. This expansion was due primarily to the greater relative profitability of cereal production compared with beef and sheep and the improved varieties which have enabled substitution to take place, e.g. barley for forage crops and oats. Cereals have, as a consequence, become more frequent in the arable rotation. The increase in acreage has led, in turn, to investment in more machinery for handling the larger crops and to a dramatic increase in the provision of drying, handling and storage facilities. Since 1958 there has been an increase in the cereals acreage each year, latterly at the rate of approximately 10 per cent per annum.

Within this overall expansion in the cereal acreage, an expansion in barley and a contraction in oats and mixed corn has taken place. The barley acreage more than doubled between 1962 and 1967, with a three-fold increase over the period 1956/1967. The oats and mixed corn acreage declined by 54 per cent over the same period. However, the provisional results of the 1967 June Census show a recovery in the acreage of oats and mixed corn and an increase in barley of just over 2,000 acres, compared with 20,000 acres in the previous year.

TABLE 3

Acreage of Cereals in Northumberland at June

	Wheat	Barley	Oats and Mixed Corn	Total* Cereals
1956	15293	35678	46343	97372
1957	13800	40184	43681	97698
1958	13529	38194	42022	93764
1959	13256	40153	40807	94228
1960	14773	44853	39216	98879
1961	14998	49607	36451	101086
1962	18637	55235	31406	105302
1963	14480	69148	29070	112711
1964	17379	79005	25569	121966
1965	22831	89560	22237	134628
1966	16208	110900	21311	148419
1967 (prov.)	20600	113100	24300	158000

*Includes a small acreage of rye (1956/1964)
Source: Agricultural Statistics.

There has been some tendency for the 'normal' acreage of wheat to increase, but the year-to-year pattern is variable. September is the main harvest month in Northumberland and the acreage of winter wheat—very little spring wheat is

grown—is limited by the short period between the harvesting of one crop and the sowing of the next; the weather during this period is the critical factor determining the wheat acreage. Hitherto, pests and diseases of cereals have not been a serious problem in the county. But with greater intensity of production, more attention is now being given to both preventative and remedial measures.

Table 3 illustrates the development of cereal acreages in Northumberland over the last 10 years.

Future Developments in Acreages and Production

There are several reasons why the acreage of cereals in Northumberland will probably continue to expand over the next five or ten years. First, cereal production remains one of the most profitable of farming enterprises. The area of cereals will therefore tend to increase as farmers strive, through intensification, to maintain their incomes in the face of rising costs and relatively stable (or declining) product prices. Secondly, one particular factor encouraging this intensification of farming systems is the rise in land values and rents. As farms change hands, those farmers who are operating at current land values will be forced to farm more intensively and this will almost certainly involve an expansion in cereals. Assuming the continuation of present trends the total acreage of cereals in Northumberland could exceed 200,000 acres by 1970/71, i.e. an increase of about 50,000 acres.

That there is plenty of scope for this expansion to take place is illustrated by the current intensity of wheat and barley production in Northumberland. Even in the major cereal growing areas, wheat and barley rarely accounts for more than 40 per cent of the crops and grass area, although the intensity of production may be much higher on individual farms.

In the longer run, a further factor encouraging an increase in cereals is the possibility of British entry into the E.E.C. The incentive of higher grain prices in the Common Market would lead to a substantial increase in the cereal acreage in the U.K. and there is no reason to expect that the response of Northumberland farmers to this incentive would be any different from those in other areas of the country.

The increase in cereal production is likely to take place both on farms where at present cereal growing is an important enterprise and where both the cereal acreage and the frequency of cereals in the rotation are likely to be increased, and also on holdings traditionally farmed with livestock, e.g. in the river valleys. It should be noted that such expansion, because of more intensified stocking rates, may not lead to a decrease in livestock numbers. It is not envisaged that there will be an extension of cereal growing to upland areas which are, basically, unsuited to such production.

Although it seems reasonably certain that a further expansion in the acreage of cereals in Northumberland can be expected, it is by no means so certain that current trends in the acreages of the individual crops will continue, at least at the same rate. First, the changes made at the 1967 Annual Review, and those to be made at the 1968 Review, in the relative prices of wheat and barley could encourage an expansion in the wheat acreage and a slackening in the rate of increase in the barley acreage. Secondly, it is quite possible that an increase could take place in the

acreage of oats, providing the problem of finding a profitable outlet for the crop can be overcome. The provisional 1967 June returns for Northumberland show a 3,000-acre increase in the area under oats and mixed corn; this comes after a steady decline in the oats and mixed corn acreage since the end of the war. Any resurgence of oats, following the introduction, for instance, of new higher-yielding varieties, or as a break from wheat and barley, could have important implications for Northumberland, for its suitability for this crop was indicated by the fact that it was only in 1959 that the acreage of barley in the county first exceeded the acreage of oats, compared with 1951 for England and Wales as a whole.

It seems that large improvements in average yields of cereals cannot be expected in the future. Any improvements in yields will be dependent on (a) the development of new varieties and better methods of pest, disease and weed control, (b) the acceptance of the new technology by farmers, and (c) improved cultural standards. Over the next ten years, however, it is difficult to see average yields improving by more than ten to fifteen per cent. On the basis of such yield improvements and the expansion in acreage that has been envisaged, the total production of cereals in Northumberland could reach 350,000 tons by 1970/71 compared with 230,000 tons in 1966/67.

Any major expansion in cereal production could well necessitate the provision of additional grain drying and storage facilities. Once existing capacity on farms is fully utilised, farmers will be faced with the choice of providing the extra facilities themselves, or finding alternative facilities off the farm. In this situation, a grain drying and storage syndicate might, in appropriate cases, fill a gap in requirements.

Location, Intensity and Size Structure of Cereal Production

Northumberland can be divided, roughly, into two parts. In the west is the hill area where the emphasis is on livestock rearing. The tillage land is confined mainly to the coastal plain in the east and along the river valleys. It is in these areas that the major part of the county's cereal production is grown.

The Ministry of Agriculture's structural statistics are not available on a county basis, but it is possible to derive some useful information on the location, intensity and size structure of wheat and barley production in Northumberland from the parish agricultural statistics. Accordingly, an analysis of the parish statistics for June 1966 was carried out to determine:

(1) the location of wheat and barley in the county;

(2) the intensity of wheat and barley production, i.e. the wheat and barley acreage as a percentage of the total crops and grass acreage in each parish;

(3) the size structure of wheat and barley production, i.e. the average wheat and barley acreage per holding in each parish. This analysis has several weaknesses. In particular, its usefulness is limited because it relates to all holdings and not the holdings with wheat and barley; in this way the average size of enterprise is understated. Also, the analysis provides no information on the distribution of the wheat and barley acreage as between different crop size groups, or between different types and sizes of farm. Nevertheless, the analysis does illustrate the relative importance of wheat and barley in different parts of the county.

The results of this analysis are presented in map form in Appendix I. The maps are supplemented in Appendix II by structural data for the Ministry of Agriculture's Northern Region.

(1) Location (Map 1)

The wheat and barley acreage of Northumberland is located mainly in the eastern half of the county. The main concentrations are (a) north of Alnwick, (55,000 acres) especially along the coastal strip and on Tweedside and (b) in the area bounded by the Tyne in the south, the A1 in the west and by a line from Morpeth through Ashington to the coast in the north (21,000 acres). In this latter area, however, a considerable proportion of the crop is grown on land in or near the urban complex and some of it is certainly being cropped continuously with barley prior to development. There are lesser concentrations of wheat and barley along the coast between Morpeth and Alnwick (13,000 acres), west and south west of Morpeth (9,000 acres) and along the Tyne Valley as far as Chollerton (12,000 acres). Over half the wheat crop is located in the major growing area north of Alnwick.

(2) Intensity (Map 2)

The most intensive wheat and barley growing areas are Tweedside and the extreme south-east corner of the county. In these two small areas, wheat and barley together account for over 40 per cent of the total crops and grass area. By the standards of southern and eastern England, where the figure often exceeds 60 per cent, this does not seem particularly intensive; on the other hand, at least, Northumberland has not yet suffered from disease problems to the same extent as some other parts of the country.

The areas falling within the range of 31 to 40 per cent are mainly centred on Blyth, Bedlington and Ashington in the south and between Alnwick and Berwick in the north. In all these areas wheat and barley production is of major importance in the farm economy, most of the grain being sold off the farm. In the rest of the county, however, wheat and barley rarely account for more than 30 per cent of the crops and grass acreage and cereal production is a less important component of the farming in these areas, often being subsidiary to dairying and livestock production. In these areas, a higher proportion of the grain is retained for on-farm use, particularly as feed.

(3) Size Structure (Map 3)

A similar pattern emerges from an analysis of the average wheat and barley acreage per holding. In the north, there is frequently more than 100 acres of wheat and barley per holding on average. In the rest of the county, except for the area around Alnwick and that between Newcastle, Morpeth and the coast, the acreage per holding is usually under 50.

From the foregoing it is clear that the North of the county with about 40 per cent of the acreage, a relatively intensive level of production and large production units, is the main wheat and barley growing area. In the rest of Northumberland, except for the extreme south-east, where special circumstances may exist, wheat and barley are relatively less important, since they are grown in much smaller units often as an adjunct to livestock production.

Existing Drying and Storage Capacity

An assessment of the existing grain drying and storage capacity on farms in Northumberland is bound to be somewhat speculative, since the Ministry of Agriculture statistics, which are based on replies to questions on drying equipment in the regular machinery census, give no indication of drying or storage capacity. The latest information for Northumberland is given in the following table.

TABLE 4

Drying Machinery in Northumberland: Estimated Numbers Owned by Occupiers of Agricultural Holdings and Agricultural Contractors, September 1966

Barn-hay driers and multi-purpose crop driers	40
Grain driers: Continuous grain flow	330
Tray, platform (in sack) or other batch type	190
Floor drying installations (not storage only)	80
Transportable multi-purpose drying units:	
Wheeled engine driven fans	50
Mobile tractor fans	60

Source: M.A.F.F.

It is not unreasonable to assume, however, that farmers who grow, say, more than 40-50 acres of cereals have equipped themselves with drying facilities of some sort in view of the lateness of the harvest in the North of England. This view is reinforced by the results of the Farm Management Survey which includes some 40 grain producers located in the southern half of the county. Twenty-six of these farms had grain driers; of these, 18 grew more than 100 acres of cereals, only one less than 50 acres. On the other hand, practically all of the farms without grain driers had less than 50 acres of cereals. At first sight this suggests that the greatest demand for off-farm grain-drying facilities may exist not in the major cereal areas, but in those areas where wheat and barley are grown in small lots as supplementary enterprises to livestock production. If this is true, then central facilities should be located in the south of the county, where small acreages predominate, rather than in the major growing areas in the North. However, these small growers, who probably retain most of their grain for livestock feed, may find it equally suitable to store their grain wet in bags; this is a very cheap and economical way of obtaining storage capacity.

So far as storage facilities are concerned, it is possible to make a rough estimate of existing capacity from Farm Improvement Scheme data. Over the period 1958/1966, some 1,000 grain and fodder storage plants were grant-aided under the F.I.S. in Northumberland; the grant paid totalled £365,000. All but a handful of these schemes were for grain storage. Thus, as the grant normally represents one-third of the cost, over the last eight years about £1,100,000 has been invested in grain storage facilities; this should have provided at least 100,000 tons of grain storage capacity. In addition, there is considerable capacity on farms for storage of grain in sacks, e.g. in lofts and barns which probably accounts for at least as much again as the new equipment.

On this basis there would appear to be adequate storage capacity for handling the present grain crop, especially when sales off the combine are taken into account. On large farms particularly, the lack of adequate storage has not been a critical factor in determining the pattern of cereal production. Generally speaking, storage capacity has expanded to keep pace with the growth of the cereal acreage. That storage capacity tends to be adequate in general and generous on some farms is indicated by the reluctance of many farmers to sell grain early in the season; although some considerable tonnages of grain are sold immediately post-harvest this is mainly to raise cash, e.g. to meet the autumn rent payment. If further expansion of the cereals acreage occurs, the present drying and storage capacity in the county could eventually be inadequate.

Further evidence on the adequacy of existing grain drying and storage facilities on farms is given in Section VI, which reports the results of the farm survey.

IV. TRADE IN WHEAT AND BARLEY IN NORTHUMBERLAND

There are no accurate and comprehensive figures available to show the utilization pattern of grain produced in Northumberland. However, a rough approximation can be made by combining information from a variety of sources, including University survey data and enquiries in the trade, and by applying national indicators where this appears to be appropriate. The results of this analysis for 1966/67 are given in Table 5 below. While the approximations involved are recognised, the figures provide a useful basis for discussion of the local cereal trade.

TABLE 5

Production and Utilization of Grain in Northumberland in 1966/67

	'000 tons			
	Wheat	Barley	Oats	Total Cereals
Production	28	172	32	232
Retained on farm[1]	–	34	20	54
Sales off farm:				
Human and Industrial Use[2]	11	25	1	37
Moved by sea[3]	–	40	–	40
Farm-to-farm sales[4]	–	14	10	24
Compounders[4]	17	59	1	77
Total Sales	28	138	12	178

Sources: (1) Derived from Farm Management Survey data.
(2) Based on utilization pattern for U.K.
(3) Based on information obtained from merchants, harbour authorities, etc.
(4) Based on information obtained from merchants and compounders.

In view of the system of deficiency payments for wheat, it is not surprising that wheat is virtually all sold off the farm, whereas approximately 20 per cent of the barley and as much as 60 per cent of the oats are retained on farms. Almost all of the grain which is sold is handled by merchants, of whom there are at least 25 major firms operating in the county.

The main outlets for wheat are the compounders and millers in Newcastle, Glasgow, Leith and with some going as far south as Yorkshire. Barley also moves through these channels, but there are additional outlets in that inter-farm trade may account for more than 10 per cent of sales and, more importantly there has been a growing traffic by sea for both domestic and export sales—mainly from Amble, Berwick,

Newcastle and Blyth. Whatever the outlet, however, it is inevitable that with a low value commodity like grain, transport costs will be a major factor influencing the distribution system. (Transport costs are examined in some detail later in this section).

Millers, Compounders and Merchants

The miller/compounder is virtually the sole final purchaser of wheat and also takes up a considerable proportion of the barley crop. With few exceptions, the miller buys his requirements through country merchants, rather than directly from farmers. This situation has altered somewhat in recent years, in that many of the merchants have been absorbed into the milling and compounding firms. Two major factors probably affect compounders' decisions to use merchants. Firstly, the compounder is anxious to preserve the number of retail outlets for his product and is, therefore, reluctant to antagonise the merchant by attempting to by-pass him. Secondly, the use of the merchant's services affords material economies in transport costs from the joint operation of delivering grain in bulk and using the returning vehicle for carrying supplies of compounds for the retail trade.

Normally the merchant will receive from the compounder a quotation for grain on the basis of a sample. He will then adjust this quotation for transport and other costs to arrive at his offer to the farmer, when the usual haggling process may begin. It is difficult to obtain reliable information on merchants' profit margins, but it has been suggested that, whereas some years ago a margin of 25/- per ton (net of transport costs) was not unheard of, current margins are around 10/- per ton, with some deals on an even lower basis. The same order of magnitude is said to apply to sea traffic in grain, so that when port charges, transport costs and merchants' profit (of 10/-) are deducted from an f.o.b. price of £20 per ton of barley, the resultant price to the farmer would be about £18. Clearly, there is little room for error on the part of the merchant as to the costs he will incur if he is to make a profit.

It is sometimes suggested that with grain, as with other products, the offering of large consignments of a standard quality may command a price premium. No evidence was found to support this assertion with respect to the cereals trade in Northumberland. In fact, in the case of barley, it was found that small lots sometimes command higher prices than large, because they could be placed relatively easily and with a minimum of handling and transport costs. In the case of wheat, several buyers pointed out that the supplier of large quantities may have to accept marginally lower prices, because of the difficulties which such a transaction imposes on the purchaser. In general, therefore, it appears difficult to substantiate for the local trade the existence of price premiums for the large seller of grain, although a premium may be paid in a few special cases, for example where the farm is equipped with particularly good loading facilities or to complete an export cargo. The advantage of being able to offer large parcels of grain to buyers seems to lie more in the ability to maintain an outlet in the face of increasing production, e.g. through offering grain of a known and consistent quality, than in any price advantage which may be obtained. Current practice may also be influenced by experience with regard to quality factors in that the larger consignment may, at present,

represent a magnification of the risk to buyers of large lots arising from lack of homogeneity, quality and cleanliness of the grain.

The Shipment of Grain by Sea

Until recent years most of the cereal exports from the U.K. were malting barley, with tonnages up to 350,000 tons per annum being exported in the period 1954/1965. The export of feeding barley is a relatively new trade and one which shows a wide fluctuation from year to year. In 1966/67 total barley exports were some 1.1 million tons, but present indications are that exports in the current year may be only about two-thirds of this. The main markets for British barley have been in Germany, Denmark, Spain, Italy and to a lesser extent other Mediterranean countries such as Algeria and Israel. There is also some coastal traffic in grain around the British Isles, for example from Northumberland to Northern Ireland and Eire.

In looking at the future prospects for grain exports it must be recognised that production is expanding in E.E.C. countries, so that not only may the import requirement of countries like Germany and Italy be reduced, but competition may increase in other export markets. The major uncertainty, however, is the situation in the U.S.S.R. and China. Given a period of favourable harvests and more effective measures to increase production in the U.S.S.R. and China, the buoyancy of the barley export trade could be substantially reduced.

Under these conditions there may be a build up of carry-over stocks in Britain in 'normal' years, these being sold off in the 'short' years. It is quite possible that the 1967/68 year may see the beginning of such carry-over stocks. If these expectations are justified, it would be prudent not to rely too heavily on continuing and expanding exports of feeding barley as a basis for any co-operative venture in grain marketing—although such prudence would not prevent taking advantage of the opportunities which may arise both for exports and coastal traffic.

In view of the way in which British grain production and marketing has been developing in the postwar period, it is not surprising to find substantial changes taking place in trading arrangements. Those merchants who have for many years dealt in malting barley, with facilities in ports such as Boston (Lincs.), Felixstowe and Colchester, are expanding rapidly. Normally these merchants operate through the London grain brokers (paying 1¾ per cent commission). In addition the international grain shipping agencies have not only been prepared to move into the business of exporting grain from the U.K., but are also moving into the domestic grain trade, on occasion buying up country merchants for this purpose. There have also been moves by merchants and co-operatives to establish direct contacts abroad, including the Eurograin organisation to which W.C.F. belongs, bypassing brokers and shippers. However, with a fluctuating market situation, such links are not easy to develop and to maintain on a profitable basis. Finally, there is the normal grain brokerage trade, operating on a world-wide basis, which has access to good market intelligence and close contact with shipping facilities. There is a range of marketing channels, therefore, into which grain for shipment by sea can be directed—the main consideration determining the channel used is transport costs, which in this case

include distance of run to port, port handling facilities, shipping size and charges and final market.

In this context it is useful to examine the port facilities which are conveniently located for Northumberland grain producers; in practice this means those at Berwick, Amble, Blyth and Newcastle. Tables 6 and 7 (based on information collected during this investigation) show the facilities which exist at these four ports and the trade which has flowed through them in the past five years.

TABLE 6

Shipments of Barley from Northumberland Ports 1963/1967 (tons)

Port	1963	1964	1965	1966	1967 Estimate
Amble	–	–	–	4000	7000
Berwick	2749	3082	12163	21700 (9 months)	–
Blyth	–	–	3573	17274	40000
Newcastle*					

*Information for Newcastle not readily available.

TABLE 7

Port Facilities in Northumberland

	Loading by conveyor from road vehicles	Rail	Storage	Land available on dock side	Ship Size (tons)
Amble	Yes	Yes	None	Yes	1300
Berwick	Yes	No	None	No	900
Blyth	Yes & chutes	Yes	None	Yes	10000
Newcastle	*	Yes	Private silos of millers	Yes	10000

*Information for Newcastle not readily available.

The cost of port facilities is, of course, important. It may be noted that an international firm of grain brokers has recently decided to erect a drier and silos at Blyth with an initial capacity of 2,500 tons, leasing land from the harbour authority. Further land is available at Blyth, possibly at a rent of 10/- per square yard per annum, and land may also be available at Amble. On the other hand, a proposal to erect two 750-ton silos on the Corporation Quay at Newcastle was abandoned because the estimated rent on a 15-year lease would have been £5,375 per annum.

It will be seen that facilities are available or could be developed at local Northumberland ports. However, it must be noted that at all local ports the handling methods are subject to weather risks and this, coupled with uncertainty concerning the exact arrival times of ships, may lead to a high level of costs. In addition, small parcels arriving by road may occasion extra costs as a consequence of slow loading. Moreover, the smaller ports (Berwick and Amble) cannot accommodate the larger ships which may be increasingly used for the more distant consignments.

It would, of course, be possible to locate a drying and storage plant at a port, even though the shipping side of the business were a minor consideration. This would not make very good business sense, however, under current conditions including land values in the port areas, a point which is given emphasis by the fact that some merchants have already established storage depots away from the ports because of the higher costs of port-side operation.

To sum up, it seems that, although individual profitable opportunities may occur, it would be unwise for a marketing group to rely too heavily on sea traffic. Furthermore, the present high costs of port facilities would suggest that any facilities might more economically be located outside the port area—although within easy trucking distance (15 miles)—if sea transport is to be a major part of the enterprise, in order to economise on transport costs. Such an organisation as this, however, would be saddled with the costs of double-handling the grain into the store from the farm and out again to the final outlet. This suggests that an examination of ways and means of obtaining lower rentals for land on which port facilities could be located may be desirable in the interests of overall efficiency in the grain trade.

Transport Costs

Table 8 illustrates the level of road transport costs involved in moving grain.

TABLE 8

Standard operating costs for 12 ton lorry

Miles per Week	Cost in Pence per Mile	Suggested Minimum Charge Pence per mile*
400	31.47	44.06
600	25.30	35.42
800	22.27	31.18
1000	20.59	28.83
1200	19.47	27.26

*To allow for idle time, empty running, profit, etc.
Source: Commercial Motor, 1966. Details of Operating Costs.

On this basis, the cost of a round trip of forty miles, i.e. 20 miles out loaded and 20 back empty, which could be regarded as relatively short, would be charged (on

the 600 mile-per-week basis) at 10/- per ton. In practice, merchants do not appear to follow exact formulae when quoting grain prices to farmers, but make deductions based on averaging to take account of idle time, return load possibilities, and similar factors. It is thought that the local minimum transport cost is around 10/- per ton for distances of up to 15 miles, rising to 17/6 per ton for a distance of 30 miles. Over short distances particularly, the loading of grain onto and off the vehicle represents a substantial proportion of total transport costs. No evidence could be found of farmers obtaining premiums for items such as good loading facilties, though this may be reflected in the overall bargain struck.

The dominance of transport costs affects the marketing pattern to a marked extent. Thus barley for transport by sea is, as far as possible, purchased from farms close to ports; grain for milling and compounding moves to the nearest mills. However, the 'return-load' potential open to the compounder may extend the distance over which he can compete for grain.

In Section V, the capital and operating costs of a centrally organised drier and storage unit are considered. In addition to these costs, it is clear—in view of the preceding paragraphs—that the transport costs incurred by farmers using such facilities will have considerable relevance. In fact any economies for the farmer from the use of central facilities may be offset by increasing transport costs. These costs will be influenced by the position of the central facilities in relation to the farms they service and to the market outlet. The type of transport employed will also be important.

If the central store were situated in the middle of the area which it was to serve and if the final outlets for the grain were outside this area, movement of grain from farms to the store would in some cases add value but, equally in other cases, grain would be moving away from the final outlet. If the store were situated between the producing area and the final outlet it might be thought that all the grain would acquire value by being moved nearer to this outlet. However, for this added value to be significant the distances would have to be considerable in view of the possible incidence of double handling charges, idle time, etc.

Were farmers to use the same transport facilities as before establishment of the central store, there might be some saving in cost, since only the variable costs would need to be considered. Against this, however, there could be a risk of disrupting harvesting if the distance to store was greater than three of four miles. If existing transport facilities were inadequate or unsuitable, the alternatives would appear to be the purchase of new vehicles or the hiring of transport. The latter could be more economical in view of the low total mileage likely to be involved.

Wherever the central facilities are located and whatever the transport employed, the cost of moving wet grain is likely to be 7 to 10 per cent higher than the cost of moving the same grain with the moisture removed.

Clearly the impact of transport costs can only be decided accurately by investigation of any particular situation. However, even with fairly favourable circumstances, the use of central drying and storing facilities is likely to lead to additional transport costs of several shillings per ton.

Future Marketing Prospects

It has already been noted that possibilities for exports abroad are likely to be variable, although this is not to deny the scope for movement of grain by sea from Northumberland to other parts of the U.K. and Eire. On the other hand, with expansion of grain production in the U.K. generally there may be less inter-county trade. Trade from Northumberland to the western counties of Northern England is already contracting as these counties increase their own production. Any considerations about the future must, therefore, look at possible developments within the county.

The first set of possibilities concerns the greater utilisation of local products in the processing industries. Tyneside millers use approximately 30,000 tons of local wheat a year, which usually lasts until January. Even allowing for some variation in quantity from year to year it is likely that millers could double their usage of local wheat, particularly if the 'harder' varieties like Maris Widgeon were available. The wheat acreage is, however, limited by seasonal weather conditions, and also by rotational requirements. On this latter point, the development of a better market for oats would permit the oat acreage to expand which in turn might allow a higher wheat acreage. Attention might therefore be given to expanding the market for oats, which may be partly a question of suitable varieties, but is mainly a matter of overcoming the lack of enthusiasm by compounders. Finally, there is the possibility of substituting more barley for maize in livestock rations. This is to a large extent a question of relative prices, but it may be relevant to note that imported maize is convenient to handle and is claimed to provide a better ration. Both the price and the quality factor might merit more positive marketing efforts than in the past.

The second set of marketing possibilities concerns increased utilisation of Northumberland grain by farmers within the county. This could be achieved in three ways: by greater farm retentions, by greater local inter-farm sales of grain and by the greater use of locally compounded feeds. Given a total demand of about 120,000 tons* of cereal feed by the livestock in Northumberland and the current level of retentions and farm-to-farm sales of about 75,000 tons (Table 5), there would seem to be considerable scope for development.

In each of the cases mentioned there would be obvious savings in transport costs by reductions both in mileage and in handling costs. Although changes in these directions would bring advantages, it must be recognised that they may call for changes in farm management, with increased emphasis on home-milling and mixing, and they will need feeding expertise on the part of any organisation undertaking local compounding. Furthermore, any such changes would stimulate a competitive response from those sectors,of the existing trade who were likely to suffer.

Seasonal Prices for Grain

Within the traditional organisation of grain marketing in Britain, the responsibility for presenting his grain for market in a condition and at a time likely to command

*This estimate of the demand for cereal feed by livestock in Northumberland was obtained by applying appropriate standards of concentrate feed requirements to the livestock populations on farms in the county at June 1967.

the most advantageous price rests with the grower. Generally, buyers have not been accustomed to carrying large stocks and the movement of grain prices throughout the year is complicated by the seasonal pattern of imports of grain. These effects, taken in conjunction with the high proportion of moisture (up to 26 per cent) common in home-grown grain, have meant that for the individual grower the holding of grain in order to find the most favourable outlets almost certainly involved drying as well as storage. Drying and storage involve costs, and the farmer has to balance these costs against expected returns. The basic necessity for some orderly flow of local grain supplies to the market during the year, as well as the cost implications for the grower, have been recognised in the Bonus and Premiums Schemes for delayed delivery which have been introduced under Government aegis.

The following table shows the monthly prices of soft milling wheat and feeding barley at Berwick for the three years 1964/65 to 1966/67. The prices are those paid to growers per ton ex-farm, for lots of not less than 5 tons (net weight excluding sacks). They are exclusive of any deficiency payments.

TABLE 9

Ex Farm Prices of Wheat and Barley at Berwick (£. S. per ton)

Month	Soft Milling Wheat			Feeding Barley		
	1964/5	1965/6	1966/7	1964/5	1965/6	1966/7
September	18.7	20.15	21.2	17.15	19.0	18.7
October	19.11	20.11	22.2	18.2	19.4	18.16
November	20.11	20.10	22.15	18.10	19.11	19.1
December	21.2	21.7	23.10	19.0	19.18	19.6
January	21.2	22.10	–	19.11	21.13	20.9
February	21.16	22.10	–	20.11	22.5	20.13
March	21.17	22.5	23.10	22.0	21.16	21.12
April	22.10	21.0	–	23.0	21.0	22.10
May	22.10	21.0	–	23.7	21.7	23.3
June	23.0	21.0	–	23.0	20.13	23.4

Source: M.A.F.F., Home-Grown Cereals Authority.

The figures illustrate the seasonal pattern of cereal prices in Northumberland. In 1964/65 and 1966/67 there was a differential of about £5 per ton in feeding barley prices between the beginning and end of the cereal season. In 1965/66 barley prices followed the normal trend until February (rising by £3 per ton), but thereafter they fell away. For milling wheat the seasonal differential appears to be rather narrower at £2 to £3 per ton.

A further incentive to encourage the storage and more orderly marketing of grain is given by the H.G.C.A. bonus scheme and the storage premiums included in the Cereal Deficiency Payments Scheme. For example, Table 10 suggests that

the total price differential for storing feed barley until March is of the order of £4 per ton. The costs of storage must, of course, be offset against this gross price differential.

TABLE 10

Estimated Price Differential from Storing Feed Barley

September spot price at Berwick 1966/67 = £18 7s. 0d. per ton.
Average U.K. forward price for March 1967 in September 1966=£20 12s. 0d.
Therefore price differential becomes:

Forward price (March) minus spot price (September)	=	£2 5s. 0d.
Plus H.G.C.A. bonus	=	10s. 0d.
Plus C.D.P. incentive(1)	=	£1 7s. 0d.
Total	=	£4 2s. 0d.

say £4 per ton.

(1)The C.D.P. incentive of 1s. 4d. per cwt. is the sum of 6d. deduction for July/October deliveries and 10d. premium for March deliveries.

V. GRAIN DRYING AND STORAGE SYSTEMS[1]

Introduction

Under Northumberland conditions due to the lateness of the harvest, most grain is harvested at a high moisture content, often in excess of 20 per cent. It is essential that the grain be dried prior to storage, and such drying must be carried out as soon as the grain is harvested. A considerable range of drying and storage systems is available including new techniques for storing damp grain either in airtight containers or by means of refrigeration. The latter methods are not suitable where grain is to be sold subsequently; for the market it is imperitive that the grain be dried adequately and at reasonably low cost.

In this section the following systems of grain drying and storage have been considered:

(a) **Floor drying and storage**
With this system the grain is stored and dried slowly in situ with cold or warm air being circulated through the grain by means of a fan and duct system under the heap of grain. Heaters are necessary to warm the circulating air when the atmospheric humidity is high.

(b) **Continuous drying and floor storage**
In this case grain is dried rapidly, prior to storage in a heap on the floor. Drying is achieved by conveying the grain through a drier where air at a relatively high temperature is circulated through it. The grain must be cooled prior to storage.

(c) **Continuous drying and bin storage**
Drying is as in (b) above but the grain is stored in specially constructed bins which require conveyor mechanisms for emptying and filling. The investigation has been largely restricted to systems of on-floor storage. But this system has been included in the analysis to provide a basis of comparison between the costs of on-floor and other systems of grain drying and storage.

In the analysis presented in this section the main object has been to identify and assess any economies of scale in the different systems, in terms of both capital investment and running costs, that may be obtainable by the individual farmer whether by installing his own plant or joining in a co-operative venture. Problems of transport and the effect of the drying and storage arrangements on the organisation of harvesting are discussed elsewhere in this report.

Detailed comparative costs of actual installations are generally unobtainable for different systems and sizes of plant. Appendix III, however, gives some general indications of capital costs, but it refers to relatively small installations. Because of the lack of information concerning actual installations, estimates based on standard data and manufacturers price lists have been made in the Tables which

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[1] The authors wish to acknowledge the assistance provided by Mr. D. J. Greig, of the Department of Agricultural Engineering, University of Newcastle upon Tyne, during the preparation of this section and also Appendices IV and V.

follow of the costs of different sizes of plant. Some of the major advantages and disadvantages of the three systems under examination have been listed in Appendix V.

It should be noted that the estimates of capital costs presented in the tables do not cover all the expenditure which would be incurred during the construction of any particular installation. For example, no allowance has been made for the costs of land or of site clearance and preparation, since this will show substantial variations from site to site and must, therefore, be considered on an individual basis. Similarly, the costs of certain items of equipment, such as conveyors, have not been included since their relationship to size of plant is normally a linear one, and has no bearing on the extent to which scale economies can be achieved. It is emphasised that the purpose of these costings is not to estimate the absolute costs involved in any one installation of a given capacity, but to determine the relationships between systems and, within each system, between different capacities of plant.

Cost Structures of Alternative Grain Drying and Storage Systems

(a) Floor Drying and Storage

(i) Capital Investment

Currently, the maximum practicable width of a drying floor is 35 feet, but with a central duct two floors can be served, i.e. 70 feet plus the width of the duct. Thus a building with a width of 75 feet will cover the duct and two drying floors. Economies of size are not very great in building construction for this type of equipment. Whilst a double floor halves the cost of the main duct, the cost of the roof and walls tends to increase in proportion to the quantity of grain handled. Fan and heating equipment is a relatively small proportion of total capital cost but some economies are possible as size increases. On the other hand, as the size of the installation increases further capitalisation may become necessary to provide covered service areas for loading and unloading.

In small installations two or three 4-inch diameter 30 ft. long augers are all the conveying equipment that is necessary, but at a size of about 300 tons it is probably worth having an auger sweep with a high output for loading and unloading.

TABLE 11

Estimates of Relative Capital Investment per Ton of Floor Drying and Storage

Capacity Tons	Building Cost £	Ducts £	Fan and Heater £	Conveyor £	Installation Costs £	Total Capital Cost £	Cost/ Ton £
100	1150	160	250	120	200	1880	18.8
250	2000	400	430	120	200	3150	12.6
500	4000	540	600	460	200	5800	11.6
750	6700	800	1000	460	300	9260	12.3

Estimates of the capital investment per ton of floor drying and storage systems are given in Table 11 for a range of plant capacities. If covered service areas are required at the side of the building, building costs will be increased by approximately £1 per ton. Thus in the case of the building with 750 tons capacity, a

covered service area has been assumed to be essential, and this accounts for the disproportionate increase in the building cost. The estimates in Table 11 do not contain any allowance for the Farm Improvement Grant and this feature should be borne in mind in making comparisons with figures in Appendix III which allow for the grant.

With existing equipment and construction techniques, the figures in Table 11 suggest that there are no economies of scale with regard to capital investment above the level of about 500 tons.

(ii) Annual Costs

The annual costs of operating a grain drying and storage plant include fuel, labour, repairs, depreciation and interest on capital. Fuel costs vary widely depending on the skill of the operator and the source of energy. For a 6 per cent extraction of moisture the range can be as wide as from 2/- to 12/- per ton with, say, an average of 6/- per ton. Labour costs are difficult to estimate except where a man is specifically employed to operate the plant. Floor systems are particularly low in their labour requirements, except for unloading.

An estimate of the annual costs per ton of floor drying and storage is given in Table 12. Interest has been charged at 7 per cent, with amortization over 10 years. Repairs have been charged at 2 per cent of initial capital costs. Labour costs have been excluded from the calculations.

TABLE 12

Annual Cost per Ton of Floor Drying and Storage (excluding labour)

Capacity Tons	Capital Cost £	Amortized 10 years @ 7% £	Repairs 2% £	Fuel per Ton £	Annual Cost/ Ton £
100	1880	267.7	38	0.3	3.35
250	3150	448.5	63	0.3	2.34
500	5800	825.9	116	0.3	2.18
750	9260	1319.6	187	0.3	2.30

Because of the method of calculation it follows that annual costs per ton shown in Table 12 (and the other Tables referring to annual costs) decline in the same manner as capital investment per ton up to a capacity of 500 tons, with no further economies apparent beyond that point.

(b) **Continuous Drying and Floor Storage**

(i) Capital Investment

The capital investment for a building for floor storage is very similar to that for a floor dryer. However, it is no longer necessary to hold the grain at an even depth with thrust walls. The grain can be allowed to find its angle of repose. The extra roof and floor for an unretained heap costs little more than the thrust walls for a

smaller building where the grain is restricted to a height of 8 feet, as is necessary for floor drying. If the grain is heaped up above a height of 8 feet in the centre, building costs will be very similar and the wider the building the greater the advantage to an unretained heap.

Estimates of the capital investment for continuous drying and floor storage for varying capacities of plant are presented in Table 13. The figures suggest that the scope for achieving scale economies is somewhat greater than for floor drying and storage, although most of the economies have been achieved at about 2,000 tons capacity. Beyond this capacity cost per ton declines only slowly.

TABLE 13

Estimates of Relative Capital Investment per ton of Continuous Drying and Floor Storage

Manufacturers capacity rating cwt/hr	Capital cost of drier (1) £	Throughput tons/hr	Hours operated per season under Northumberland conditions	Gross tonnage dried tons	Installed cost of Drier £	Installed cost per ton dried £/ton	Total cost per ton incl. £3 12s. p ton for storage (2
25	800	1.25	200	250	880	3.52	6.64
25	800	1.25	500	625	880	1.41	4.53
35	940	1.75	500	875	1034	1.18	4.30
50	1200	2.50	500	1250	1320	1.06	4.18
80	1500	4.00	500	2000	1650	0.83	3.95
120	1920	6.00	500	3000	2112	0.71	3.83
160	2450	8.00	500	4000	2695	0.68	3.80
240	3050	12.00	500	6000	3355	0.56	3.68
320	4250	16.00	500	8000	4675	0.58	3.70

(1) Based on a manufacturer's range of driers.
(2) Building costs are estimated at £3 12s. per ton for this type of building within the capacities quoted in the table.

(ii) Annual Costs

These have been calculated as for floor drying, but greater allowance has been made for fuel costs because of the greater heat required. Also, there is no reason to expect greater fuel efficiency with the larger continuous drying plants. Labour has again been excluded because of the difficulty of estimating at what stage specialised labour would be required. Estimates of the annual costs of continuous drying and floor storage have been presented in Table 14 for a range of plant sizes.

Again most of the scale economies have been achieved at a capacity of about 2,000 tons, i.e. above this level costs are more or less constant.

TABLE 14

Annual Costs of Continuous Drier and Floor Store (excluding labour)

Capacity	Capital Cost/Ton £	Amortized 10 yrs. @ 7% £	Repairs @ 2% £	Fuel £.6/Ton £	Total Annual Cost/Ton £
250	6.64	0.945	0.13	0.6	1.675
625	4.53	0.645	0.09	0.6	1.335
875	4.30	0.612	0.09	0.6	1.302
1250	4.18	0.595	0.08	0.6	1.275
2000	3.95	0.562	0.08	0.6	1.242
3000	3.83	0.545	0.08	0.6	1.225
4000	3.80	0.541	0.08	0.6	1.221
6000	3.68	0.524	0.07	0.6	1.194
8000	3.70	0.527	0.07	0.6	1.197

(c) Continuous Drying and Bin Storage

Estimates of the capital investment and annual costs of continuous drying and bin storage are given in Tables 15 and 16 for plant with capacity ranging from 250 to 5,000 tons. Here, most of the scale economies have been achieved at a capacity of 3,000 tons; at higher capacities costs per ton are roughly constant. A more detailed estimate of the capital cost of a continuous drier and storage for 2,000 and 5,000 ton capacity has been included at Appendix IV.

TABLE 15

Estimate of Relative Capital Investment per ton of Continuous Drying and Bin Storage

Capacity Tons	Drier Cost/ ton as Table 13 £	Capital Cost of Store £	Capital Cost incl. Installa- tion £	Cost/ ton Store £	Total Cost/ ton £
250	3.52	4000	4400	17.6	21.1
625	1.41	7500	8250	13.4	14.8
875	1.18	9000	9900	11.3	12.5
1250	1.06	11000	12100	9.7	10.8
2000	0.83	13400	14740	7.5	8.3
3000	0.71	19000	20900	7.0	7.7
4000	0.68	25000	27500	6.9	7.6
6000	0.56	38000	41800	6.9	7.5
8000	0.58	50000	55000	6.9	7.5

TABLE 16

Annual Costs: Continuous Drier and Bin Storage (excluding labour)

Capacity Tons	Capital Cost/ton £	Amortization 10 yrs. @ 7% £	Repairs 2% £	Fuel £.6/ton £	Total Annual Cost/ton £
250	21.1	3.004	0.42	0.6	4.024
625	14.8	2.107	0.29	0.6	2.997
875	12.5	1.78	0.25	0.6	2.630
1250	10.8	1.54	0.22	0.6	2.360
2000	8.3	1.182	0.166	0.6	1.948
3000	7.7	1.096	0.154	0.6	1.850
4000	7.6	1.082	0.152	0.6	1.834
6000	7.5	1.068	0.15	0.6	1.818
8000	7.5	1.068	0.15	0.6	1.818

Suitability of Different Systems for On and Off Farm Location

In the following paragraphs, an assessment has been made of the extent of scale economies in grain drying and storage. An estimate of the cost advantage to an individual farmer in joining a co-operative grain drying and storage venture has also been included.

(a) Capital Investment

Where small tonnages are involved, i.e. less than 200 tons, floor drying and storage has the lowest capital cost. Indeed costs could well be lower than those indicated in Table 11, since on many farms existing buildings may often be suitable for adaptation into a floor store. Costs fall rapidly, however, for continuous drying and for both forms of storage as size increases. As was noted above, most of the economies are achieved at a capacity of 3,000 tons for bin storage and in the case of floor storage at 2,000 tons. It is important to remember, however, that no land costs or grants have been considered up to this point. Except at very small tonnages, continuous drying and floor storage has a lower capital cost per ton than the other two systems.

(b) Annual Costs

Again, except for very small tonnages, where total building costs are relatively high for a drier plus store, continuous driers with floor storage have a lower annual cost per ton than any other system.

Off Farm Drying and Storage

The advantage to an individual farmer in considering whether to join a co-operatively owned drier and store as an alternative to providing his own facilities will depend on the scale of his own grain production. As an illustration of this point, the possible savings in cost from joining a co-operative grain drying and storage venture for 2,000 tons have been estimated in Table 17.

TABLE 17

Possible Savings in Capital Investment and Annual Costs of a Co-operative Drier and Store of 2,000 tons capacity

Individual Production tons	Capital Costs per ton of lowest cost systems for tonnages in Col. 1 £	Annual Costs per ton for systems in Col. 2 £	Capital Cost per ton for 2,000 ton continuous drier and Floor storage £	Annual Cost per ton for 2,000 ton continuous drier and Floor storage £	Capital Cost Savings (Col. 2– Col. 4) £ per ton	Annual Cost Savings (Col. 3– Col. 5) £ per ton
100	18.8	3.05	3.95	1.242	14.85	1.808
250	6.64	1.675	3.95	1.242	2.69	0.433
625	4.53	1.335	3.95	1.242	0.58	0.093
875	4.30	1.302	3.95	1.242	0.35	0.060
1250	4.18	1.275	3.95	1.242	0.23	0.033

The cost savings above take no account of extra labour and transport costs. As the savings are only significant at relatively small tonnages it is only at small levels, i.e. less than 250 tons, that there is likely to be sufficient margin to cover any extra labour or transport costs involved in centralised plant. Indeed even at very small tonnages the real savings might be much less than indicated in the Table because the capital investment might be considerably less than shown because of the possibility of adapting existing buildings for grain storage. Furthermore, on livestock farms barley can be stored damp for home consumption at a capital cost of £4 10s. 0d. per ton in butyl silos.

It is possible that where production falls between two of the tonnages calculated in Table 17 there may be greater advantages in joining a co-operative, because the drying equipment of the installation may only be available in widely different sizes, so that the individual farmer may face high costs simply because a suitable sized unit is not available. However, in practice, there are a range of dryers covering relatively small increments of capacity and this indivisibility of equipment is therefore not particularly significant.

On Farm Drying and Off Farm Storage

This does not offer any advantage since costs per ton of floor storage do not decline significantly with size. The main advantage of size lies in the lower capital cost per ton of the drier. However, as discussed elsewhere in this report, there may be marketing advantages in centralised storage of large parcels of grain.

Land Costs

The calculations of capital costs and annual costs in this section have not included any consideration of the cost of land for the site. This would vary very considerably. Land in the grain producing areas would probably be relatively cheap, perhaps little more than the price of agricultural land. (It might even be provided by one of the

syndicate members). But if the store were to be situated at a port or in a major town near to the mills, then land costs might be considerable and could have a significant bearing on the viability of any proposals.

VI. FARMER REACTION

It was decided, as part of the study, to undertake a limited farm survey to ascertain the demand for a centralised grain drying, storage and marketing organisation in Northumberland. In the event, it was decided to carry out a survey not only to test potential reaction by farmers, but also to collect information on certain aspects of cereal production and marketing as a check on data obtained from other sources. The survey was designed, therefore, (a) to provide information on the production, drying, storage, utilisation and marketing of cereals in the county and (b) to assess potential farmer reaction to any provision of central facilities for handling the grain crop. A copy of the survey questionnaire has been included at Appendix VI.

The Sample

The sample of farmers to take part in the survey was selected from names and addresses supplied by W.C.F. staff at Berwick, Morpeth and Hexham. In all, a list of some 150 names was provided, including a range of both large and small cereal producers. A sample of forty-seven farmers was selected at random from this list. With four non-respondents, the analysis was based on forty-three completed questionnaires; this is a small sample, but much of the information obtained confirmed data already available, e.g. from the Farm Management Survey and the N.A.A.S.

Geographically, the farms were distributed fairly evenly throughout the major cereal growing areas in East Northumberland, although there was a slight bias towards the south of the county . No farms from the more westerly areas of the county were included. The distribution of the sample farms by size of cereal acreage was as follows:

TABLE 18

Distribution of Sample Farms by Size of Cereal Acreage

Number of Farms	Cereal Size Group (1967) (acres)
2	Under 50
8	50–100
16	101–200
11	201–400
6	401 and over
43	All Sizes

The acreage and production of cereals on the sample farms in 1966 is shown in Table 19.

TABLE 19

Acreage and Production of Cereals on Sample Farms in 1966

	Acreage	% of county acreage	Production (tons)	% of county production
Wheat	1401	8.6	2482	8.9
Barley	6853	6.2	11230	6.5
Oats and Mixed Corn	867	4.1	1452	4.6
Total Cereals	9121	6.1	15164	6.5

The 43 sample farms had a total of 9,121 acres of cereals in 1966 and production was 15,164 tons. The farms accounted for 6.1 per cent of the county acreage and 6.5 per cent of county production respectively. Yields on these farms, therefore, were slightly above the county average; this is to be expected since the farms were situated in the more favourable cereal growing areas.

Utilisation and Marketing of Grain

The production and utilisation of grain on the 43 farms in 1966 is summarised in Table 20.

TABLE 20

Production and Utilisation of 1966 Cereal Crop

	Wheat		Barley		Oats & Mixed		Total Cereals	
	tons	%	tons	%	tons	%	tons	%
Sales	2444	98.5	8875	79.0	491	34.0	11811	78.0
Retentions	38	1.5	2354	21.0	961	66.0	3353	22.0
Production	2482	100.0	11230	100.0	1452	100.0	15164	100.0

These results confirm the Farm Management Survey information which was used to estimate total retentions on farms in Northumberland (see section IV). The F.M.S. showed wheat retentions of 2½ per cent, barley 20 per cent and oats 62 per cent, compared with 1½ per cent, 21 per cent and 66 per cent respectively for this sample. There was little scope for the sample farmers to increase their own retentions of grain since they already provided from their own farms over 90 per cent of the demand for cereal feed by their livestock. This does not, however, preclude a greater movement of grain direct from producers to farmers wanting grain as suggested in Section IV.

The seasonality of grain movements off these farms during the 1966/67 season is shown in Table 21 for wheat and barley.

TABLE 21

Seasonality of Wheat and Barley Sales 1966/67

Date of Sale[1]	Wheat Quantity tons	Sold %	Date of Sale[1]	Barley Quantity tons	Sold %
July/Sept. 1966	202	8	July/Oct 1966	2382	27
Oct./Nov. 1966	765	31	Nov./Dec. 1966	989	11
Dec. 1966/Feb. 1967	841	35	January 1967	1378	15
March/April 1967	492	20	February 1967	1814	20
May/June 1967	144	6	March 1967	888	10
			April 1967	643	7
			May/June 1967	895	10
Total	2445	100		8990[2]	100

(1) The sale periods are those of the Cereal Deficiency Payments Scheme.
(2) Includes 115 tons carried over from 1965/66.

There was no great pressure on these farms to sell grain off the combine; for example, only a quarter of the barley was sold by the end of October. This is an obvious pointer to the storage capacity on these farms: it suggests that adequate storage is available for the existing crops (see below) and tends to confirm the impression (see Section III) that grain is sold early in the season for reasons other than any inadequacy of storage capacity.

Considerable use was made by the farmers of the Home-Grown Cereals Authority's forward contracting arrangements. This is indicative of the farmers' willingness to enter into a contractual agreement for the more orderly marketing of their grain. In 1966/67, 1,289 tons of wheat (53% of sales) and 5,985 tons of barley (66%) were sold on forward contract from 32 of the survey farms. In the 1967/68 season 30 farmers were planning to use forward contracting arrangements for marketing the 1967 grain crop; two more were, as yet, undecided. Thus, a considerable interest in forward contracting arrangements was displayed by these farmers since three quarters of those who sold grain had used, or were planning to use them. Only 4 farmers who used forward contracting in 1966/67 were not planning to enter into contracts in 1967/68.

Drying and Storage

It was suggested in Section III that the grain drying and storage capacity on farms in Northumberland is generally adequate for handling the current cereal crop. The results of the survey confirm this conclusion. Only three of the farms included in the survey lacked any sort of grain drying facilities. Continuous flow driers were the most popular type (28 installations) followed by on-floor (7), batch/platform driers (5) and bins (4).

The storage capacity on these farms tended to be generous. There was a total storage capacity for 15,510 tons of grain in relation to a total production of 15,164 tons in 1966. There was excess storage capacity on fourteen of the farms. There was little evidence of farmers being forced to sell grain early in the season

due to shortage of suitable storage facilities; only five farmers mentioned that they were forced through lack of storage to sell grain either straight off the combine or very shortly afterwards. Seven farmers made use of off-farm drying and storage facilities, usually on a neighbouring farm. A further indication of the adequacy of existing facilities is provided by the fact that only 7 of the farmers in this survey had firm proposals for expanding the grain drying and storage capacity on their farms. Also, farmers who have recently invested in new facilities seem to have allowed plenty of room for expansion of production.

The conclusion to be drawn is that, as suggested earlier, there is no general shortage of storage capacity for grain on farms and, therefore, no need for centralised drying and storage facilities in relation to current levels of production. If further expansion in grain production occurs, however, the existing facilities, in toto, will not be adequate.

Farmer Reaction to Provision of Centralised Grain Drying, Storage and Marketing Facilities

In view of the position with regard to storage capacity on these farms, it was hardly surprising that the farmers showed little interest in joining a grain drying and storage syndicate. Only 7 farmers were interested in joining a syndicate, whereas 36 were definitely not interested.

There was, however, a greater interest in group marketing arrangements for grain. Thirty-two farmers said they would be willing to enter a contract to dry, store and market grain through a syndicate for a period of not less than 5 years ahead if this ensured an outlet for their grain; only 11 farmers were unwilling (or not interested) to enter into such an arrangement. Of the 34 farmers not interested in joining a drying and storage syndicate, 25 were prepared to consider joining a group to improve the marketing of their grain.

Taking the sample as a whole, the farmers were prepared to commit about 40 per cent of their production to a cereal marketing group. On this basis there might be scope for a central grain marketing organisation in Northumberland to handle about 80,000 tons of wheat and barley, but a more extensive survey would be necessary to make any reliable predictions on this point.

Conclusion

To sum up, one can conclude from the results of this survey that:

(a) there is sufficient drying and storage capacity on farms to handle the existing production of cereals in the county;

(b) at present there is neither the need for, nor interest in, the provision of centralised drying and storage plant;

(c) there is, however, considerable interest in collective action to improve the marketing of grain.

VII. DISCUSSION

This investigation has been concerned with 'the desirability, feasibility and commercial viability of organising co-operative grain marketing facilities in Northumberland.' In the preceding sections of this report consideration has been given to current and future trends and wheat and barley production in Northumberland; the organisation of the trade in cereals in the county; alternative systems of grain drying and storage, with particular reference to their costs and to any economies of scale which may be obtainable; the existing situation with regard to on-farm drying and storage facilities; and farmers' views regarding the provision of centralised grain handling and marketing facilities. In this section, the various threads of these analyses are brought together and their bearing on the desirability of organising co-operative grain drying, storage and marketing facilities in Northumberland considered.

(1) The Case for Centralised Grain Drying and Storage Facilities

The investigation paid particular attention to the merits of centralised drying and storage facilities and to the best location for such facilities (see Section II). In the event, however, the results of the farm survey undertaken to ascertain the demand for a central drier and store suggested that there was relatively little demand amongst farmers for a facility of this nature at the present time (Section VI). The survey confirmed the impression that there was sufficient drying and storage capacity available on farms to handle the existing production of cereals in the county, particularly when it is remembered that some 20 to 25 per cent of grain is sold off the combine. There was a total storage capacity on farms in the sample survey in 1966 for 15,500 tons in relation to a total production of 15,164 tons; there was excess storage capacity of one-third of the farms surveyed, while only seven farmers out of forty-three had firm plans for expanding their storage capacity. Moreover, only seven farmers were interested in joining a central storage syndicate. This was confirmation of information on the overall adequacy of grain storage capacity obtained from other sources. It appears, therefore, that there is little demand at the present for centralised facilities.

Because of the apparent lack of general interest in centralised plant, questions about type and location of a central grain drier and store are largely theoretical. Nevertheless, it is worthwhile considering the costs and benefits of providing central facilities since interest might grow with any expansion of the cereal acreage.

(a) Economies of Scale in Grain Drying and Storage

Firstly, as was shown in Section V, there are no significant size economies to be obtained with on-floor storage to justify the abandonment of existing plant on farms. With continuous drying and bin storage, there are indeed size economies up to about 3,000 tons capacity, but this investigation has been primarily concerned with consideration of low-cost systems of on-floor storage. There are no economies of scale above 500 tons for on-floor drying and storage systems; 500 tons appears to be a 'unit size' for this system, that is, one should move in steps of 500 tons to 1,000 tons (2 x 500), 1,500 (3 x 500), 2,000 tons (4 x 500) and so on. Even with continuous drying and floor storage—the cheapest of the three systems—most of

the size economies have been achieved at a capacity of 2,000 tons. Above this capacity, costs per ton are more or less constant.

The advantage to a farmer in joining a grain drying and storage syndicate depends on the scale of his own cereal production. At tonnages of less than 250 the savings to the grower might be considerable (see Table 17), particularly on farms where there is little scope for adapting existing buildings into a floor store. But for a grower with more than 250 tons, the savings in joining a syndicate are, under present marketing arrangements, likely to be small and they may be more than offset by the incidence of land charges, higher transport costs, and the cost of labour hired specifically to operate the plant.

In addition, where the grain has to be transported several miles, centralised drying and storage could interfere with the smooth organisation of the actual harvesting, since grain has to be transported over longer distances from the combine to the drier. There may be little attraction to a farmer in a central store if his harvesting is made more difficult. This is particularly important in a county like Northumberland where the cereal harvest may be late and difficult—anything which slowed down the speed of the harvesting operation under these conditions would not be welcomed by the farmers and they might well prefer to provide their own drying and storage facilities, at higher cost, as a kind of insurance policy at harvest time. While there may not be general interest in a central grain drier and store, in some limited cases such interest may exist for special reasons, e.g. lack of existing facilities or the special case of the small cereal producer.

(b) Transport Costs

A second disadvantage of centralised facilities is the higher cost to the farmer of moving grain from farms into a central store, except in those few instances where the farm was situated only a mile or two away from the store and could be moved by farm transport without affecting the harvest. The use of haulage contractors to move grain from farm to store would cost at least 10/- per ton. Similarly, grain could not be moved out from the store to the final outlet for less than 10/- a ton, thereby incurring a minimum total transport charge of £1 per ton. On the other hand, the information obtained during this investigation suggests that grain could be moved direct from farm to final outlet for 10/- per ton up to a distance of 15 miles; even at a distance of 25 miles from the outlet haulage may only cost 15/- per ton. Given the present level of merchant's margins—now typically 10/- per ton or less (and lower than once was the case), farmers using a central store could not expect to be compensated for higher transport costs by a higher price for their grain. They would have to absorb most, if not all, of the additional costs themselves—and as pointed out above the savings in annual costs by joining a syndicate may not be sufficient to cover the higher transport costs.

(c) Location of Central Facilities for Drying and Storing Grain

Thirdly, it has been suggested that it might be desirable to locate a central grain drier and store at a port, specifically to cope with the trade in grain by sea, and feed barley exports in particular. Whilst not denying the advantages to the shipper

of having a conveniently sited buffer store to enable him to load ships as quickly as possible, there are a number of major disadvantages in this proposition,

To deal first with the situation at the four Northumberland ports, Berwick, Amble, Blyth and Newcastle. No land is available on the quayside at Berwick so that any facilities in the Berwick area would suffer from the disadvantages of double-handling; moreover, Berwick cannot deal with the large ships of up to 5,000 tons which will be increasingly necessary if British grain is to compete successfully in export markets with cargoes from other countries. Similarly, Amble could not deal with ships above 1,500 tons, although land is available on the quay at this port; Amble suffers the further disadvantage of being a considerable distance away from other outlets for grain which cannot be exported. Blyth, on the other hand, could handle large ships and land is available.

This leaves Newcastle, with its range of outlets. Newcastle could handle large ships and two major outlets, i.e. sea transport and the millers and compounders, are both conveniently placed. But land on the Tyne is expensive and unless the plant was sited alongside the compounder or miller—and this could have serious implications for the independence of the operator of the grain drier and store in that the compounder's bargaining power over him would be very strong—the problem of double handling grain to non-export outlets would still exist. An additional point is that with the sort of annual charge likely for a port facility at Newcastle (see Section IV) and bearing in mind the undertain nature of the export trade, one could afford to carry a lot of lorry idle time collecting grain from farms and still operate more economically than a port installation.

(d) Future of the Grain Export Trade

There are thus disadvantages in siting a grain store on the quayside at all four Northumberland ports. But the major argument against siting a central store primarily to suit the needs of sea transport is the future prospects for the export trade itself. It was pointed out in Section IV that the British export trade in feeding barley was of comparatively recent origin, and only in 1966/67 did exports exceed 1 million tons. Some people seem to have been carried away by last year's successful export performance into thinking that exports at this level will henceforth provide a profitable and sizeable outlet for British grain; but this level of exports was achieved only as a result of poor crops in other West European countries, particularly Spain. The prospects for exports in 1967/68 are far less promising. The E.E.C. countries, as well as Denmark and Spain, have all harvested larger crops this year—and these countries have been amongst the leading buyers of British grain in the last 2 or 3 years. At the time of writing (December 1967) it seems unlikely that exports in 1967/8 will be much in excess of 700,000 tons.

Export prospects are also unfavourable in the longer term, mainly due to developments in the E.E.C. Not only will the expansion of domestic grain production in the E.E.C. countries and the operation of the E.E.C. import levies reduce the market for British grain exports to E.E.C. countries, but the operation by the E.E.C. of its export restitution system will enable the E.E.C. members to win export orders in other countries—such as Poland—at the expense of the British trade. This unfavour-

able outlook for the export trade raises the question as to whether it would be prudent to invest capital in a grain drying and storage plant on the quayside to service a market which may, or may not, be a reliable outlet. Although the possibility of trade in grain around the coasts of the United Kingdom cannot be ruled out—there is already some coastal traffic in grain from Northumberland ports—this trade, and any export contracts which may be negotiated, could be serviced quite adequately through existing buffer stores.

To sum up, action to provide co-operatively-owned grain drying and storage facilities in Northumberland would not seem to be justified on any significant scale. This is because there is no general demand for, nor interest in, the provision of centralised facilities. Also, there are no size economies to justify the abandonment of existing plant. Any size economies which might be obtainable may be offset, above very small tonnages, by the incidence of land costs and transport costs. Further, there are problems associated with double handling grain and the higher transport costs thereby incurred. The uncertain prospects for the export trade in grain rule out the provision of any facilities specifically intended for servicing this trade. However, to say this is not to deny that particular situations may exist where it could suit groups of farmers to provide collective facilities rather than each provide his own. Such cases would need to be examined on their merits.

(2) A Grain Marketing Group

A much stronger case can, however, be made out for co-operative action to improve and encourage the more orderly marketing of grain. In the first place, farmers are becoming more interested in improving the marketing of their produce. The results of the field survey showed that three-quarters of the farmers who sold grain in 1966/67 made use of the H.G.C.A. forward contracting arrangements; 53 per cent of the wheat and 66 per cent of the barley sold from the survey farms were covered by such arrangements (Section VI). In the county as a whole in 1966/67, 180 contracts covering 14,198 tons of wheat and 811 contracts covering 56,654 tons of barley were made under the H.G.C.A. bonus scheme, accounting for about 50 and 40 per cent respectively of wheat and barley sales. All this is indicative of the willingness on the part of many farmers to enter into a contractual agreement for the more orderly marketing of their grain.

As was pointed out in Section VI, the farmers who took part in the survey showed far greater interest in joining a grain marketing group than they did in a grain drying and storage syndicate—three-quarters of the farmers were interested in joining a marketing group and they were prepared to commit about 40 to 50 per cent of their grain production to such a group, subject to normal safeguards about price levels, etc. This would seem to justify giving serious consideration for taking co-operative action to improve the marketing of grain. But the main arguments in favour of a grain marketing organisation stem from the likely developments in the production of cereals and in the trade over the next five or ten years.

(a) Developments in cereal production and the outlets for grain

It seems certain that the next few years will bring forth a further expansion in the production of cereals in Northumberland, possibly of the order of an extra 120,000

tons per annum by 1970/71 (Section III). This expansion will come at a time when considerable pressure is being exerted on the outlets for Northumberland grain. Attention has been drawn earlier in this section to the undertain prospects for the export trade. Outlets in the livestock areas to the west have contracted as these areas have increased their own production of grain. However, against this must be set the possibility of an import-saving programme which encouraged the substitution of domestically-produced feed grains for imported supplies. Even so, the inter-action of these various factors could lead to the development of some carry-over stocks of grain in this country.

The problem of finding and maintaining alternative and existing outlets for grain may need, therefore, to be tackled by a specialist grain marketing group to deal with the many problems involved in developing outlets, negotiating contracts, supplying grain of the required qualities, etc. Suggestions have already been made in Section IV as to the type of outlets which might be developed. These include an expansion in the uptake of domestic grain by the millers and compounders and, more particularly, an increase in local direct farm-to-farm sales from the producers in arable areas to the consumers in the livestock areas. The advantage of this latter development to both producer and consumer lies in the saving in transport costs, since the grain would be moved over much shorter distances; but it would not be without its problems, for example preserving the entitlement of the producer to his Cereal Deficiency Payment and, for the consumer, the absence of trade credit. Other problems would include the concomitant provision of facilities for home-milling and mixing on livestock farms and a change in outlook on the part of certain millers and compounders to use more British grain.

It is beyond the terms of reference to probe deeply into these subjects in this investigation, but they are undoubtedly relevant to the future of grain marketing. So also is an investigation into the feasibility of expanding local feed compounding facilities operated, for example, by agricultural co-operative societies. The main advantage of local compounding would again seem to be in minimising transport costs; grain would still be double-handled, but it would move over much shorter distances and the possibility of return loads would still exist. (This seems at least at first sight, to be a more advantageous arrangement than the existing system where grain may be moved from farm to compounder over distances of up to 120 miles, only for compound feedingstuffs to return to the same depot on the same lorry!) Cereal growers in the south of Northumberland are, perhaps, not too badly placed in this respect as those in the north due to the existence of three major millers on the Tyne. Local compounding could be more attractive to farmers in the Berwick area, however, whose nearest outlets (apart from sea transport) are 60 miles away to the north and south.

(b) Improved Marketing

In addition to the problem of finding and maintaining outlets, a cereals marketing organisation could perform a useful function in encouraging the more regular and timely marketing of grain. That there is a need for more timely marketing is apparent from the reluctance of many farmers to sell grain early in the season. This is, of course, partly a consequence of the storage premiums which have been built into

the C.D.P. scheme, but it is surely not in farmers' best interests to hold back supplies early in the season so that users have to bring in imported supplies even when there is plenty of domestic grain available—this merely increases the problem of finding outlets for their grain, increases the pressure on the market later in the season and makes the development of carry-over stocks all the more likely.

It would seem, therefore, that serious consideration might be given to the formation of a grain marketing group in Northumberland. Any group which is formed might be modelled on one of the already existing cereal groups. In brief, the members would be required to enter into a contract to sell all their grain (except that retained on the farms for seed and feed) through the group for a period of not less than 10 years, with, perhaps, a break clause on both sides after 5 years. At harvest each member would notify the group of the quantity and variety of grain he wished to sell and when he preferred to sell it. The group, in its turn, would make long-term contracts with a merchant or co-operative who would undertake to sell the group's grain on a commission basis; in this connection it is worth remembering that a commission of 2½ per cent approximates to the average merchant's margin at the present time of 10/- per ton. A marketing group would not require a heavy initial capital outlay—a contribution of 2/6d. for each contracted acre is probably all that is required. Permanent staff would be needed to plan the marketing decisions on behalf of members in the light of their specialised knowledge of the grain trade, to liaise with merchants and/or co-operatives and to take part in the negotiation of contracts with final users. The group should handle not less than 10,000 tons, and preferably considerably more to justify the employment of salaried staff of adequate calibre. Initially, help with salaries, etc., might be available from the Central Council for Agricultural and Horticultural Co-operation so that, at first, a tonnage of less than 10,000 tons would be feasible. But it would be essential to achieve this target before the termination of assistance (after 3 years) for the group to survive as a sound business venture, and employing staff of a suitable calibre.

(c) Advantages of a Marketing Group

The advantages to a farmer in joining a cereal marketing group would lie mainly in the ability to maintain an outlet for his grain once the group has built up good relations with the trade, and through the group's ability to supply final users with grain of the quality they require, in sufficient quantities and at the right time. The group could, for example, arrange for particular farmers to grow the varieties of grain required by final users on the basis of a contract between the group and the final users. Wheat for biscuit-making is a case in point. There would also be benefits from the group's size in terms of its greater local bargaining power, in other words the farmers' position would be far less vulnerable; further, the group would be able to insist on prompt payment terms for grain and possibly to offer loans to members to prevent weak selling at harvest. Additional advantages would accrue from the greater market expertise which would be developed by the Group's directors and permanent staff; by the saving of time which was previously spent in arranging grain sales; and through the group's ability to arrange contracts for the production of particular qualities of grain, e.g. hard wheats.

There is no reason why an agricultural co-operative should not market grain, on commission, on behalf of such grain marketing groups. It could, in fact, be the sole agent for a group. The advantages to the co-operative in this type of arrangement would be considerable since it would know at the start of each season how much grain it would have to handle and the time of sale preferred by farmers; it would thus be much easier both to enter into forward contracts with millers, compounders and shippers and to cover the contracts once they have been made. However, in order to preserve the group's eligibility for co-operation grant, it would seem that farmers should be encouraged to form a particular marketing group, legally incorporated as a co-operative company or society, and for this group to use the facilities of the co-operative to market its grain on commission. An alternative would be to form a specialist grain marketing co-operative within the parent organisation, but as mentioned in Appendix VIII, this type of organisation might not be eligible for grant-aid as a consequence of the control exercised over the specialist society by the parent co-operative.

APPENDIX I

The Location, Intensity and Size Structure of Wheat and Barley Production in Northumberland

Map 1
Location of Wheat and Barley Acreage in Northumberland. June 1966.

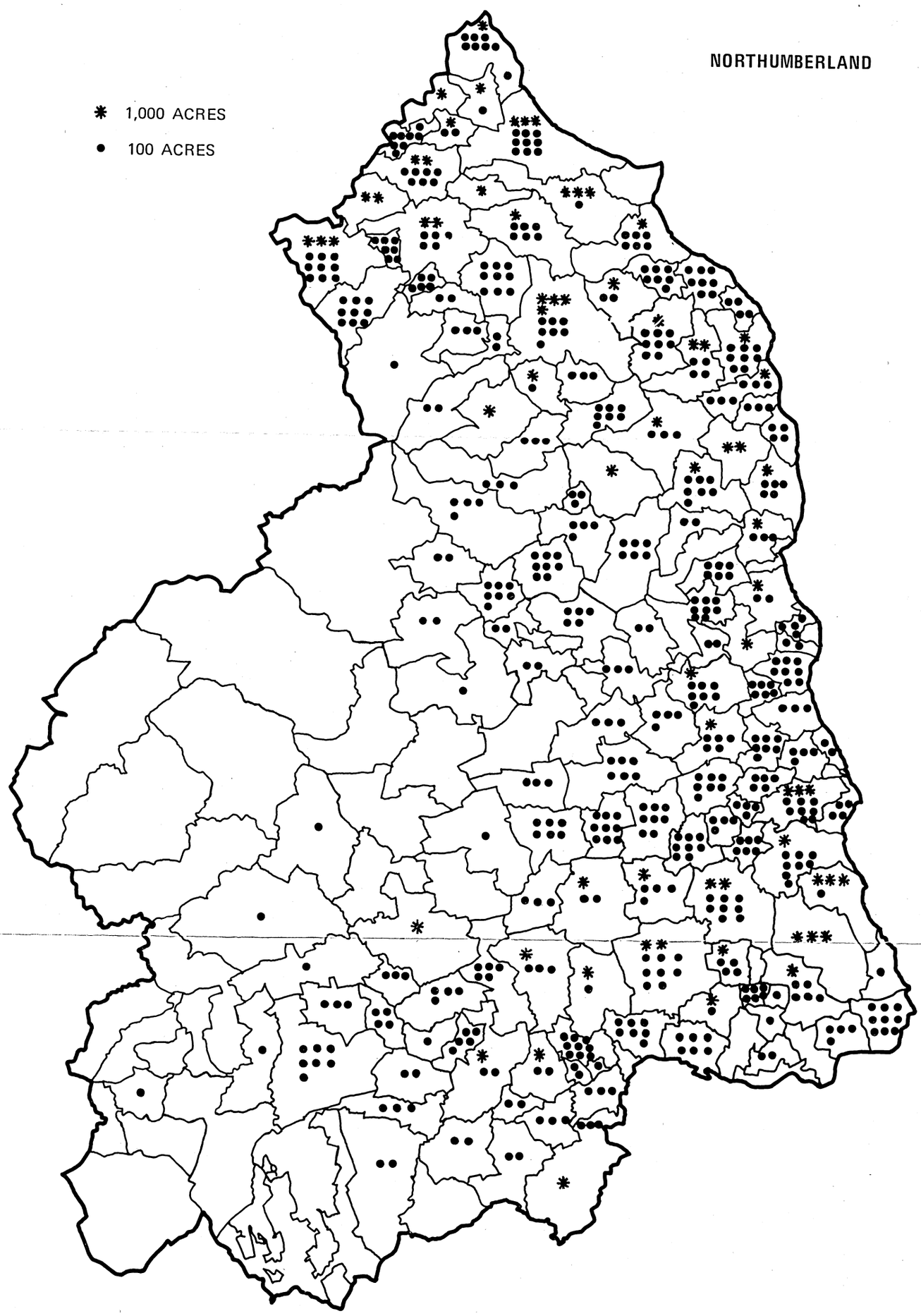
Map 2
Intensity of Wheat and Barley Production in Northumberland. Acreage of Wheat and Barley as Percentage of Crops and Grass Acreage, June 1966.

Map 3
Size Structure of Wheat and Barley Production in Northumberland—Average Wheat and Barley Acreage per Holding, June 1966.

MAP 1

LOCATION OF WHEAT AND BARLEY ACREAGE IN NORTHUMBERLAND

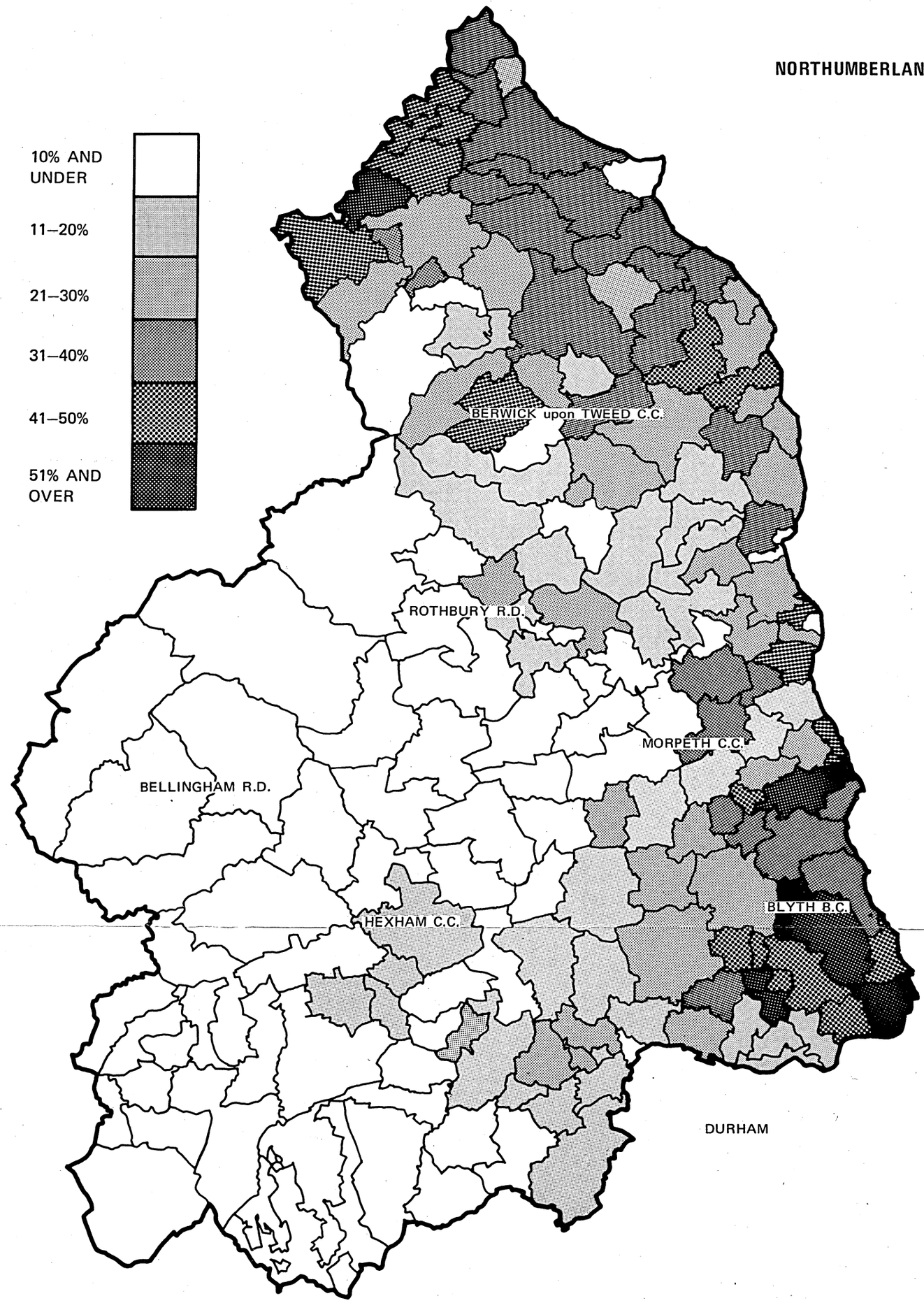
JUNE 1966



MAP 2

INTENSITY OF WHEAT AND BARLEY PRODUCTION IN NORTHUMBERLAND 1966

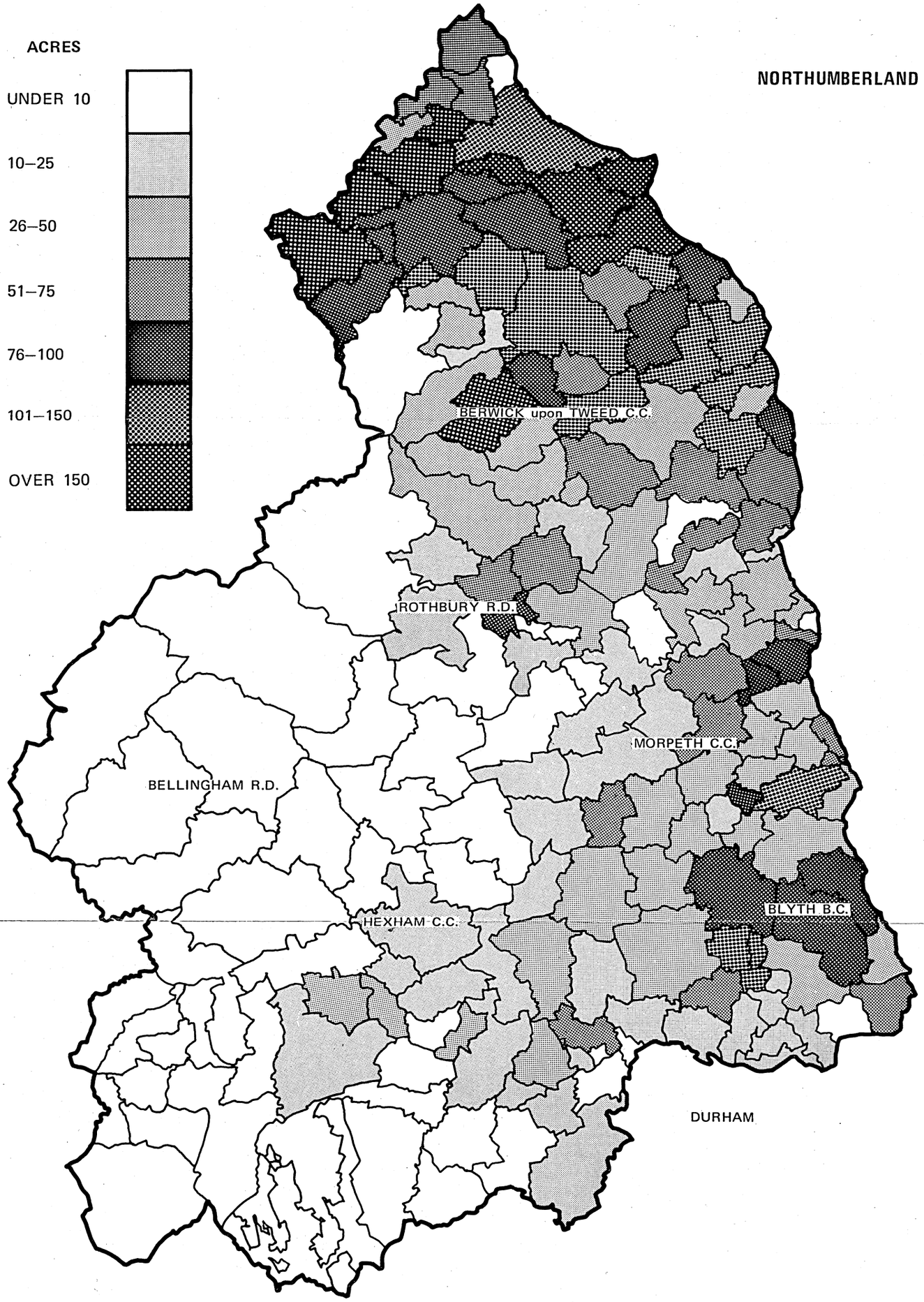
WHEAT AND BARLEY AS PERCENTAGE OF CROPS AND GRASS ACREAGE



MAP 3

SIZE STRUCTURE OF WHEAT AND BARLEY PRODUCTION IN NORTHUMBERLAND

AVERAGE WHEAT AND BARLEY ACREAGE PER HOLDING IN 1966



APPENDIX II

The Structure of Wheat and Barley Production in Northern England

It was pointed out in Section III that the Ministry of Agriculture does not prepare its farm classification and structural data on a county basis, hence any assessment of the structure of cereal production in Northumberland must be limited to information derived from the parish statistics. Classification data are, however, available for the Ministry's Northern Region (Cumberland, Westmorland, Northumberland, Durham and the North Riding of Yorkshire).

The following paragraphs describe the structure of wheat and barley production in the Northern Region as a whole. It does not follow, of course, that Northumberland conforms precisely to the regional pattern* but the data are, nevertheless, a useful supplement to the information derived from the county/parish statistics.

The following tables provide information for Northern England on:

(1) The relative importance of wheat and barley production on holdings of different types (Table A);

(2) The distribution of the wheat and barley acreages by type of farming and size of business (Table B);

(3) The distribution of holdings with wheat and barley and the wheat and barley acreages by crop size groups (Table C).

Table C is based on an analysis of a special sample of farms drawn from the 1964 June returns. Tables A and B are derived from the economic classification of farms based on the 1966 June Census.

The main features of wheat and barley production in Northern England which emerge from this analysis are:

(1) Barley production is more important than wheat as part of the individual farm economy, both as a cash crop and as a source of feed for livestock. Fifteen per cent of the full-time holdings in the region grow some wheat; 50 per cent grow barley. Wheat is found on less than 10 per cent of the farms where production of livestock and livestock products predominates, but nearly half these farms grow barley probably for retention for on-farm use. Virtually all cropping farms and 86 per cent of mixed farms grow barley; but despite the greater emphasis on cropping on these farms, only 45 and 30 per cent respectively grow wheat.

(2) The average acreage of wheat and barley (especially barley) tends, of course, to be lower on farms concentrating on livestock production. Large scale cereal production is more commonly found on cropping and mixed farms where cereal production is often the major enterprise.

(3) The distribution of wheat and barley between types of farming and sizes of business follows a similar pattern. Over 40 per cent of the wheat and barley in the region is grown on cropping farms; nearly 20 per cent is on large cropping farms. About 20 per cent is on mixed farms, whilst dairy and livestock farms together account for some 30 per cent of the acreage. Almost half the wheat and barley is produced on large farms of over 1200 standard man-days; only 12–15 per cent is accounted for by small farms in the 275–599 S.M.D. Group.

*Northumberland had about one-third of the wheat and one-quarter of the barley in the region at June 1966.

(4) The distribution of holdings with wheat and barley and the wheat and barley acreage by crop size groups follows the normal skewed pattern. Seventy-one per cent of the holdings with wheat have less than 20 acres and account for 33 per cent of the acreage; 96.5 per cent have less than 50 acres. However, the 3.5 per cent of holdings with 50 acres or more of wheat account for 25 per cent of the crop.

(5) Barley production is carried out on a rather larger scale. Twenty-seven per cent of the holdings with barley have 50 acres or more and these account for two-thirds of the acreage. The 10 per cent of holdings with 100 acres or more have 40 per cent of the crop. Less than 20 per cent of the barley is grown in units of less than 30 acres, compared with a third for wheat.

TABLE A

Relative Importance of Wheat and Barley Production on Holdings of Different Types

Type of Farming	Per Cent of holdings with Wheat	Barley	Average Acreage on holdings with Wheat	Barley
Dairy	7.7	48.6	16.5	25.7
Livestock	8.9	42.1	26.0	42.7
Pig and Poultry	9.3	47.6	23.6	44.8
Cropping	45.5	99.0	26.5	101.4
Horticulture	2.3	19.4	14.8	25.9
Mixed	28.4	86.1	19.2	51.3
Total Full-time	15.1	57.7	22.6	49.7
Part-time	1.0	11.7	9.1	14.2
Total	9.7	38.8	22.1	47.4

TABLE B

Percentage of the Wheat and Barley Acreage by Type of Farming and Size of Business

(a) Wheat

Type of Farming	Size of Business (S.M.D.) 275-599	600-1199	1200 & over	Total
Dairy	1.1	3.9	8.3	13.4
Livestock	2.2	4.7	11.5	18.4
Pig and Poultry	0.3	0.2	1.4	1.9
Cropping	6.7	19.2	17.6	43.4
Horticulture	0.1	–	0.2	0.2
Mixed	1.9	7.6	11.4	20.9
Part-time	–	–	–	1.8
Total	12.3	35.6	50.4	100.0

Percentage of the Wheat and Barley Acreage by Type of Farming and Size of Business

(b) Barley

Type of Farming	Size of Business (S.M.D.) 275-599	600-1199	1200 & over	Total
Dairy	2.3	5.5	7.5	15.3
Livestock	2.6	6.7	7.3	16.6
Pig and Poultry	0.3	0.6	1.2	2.1
Cropping	6.9	16.6	18.6	42.1
Horticulture	0.1	0.1	0.3	0.5
Mixed	2.3	9.1	8.3	19.7
Part-time	–	–	–	3.7
Total	14.5	38.6	43.2	100.0

TABLE C

Size Structure of Wheat and Barley Production in Northern England

(a) Distribution of holdings with wheat and of the wheat acreage by crop size groups on full-time farms in 1964.

Crop Size Group Acres	Holding with wheat Number	%	Wheat Acreage Acres	%
¼– 4¾	537	15.6	1697	2.6
5– 9¾	903	26.2	6235	9.5
10– 19¾	996	28.9	13670	20.9
20– 29¾	438	12.7	10455	16.0
30– 49¾	453	13.2	16812	25.7
50– 69¾	42	1.2	2430	3.7
70– 99¾	36	1.1	3149	4.8
100–199¾	24	0.7	3397	5.2
200–299¾	12	0.3	2713	4.2
300 and over	6	0.2	4795	7.3
All Sizes	3446	100.0	65353	100.0

(b) Distribution of holdings with barley and of the barley acreage by crop size groups on full-time farms in 1964.

Crop Size Group Acres	Holdings with barley Number	%	Barley Acreage Acres	%
¼– 4¾	736	9.1	2306	0.7
5– 9¾	1172	14.5	7968	2.4
10– 19¾	1611	20.0	22875	6.8
20– 29¾	1100	13.7	26665	8.0
30– 49¾	1260	15.6	48810	14.6
50– 69¾	804	10.0	46887	14.0
70– 99¾	591	7.3	48306	14.4
100–199¾	637	7.9	82950	24.8
200–299¾	98	1.2	24160	7.2
300 and over	48	0.6	23574	7.0
All Sizes	8059	100.0	334501	100.0

APPENDIX III

Examples of Capital Costs of Grain Drying and Storage Plants Installed 1963/64

Type of drier	Storage	Conveying	Ancillary Equipment	Tons dried Annually	Tons Stored Annually	Total Capital Cost* £	Capital cost per ton stored* £
Platform, 2 tons all-electric	None	None	None	50	–	250†	5†
Tray, 2 tons oil-fired	None	Mobile augers	None	150	–	750†	5†
Floor-ventilated bins all-electric	Rectangular galvanised steel	Bucket elevator chain and flight conveyor	Cleaner	300	250	4000	16
Floor-ventilated bins gas-fired burner	Outdoor cylindrical galvanised steel	Large capacity augers	None	300	250	3000	12
Radially ventilated silos all-electric	Indoor cylindrical expanded metal	Bucket elevator chain and flight conveyor	Cleaner	300	250	4000	16
Continuous 1½/2 tons/hr.	Rectangular galvanised steel	Bucket elevator chain and flight conveyor	Cleaner	400	250	5000	80
Continuous 2½/4½ tons/hr.	Rectangular galvanised steel	Bucket elevator chain and flight conveyor	Cleaner	500	300	5400	18
Continuous 5 ton/hr.	Rectangular galvanised steel	Bucket elevator chain and flight conveyor	Cleaner	800	600	9600	16
Continuous 5 tons/hr.	On-floor	Mobile augers	None	800	600	6000	10
In bulk on floor	On-floor	Mobile augers	None	200	200	1800	9
In bulk on floor	On-floor	Mobile augers	None	400	400	3200	8
In bulk on floor	On-floor	Mobile augers	None	800	800	6400	8

*Except where otherwise stated, includes building costs after deduction of grant under Farm Improvement Scheme.
†Excludes any new building costs.
Source: M.A.F.F. Bulletin No. 149. Farm Grain Drying and Storage.

APPENDIX IV

A more detailed estimate of the Capital Costs of a Continuous Drier and Storage for 2,000 tons and 5,000 tons capacity

Specification

(1) 15 ton per hour continuous drier, giving a capacity of 200 tons per day over 6 to 8 weeks.
(2) Storage (in bins) for 2000–5000 tons of grain.
(3) In-coming moisture content 24% w.b. maximum; drying to 14% w.b.
(4) Precleaner operable at intake rate of 20 tons/hour.

Drier

Either Bentall ICV 320; 60 h.p. Motor
320 cwt/hr. 20-15% M.C. extraction at £4250 ex works.
or Alvan Blanch. C333 90 h.p. Motors.
333 cwt/hr. 20-15% M.C. extraction at £3495 ex Works.

Delivery and Installation, say £500.

Storage

As floor space is at a premium, rectangular bins may be required. With some mechanisation of handling an integral tunnel will be required.

2,000 tons size	£
1 nest basic bins 15′ 0″ x 14′ 8″ x 22′ 0″ high at £1300	1300
9 additional nests at £900	8100
Roof structure and Asbestos cladding	4000
	13400

(Equivalent to £6.7/ton stored).

5,000 ton size	£
1st nest 200 tons at £1300	1300
25 additionals at £900	22500
Roof structures and cladding	8500
	32300

(Equivalent to £6.4/ton stored).

Precleaner

1. Garvie and Sons Precleaner only at £250.
or 2. Alvan Blanch Precleaner at 20 t/hr. £500.
or 3. Turner full cleaner at 20 t/hr. £726.

Wet Storage

A group of outdoor silos or bins would be the cheapest system of wet storage. These should be ventilated to safeguard against delays in drying and for 500 tons capacity would cost approximately £4,000. Un-ventilated bins of this capacity would cost about £1,800. These prices include foundations and siting round central auger outlet point.

Total Capital Costs

	2,000 tons	5,000 tons
	£	£
Dryer and Installation	4,500	4,500
Storage	13,400	32,300
Cleaner	500	500
Total	18,400	37,300
Cost/ton stored	9.2	7.4
Including ventilated wet store of 500 ton capacity	22,400	43,300
Cost/ton stored	11.2	8.7

Continuous Drier and Floor Storage

If floor storage is required as an alternative to bin storage then the cost of providing special buildings to do this will show some economies over bin storage (see Section V).

The following floor areas would be required for different depths of storage for the 2,000 and 5,000 ton capacities, for dried barley.

	5,000 tons capacity	2,000 ton capacity
Stored 10 ft. deep	25,000 ft.^{2}	10,000 ft.^{2}
Stored 20 ft deep	12,500 ft.^{2}	5,000 ft.^{2}
Stored 30 ft. deep	8,333 ft.^{2}	3,333 ft.^{2}

It was shown in Section V that it is unlikely that great differences exist between the cost of buildings having thrust walls and wider buildings, in which grain is piled in the centre, if grain depth is less than 10 ft. For greater depths of grain there will be some economy because 'piling' can take place in the centre.

APPENDIX V

Advantages and Disadvantages of Alternative Grain Drying and Storage Systems

(a) Floor Drying and Storage

Advantages:

(i) Low capital cost, especially for relatively small capacities.
(ii) The system can operate without the need for expensive fixed conveying equipment.
(iii) Because of restrictions on maximum depth of grain, the building consists of a greater proportion of relatively inexpensive roof and a lower proportion of expensive walls when compared with, say, ventilated bins.
(iv) The drier and store are the same. Thus, particularly with small plants, covered 'service' areas are minimal. One does not have to provide separate buildings for the drier and for the store.
(v) The building contains little equipment of a specialised nature; it is therefore very flexible as regards alternative uses.
(vi) The system imposes no constraints on the rate of delivery into store other than the maximum rate imposed by the transport equipment itself. Provided there is adequate total storage capacity, the capital cost per ton of operating combine capacity is much lower than with other forms of drier.
(vii) The low temperatures used makes the system particularly suitable for milling wheat and seed corn.

Disadvantages:

(i) The system is wasteful of land compared with bins, because the height of grain is restricted to a maximum of 8 feet. Although this may not be a critical factor for on-farm systems it would be very important in dock-side installations where land is expensive.
(ii) With a relatively large drying floor, supervision and control of a large number of loads of grain of variable moisture content is difficult. Loads must therefore be spread thinly over the surface of grain already in store, so that any wet loads are present as a thin horizontal layer rather than vertical blocks which are difficult to dry.
(iii) With large plants problems arise in the removal of specific batches of grain unless expensive covered surface areas, or, alternatively, expensive conveying equipment, are provided. Loading with a tractor shovel is, however, a reasonably quick and cheap system.
(iv) Unless the building is light-proofed, bird contamination can be a problem.

(b) Continuous drying and floor storage

Advantages:

(i) Drying can be carried out quickly.
(ii) Account can be taken of variations in moisture content between batches.
(iii) Drying can continue at a rapid rate even when air humidity is high.

Disadvantages

(i) Speed of drying falls considerably when grain is very wet, leading to bottle-necks in harvesting.
(ii) Holding bins and pits for wet grain are necessary in order to even out the load on the drier.
(iii) Expensive conveying equipment is usually required.
(iv) Unless the equipment is automated at considerable expense, the labour requirements for supervision is higher than with a floor system.
(v) High temperatures may damage seed grain and milling wheat.
(vi) Fuel costs are relatively high as compared with floor drying because of the greater heat requirement.
(vii) It is important that drying should be efficient. There is no easy solution to the problem of damp patches of grain as with a ventilated floor where increased ventilation can be provided.

(c) Continuous Drying and Bin Storage
Advantages:

(i) Different parcels of grain can be kept separate more easily than with floor storage.
(ii) Unloading may be carried out at a more rapid rate; with floor storage a tractor and bucket can achieve a loading rate of 30 tons/hour.
(iii) Unloading can be automated with little labour requirement.

Disadvantages:

These are mainly related to the higher capital costs associated with the above.

APPENDIX VI

CONFIDENTIAL

West Cumberland Farmers Ltd. and University of Newcastle upon Tyne

Investigation into Grain Drying and Storage in Northumberland

Questionnaire on Production, Drying, Storage,

Utilisation and Marketing of Cereals

1. Name of Farmer_____

Address_____

2. Acreage of Cereals

	June 1966	June 1967	Forecast 1970
Wheat			
Barley			
Oats & Mixed Corn			
Total Cereals			
Crops & Grass			

3. Production and Utilisation of 1966 Cereal Crop

	Wheat tons	Barley tons	Oats & M.C. tons
Estimated Production			
Quantity Sold			
Quantity Retained on Farm for Feed and Seed			

What proportion (approx.) of the demand for cereal feed by your livestock is provided from your own farm? Per cent ☐

4. Sales of Wheat and Barley from 1966 Crop

Wheat

Date of Sale	Quantity Sold (tons)
July-Sept. 1966	
Oct.-Nov. 1966	
Dec.1966-Feb.1967	
March - Apr. 1967	
May-June 1967	

Barley

Date of Sale	Quantity Sold (tons)
July-Oct. 1966	
Nov.-Dec.1966	
January 1967	
February 1967	
March 1967	
April 1967	
May-June 1967	

How much of this grain was sold on forward contract?

Wheat tons	Barley tons

Do you plan to use forward contracting arrangements for marketing the 1967 grain crop? (Please tick)

Yes	No

5. Grain Drying and Storage

Please give details of the existing drying and storage facilities on your farm.

Drier		Storage	
Type	Capacity	Type	Capacity (tons)
Continuous flow		On-floor	
On-floor		Bins	
Bins		Wet Storage	
Batch/platform		Other e.g. lofts	
None (please tick)		None (please tick)	

Have you any firm proposals for expanding the grain drying and storage capacity on your farm? (Please tick)

Yes	No

If any use is made of off-farm drying and storage facilities, please give full details:-

Location _____

Quantity (tons) _____

Charge per ton _____

6. Centralised Grain Drying, Storage and Marketing

Yes	No

Would you be prepared to join a grain drying and storage syndicate, if this could be shown to give you a lower capital outlay and cheaper operating costs?

Would you be willing to enter a contract to dry, store and or market grain through a syndicate for a period of not less than 5 years ahead if this ensured an outlet for your grain?

If so, what proportion of your grain production would you be thinking of drying, storing and marketing in this way?

Per Cent

APPENDIX VII

Review of Literature on Centralised Grain Drying, Storage and Marketing

The currently available literature on grain drying and storage syndicates is somewhat scanty, consisting mainly of various articles or case studies in the farming press in which the formation and organisation of various syndicates are described. These articles are, of course, limited in their scope and whilst they may be of some interest to the general reader, their value in the context of the present study is limited. However, a number of studies have been published and a list of these is attached, preceded by brief comments on some of them.

Organisation and Operation of Grain Drying and Storage Syndicates

The organisation and method of operation of a 'typical' grain drying and storage syndicate has been described in a report issued by the University of Reading,(1) whilst the organisation of an 'ideal' syndicate has been described by Mr. N. D. O. Capper, Chairman of Syndicate Credits Ltd. in Hereford.(2) Organisational and management aspects of drying and storage syndicates are discussed fully in Appendix VIII. Only brief mention of these organisational aspects is made in this appendix.

The basis of sharing in grain drying and storage syndicates seems to follow a common pattern. Typically, the purchase price of the drying and storage plant is divided between the members on the basis of their estimates of their requirements as a proportion of the total capacity of the plant, whilst the drying and storing of each member's grain is charged to him at more or less commercial rates. The surplus of these charges over the cost of running the syndicate is returned to members in proportion to their contribution to the purchase price.

Advantage of Grain and Storage Syndicates

Grain drying and storage syndicates benefit from the advantages usually ascribed to the joint ownership and use of machinery.(3) These include lower average ownership costs (depreciation, insurance, interest, etc.) per unit of work done; a reduction in the amount of capital invested in machinery and equipment thereby releasing funds for investment elsewhere on the farm; the use of the latest equipment permitting work to be carried out more efficiently and, perhaps, more quickly; the saving of labour and power at the peak period during harvest; and greater reliability compared with, say, borrowing or hiring arrangements.

There are, on the other hand, a number of problems related to the sharing of drying and storage equipment. These include the problem of finding willing and acceptable partners, the risk of disagreement between members, and the difficulties of arranging the programme for operating the plant and ensuring an adequate standard of machine maintenance. That there are at the present time some 40 grain drying and storage syndicates in existence in England and Wales is testimony to the fact that these difficulties are not unsurmountable.

Principles of Drying and Storage Syndicates

Grain drying and storage syndicates are most commonly established to provide, on a group basis, facilities for the replacement of on-farm drying and storage. The

principles considered necessary for the success of these syndicates have been described in two reports[4][5]. These reports also considered the wider marketing implications of group action for drying and storing grain.

The Economist Intelligence Unit report on Wheat and Barley Marketing in in Kent[4]concluded that there was considerable merit in group action in the cleaning, drying, storing and selling of bulk grain. The report emphasised the importance for efficient grain marketing of developing adequate bulk grain storage and drying facilities, even though the market might not provide a return which fully covered the cost of drying and storing grain. The advantages of conditioning grain in bulk lay mainly in facilitating a readier sale, in obviating the need for the removal of grain as soon as it was sold and in enabling optimum use to be made of expensive bulk transport facilities.

The advantages of farmers undertaking drying, storage and selling of grain on a group basis were listed by the E.I.U. in the following terms:

(1) It is cheaper to handle bulky commodities like grain in bulk rather than in smaller parcels.
(2) Labour and managerial economies may be presumed to exist.
(3) Considerations of cost need not prevent the use of the most suitable equipment.
(4) The benefits of group discipline.
(5) The influence of the group on the marketing system in the area.

These advantages are all related to the economies of scale of group action. Other benefits included the possibility of selling feeding qualities direct to livestock producers, i.e. by-passing the merchant, and milling and mixing feedingstuffs centrally for the group members.

Nevertheless, despite the advantages which the E.I.U. saw in group action, some doubts were expressed about where the group services should be carried on. 'Whilst there should clearly be centralisation of control over the members of the group there need not necessarily be centralisation of operation'. The crucial issue here, apart from the existence of a suitable site, is the location of the drying and storage facilities in relation to the geographical distribution of the members' cereal acreage. If this acreage is fragmented and incapable of consolidation, there is a case for dispersion of the storage; alternatively the scheme might be restricted to farmers occupying conveniently situated land. The catchment area of a central silo is restricted by the inability to move grain long distances straight off the combine unless large numbers of lorries are employed or unless holding facilities for damp grain are available on farms, either contingency being potentially very costly. Regard must also be paid to the members' existing storage facilities which can be used for holding damp grain before it is removed to central driers, for drying grain for storage centrally, for holding grain for sale early in the season, or for overflow capacity for the central plant, etc.

For these reasons, although the E.I.U. recommended group action as the way to obtain the best possible prices for wheat and barley, the establishment of a centralised drying and storage plant was not recommended. It was suggested that the group should work largely from existing installations, mainly because it was

assumed that not all the grain produced would be sold through the group and the members would therefore still need drying and storage facilities on their own farms.

East Kent Cereal Growers Ltd.

The E.I.U. recommendation for a farmers cereal marketing organisation led to the establishment in July 1964 of East Kent Cereal Growers Ltd. The activities of E.K.C.G. have been described in a number of reports [6][7][8] and, it may be useful to summarise briefly the main features of this Company.

The primary objective of E.K.C.G. is to market members' grain to the best advantage. At present there are some 70 members and the group handles about 30,000 tons of grain annually. Members must sell all their grain through the company, other than that retained for use on their own farms. At harvest each member must notify the company of the quantity and varieties of grain he wishes to sell and his preference with regard to time of sale; the final decision on when to market, however, rests with the company. The grain is marketed, on commission, through three merchants who have entered into ten-year contracts with the company. Members also contract with the company for a ten-year period, but with a break clause after five years. Payments for members' grain are based on a pooling system; the pool periods are December–February, March–April and May–June. The Member receives 50 per cent of the value of his grain in the pool six weeks after the start of the pool period, 25 per cent after a further four weeks and the remainder three weeks after the end of the pool period. If the member requires cash before his grain is sold, 75 per cent of its proable value will be advanced as a loan upon which the Company charges interest at the rate at which it has borrowed the money. The Company employs a full-time manager and part-time secretary. Operating costs are budgeted in advance and deductions are made from payments due to members to cover costs, any necessary adjustments between budgeted and actual expenditure being made at the end of the year.

In addition to any advantage in price which the Company might obtain for its members, E.K.C.G. claims two other broad types of advantage. These are related respectively to the size and organisation of the company. The size advantages, which are largely due to the company having greater marketing influence than its members can exert individually, include greater local bargaining power and the ability to deal with merchants on equal terms, to negotiate more equitable payment terms, to eliminate speculation in members' grain and to give merchants the opportunity of negotiating large sales with the minimum of work. The organisational advantages include greater market expertise, financial assistance to members which can prevent weak selling at harvest, saving of time in arranging grain sales and rationalisation of production to meet a demand for grain of a particular quality.

East Kent Cereal Growers has been the model for a number of other farmers' cereal marketing organisations, for example South Central Cereal Growers in Sussex and Surrey, and the grain marketing scheme operated by the Three Rivers Trading Company Ltd.[9] [10]. All these organisations seem to be aimed, at least partly, at improving the producers' bargaining power within the grain trade. At present, they are marketing organisations only and they do not own or operate

grain drying and storage facilities on a centralised basis. They have, however, more recently shown some interest in jointly-owned and operated plants in view of the need for additional on-farm grain drying and storage facilities in their areas.

Jointly-owned Drying and Storage Facilities

For example, three directors of E.K.C.G. have carried out an investigation into problems of jointly-owned grain drying and storage plants by visiting existing stores[5]. Their recommendations may be summarised as follows:

(1) Size and location. The size of the installation is limited by the distance the grain has to be carried from the most outlying farm to the central store. Where long distances have to be covered, involving heavy expenditure on transport, these extra transport costs might outweigh some of the low-cost advantages of the central store. The ideal location, therefore, is in the middle of a high-yielding intensive corn-growing district. A minimum capacity of 1,200 tons for the type of storage studied is required to keep costs as low as possible.

(2) Operating the equipment. High capacity handling equipment for quick emptying of intake pits and loading out is essential. The advantages lie in a lower labour requirement and in marketing. Speed and ease of loading out is a distinct advantage to the buyer; and whilst a premium may not be obtained for this quick loading facility, it might mean that the syndicates were offered first chance of, say, export contracts. The plant might be operated by permanent part-time labour, e.g. a local smallholder.

(3) Type of equipment. Ventilated bins are particularly suitable, especially if the individual identity of grain can be lost. Wet storage capacity related to the number of members, their total daily output and the capacity of the drier is essential where a continuous flow drier is used. Where a really large store is envisaged there is a case for erecting large bulk stores filled with dried grain which can be conditioned by blowing air through single ducts laid on the floor.

(4) Finance. The net cost, after grant, of the four stores visited by the directors was approximately £15 per ton for fully automated plants of 1100 to 1400 tons capacity; these costs, with storage in bins, included the cost of land, buildings, machinery and equipment. Capital can be raised through Syndicate Credits Ltd. and a one-third grant towards the cost of buildings and fixed equipment is available. Members contribute to the capital costs in proportion to their expected requirements for drying and storage. Running costs in the four stores visited amounted to 27/6d. to 30/- per ton, including depreciation. Where floor storage is appropriate, as in the case of a few farmers getting together or where farm labour is readily available, the capital cost is much cheaper—about £8 per ton.

(5) Control. If production and harvesting can be integrated as well as drying and storage, the administration of the store is greatly simplified. For instance, if the grain from several farms is bulked up and its individual identity lost, there is no longer any need to clear individual loads from the intake pits.

The report concluded that the major advantages of jointly-owned grain drying and storage facilities lay in easier raising of capital, labour economy and in marketing

(grading and loading). A further reason for forming a grain drying and storage syndicate is the possibility of co-operative feed processing where large numbers of livestock are kept by the members. Against these advantages must be set the extra transport costs to move grain from the combine to the central store.

It may be possible, however, to extend existing stores for a third of the capital costs of the stores visited by the E.K.C.G. directors so that for the larger cereal growers the facilities of a syndicate might be obtained at a higher cost than they could provide themselves. But for farmers who have no storage, particularly those with only a small acreage of cereals, centralised facilities would usually be cheaper. The case for jointly-owned grain drying and storage facilities, therefore, rests in part on the present situation of its potential members and there seems to be need for careful, case by case, examination.

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(8) Report of Agricultural Market Development Executive Committee 1962/66.

(9) Three Rivers Trading Company Ltd. Report on Grain Marketing Scheme 1963/1966.

(10) G. W. King. A Livestock and Cereal Trading Group. Report and Proceedings of Conference 'Towards Better Marketing', Nottinghamshire Education Committee, 1966.

APPENDIX VIII

The Organisation of Collective Grain Drying, Storage and Marketing Facilities

The organisation of a collective grain drying, storage and marketing operation can vary according to its scale and scope of operation and the number of its members. The information in this appendix has been included primarily to serve the interests of a wider audience following the publication of the report.

The following are four forms which a collective grain organisation might take. They are:

(i) A machinery syndicate for grain drying and storage, i.e. the joint ownership and use of grain drying and storage machinery.
(ii) A production co-operative where the production, harvesting, drying, storage and marketing of grain is fully integrated.
(iii) A grain marketing group, with no centralised drying and storage facilities.
(iv) A centralised grain drying, storage and marketing service offered to its members by a parent body, e.g. an agricultural co-operative society.

In this appendix, these four possibilities are discussed. Particular attention has been paid to their eligibility for various types of Government assistance, since the type of organisation chosen may be largely influenced by its eligibility for grant-aid; the methods by which they can be financed; and their management. Some observations have also been made regarding the obligations of farmers towards a central grain drying, storage and marketing body.

Detailed information regarding eligibility for government grants and entitlement for cereal deficiency payments is, of course, available from the appropriate authorities to persons proposing to enter into collective or co-operative arrangements for drying and storing grain. It is emphasised that only generalised advice can be offered in a report such as this.

(i) Machinery Syndicate

The membership of a machinery syndicate is limited by law to a maximum of 20. A grain drying and storage group taking the form and organisation of a machinery syndicate is best suited to the situation where a small number of farmers wish to co-operate to replace individual on-farm drying and storage with centralised facilities. A major problem of machinery syndicates, however, is that farmers are not allowed to sell from a syndicate as a group. They must either sell as individuals, or form a separate company to which members would notionally 'sell' their grain; this company could then market grain on the members' behalf.

Under the terms of the new co-operation scheme administered by the Central Council for Agricultural and Horticultural Co-operation, a Machinery Syndicate for grain drying and storage could be eligible up to a one-third grant towards the cost of buildings and fixed equipment. Loans to assist in the joint purchase of shared machines are available through the local Syndicate Credits Company. In the case of fixed equipment, such as a grain drying and storage plant, loans of up to 90 per cent of the purchase price with half-yearly repayments over a period of several years can often be arranged. This credit is granted on preferential terms;

it is at a low rate of interest related to the Bank Rate, it does not require special collateral and, providing the borrowing terms are honoured, it is without risk of recall.

The relationship between the members of a grain drying and storage syndicate is essentially that of a partnership. Thus the members are jointly and severally reponsible for any loans or other expenditure incurred by the syndicate. For expensive machines like grain drying and storage plants, it is usual for the purchase price to be divided according to careful estimates of members' requirements, whilst all work done for each member is charged to him, initially, at commercial rates. (For examples of these rates see Appendix VII). At the end of the season, the surplus of these charges over the running costs of the plant are returned to the members in proportion to their contributions to the purchase price.

The day to day running of a grain drying and storage syndicate is covered by a set of 'Local Operating Rules'. These rules should cover the following points:

1. The proportions in which members shall contribute to the purchase price.
2. The basis on which members shall contribute to the running costs and to any other expenses.
3. The entitlement of members to the use of the plant.
4. Who shall operate the plant.
5. Who shall provide fuel, other materials, additional labour and ancillary equipment.
6. How adjustment shall be made between members for any items provided to one member by another.
7. Who shall be primarily responsible for maintaining the plant.
8. Which engineer shall inspect and report on the condition of the plant, and at what times of the year.
9. What bonuses shall be paid to operators to encourage good operation and maintenance of the plant.

So far as the management of the syndicate is concerned, it is usual for grain drying and storage syndicates to employ a firm of accountants to act as Secretary and to cope with the many internal transactions which are involved. A Management Committee of three or four members is usually appointed to take the day-to-day decisions on behalf of the syndicate. Local regular part-time labour, e.g. a small farmer, might be employed by the syndicate to operate the plant, thereby eliminating the pressure on farm labour during the peak period of harvest.

(ii) Production Co-operative

Producers who are interested in corporate action beyond that provided by a simple grain drying and storage syndicate may decide to form a production co-operative for the integrated growing, harvesting, drying, storing and marketing of their grain. When a number of farmers merge their trading activities, e.g. to market a particular product such as grain, legal incorporation may become essential. Where the major purpose of the operation is marketing, incorporation may be necessary from the point of view of eligibility for grant. There are two main advantages of incorporation–the liability of individuals is limited to the extent of their shareholdings,

whereas otherwise individual liability is unlimited. The formation of a corporate body also ensures a permanent existence for the group extending beyond the lifetime of the founder members.

In any case, when more than 20 people agree to carry on some trading activity together, incorporation is required by law under the 1948 Companies Act. There are two procedures whereby a joint trading activity may become a legally incorporated co-operative association. These are:

1. By registration as a Company which is co-operative in character, under the 1948 Company Act.
2. By registration as a Co-operative Society, under the 1965 Industrial and Provident Societies Act.

Many features are common both to co-operative companies and to Societies. Their constitutions must contain provisions concerned with:

1. The distribution of profits, after providing for a return on share capital not exceeding 7½ per cent per annum, according to the use made by members of the facilities provided by the co-operative.
2. Limitations on voting rights to prevent concentration of power into the hands of a few members.
3. Limitations on the services offered to persons who are not members of the co-operative.
4. The power to enter into contracts with members so that they are bound to sell, or market, through the co-operative. This is important to ensure that the co-operative is not used as a seller of the last resort.
5. Control over the selection and expulsion of members.
6. The requirement that 90 per cent of shares are held by occupiers of agricultural land.
7. The requirement that all members shall have equal access to the services provided by the organisation, regardless of size of shareholding.

In few instances is there a clear case for recommending a company rather than a society, or vice versa. Two exceptions are (a) in the case of a small group with less than 7 members, or (b) where shareholdings of over £1,000 per member are required; in both cases it would be necessary to take the constitution of a company. Usually, however, the choice will rest on the personal preferences of the members.

Co-operative companies and societies will both be eligible for assistance under the new co-operative scheme. But before it can obtain grant-aid the company or society must prove that it behaves co-operatively. It must demonstrate to the Central Council, which administers the scheme, its support and how it proposes to work. With a cereal production co-operative, for instance, the production, harvesting, conditioning and marketing of grain must be planned and managed co-operatively and all grain fully committed to the organisation. The cereals on all members' farms must be managed as a single cereal enterprise, in terms of planning the varieties to be grown, arranging planting and harvesting, drying, storing and selling the grain, etc. Whereas processing of cereals for sale would not be eligible for grant, milling and mixing members' grain in a co-operative project where members will feed the grain to their own stock would, in general, be eligible.

A cereal production co-operative, which was properly constituted and which fulfilled these conditions, could be eligible for grant as follows:

1. 75 per cent of the cost of feasibility studies.
2. One-third of the cost of managerial staff for 3 years.
3. Seventy-five per cent of the cost of forming the co-operative, excluding any statutory fees.
4. One-third of the cost of buildings and fixed equipment.
5. One-third of the cost of working capital items, e.g. moving equipment, rent, rates, fuel, between the time of forming the co-operative and the time when income begins to flow in. There is no assistance towards the cost of land or for interest on loans.

There is, however, no entitlement to grant under the scheme. Each proposal is considered on its merits and the actual rate of grant is fixed by the Council up to the maxima shown above.

A further condition of grant is that any facilities provided by a production co-operative must be appropriately sited in relation to the holdings of its members rather than to its main marketing outlets. This condition may not apply to a grain storage and marketing co-operative with facilities at a port.

It is usual for as mcuh as possible of the capital requirements of a co-operative to be obtained from its members, after allowing for any grants which may be received. Probably the best method of raising capital from members is for them to contribute according to their expected use of the facilities provided by the co-operative. For instance, in the case of a joint grain drying and storage plant costing say, £10,000 for 2,000 tons, each member should be required to subscribe £5 for each ton of grain committed to the co-operative. The minimum capital required from members is one-third if the co-operative is to be eligible for grant, but the aim should be to obtain from members as much of the total cost of fixed assets, less grant, as possible. One method of raising the initial capital not subscribed by members or received as grants is, of course, from the banks. Although banks may prefer to lend for working capital rather than fixed assets, bank loans can normally be obtained for capital items, but loans are unlikely to provide more than a third of the cost. Provision for repayment of loans should be included in the operational charges levied on members for use of the group's services. Terms on which such loans could be made would have to be discussed with the bank selected, but in general bankers are likely to require a significant commitment by members and perhaps joint guarantees by members or directors to cover the loans requested by the co-operative.

To sum up, the initial capital of a production co-operative might be raised as follows:

1. Up to one-third by way of grants on buildings and fixed equipment, etc.
2. Not less than one-third from the members, who would subscribe in relation to their expected use of the co-operative.
3. The remainder, but normally not more than one-third, in the form of a bank loan.

A grain co-operative would be managed by a Board of Directors in the normal way. Provided it was large enough, a salaried manager could be employed to control the day-to-day management of the co-operative's affairs, with part-time clerical and operational staff. As a rule of thumb, the manager's salary should not exceed 2 per cent of the group's turnover; thus, for a manager receiving salary and expenses equivalent to £2,000 a year, a grain co-operative would need to handle a minimum of 5,000 tons of grain a year. It should be borne in mind that a co-operative cannot hope to operate over a period of years entirely on voluntary assistance from its members. It follows that if the group cannot make sufficient savings in costs to justify the employment of staff, its existence can hardly be justified. It is for this reason that substantial grants are available for preliminary feasibility studies, and for initial assistance with managers' salaries.

(iii) Grain Marketing Group

Where a group of producers wishes to co-operate to improve the marketing of grain, but without integrating the production of cereals on their farms or investing capital in centralised grain drying and storage facilities, the solution might be to form a grain marketing group. For instance, an incorporated grain marketing company or society could be established. Members would subscribe to the initial capital at the rate of one share for each acre of cereals grown, in the case of East Kent Cereal Growers, 2s. 6d. per acre. A salaried manager and secretarial assistance, probably on a part-time basis, would be employed. The group would market its members' grain on commission through normal merchants channels, the merchants being contracted with the company for a period of years. There is no reason why an agricultural co-operative society should not be one of the commission agents employed by the grain marketing group. Members would be required to enter a contract with the group to sell through it all their production of cereals, except that which they wish to retain for use on their own farms. This is important because the group must have a continuous supply of grain available which can be sold in the best outlet; this it could not do if the group was used by members like a buyer of the last resort. Members' contracts with the group should be of not less than five years duration.

Alternatively, instead of forming a grain marketing group which sold grain on commission through agents, a specialist group could be formed within a large general co-operative society. To be eligible for membership of the specialist group, farmers would have to be members of the parent co-operative. The only member who would not be a member of the 'larger' society would be the 'larger' society itself. The specialist group could either be unconstituted, or take the form of a specialist incorporated society. If unconstituted, the members would have to be members of the parent society and would have to sign a special agreement with it, covering the various activities to be undertaken, commitment of produce, discipline, and so on. The parent society for its part would have to keep separate books and accounts for the group and return any profits accruing to its members to them exclusively.

If the group were to be a specialist society, although for ordinary purposes it would function independently, the larger society would hold some degree of

control over it. For instance, the larger society would have the right to appoint at least one director to the board of the specialist group; it would have an influence on the appointment or dismissal of the paid staff; and the rules of the specialist society could not be changed without its approval. It is open to serious question, however, if the kind of arrangements postulated in this paragraph were required by the parent co-operative, whether the scheme would be eligible for co-operative grant.

The members of the specialist grain marketing society would look upon it as the only means by which their common interest in grain marketing was to be forwarded. They would therefore be required to enter into a contract to use the services of the society for the disposal of the whole of their grain production, except for the grain they wish to retain themselves. To prevent the society engaging in trade the grain would remain the property of the producer until sold by the society.

A specialist society would normally enter into an arrangement with the larger society to provide a sales outlet for the grain. The advantage of this arrangement to the large society is that it would know in advance how much grain it would have to handle and when the grain would be coming forward. It would thus be easier to make and cover forward contract arrangements, to supply relatively large parcels of grain to final users if required, and particularly to obtain shipping contracts. It would also avoid the handling charges of moving grain into a central silo and out again since it—or the specialist society—would arrange for the grain to move direct from farm to final outlet. These advantages would also accrue to a large society selling grain on commission for a grain marketing group. Whether marketing of the grain is carried out by the parent society on behalf of contracted members or by the specialist society on behalf of its own contracted members, if the scheme is to be eligible for grant this function must be carried out by making a fixed service charge and returning the remainder realised to members, using either a 'pool' system or payments to individuals on their own consignments. If the organisation buys the grain from members and resells, profit must be fully shared among members on realisation after deduction of known charges.

The capital for a specialist society would be provided by means of qualification loans. These would be directly related to the amount of grain which the society expected to handle on the members' behalf. It is worthwhile pointing out that the inclusion of permanent and exclusive marketing arrangements in any scheme might prejudice its chance of attracting co-operative grants.

Persons interested in forming a production co-operative for the integrated production and marketing of cereals, a grain marketing group or a specialist society under the umbrella of a larger society can obtain advice from the Central Council. Also, model rules for co-operative societies (including a specialist society) and companies are obtainable from the Agricultural Co-operative Association Ltd., and from the N.F.U. Marketing Development Department.

(iv) Centralised Facilities Provided by a Parent Body

As a further possibility, centralised drying and storage facilities could be provided by a parent body, such as a large co-operative society, as a service for its members. In

this case the organisation would be very simple with members sending grain to the central dryer and store as appropriate and paying the commercial rate for the service provided. A paid manager and operating staff would be employed by the society to manage and operate the plant.

There could be some advantage to a co-operative in this type of arrangement since it would allow grain to be brought into a central silo cheaply—perhaps even at the ex-farm price if the farmers were near enough to use their own transport to move the grain straight from the combine to the central store—from whence it could be moved to the final outlets as required. There are, however, several major disadvantages associated with this type of organisation. These include:

1. The initial capital would have to be found by the co-operative or partly by the co-operative and partly by its members. A substantial sum would be involved—say £20,000 for floor storage for 5,000 tons, exclusive of any land charges. It is unlikely that the proposal would be eligible for co-operation grant. However, Development Area grant might be obtained where appropriate provided some processing of the grain, e.g. grinding, crushing and mixing of grain for animal feedingstuffs, was also carried on.
2. The central facilities would tend to be used by farmers as a dump for grain which could not be handled with their own drying and storage capacity. There is some evidence that this has happened in some centrally owned stores in other parts of the country.
3. Unless members entered into firm contracts with the society to send grain to the central store over a period of years, there is no guarantee that the facilities would be used to capacity.
4. There is the problem associated with double-handling the grain from the farm to the central store, from the central store to the final outlet. Even if the store is conventiently situated to one outlet, e.g. on the quayside to serve the shipping trade, there is still double handling involved in transporting grain to other users.

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