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THE SCOPE FOR DEVELOPING DEEP-WATER PORT FACILITIES FOR SCOTTISH BARLEY EXPORTS

G. ENTWISTLE and J. R. CRABTREE

July 1985

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The North of Scotland College of Agriculture
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SUMMARY

1. Of the grain produced in Scotland, only barley will show a surplus of production over domestic usage in the next 3-5 years. The barley surplus is estimated to average 575,000 tonnes per year during 1985-1988, with 50% of this tonnage (290,000 t) from the North East (Grampian Region).
2. In recent years the Scottish barley export trade has become predominantly based upon the transshipment trade through North European Ports, principally to Saudia Arabia. Direct shipments to third countries (Algeria, Lebanon, USSR) are likely to represent only 25% of total exports in 1984/85. Whilst direct shipments to third countries may increase in coming seasons, the transshipment trade is expected to remain very important to Scotland. A changeover in the Saudia Arabia trade from bagged to bulk will slightly increase the FOB⁽¹⁾ differential between small boat and 15,000 tonne cargoes.
3. Leith already has a facility to accommodate 15,000 t bulk carriers and a development is planned for Invergordon. The remaining ports with potential are Dundee, Aberdeen, Peterhead and Peterhead Bay. Because of its proximity to Leith and the limited local surplus no major development at Dundee is expected. Peterhead will be operational until its proposed harbour extension is completed in 4-5 years time. Whilst Peterhead Bay has the potential to develop as a major export terminal, any development will require considerable investment to safeguard shipping and this would be difficult to justify for grain exports alone. Aberdeen remains the only contender for immediate development.
4. The viability of an Aberdeen investment depends principally on the annual tonnage exported. This itself depends on the FOB price advantage that Aberdeen could offer over the other local small ports. The question of whether local intervention grain would be exported through Aberdeen in 1985 and 1986 is a second central issue since this could have a major effect on the total tonnage exported. From this study, it is concluded that large (15,000 t) cargoes loaded at Aberdeen could command an FOB advantage of around £4/tonne over small boats loaded elsewhere. On this basis Aberdeen should capture 100,000 t and possibly 150,000 t of barley per year, depending on the operator and the extent to which intervention grain is released and then exported through the port. Only a relatively low-cost, efficient operation could recover its capital in 3-4 years from barley exporting alone.

(1) The "Free on Board" price. This is the price loaded and trimmed on ship in port.

SECTION 1

THE SCOTTISH EXPORTABLE CEREAL SURPLUS

The Scottish cereal area has increased from a 1970 level of 452,000 hectares to 535,000 hectares in 1984 (+18%) with winter cereals representing 31% of the total area. Production increased from 1.884 m tonnes in the 1969-73 period to 2.923 m tonnes in 1984 (+55%). In the early 1970s Scottish grain was mostly consumed on the domestic market and largely as feed. Use of both oats and barley on the farm of origin was high and both wheat and malting barley tended to be imported. Since then the situation has changed dramatically. Farm of origin usage has fallen as the number of specialist arable units has increased and farmers have been faced with important new markets.

An expansion in Scottish wheat production has been matched by an increase in uptake by Scottish millers and by the new interest in wheat being shown by grain distillers. This demand, combined with an increase in its use as animal feed, is likely to prevent any exportable wheat surplus from developing over the next few years.

An increase in off-farm sales of barley has been partly absorbed by an expansion in the uptake of Scottish barley by maltsters. The use of barley as animal feed is falling as a consequence of declining livestock numbers, the use of cereal replacers and, recently, its partial replacement in rations by wheat which is becoming increasingly available at favourable prices. As a result, the export and intervention markets have emerged as necessary outlets for surplus barley.

On the basis of present trends, barley is the only cereal likely to show an appreciable Scottish surplus during the remainder of the 1980s. The estimation of the size of the expected barley surplus is central to any appraisal of investment in deep-water export facilities. The total surplus and its regional distribution provide the starting point for calculating the likely throughput that a particular facility may attract. In estimating the surplus it was assumed that the cereals regime will continue largely unchanged in form but with a downward pressure on real prices. This will produce a continuing search for profitable crops and production methods and the development of more diversified crop mixes.

Given long-term uncertainty about the continuation of present support levels for cereals, most investors would use a maximum planning horizon of 5 years and in many cases limit the life of an appraisal to 3 years. Accordingly the barley surplus projections are based on expectations for the 1985-1988 period.

Barley Production 1985-1988

The area sown to barley in Scotland showed a consistent increase through the 1970s from 286,739 hectares in 1970 to 455,000 hectares in 1982. Since then the barley area has fallen back to 437,800 hectares in 1984 and further small falls are expected in 1985 and 1986. The rapid expansion in the cereal area in Scotland is now over and growers are looking to diversify their cropping patterns and move away from a predominantly barley base. The options open to Scottish growers appear, however, limited and the barley area is not expected to fall below 400,000 hectares. A continued expansion in the wheat area is being discouraged by problems associated with late harvesting date. With the traditional premium paid for wheat in Scotland expected to disappear in 1985 following the recent expansion in Scottish production, any further increase in wheat area is likely to be limited to the South East, Central Scotland and early areas around the Moray Firth.

The prospect of a difficult or risky harvest is also limiting the expansion of many of the 'new' crops presently being considered by producers. Only triticale⁽¹⁾ and durum wheat appear to have the potential to make serious inroads into the barley area. As yet, however, this potential is unclear. The currently sharp expansion in the oilseed rape area will almost certainly slow down as many growers have already surpassed the rotational limits of their farms.

Barley yields in Scotland have tended upwards over the past ten years with the five year average increasing from 4.48 t/ha in 1970-74 to 4.79 t/ha in 1980-84. This increase is a result of the increasing application of new crop technology, varietal improvements and a swing towards higher yielding winter sown varieties. The proportion of winter barley has increased from 9% in 1981 to 22% in 1984. A further increase beyond this level is not expected, there being continued strong interest in spring varieties and concern over the relatively high input costs for the winter crop and the labour/machinery problems which its production can entail.

The ten year trend in Scottish barley yields indicates an average annual yield increase of 0.05 t/ha and gives a predicted 1985-88 average yield of 5.0 t/ha. In the seven years since 1978, however, the observed annual rate of yield increase has been higher and a slightly higher projected yield of around 5.1 t/ha for 1985-88 is therefore used. This will give an annual production of 2.04 m tonnes for 400,000 hectares. The likely variation in total output is also of concern to someone contemplating investment in port facilities since a shortfall of say, 1% in output has a much larger proportionate effect (around 4%) on the barley surplus.

Over the last 10 years the most extreme yields observed have been 12.5% below and 11.5% above the mean. On this basis, total forecast output could fall roughly in a range from 1.80 - 2.25 m tonnes.

Table 1 shows the barley production levels achieved since 1980, the anticipated mean 1985-88 figure of 2.04 m tonnes and the corresponding surpluses.

Table 1 Production and Utilisation of Barley in Scotland '000 tonnes

	1980/81	1981/82	1982/83	1983/84	1984/85	1985-1988
Production	1850	2200	2240	1966	2260	2040
Industrial Users (Maltsters/ Distillers/Brewers)	561	750	678	666	675	700
Feed (On Farms/ Compounders)	811	762	902	771	700	675
Seeds and Waste	100	100	90	90	90	90
Surplus	378	588	560	438	794	575

(1) A wheat x rye hybrid.

Barley Consumption 1985-1988

The uptake of Scottish barley by brewers and maltsters has fallen over the period 1981/82-1983/84 by almost 30% (190,000 tonnes) to 487,000 tonnes. This is almost entirely due to a sharp fall in the use of Scottish barley by English brewers and maltsters. Its use by Scottish maltsters has held up remarkably well given the difficulties being faced in the malt market. In 1984/85 the fall-off in English demand for Scottish malting barley has continued. There has, however, been a compensating increase in the uptake by Scottish maltsters which will hold brewers' and maltsters' demand stable in 1984/85. The return of this English demand for Scottish malting barley cannot be expected for some years, until the malting and drinks trade shows some recovery from its currently depressed state.

The use of barley by distillers has increased from 75,000 tonnes in 1981/82 to 180,000 tonnes in 1983/84. Further small increases have been reported in the first four months of 1984/85. Barley is used by distillers as a replacement for imported maize. It competes with wheat and its use is dependent upon the receipt of export refunds paid by the Intervention Board in accordance with EEC regulations. While barley is expected to retain its competitive position against wheat and maize, its use by distillers may fall off due to the difficulties experienced in obtaining a consistently high quality grain.

Total industrial usage of Scottish barley is expected to increase in 1984/85 to 700,000 tonnes (Table 1). Increases beyond this level are unlikely without a re-emergence of an English demand for Scottish barley. Any cut in malting activity in Scotland or reduction in distillers' demand for barley will reduce the uptake of Scottish barley and increase the volumes available for export.

The use of barley as feed in Scotland is falling but still remains a significant market. Its use by compounders has fallen steadily through the 1980's from 134,000 tonnes in 1981/82 to an estimated 90,000 tonnes in 1984/85. This follows an increase in the use of wheat as a replacement for barley and the recent cutbacks in compounding activity. Further falls can be expected, as wheat becomes more competitively priced in Scotland to around 75,000 tonnes. On-farm use is not expected to suffer such a sharp decline given its suitability and convenience as a feed. Falls in livestock numbers on Scottish farms will however reduce on-farm demand and cut on-farm feeding from 650,000 tonnes in 1983/84 to around 600,000 tonnes over the period 1985-1990. This will give a total feed demand of 675,000.

With an estimated 90,000 tonnes of barley falling into the seed and waste category, the average surplus during 1985-88 is calculated at around 575,000 tonnes (Table 1).

The Regional Distribution of Surplus Grain

Barley production is concentrated in the Eastern regions of Scotland in four distinct areas - The North, North East, Central and South East Scotland. Each area surrounds a deep water port with the potential to load cargoes of at least 15,000 tonnes. Table 2 indicates the level of production that can be expected in these areas over the period 1985-1988 and the associated surpluses that will be available for export or sale into intervention.

Table 2 Regional Distribution of the Scottish Barley Surplus

	Area '000 ha		1985-1988 Surplus '000 tonnes
	1984	1985-1986 (Forecast)	
North	30	28	55
North East	136	129	290
Central	132	118	100
South East	83	75	130
Rest of Scotland	57	50	0
Total	438	400	575

The North of Scotland - The Highland Region

The barley area in the Highland Region is forecast to fall by 7% or 2,000 hectares from its 1984 level to around 28,000 hectares over the period 1985-1988. The tendency towards an early harvest in the region's main arable area will encourage a move from barley into wheat, peas, durum and perhaps triticale. The strong local demand for malting barley will however act to counter these moves with a high proportion of the barley area remaining spring sown.

Barley production in the region is expected to average 142,000 tonnes with an exportable surplus of 55,000 tonnes. Production in 1984 reached 155,000 tonnes. Of this 14,500 tonnes had been offered into intervention by March 31st and a further 40,000 exported through the region's ports - a total of 54,500 tonnes.

If Morayshire is included in the hinterland of Invergordon (the region's major deepwater port), the surplus potentially available for export through this port rises to around 80,000 tonnes.

The North East of Scotland - The Grampian Region

The barley area in the Grampian Region is forecast to show the smallest fall of the four regions due to the unattractiveness of the alternative crops in an area which often experiences a late harvest in difficult conditions. A 5% fall in area is anticipated to 129,000 hectares. Barley production is expected to be 660,000 tonnes with an exportable surplus of 290,000 tonnes. Production in 1984 reached 700,000 tonnes of which 120,500 tonnes had been offered into intervention by March 31st and 196,000 tonnes shipped through the region's ports - a total of 316,500 tonnes.

Grampian Region produces approximately 50% of Scotland's barley surplus. Of this surplus only a small part - perhaps 10% can be expected to be of malting quality and require shipment in small boats. The remaining 90% will be of feed quality, available to be shipped in any size of vessel. This represents the greatest concentration of surplus feed barley in Scotland.

Central Scotland

The barley area in Central Scotland is forecast to fall by 10% or 14,000 hectares to 118,000 hectares due to considerable interest in wheat and a variety of 'new' crops that include oilseed rape, peas and flax. Barley production is expected to average 600,000 tonnes with an exportable surplus of 100,000 tonnes. Exports out of the region peaked at 162,000 in 1981/82 before intervention sales diverted grain out of the region. A large proportion of the surplus - perhaps 50%, will normally be of malting quality. In years with a strong export demand for malting, this grain will tend to be shipped in small vessels to the continent leaving a substantially reduced feed barley surplus of less than 70,000 tonnes available for bulk shipment.

In 1984 barley production reached 680,000 tonnes of which 84,800 tonnes had moved into intervention and 107,000 tonnes shipped through the region's ports by March 31st - a total of 191,800 tonnes.

South East Scotland

The barley area in this region is forecast to fall by 10% or 8,000 hectares to around 75,000 hectares due to a considerable interest in wheat and various 'new' crops particularly peas. Diversification is favoured by the region's generally earlier and safe harvest and its proximity to Scotland's major centres of cereal consumption - the millers, distillers and compounders.

Barley production is expected to average 380,000 tonnes with an exportable surplus of 130,000 tonnes. As in the central region, a large part of this could well be of malting quality which will move in small vessels when trade occurs. Shipments through the region's ports (Leith and Berwick) peaked at 130,000 tonnes in 1981/82. Shipments in 1983/84 reached 114,000 tonnes with large movements out of the region to Teeside and Blyth. In 1984 production reached 430,000 tonnes of which 130,000 tonnes has been offered into intervention and 69,000 tonnes moved through the region's ports by 31 March, a total of 199,000 tonnes.

SECTION 2

SCOTTISH EXPORT MARKETS

Introduction

Scottish barley has until recently been exported into three distinct markets:

- Non-EEC countries bordering the Baltic, particularly Poland and East Germany, as feed.
- The major trading ports of Belgium, Holland and Northern France for transshipment to a variety of non-EEC destinations as feed.
- Various Northern EEC ports for local consumption, either as feed or for malting.

Scottish barley was restricted from directly entering markets outside these three areas because of:-

- Scotland's geographical isolation from the important markets of the Mediterranean relative to competing sources of feed grain in England, France and recently Spain.
- The inability of Scotland's ports to load cargoes greater than 3,500 tonnes and ship these cargoes at competitive rates to distant markets.
- The relative scarcity of shipping along Scotland's East Coast and the consequential greater chartering cost when compared with the continental coasts.

The provision, in 1984, of grain elevators capable of loading vessels larger than 3,500 tonnes at Aberdeen, Dundee and Leith has helped remove one of the constraints which prevented entry to more distant markets. Elevators at Leith are now considered capable of loading vessels of up to 15,000 tonnes dwt while the Dundee and Aberdeen elevators will regularly load vessels of up to 5,000 tonnes dwt. Though the geographical isolation and scarcity of shipping remain, these port developments have enabled direct shipments to more distant markets to take place during the 1984/85 season.

Table 3 Scottish Barley Exports August-March 1984/85

Destination	No of Vessels	Tonnage Carried	Normal Size of Vessel
Ghent/Antwerp/Rotterdam/ Zeebrugge/Amsterdam - for transshipment	224	291,000	2,400 tonnes or less
Bremen/Hamburg/Olso - intra-Community trade	9	7,600	2,400 tonnes or less
USSR	19	67,000	5,000 tonnes or less
Algeria/Lebanon	3	45,000	15,000 tonnes

Source: Survey of ports by NOSCA

Export Destinations

Table 3 lists the destinations for Scottish exports and the respective cargo sizes over the period August-March 1984/85.

Direct shipments to Russian Baltic ports and Mediterranean countries have for the first time become a regular feature of the Scottish trade. The table clearly shows, however, that the transshipment trade through the North European ports is the single most important outlet for Scottish barley.

During the late 1970s and early 1980s the East European Baltic states represented the major market for Scotland's barley, with over 50% of Scottish exports regularly moving into Poland and East Germany. The transshipment trade generally came second in importance taking 30-40% of Scottish exports whilst intra-community trade would account for the remaining 10%. Intra-community trade has only been of real importance when a strong export demand for Scottish malting barley has emerged. In some years this trade has represented almost 50% of Scottish barley exports. It remains dependent however upon poor malting barley crops elsewhere in Europe due to the normal inferiority of Scottish supplies. The opportunity for for malting barley exports is diminishing however, due to the general fall in malting activity throughout Europe following cutbacks in production within the drinks industry.

Following the withdrawal of the credit lines, upon which trade with Poland and East Germany depended, the East European Baltic trade effectively stopped. Since then the Scottish barley export trade has become predominantly based upon the transshipment trade through North European ports. At these ports grain is collected from throughout the EEC and shipped in large 25-40,000 tonne vessels to various destinations. Of particular importance in recent seasons has been the trade in bagged barley to Saudi-Arabia. The growth and importance of Saudi-Arabian imports during the period 1980/81 to 1984/85 is illustrated in Tables 4 and 5.

Table 4 World Barley Imports 1980/81 - 1984/85 (m tonnes)

	1980/81	1981/82	1982/83	1983/84	1984/85
Saudi Arabia	1.6	2.7	2.6	3.2	3.4
USSR	4.0	3.6	2.2	0.6	2.6
Japan	1.5	1.5	1.2	1.6	1.6
Eastern Europe	2.1	1.2	1.5	1.5	1.3
Spain	0	0.7	1.6	0.1	0
EEC	0.6	1.1	1.2	1.2	0.5
Others mainly: - Algeria/Libya/Iran - Taiwan/Singapore	4.4	4.4	3.5	6.4	7.1
Total	14.2	15.2	13.8	14.6	16.6

Source: HGCA Review of USDA World Trade Estimates
HGCA Weekly Digest Vol. 11 No. 17 (26/11/84)

Table 5 UK Barley Export '000 Tonnes

	1982/83	1983/84	1984/85 (Aug-March)
Belgium	438	522	903
Denmark	1	183	4
Eire	10	69	2
France	150	69	44
W. Germany	170	221	13
Greece	0	26	0
Italy	133	466	188
Netherlands	227	158	40
EEC Total	1,129	1,714	1,194
Algeria	230	479	390
Tunisia	2	11	20
Libya	0	37	77
Iran	2	84	149
Saudi-Arabia	422	347	346
Cyprus	33	67	116
Jordon	0	33	48
E. Germany	20	0	1
USSR	0	0	346
Poland	11	14	10
Spain	649	48	3
Other Countries	81	80	61
Non EEC Total	1,450	1,200	1,567
Total	2,579	2,914	2,761

Source: HGCA compilation of HM Customs and Excise Data

Saudi-Arabia

Saudi-Arabia has in recent seasons become the single biggest importer of barley in the world (Table 4). This follows the introduction of a subsidy on feed barley consumption in the Kingdom. The demand is for bagged barley and has been met by large and efficient bagging plants in both Australia and the North European ports. The introduction of bagging plants at Saudi-Arabian ports is expected to turn the Saudi trade entirely over to bulk cargoes shipped in vessels of 25-40,000 tonnes deadweight probably by the end of 1985.

Scotland has been well placed to supply barley for bagging at continental ports with eventual shipment to Saudi-Arabia (Table 5). The effect that the change to bulk shipments will have on this transshipment trade is uncertain. Given the continuation of the feed subsidy in Saudi-Arabia, it is expected that grain will continue to be collected at the North European ports for transshipment in large vessels to Saudi-Arabia and will continue to represent an important market for Scottish barley shipped in small vessels of around 2,400 tonnes. Indeed, given the need to bring in the largest cargo possible to fit in with very tight unloading schedules at Saudi ports, it is likely this trade will go almost completely towards large 30-40,000 tonne cargoes shipped out of Antwerp or Ghent with 15-20,000 tonne English cargoes less

well placed to compete.

USSR

Imports of barley by the USSR declined steadily from 4.0 m tonnes in 1980/81 to 0.6 m tonnes in 1983/84. Imports are however expected to increase sharply in 1984/85 to around 2.6 m tonnes following another poor Russian harvest. Strong lobbying by French trade officials has ensured that the EEC secures part of this trade and the UK has contributed to this tonnage. 346,000 tonnes was shipped from UK ports to the USSR in the period August - March 1984/85 but there were no exports in 1982/83 or 1983/84 which illustrates the unpredictable nature of this trade.

The Russian trade is predominantly concentrated in 15-25,000 tonne vessels. Some Baltic trade has however taken place in vessels of 5,000 tonnes and smaller. Scotland, with improved loading facilities, has been able to participate in this trade with 15,000 tonne cargoes shipped from Leith and several smaller cargoes shipped from Dundee, Montrose, Aberdeen, Peterhead and Invergordon. The future of this trade is however very uncertain, dependent as it is on Russian purchasing decisions and the size of vessel they designate to carry the trade.

Japan

While Japan is expected to remain a significant importer of barley, trade agreements with the US do not permit EEC grain to compete in this market.

Eastern Europe

The Eastern European Baltic trade is now almost entirely based on cash sales. The UK shipped no barley to Eastern Europe in the first half of the 1984/85 season although sizeable wheat shipments have been made. Should a trade in barley to Baltic ports develop, Scotland is well placed to supply cargoes in a range from 600-5,000 tonnes. Given the somewhat limited potential for increasing domestic grain production in Poland, the IWC⁽¹⁾ estimate that Poland will probably need to import substantial amounts of grain over the next few years. As the export of livestock products remain an important source of foreign exchange, feed grain imports are likely to be important whenever a shortfall in domestic production occurs.

Spain

Spain, once a major market for UK barley, produced a surplus of barley of around 1 m tonnes in 1984/85. Improvements in crop husbandry techniques in Spain can be expected to reduce the annual fluctuations in production and perhaps remove the need to import feed grains.

EEC Internal Trade

The USDA estimates presented in Table 4 show the EEC import demand for barley from third countries falling to an estimated 0.5 m tonnes in 1984/85. Trade in barley between member states however remains important. For example, UK barley exports during the 1984/85 season to Italy will approach 200,000 tonnes (Table 5). Intra-Community trade for local

⁽¹⁾ Poland - An Outline of the Grain Economy. International Wheat Council Market Report 31st May 1984.

consumption elsewhere is less important with shipments during August-March (1984/85) of approximately 4,000 tonnes shipped to Denmark, 2,000 tonnes shipped to Eire, and 13,000 tonnes shipped to West Germany. The remaining trade with Belgium (903,000 tonnes), Holland (40,000 tonnes) and France (44,000 tonnes) will be predominantly for transshipment. Whilst transshipment dominates the Scottish export trade, quantities have been shipped in small vessels for consumption within the Community. Scotland would be well placed to take advantage of this trade should barley production and feed grain supplies decline elsewhere in Europe.

Other Third Countries

While important markets for UK barley lie in this category, only a few offer opportunities for the direct shipment of Scottish barley. A trend is evident in all but the important Algerian market towards large 20-25,000 tonne vessels (Cyprus - 22,000 tonnes, Tunisia/Morocco - 20,000 tonnes, Iran - 25,000 tonnes). Algeria will only trade in vessels of around 15,000 tonnes or less due to depth limitations at her ports. Scotland is now supplying cargoes of 5-15,000 tonnes to Algeria. This trade can be expected to continue provided Scottish barley remains competitive against English, French and Spanish supplies.

Vessel Sizes and Destinations

Particular export destinations for UK barley tend to be associated with a particular size of vessel. This is a reflection of differential freight costs and limitations on port capabilities either in the importing or exporting country.

Table 6 lists these characteristic vessel sizes.

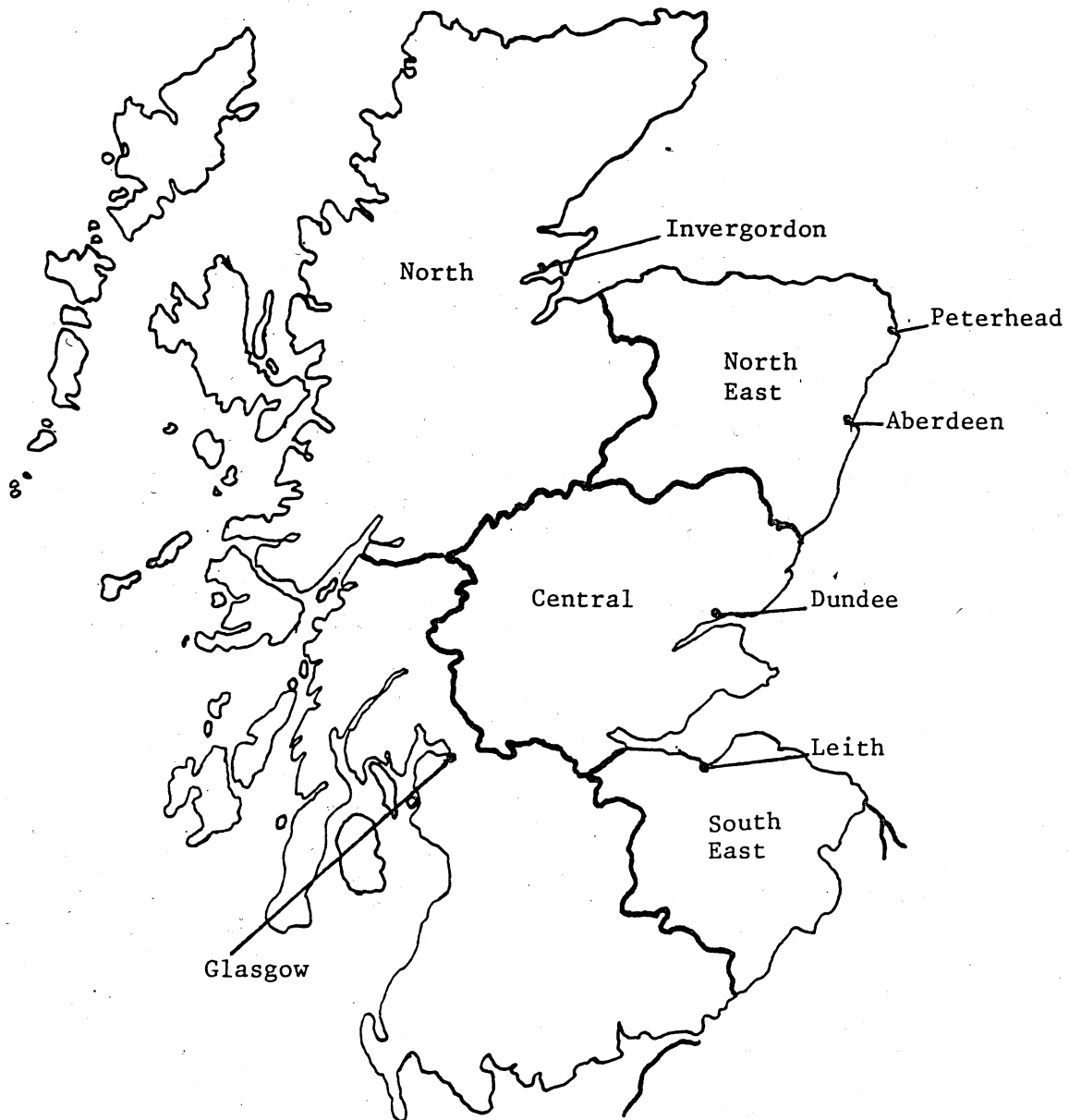
Table 6 Typical Sizes of Vessel for Different Export Markets

Destination	Typical Vessel Size
Algeria	13-15,000 t (some smaller vessels)
Adriatic Coast	15,000 t (some smaller vessels)
Belgium, East Germany, Netherlands	2,400 t
Cyprus	22,000 t
Iran	25,000 t
Morocco	20,000 t
Poland/Baltic States	2,400-5,000 t
Saudi-Arabia	20-45,000 t
Spain and Mediterranean	2,400 t upwards
Tunisia	20,000 t
USSR	Various, 2,400 t - 45,000 t

The vessel size groupings in Table 6 are of considerable relevance. For much third country trade the typical size is 20-25,000 t with the exception of Algeria, the Baltic ports, USSR and some European/Mediterranean destinations. The 8,000-10,000 t vessel, of which there are relatively few, has no clear market niche. The coaster vessels up to 5,000 t still have a wide range of nearby markets covering the Baltic ports and European destinations, with the Belgian transshipment (bagging or direct transfer in bulk to a larger vessel) being especially significant.

Whilst the development of port facilities capable of loading vessels of up to 15,000 tonnes will widen the range of markets into which Scottish markets can be competitively shipped, the traditional trade in small boats to Dutch, Belgian and French ports for transshipment is likely to remain an important market for Scottish barley. Any increase in either intra-Community or Eastern European Baltic trade for local consumption will favour Scotland and provide opportunities for trade in various sizes of vessel.

Figure 1 Ports with the Potential to Accommodate and Load Vessels of at
least 15,000 tonnes dwt



SECTION 3 SCOTTISH GRAIN EXPORTING FACILITIES AT DEEP WATER SITES

Of the Scottish ports Invergordon, Peterhead, Aberdeen, Dundee and Leith have the potential to accommodate and load vessels of at least 15,000 t. Glasgow is not considered due to its geographical disadvantage and limited potential as a grain exporting port.

Invergordon

The Cromarty Firth has well sheltered deep water which regularly accommodates vessels of up to 160,000 dwt. Three piers capable of loading cargoes of barley exist at Invergordon and a fourth is under construction. Currently, grain cargoes of up to 5,000 tonnes are loaded at the port using small mobile elevators supplied by lorries.

Invergordon, following the recent improvements made to the A9, is now well connected, by road, to central Scotland. Road links with the Grampian Region however remain congested. The port is connected to the national rail network and has sidings within both the dock area and the National Enterprise Zones that have been designated in and around Invergordon.

The four piers offer the following facilities.

- British Alcan Pier. Vessels of up to 50,000 tonnes dwt with 38 ft (11.6 m) draught can be accommodated at all states of the tide. A conveyor runs the full length of the pier, designed to unload materials for the now closed aluminium factory at Invergordon. Various studies made by shipping interests have deemed it impractical to reverse the conveyor for grain loading purposes. The pier is however accessible by road vehicles and grain could be loaded from the pier using mobile elevators. Careful control of traffic on the pier would be necessary to avoid congestion.
- Admiralty Pier. Vessels of up to 40,000 tonnes dwt can be accommodated with 36 ft (11 m) draught at all states of the tide. The restrictions imposed by the Royal Navy on the use of this pier (priority access to all Royal Navy ships) will deter any other development.
- Invergordon Supply Base. Vessels of up to 25,000 tonnes dwt with 29 ft (8.8m) draught can be accommodated at this pier. The priority given to oil supply vessels will deter any development in grain loading facilities.
- A new pier is under construction at Evanton, 8 miles west of Invergordon. During the 1985/86 season an export terminal, based at the new pier, is to be developed with the capacity of loading vessels of up to 20,000 tonnes dwt. The facility will be part of an extensive grain storage complex located adjacent to one of the piers. The viability of this development does not depend solely on income from grain exporting. It is envisaged that initially, at least, the terminal will take grain from the local regional surplus and attract some supplies from Morayshire and possibly Central Scotland.

Peterhead

This port is the busiest grain exporting port in Scotland and regularly ships more than 100,000 tonnes of barley through a season. It is presently able to accommodate vessels of up to 3,500 tonnes dwt with a maximum length of 295 ft (90 m). These vessels can only leave harbour 2 hours either side

of high tide. Work practices at the port are highly regarded by shippers. Usually loading can be completed within 24 hours using mobile elevators supplied by lorries.

The development plans proposed by the Harbour Board envisage an extension of the harbour which will in 4-6 years time take all vessels of 7-8,000 tonnes at a new quay with 8.5 m draft. It is considered by the Harbour Board that 60% of vessels of 10-12,000 tonnes in the Lloyds register will be able to use the new quays. Following the outcome of the Parliamentary Commission in May 1985 the likelihood is that the Harbour Board will be able to proceed with these investment proposals.

The Peterhead Bay Harbour adjacent to the Peterhead Harbour can provide a berth for vessels of up to 40,000 tonnes dwt with a minimum depth of 12 metres, at a purpose-built, tanker jetty. The jetty has the potential to be developed as a grain export terminal. Extensive alterations, estimated at £3-5 m, will however be first required before the security of vessels in all weathers can be guaranteed. Furthermore with only limited space on the jetty for road vehicles, grain will need to be carried to the jetty by overhead conveyor, loaded outside the harbour. The immediate area is particularly exposed during the winter months and any development will need to be sited on the landward side of the access road. Nearby, disused warehouses in a good state of repair, provide a possible site for convenient grain storage.

Aberdeen

A deep water berth exists at Aberdeen capable of accommodating vessels of up to 19,000 tonnes dwt with 9 m draft. No space is available next to this berth for the development of flat storage and the use of large mobile elevators. The restrictions of space within the harbour will only allow the development of a silo storage complex of limited capacity of approximately 5,000 tonnes with loading via a gantry. This has been costed at approximately £1.25 m.

Although labour arrangements within the port are directed by the Dock Labour Scheme and are less flexible than those at Peterhead, it is thought that acceptable practices could be negotiated. Traffic congestion in and around the port is not considered a problem by those familiar with the location.

Mobile elevators, presently available at the port, enable vessels of up to 5,000 tonnes dwt to be loaded.

Dundee

Dundee is developing slowly as a grain exporting terminal. Investments made by the port will allow vessels of up to 15,000 tonnes dwt to be loaded using mobile elevators supplied by lorry. Only one deep water berth, capable of accommodating vessels of up to 15,000 tonnes dwt with a draught of 9 m (28 ft), is however available in the port. The demand for this berth from other port users prevents it being reserved for grain shipments. Other berths with draughts of 5-6 m will accommodate vessels of upto 8-9,000 tonnes.

Despite the availability of approximately 6,000 tonnes of storage space close to the quay side, the importance of the malting barley trade in the port's hinterland and the limited feed barley surplus appear to preclude Dundee from any large scale investment.

Leith

Leith is the only port in Scotland that has developed as a deep water grain export terminal. Currently it can load vessels of up to 15,000 tonnes using two Fisons mobile elevators. The constraints of the Dock Labour Scheme, the current elevation equipment and the distance of the port silos from the quay have led to some weaknesses in the functioning of the port as a grain exporter. Investment in new equipment should increase the rate of loading while greater labour flexibility will improve the reputation of the port. Barring any major elevation problems, Leith is expected to develop further and attract, perhaps, 150,000 tonnes of grain per season for export.

SECTION 4

PORT DEVELOPMENT PROSPECTS

For investment in specialised deep water export facilities to be viable there must be an acceptable relationship between

- (i) the capital expenditure in storage/elevation equipment;
- (ii) the barley tonnage exported/year through the facilities and
- (iii) the financial margin/tonne available after covering the operating costs.

The margin per tonne (iii) and the tonnage throughput (ii) determine the total income generated which is available to cover the capital and interest charges associated with investment. All investment possibilities, at whatever port, centre on the capital cost, throughput and margin/tonne estimates and the associated risks. The estimation of these components will, needless to say, usually be complicated by the range of facilities which could be developed depending on the target vessel size, speed of loading and desired storage capacity. The target vessel size is a key decision, since this determines the required expenditure on storage and elevation equipment. It also tends to determine the destination for which the facility will be most competitive, since many destinations have a clearly preferred vessel size, determined by physical port characteristics or economies in freight costs.

A potential investor in port facilities should also take a view on the development prospects for both the CAP cereal regime and the export markets for barley. An investor has to envisage a niche in the overall export scene which is sufficiently profitable and secure to give a required return on capital over 3-5 years.

The basis adopted here for the general assessment of port facility investment is that the current export destinations and the export restitution system of the CAP will not change radically over the next three years.

Assumptions regarding the Scottish barley surplus have been discussed in Section 1.

Investment in Port Facilities

To be accepted by the international shippers as a mainline export terminal, a port should have around 10,000 tonnes of storage and be able to load vessels up to 25,000 t at rate of 4,000 t/day. The elevation equipment and outflow rate from the storage are seen as critically important since they are the main determinants of the daily loading rate. No Scottish port can offer facilities to this standard nor could such investment be justified given the limited throughput available. This will become apparent when the viability of lower cost facilities is discussed later in this section.

Investors in Scottish ports must settle for a lower-grade facility at lower capital cost. In general terms the 15,000 tonne vessel is about the maximum that can be loaded without fixed, high-cost storage and elevation equipment. The choice of target vessel size is governed in many ports by the limited depth of water. Below this constraint the choice of maximum vessel size is intimately connected with the related export markets, the associated storage/elevation facilities and the throughput required for viability.

An export facility for 13-15,000 vessels has a reasonable range of export destinations (see Section 2) and the obvious flexibility to handle smaller boats if necessary. Depending on the port and the availability of barley in

the vicinity, around 5-8,000 tonnes of storage would be needed and the desired elevation rate would be 4,000 t/day. This would generally be achieved by a mixture of ex-store and ex-farm deliveries with a rapid lorry unloading time. The capital costs for such a facility typically vary between £0.75 and £1.25 m, depending on the size and type of the storage and elevators.

A facility aiming for 8-10,000 tonne vessels (such as is proposed at Peterhead) would require a smaller investment but two aspects are relevant here. Firstly there are relatively few vessels of this size so that in practice such a facility would tend to load 5,000 t vessels. Secondly the 8-10,000 vessel is not well placed to compete in export markets with either the 5,000 t or 15,000 t vessels. It could operate in the Algerian trade and even in some USSR and Baltic trade but the 8-10,000 tonne vessel does not occupy a secure niche in the export market. It is doubtful whether a specialised 8-10,000 facility could pay off as compared with a 5,000 t or 13-15,000 tonne.

A 5,000 t vessel facility could be based on good elevation, with limited or storage, relying directly on off-farm deliveries perhaps with a back-up store. This vessel size does serve a large variety of export markets. For ports capable of berthing 5,000 t ships the up-grading from the 2,400 vessel to 5,000 t is a relatively small step requiring an improved elevation speed, preferably with on-quay storage. This type of development is not seen as a central aspect to the present study which will concentrate on the much more costly and risky step of moving to the 13-15,000 t vessel.

Throughput of Barley

Probably the single most crucial variable in an appraisal of investment for a 15,000 t facility is the expected throughput tonnage. The starting point must be the expected regional barley surplus as calculated in Section 1. Of this, however, a proportion will typically be sold into intervention and not immediately available for export. A proportion will typically be malting barley (particularly high in the Central and South-East regions) which is normally exported in small boats. This tonnage is lost to the 5,000 t vessel. With the free market, non-malting barley there remains the question of how much would be attracted through a specific port, given transport costs, competition from other ports and the market power of merchants and shippers with other vested interests. Clearly an investor offering a fobbing⁽¹⁾ facility but without control of supplies (either directly, by joint investment or by contract) is in a weak market position. Fobbing rates could be put under pressure and there could be difficulties in attracting trade with which to establish a reputation for the facility. Much depends on the FOB premium that a 15,000 t vessel could attract since part of this premium would be available to procure supplies through a price incentive.

The current FOB premium on 15,000 t ships compared with 2,400 t is around £3.50 rising at times to a maximum of £4.50. It is important to note that this is not derived from a comparison of identical markets, the 2,400 t trade mainly being to Antwerp and Ghent for bagging or direct transhipment. In the future, with the demise of Saudi-Arabian bagged imports, the relevant 2,400 t trade will be to Continental ports for transhipment to 20,000-

⁽¹⁾An elevation/weighbridge facility that takes grain delivered to port and elevates it on ship to give an FOB cargo. In some cases a storage facility may be included.

45,000 t vessels. The best single approach is thus to cost the transfer of a 2,400 t small boat cargo (say ex-Peterhead) to FOB Antwerp and then to compare the FOB Antwerp with FOB 15,000 t East Coast Scotland.

Approximate costs would be

Freight Peterhead - Antwerp	£5-£6/tonne
Finance cost, insurance, weight loss	£0.75/tonne
Transshipment to large vessel	£1.50/tonne
	<hr/>
	£7.25-£8.25/tonne

Thus, the transfer of barley from FOB Peterhead to FOB large vessel at Antwerp costs £7.25-£8.25/t. To complete the Peterhead/Aberdeen comparison, rather more than the 2-3\$ FOB advantage which Antwerp has over the English deep water ports must be deducted since Scottish ports would be at a slight freight cost disadvantage.

On this basis the FOB 15,000 t Aberdeen would in the future probably be £4.0-5.0/t higher than the FOB 2,400 t Peterhead. It is therefore not apparent that the change in the Saudi-Arabian trade towards total bulk shipment will dramatically change the small/large vessel comparison. For budgeting purposes it is suggested that a £4 price advantage would be the best estimate. On this basis a shipper has £4/tonne to cover increased fobbing costs (say £2/tonne) leaving only £2/tonne or perhaps £2.50 for procurement of grain.

Table 8 Scottish Road Transport Rates Quoted by Merchants (1)

Miles	£/tonne
1- 10	2.70 - 2.90
11- 20	3.15 - 3.30
21- 30	3.50 - 3.80
31- 40	3.85 - 4.20
41- 50	4.20 - 4.50
51- 60	4.35 - 4.75
61- 70	4.55 - 5.05
71- 80	4.95 - 5.55
81- 90	5.30 - 6.00
91-100	5.60 - 6.30

Although on the basis of transport costs alone (see Table 8) a £2 differential could attract grain from a substantially enlarged area, this apparent "drawing-power" could be deceptive. It is generally thought that freight and fobbing rates for small boats would be very elastic in the face of a nearby threat from a deep water port. Additionally, in the short term, the market power and traditional behaviour of the grain stockholders could substantially reduce the apparent price advantage derived from large vessel operation. The ease with which small boat exporting can be organised particularly in the hectic harvest period is another factor indicating that the price advantage of a deep water facility would not necessarily lead to great security of supply.

(1) Rail transport tends not to be competitive with road in Scotland unless both loading and discharge points are rail linked.

Special notice must also be taken of the relevance of Intervention grain to a deep-water investment. Intervention can attract a large percentage of the exportable surplus (40% of the Grampian surplus in 1984/85). Much depends on the size of the surplus in a particular year and the strength of the early season export trade. Generally speaking, intervention is of greater importance in Scotland than elsewhere in the UK because of depressed prices at harvest. Intervention grain poses a host of questions for a potential development and it would be essential to take a view on the intervention tonnage likely to be captured by a deep water facility.

There are currently around 290,000 tonnes of feed barley in Scottish Intervention stores. This poses the question of whether some or all of this barley will move out to be exported in 1985 prior to the next harvest. If it does then it would be essential for an investor at port to engage in a dialogue with the EEC Commission and relevant UK bodies in order to further the case for export through the local facility. With the tonnages involved this would be of crucial importance. There is, however, grave doubt as to whether any Scottish intervention grain will move in 1985. If this is the case most 1985/86 intervention grain is likely to be stored in Central and Southern Scotland since stores in Grampian and northwards are full. This would be a potential gain to a Dundee or Leith facility but a loss to any investments at Invergordon, Peterhead or Aberdeen. The further south intervention grain travels to find storage, however, the greater the likelihood that it will ultimately be exported through a English port. The inadequacy of Scottish intervention facilities does represent a threat to all Scottish ports.

An alternative scenario for 1985/86 is that, with great physical and financial pressure on the intervention system with its requirement for high quality storage, for interim Government financing and finally for financing under the CAP, the whole intervention system may crumble. This could increase the free market grain surplus and increase the immediate potential exportable surplus. The question of how much grain an individual facility could capture would then depend on where the surplus grain was stored, who owned the grain and where the balance of market power rested.

Fobbing Costs and the Financial Margin

Fobbing costs are negotiable and reliable information is difficult to obtain. The cost covers harbour dues, weighbridge costs, labour, elevation costs and other overheads including profit. For 2,400 t vessels at Peterhead and Aberdeen, figures of £1.20/t and £1.80/t are quoted respectively. For the deep water ports the average seems to be around £3/tonne, although it is clear that shippers will negotiate attractive fobbing rates in return for a guaranteed tonnage. With tonnage central to the viability of elevation/storage investment and ship dues linked to tonnage it is not surprising that tonnage guarantees can give important negotiating power to shippers dealing with port authorities or facility owners searching for volume.

If £3/tonne is taken as a likely fobbing charge, then depending on the port, £1.75-£2.25 should be available as a return to the capital invested in storage/elevation facilities. This is the residual after deducting labour costs, weighbridge costs, port dues and a return to management. Table 9 gives the throughput required to break-even (15% cost of capital⁽¹⁾) in 3, 4 or 5 years at margins/tonne of £1.75-£2.25. A £1.25 m investment in

(1) This assumes no inflationary price changes during the investment life.

facilities to load a 13-15,000 t vessel would require throughput of 187-240,000 tonnes/year for 4 years depending on the fobbing rate. These figures may be pessimistic since they assume an end-year income stream whereas an investment completed just prior to harvest would start to generate income immediately. A lower cost investment with limited and low-cost storage at, say, £0.75 m would need 112-144,000 tonnes throughput depending on the margin/tonne shipped. For a business already enjoying high (taxable) profits the cost of such an investment would be reduced because of the value of the capital allowances on elevation equipment and silos, and the interest offset against tax.

Even so, a throughput of around 125,000 t/year is still needed to justify a £0.75 m facility and this tonnage increased to over 180,000 t/year for a £1.25 m investment.

Table 9 Barley Throughput (tonnes) Required for a Viable Investment

Margin/tonne	Life (Years)	Capital Cost	
		£0.75 m	£1.25 m
£2.25	3	139,000	232,000
	4	112,000	187,000
	5	96,000	160,000
£2.00	3	157,000	262,000
	4	126,000	218,000
	5	108,000	180,000
£1.75	3	179,000	298,000
	4	144,000	240,000
	5	123,000	205,000

Viability of Port Developments

Leith

This port has loaded several 15,000 tonne vessels. There have been problems with the loading rate and it is not accepted by all shippers. Improved elevation equipment has been ordered and this should improve the load-out rate. Its 1984/85 target tonnage is 150,000 t with a potential considerably higher. However it seems likely that the 1984/85 throughput may only reach 100,000 t unless there are intervention sales which could raise it to 150,000 t. Because of its rail link, Leith is a potential malt exporting port but this will not make a contribution in 1984/85.

As Scotland's only functioning deep water facility its relevance is important as a possible deterrent to other investments and because it exemplifies the difficulties of attracting throughput. The Leith facility discounts a major investment at Dundee because of competition for limited free-market feed barley in the area. Its limited throughput probably stems from a combination of factors. Primarily it is a port-owned facility and has no direct access to grain. It is not well placed for furthering its position because it lacks the direct involvement in the grain trade of the shipper/grain trader. Fobbing charges and ship dues at Leith are allegedly high but given time to

improve its functioning, and assuming it can attract more shippers, Leith could raise throughput and become firmly established.

Invergordon

A large vessel facility is planned with a 100,000 t target throughput. Given the throughput requirements of Table 9, its viability must depend on other trading and storekeeping functions for the storage facility. It will also draw grain from Morayshire and possibly Central Scotland. This development clearly precludes any other at Invergordon.

Dundee

There is no scope for a viable 15,000 t facility at Dundee given the proximity of Leith and the limited feed barley surplus in Central Scotland. Its plan to cater for 5,000 t vessels with minimal investment would seem more appropriate.

Peterhead

Plans to develop Peterhead harbour have passed the hurdle of a Parliamentary Commission and are likely to proceed. If accepted, new quays capable of accommodating vessels of 8-10,000 tonnes will become available in 1988/89. It is likely, however, this development will mainly attract grain vessels of up to 5,000 tonnes.

The development of Peterhead Bay as a grain exporting terminal would enable vessels of up to 40,000 tonnes dwt to be loaded. Such a development would require an investment of at least £5m. This expenditure could not be justified solely by the grain traffic it would attract. It would need to provide further benefits that could only be realised by some degree of co-operation between the Peterhead Harbour Trustees and the Peterhead Bay Authority. The development of Peterhead Bay as a grain terminal with space for other commercial traffic would release space with Peterhead harbours for fishing and provide commercial berths with deeper water than envisaged under the existing plans of the Harbour Trustees. It seems highly unlikely, however, that the Bay Authority will proceed with such a substantial investment.

Aberdeen

Aberdeen remains the only serious contender for a deep water facility given the investment at Leith and the expected development at Invergordon and the difficulty of developing Peterhead Bay. The site (see Section 3) is not ideal since with space limitations high cost silo storage would be needed. It is also not clear whether all 15,000 t vessels could be berthed. Given its urban location within the port it seems unlikely that an operator could obtain additional income from other storekeeping functions. Apart from any reservations that an investor may have about the labour at the port the main determinant of success is the anticipated throughput. Although the estimated surplus is 290,000 tonnes in the North East (Section 1), with the risk of losses to intervention, continued small boat exports at Peterhead and a limited financial margin with which to attract grain, an investor could not plan on more than a basic 100,000 throughput per year. This may seem pessimistic but the Morayshire part of the N.E. surplus would be under strong competition from an Invergordon development, although Aberdeen could compete for some Central Scotland grain. The £4-4.50

Aberdeen/Peterhead FOB differential does not give great scope for long-distance purchases and it is considered that the small boat trade would still capture a significant proportion of the trade. Intervention is also a key aspect. If the operation of an Aberdeen facility could feel confident that grain from stores between Turriff and Stracathro (with stocks of 130,000 tonnes) would largely flow through Aberdeen, then the investment scenario changes radically. For the years 1985-88, investors might expect a baseline tonnage of 100,000 t per year increasing perhaps to 150,000 t if intervention grain were shipped through the port. With a substantial capture of intervention exports it would be possible to envisage a peak throughput of 200,000 t in any one year.

This throughput scenario suggests that the facility would have to be low cost and efficient. For the highest chance of success it would have to attract a major shipper not committed elsewhere or a company/group with shipping and trading experience probably with control of some grain supplies in the region. The dearth of potential investors does itself tend to reduce the likelihood of any development at Aberdeen. This does not rule out the possibility of a lower-cost solution, based on a different site or a different view of the throughput prospects.

Conclusion

With heavy reliance on the small boat trade for export of its barley surplus of nearly 600,000 t per year Scotland appears to have potential for development of deep water export facilities. A greater export capability would give a greater range of market outlets and tend to increase market prices as exporters competed for supplies. The exportable barley surplus is, however, widely dispersed geographically with relatively poor transport links and much of it in 1984/85 has left the free market as intervention stocks.

Of the potential deep water ports, Leith already has a facility capable of loading 15,000 t vessels and their limited tonnage to-date is expected to increase as elevation efficiency improves. Dundee's development to take 5,000 t vessels is sensible given the smaller feed barley surplus in the locality and its proximity to Leith. Investment to cater for 15,000 t vessels is not to be expected. An elevation investment at Evanton with related storage facilities is in progress. This will give the Inverness Region a large vessel export facility and pull grain from Morayshire and possibly Central Scotland.

No grain-related development is expected at Peterhead Bay because of the major harbour investment needed and its orientation towards oil-related activity. The Peterhead Harbour proposals are now very likely to proceed but will not be operational until 1988-89 at the earliest. Even then the facility will be restricted to an 8-10,000 t maximum vessel size. Aberdeen is well placed geographically in relation to surplus barley but unless a relatively low cost or multi-use facility can be envisaged the calculated profitability of an Aberdeen investment does not make it particularly attractive.