Measuring the Competitiveness of Irish Agriculture (1996-2000)[*]

by

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List of Abbreviations

AWU	Annual Work Units
CAP	Common Agricultural Policy
DAFRD	Department of Agriculture, Food and Rural Development
DP	Direct Payment
FADN	Farm Accountancy Data Network
LU	Livestock Units
UAA	Utilised Agricultural Area

Executive Summary

Background

This research project was initiated in direct response to a specific recommendation from the report of the 2010 Committee (DAFRD, 2000) which found that there was insufficient work and data in the area of competitiveness. Ensuing from this, three separate pieces of research were undertaken. Alan Matthews and Carol Newman, Trinity College, carried out an assessment of the productivity growth in Irish agriculture from 1984 to 2000. Proferssor Gerry Boyle, NUI Maynooth, updated previous work carried out in the early 1990's on cost based and partial productivity based indicators of competitiveness. In addition, Rural Economy Research Centre, Teagasc, responded to the recommendation from the committee for '*the collection and publication on a regular basis of key competitiveness indicators, with appropriate international comparisons*" (DAFRD, 2000, p.40). Appropriate indicators of competitiveness were identified and calculated for the years 1996 to 2000. These indicators provide a baseline upon which competitiveness of Irish agriculture can be examined on a regular basis.

Selecting Measures of Competitiveness for Irish Agriculture

Phase I of this project investigated alternative indicators for measuring the competitiveness of the agricultural and food sectors, which meet the requirements of the theory of competitiveness and for which relevant data could be collected on an annual basis. Profitability was selected as a measure of competitive *performance* and costs of production, value of output and partial productivity indicators were examined as possible sources (*potential*) of competitive *performance*. In addition to *performance* and *potential*, the c*ompetitive process* is often referred to in studies of competitiveness, the mechanism whereby *competitive potential* is translated into *competitive performance*. However, the majority of these measures are qualitative in nature and consequently were not considered for the purposes of this research whereby appropriate quantitative indicators of competitiveness are to be identified.

The Farm Accountancy Data Network (FADN) was the primary source of data used in this analysis.

Results

Milk Sector

- Data analysis was confined to specialist dairy farms as defined by FADN (Farm Type 411), on which the standard gross margin from dairying accounts for at least two-thirds of the farm total gross margin. The competitive position of Irish farms was compared against Belgium, Denmark, France, Germany, Italy, the Netherlands and the UK.

- Selected partial productivity measures for Irish dairy herds were generally lower over the period 1996 –2000, compared to other European dairy producing countries examined. These results are consistent with partial productivity indicators for the same EU countries in the period 1990 – 1993 (Fingleton, 1995). Furthermore, land productivity measures for specialist Irish dairy farms declined over the period relative to the average of all countries in the analysis.

- Cash costs as a percentage of dairy output value were relatively low in Ireland over the period 1996 to 2000. Italy had the lowest cash costs as a percentage of output at 61 per cent, but the cost structure in Ireland and Belgium was only slightly higher at 66 per cent. The highest cash costs as a percentage of output was experienced in Denmark where cash costs were 89 per cent of total output of the enterprise. Further analysis of the specialist dairy farms that had between 50-99 dairy cows did not show substantial deviation from these results.

- The competitive advantage displayed by Irish milk producers deteriorated when total economic costs were considered. Total economic costs as a percentage of output were highest in Germany, but Ireland followed with the second highest total economic costs at 119 per cent of output. Irish dairy farms had on average 6 per cent higher total economic costs relative to other competing countries in the EU. The most significant imputed cost that contributed to the relatively high total economic costs experienced in Ireland over the period was the charge for owned land. When the imputed land charge for owned resources is not taken into consideration the relative competitive position of Irish dairy farms remains high, with on average 9 per cent lower economic costs (excluding owned land charges), relative to the competing countries examined. These results seem to indicate that the opportunity cost of land has a major impact on the competitive position of Irish milk producers in the long term.

- The second measure of comparative costs and returns used in this analysis was costs (both cash and economic) per kg of milksolids produced. This measure takes into account the variation in the milk constituents (fat and protein) between different countries. Despite the fact

that milk solid yields were relatively low for Irish dairy farms compared to competing countries examined, the competitive ranking for Ireland was similar for this indicator as was evident previously when costs were expressed as a percentage of output value. This result is due to the relatively low milk price received by Irish dairy farms over the period.

- The cost components of cash and economic costs show the sources of competitive *performance*. In particular, Irish dairy farms had relatively low costs for seeds and plants, crop protection, purchased feedstuffs, depreciation and machinery. However, these relatively low costs were counteracted, in particular, by high costs for fertiliser and imputed charges for owned land. These cost components provide some indication of the sources of competitive advantage and disadvantage associated with milk production in Ireland over the period.

Beef Sector

- Data analysis was confined specifically to two categories of specialist cattle holdings within the FADN dataset: (1) Specialist cattle – mainly rearing; and (2) Specialist cattle – mainly fattening. The competitive position of Irish farms was compared against France, Germany and the UK.

- Ireland's productivity in these two beef systems was generally lower for the period 1996 –2000, compared to competing beef producers in Europe examined. These results are consistent with the findings from Boyle (2002) where Irish specialist 'mainly beef rearing and fattening farms' were analysed relative to the same group of countries in 1989/99. However, it is reassuring to note that these disparities were declining over the period 1996 – 2000. This was especially evident for output per forage hectare and output per AWU, where Ireland's competitive position was increasing over time. This may be associated with the reform of the EU beef regime which became evident during this period, where the ability of Irish beef producers to secure higher levels of direct payments (Dunne *et al.*, 1997), relative to competing countries became apparent.

- A number of cost and return based indicators of competitiveness were examined for beef systems: costs as a percentage of output and allocated direct payments, margin over costs per hectare and margin over costs per suckler cow and per fattening enterprise livestock unit (LU). Overall, these results for the beef rearing and fattening enterprises show that over the period 1996 to 2000, Irish producers had a competitive advantage when cash costs were examined. In particular, Irish beef producers experienced relatively low costs for direct inputs such as seeds and plants, energy, and costs for purchased feedstuffs were particularly low on fattening

enterprises. In addition, overhead costs such as depreciation, rent, interest and machinery were also relatively low on Irish beef farms over the period.

- The competitive position exhibited by Irish beef farms dissipated when total economic costs were taken into consideration. The imputed charge for owned land and labour had a large influence on the relative competitive advantage of Irish beef farms. Considering total economic costs as a relative guide to the longer term competitive position of competing countries (Fingleton, 1995), this may be an early warning sign for Irish beef producers. However, when the imputed land charges were excluded from the calculation the longer term outlook for these farms improves substantially.

- Reliance on direct payments must be considered in view of the longer term competitiveness of Irish beef production systems. To investigate this issue a number of the cost based indicators of competitiveness were revisited to determine the ability of Irish cattle farmers to survive in a decoupled policy scenario. For the period 1996 – 2000, Irish beef rearing and fattening farms had on average 12 per cent and 3 per cent lower cash cost to market based output ratio respectively, compared to the average of all countries in the analysis. Boyle's findings showed that the competitiveness index for cash costs to output for the year 1998/99, for Ireland was higher than the average for all countries in the analysis. Further analysis of the farm data for 1996 – 2000 revealed that the year 1998/99 was in fact an atypical year in this period, which highlights the problem with using single year data for measuring competitiveness. However, it is worthwhile noting that Irelands' competitive position did deteriorate when economic costs were considered as a percentage of market based output, relative to total output (including direct payments). Furthermore, Ireland's market based competitiveness for specialist beef rearing farms deteriorated significantly over the period 1996 to 1999.

Cereals Sector

- The FADN farm classification type used in this analysis was specialist cereal, oilseed and protein (COP) producers, from which the cereals enterprise was selected and examined. The competitive position of Irish farms was compared against Denmark, Germany, France, Italy and the UK.

- Selected partial productivity indicators on Irish cereal farms were on average more positive than the results shown for the other enterprises examined. Yields were well in excess of the average of all countries examined and land and labour productivity levels were similar to the average for all countries. These results are consistent with findings from Boyle (2002) where

partial productivity indicators for Ireland were higher for cereals than for other commodities analysed. Furthermore, there was no consistent productivity trend over time observed for Irish cereal farms, relative to the average of all countries.

- A number of cost and return based indicators of competitiveness were examined for the cereals sector: costs as a per cent of total value of output, margin over costs per 100kg of product volume and margin over costs per hectare of cereal production. The three measures of competitiveness indicate that Irish cereal producers maintained a competitive advantage relative to the average of all countries in the analysis, when cash costs and economic costs were considered (excluding imputed charges for owned land). For example, Irish cereal producers had the second lowest cash cost: output ratio at 71 per cent, compared to the other countries examined.

- When total economic costs were measured Irish cereal producers still maintained a competitive advantage compared to the average of all countries with a cost: output ratio that was 7 per cent lower than the average for all countries examined.

- These results are consistent with the findings obtained in Boyle (2002) where Irish cereal producers also emerged as a strong competitor when costs were compared with France, Denmark and the UK. As the findings obtained by Boyle were based on costs as a per cent of market based output for the year 1999, it was considered important to replicate this analysis for the years 1996 to 2000. This market based assessment is particularly important for Irish cereal producers given that Irish producers had the highest reference yields (Commission Regulation, No. 2316, 1999) and consequently the highest direct payments per hectare during the years analysed. Excluding direct payments from the analysis, shows that the competitive position of Irish cereal producers was maintained during the period 1996 to 2000, when costs were expressed as a percentage of market based output, as distinct from total output (including direct payments). No apparent trend was found in this data over the time period 1996 to 2000.

- Prominent *sources* of competitive advantage associated with Ireland's relatively low cash cost structure, were low machinery costs, other direct inputs, depreciation and paid wages. In contrast to these specific cost items, which were relatively low in Ireland, there were also a number of items that were higher in Ireland than the other countries, namely, fertilisers and crop protection materials. This could be associated with high usage levels or the relatively high costs of these items in Ireland. The high cost of fertiliser was also evident in the other commodities analysed and was not peculiar to cereals.

Sheep Sector

- The data used for analysis was from the FADN and the farm classification type used was specialist sheep (Farm Type 4410), where the standard gross margin for the sheep enterprise on the farm accounts for greater than two-thirds of the whole farm gross margin.

- Selected partial productivity indicators show that Ireland and the UK had relatively low stocking rates and land productivity compared to France over the period 1996 to 2000, but Irish sheep farms did have higher technical performance based on these two measures compared to the UK. However, the UK and France both outperformed Ireland in terms of labour productivity. Similar technical performance indicators were obtained by Boyle (2002) in his comparison of sheep productivity levels in 1998/99. The high stocking rates and land productivity levels in France are linked with the intensive indoor rearing of sheep, for the purposes of milk production, which is common in France.

- A number of cost and return based indicators of competitiveness were examined for the sheep sector: costs as a percentage of output, margin over total costs per 100kg of sheep meat; and margin over costs per forage hectare. These three measures of competitiveness show that Irish sheep producers have a comparative advantage compared to France and the UK, when cash costs are considered. Irish producers have the lowest cash costs as a percentage of output and the highest margin over cash costs per 100kg of product volume. However, French producers replaced Irish producers with the highest margin over cash costs per forage hectare. This advantage experienced by French producers in terms of margin over cash costs per hectare can be attributed to the high stocking rate per hectare on French sheep farms, which is associated with intensive indoor feeding of sheep for milk production.

- The three measures of cost competitiveness show that Ireland's comparative advantage on a cash cost basis deteriorated quite significantly when economic costs were considered, over the period 1996 - 2000. For example, when the cost: output ratio for Ireland was expressed as a per cent of the average cost: output ratio, for all countries, the Irish ratio was 6 per cent higher than the average.

- Furthermore, over the period Irish sheep producers relied more heavily on subsides to supplement the revenue of the sheep enterprise, compared to the UK and France. Subsides accounted for 55 per cent of total output from the sheep enterprise in Ireland, 49 per cent in the UK and 25 per cent in France. Consequently, when costs were expressed as a percentage of

market based output, Irish producers were replaced by French producers, who had the lowest cash costs as a per cent of market based output. On an economic cost basis Ireland again appears as the highest cost producer.

- Costs for seeds and plants, purchased feedstuffs, energy, and depreciation were relatively low on Irish sheep farms over the period. However, imputed charges for owned land and family labour were particularly high in Ireland. The imputed charge for labour on Irish sheep farms was double the charge experienced in the UK and France when costs were expressed as a percentage of output.

Concluding Remarks

- In summary, it appears that for the period 1996 to 2000, the competitive position for Ireland, for all four enterprises: milk, beef, cereals and sheep, was positive when cash costs were considered in isolation from imputed charges for owned resources. Furthermore, Irish beef rearing, beef fattening, and sheep farms actually appeared as the lowest cash cost producers (as a per cent of output) compared to the other countries examined in the study. However, when cash costs were measured relative to market based output, the competitive position of Irish beef and sheep farms did deteriorate slightly, but still maintained lower costs as a per cent of output relative to the average of all countries.

- Furthermore, when the imputed charges for owned resources were considered the competitive ranking for Irish agriculture deteriorated relative to the other countries, for all commodities examined. However, in most cases the exclusion of imputed charges for owned land from the analysis reinforced the competitive position of Irish farms.

- It is however, worth noting that on an economic cost basis, (both including and excluding land), Irish beef farms (both rearing and fattening) and sheep farms appeared to be uncompetitive relative to the average of all countries, when costs were expressed as a percentage of market based output. Furthermore, specialist beef rearing farms appeared to experience a deterioration in market based cost competitiveness over the period 1996 – 2000 relative to the average of all countries. This is important in the context of impending reforms to the CAP, when direct payments become decoupled from production. As relative economic costs are considered as '*a relative guide to the longer-term competitive position*' (Fingleton, 1995, p.15) of competing countries, these findings could be considered as warning signals for the future competitive *performance of* Irish beef and sheep production.

- To understand the strengths and weakness, which underpinned the relative *performance* of Irish agriculture over the period, the indicators of competitive *potential* were examined, namely, partial productivity measures and cost and return variables. Most of the indicators of partial productivity which were measured for the commodities, indicated that the technical performance of Irish agriculture was lagging behind competing countries. However, productivity levels on Irish cereal farms were on average more positive than the results for the other commodities. In particular Irish wheat yields were well in excess of other competing countries.

- In addition to 'average' productivity levels over the period 1996 to 2000, there were also some interesting trends observed during the period. Specialist milk producers in Ireland with 50-99 dairy cows, experienced a decline in land productivity measures from 1996 to 2000, compared to the average of all countries examined. However, on a more positive note, Irish beef rearing and fattening farms improved output per hectare and per AWU relative to the average of all countries examined, which may be explained by preferential access to direct payments during the period.

- The cost variables identified for each or the commodities, showed that Ireland had a relative advantage in terms of the cost of particular 'cash cost' items but these particular advantages were outweighed on a total economic cost basis, due to the high imputed cost of owned resources on Irish farms. Certain 'cash cost' items consistently appeared as low cost items across the commodities, such as seed and plant costs, interest charges, depreciation, and fixed asset charges. However, imputed charges for owned land and labour were also consistently high across the commodities for Ireland.

- Furthermore, the results of this study provide a baseline position against which the change in competitiveness of Irish agriculture can be measured. This is an important development in the process of monitoring the position of Irish agriculture relative to other EU countries.

1. Introduction

This research project was initiated in direct response to a specific recommendation from the report of the 2010 Committee (DAFRD, 2000) which stated "*The Committee is also of the view that there is insufficient up to date evidence on competitiveness in the agricultural sector. The action programme should therefore include provision for the collection and publication on a regular basis of key competitiveness indicators, with appropriate international comparisons*" (p.40).

Phase I of this project investigated alternative indicators for measuring the competitive performance of the agricultural and food sectors, which meet the requirements of the theory of competitiveness and for which relevant data could be collected on an annual basis. The main findings from this research are outlined in the literature review (section 2) below. The appropriate measures identified were subsequently quantified for the period 1996 to 2000, for the main agricultural commodities: milk, beef, cereals and sheep production. The methodology and results for this analysis are outlined in sections 3 and 4.

2. Literature Review

The literature review focused on the identification of: (i) an appropriate definition of competitiveness; (ii) relevant indicators of competitiveness; (iii) examples of where the indicators were used previously; (iv) features of the identified indicators; (v) advantages and limitations of its use; (vi) availability of data for Ireland; and (vii) ease of international comparison.

Competitiveness is much debated by both economists and policymakers. However, nearly every study on the topic of competitiveness adopts a different definition of the term and this was noted by Reich (1992) who had the following to say about the term: "*Rarely has a term in public discourse gone so directly from obscurity to meaninglessness without an intervening period of coherence*" (p.1). Accordingly, it is imperative for the purposes of this study that the main developments in the theory of competitiveness are outlined in an effort to identify an appropriate definition competitiveness.

2.1 The Theory of Competitiveness

The theory of competitiveness has been analysed using three approaches (Thorne, 2002b): traditional trade theory, industrial organisation theory and strategic management theory.

2.1.1 Traditional Trade Theory

Traditional economic trade theory provides useful insights into the development of the concept of competitiveness. However, McCalla (1994) identified the focus of traditional trade-based theories of competitiveness as being inherently structured on supply side economics. Relative price differentials have remained the primary indicators of competitiveness definitions based on trade theory. Therefore, it must be concluded that these theories do not account very well for demand side economics. There is an inherent failure amongst these theories to address qualitative differences in products, marketing and service abilities of firms and the strategies by which industries attain competitiveness (van Durren *et al.,* 1991). Following from the failure of trade models to address such issues additional schools of thought must be investigated to develop a theory which defines the concept of competitiveness from a supply and demand perspective.

2.1.2 Industrial Organisation Theory

The main focus of Industrial Organisation (IO) theory is the identification of variables that influence economic performance and is a derivative of the theory that governs monopoly and monopsony (van Durren *et al.,* 1991). A number of theories have been developed based on the identification of variables which influence economic performance, of which the most notable are: Bain type IO, the Schumpterian model, the Chicago school and Transaction cost economics (Conner, 1991). However, the main hypothesis upon which IO theory is based is the structure, conduct, performance concept (S-C-P), also called Main type IO (van Durren *et al*., 1991).

This S-C-P model is based on the assumption that performance in an industry is said to be dependent upon the conduct of sellers and buyers in such matters as pricing policies and practices, advertising, and so on. Conduct in turn depends upon the structure of the relevant market, which is determined by characteristics such as the number of buyers and sellers and the presence or absence of barriers to entry. Subsequent empirical analysis of this concept has paid particular attention to the relationship between industry concentration and profits. According to Conner (1991) the empirical results of this analysis has been weak which has cast doubt on the legitimacy of the concept.

McCalla (1994) provided a framework which summarised the attributes of IO based theories of competitiveness in which a number of characteristics of the theory were identified: (i) a limited use of theory, research is inductive in its nature and as a consequence the frameworks developed are complex and conceptual; (ii) the belief that competitiveness is demand driven; (iii) policy is not considered as an important construct variable; (iv) non-price elements are much more important than price variables.

Based on this summary the transition between traditional trade theory and IO is evident. The difference between the two is based on the relative emphasis placed on supply side economics and demand side economics respectively.

2.1.3 Strategic Management

The strategic management school of thought can be viewed as a theory of competitiveness which brings together the concepts of both trade theory and IO. Kennedy *et al*., (1997) defined competitiveness as outlined by strategic management theorists as "*the ability to profitably create and deliver value through cost leadership and or product differentiation*" (p.386). This definition implies that competitiveness is directly related to factors that influence both the cost and demand structure of a firm. Previously the traditional trade theory of competitiveness was defined which focused on the cost structure of the firm and IO focused on the demand structure of the firm. In addition to incorporating the concepts of previous theories of competitiveness the strategic management school has also introduced a number of new concepts which led Martin *et al.,* (1991) to state: "*This literature is pregnant with lessons that businesses are learning about the manner in which they combine their resources, the quality and distribution channels they chose through which to distribute their products and particularly, the use of strategic alliances with their customers or suppliers" (p.1457).*

Porter's "Competitive Advantage of Nations" (1990) has been identified as the leading source in strategic management literature that has been proved to have the ability to broaden and integrate many recent contributions to the theory of competitiveness as well as including many of the central concepts of more established theories (van Durren *et al.,* 1991). The basic question which Porter addresses in his thesis is "Why does a nation achieve international success in a particular industry?". Porter believes that the answer to this question is inherent in his *Porter Diamond* model. Porter's Diamond sets out to determine the various sources of competitiveness of individual firms which operate within the industry. Along with the four main sources of competitive advantage, i.e. factor conditions, demand conditions, firm strategy, structure and rivalry; and related and supporting industries, an additional two factors are included which Porter believes contribute to the position of competitive advantage. These are chance and government. Any given industry may gain a competitive advantage, relative to competitors, based on only one or two of the above factors but this is highly unlikely to be sustained for any relatively long period of time. Competitors will soon ascertain the source of advantage and will latch onto the factor providing the initial comparative advantage. Thus, Porter acknowledges the importance of continuing to upgrade individual sources of competitive advantage to remain competitive in the longer term.

Based on the approaches discussed above, the strategic management concept of competitiveness is often argued to be the strongest model. This conclusion derives from (i) its explanatory power (van Durren *et al.,* 1991) and (ii) the critical importance assigned to sources of competitiveness rather than indicators of competitiveness. However, Harrison and Kennedy (1997) argue despite of the importance of identifying sources of competitiveness it is also vitally important that there is an inherent link between the sources and measures of competitiveness, which the strategic management school, including Porter (1990), has failed to do. An additional critique of the strategic management concept of competitiveness is that it has not yet been advanced to the point where it provides generalised statistically hypotheses (van Durren *et al*., 1991; Grant, 1991).

2.1.4 Defining Competitiveness

Based on the critique of the main theories of competitiveness outlined above it is appropriate at this stage to define a definition of competitiveness that is considered appropriate for this analysis.

Earlier work by Pitts and Lagnevik (1998) accepted that "*a competitive industry is one that possesses the sustained ability to profitably gain and maintain market share in domestic and/or foreign markets*" (Martin *et al*, 1991). For the purpose of this study profitability is considered as a leading indicator of competitiveness and market share will be considered in subsequent research. From the above critique of competitiveness theory which highlights the importance of (i) considering both supply and demand and (ii) identifying appropriate measurable indicators, measures of profitability are appropriate given that both cost and return variables are considered.

2.2 Levels of Competitiveness

Further to defining competitiveness it is necessary to accurately measure the term. Buckley *et al.,* (1988) identified a useful distinction between different measures of competitiveness:

- *Competitive Performance* is the measurement of indicators of competitiveness of specific firms, sectors or countries. Profitability is considered for this study as a leading indicator of performance[i].
- *Competitive Potential* is the measurement of sources of *competitive performance*. In this context an important question was raised by Boyle (2002): "*should competitiveness focus entirely on cost comparison or should it also include any product price difference*?"(p.31). This issue is addressed in Appendix 1 where various indicators of *competitive potential* are examined.
- *Competitive process* is the mechanism whereby *competitive potential* is translated into *competitive performance*. The majority of measures of the *competitive processes* are qualitative in nature and consequently are not considered for the purposes of this

research whereby appropriate quantitative indicators of competitiveness are to be identified.

Supporting the rationale outlined above indicators of *competitive performance* and the *competitive potential* are identified in Appendix I.

3. Methods

This section of the report outlines (i) the data sources and (ii) the measures of competitiveness used in the analysis.

3.1 Source of Data

The Farm Accountancy Data Network (FADN) was the primary source of data used in this analysis. The aim of the network is to gather accountancy data from farms for the determination of incomes and business analysis of agricultural holdings. The concept of the FADN was launched in 1965, when Council Regulation 79/65 established the legal basis for the organisation of the network.

The network consists of an annual survey carried out by the Member States of the European Union. Derived from national surveys, the FADN is the only source of micro-economic data that is harmonised, i.e. the bookkeeping principles are the same in all the countries. The information collected, for each sample farm, for each member country is transmitted by Liaison Agencies (FADN, 2003). Teagasc is the liaison agency for Ireland.

Currently, the FADN annual sample includes approximately 60,000 holdings. They represent a population of about 4 million farms in the 15 Member States, which cover approximately 90 per cent of the total utilised agricultural area (UAA) and account for more than 90 per cent of the total agricultural production of the Union.

FADN data itemises costs on a whole farm basis only, and some method of allocating these costs to the specific enterprises analysed in this research had to be attempted. For the majority of cost items, whole farm costs were allocated to the specific enterprise activity according to the share of specific enterprise output in total farm output. A number of exceptions to this general rule were adopted for individual cost items at the enterprise level. These are outlined in the individual enterprise sections of this report.

The specific FADN countries used in the analysis for the purpose of comparing competitiveness varies depending on the enterprise. Alternate countries are appropriate comparative units

depending on production capacity, export potential and import potential of specific countries. The comparative countries used in the analysis are outlined in section 4.

3.2 Measurement

The expression of the different indicators of competitive *potential* and *performance* employed in this analysis varies depending on the enterprise examined. The different methods employed to express the results are presented in the individual commodity sections. However, all the measures of competitiveness used in this report are based on profitability as the leading indicator of competitive *performance*. Boyle (2002) in his analysis of the competitiveness of Irish agriculture said that '*returns and costs matter to competitiveness'* (p.153). Using profitability as an indicator of competitiveness means that both costs and returns are taken into consideration.

For each of the enterprises examined, costs were defined in the following way:

(i) **Total cash costs**, which include all specific costs, directly incurred in the production of a given commodity, for example fertiliser, feedstuffs, seeds etc. plus external costs such as wages, rent and interest paid, plus depreciation charges.

(ii) **Total economic costs**, which includes all of the cash costs identified above, except interest charges, plus imputed resource costs for family labour, equity capital and owned land.

The calculation of total economic costs for the competing countries was one of the most problematic exercises in this analysis. If long-term competitiveness is to be examined the assumptions regarding the measurement of opportunity costs for family labour, owned land and other non-land capital must be as realistic as possible. The valuation methods adopted for the research in this study are outlined below:

- Family labour was assigned an opportunity cost equal to the cost of hired labour in each of the enterprises studied[ii]. The hired labour charge was determined from the FADN data.
- Owned land was assigned an opportunity cost equal to the cost of rented land in each of enterprises studied. The land rental charge was also determined from the FADN data. This approach follows the methodology adopted by Boyle *et al.,* (1992), Boyle (2002), and Fingleton (1995). However, this approach does not distinguish between the marginal and average cost of land rental. Based on Clark's (1973) argument '*that land has an average product and a marginal product which may differ, and that its rent should depend on its marginal product…..[therefore] we have to fall back on estimating economic rent as a residual, from the gross product after all other necessary inputs have been remunerated*' (p.14). Consequently, total economic costs were calculated with and without an imputed value for land. Further discussion on the implication of

including and excluding owned land in the valuation of total economic costs can be found in the results and conclusions sections.

- Non-land assets also proved to be a problematic resource for valuation purposes.

Boyle *et al.,* (1992) and Boyle (2002) recommended using a (i) real interest rate which takes into account taxes, subsidies and inflation adjustments and (ii) a depreciation rate. However, Fingleton (1995) recommended using a long-term interest rate, rather than a real inertest (derived from the FADN data) as proposed by Boyle, derived by subtracting the price deflator for private consumption from the nominal long-term interest rates for each country for each relevant year. Both of these approaches were considered but were not adopted for the research. Application of a derived real interest rate substantially increased the spread of rates charged on non-land assets between the countries examined. In addition the application of a long-term interest rate was not considered appropriate given the record of real interest rates over the time period 1996-2000 for Ireland. Due to high inflation in Ireland in this time period, the computed long-term interest rate was negative in some time periods. For this study a nominal interest rate was applied for each of the countries for each relevant year. This approach was considered to provide more realistic opportunity costs for the purpose of valuing non-land assets in this analysis, than the two methods identified above.

In addition to defining the cost variables included in the analysis, it is also important that the returns associated with the individual enterprises are accurately defined. Murphy *et al.,* (2000) outlined the importance of including direct payments in studies which compared inter-country cost and return data. Therefore, the inclusion of direct payments was considered an important issue in this research. The allocation of direct payments to the different enterprises is outlined in the individual commodity sections.

An important issue in measuring competitiveness is the distinction between the different *levels* of competitiveness. All too often research on the topic of competitiveness tends to focus on indicators of competitive *performance* and indicators of competitive *potential* are ignored (Harrison and Kennedy, 1997). Consequently, the indicators presented in this research go some way towards identifying the sources of competitiveness in addition to presenting results of competitive *performance*. The individual measures (i) costs as a percentage of output; (ii) margin over costs per product volume; and (iii) margin per hectare; provide an insight into the competitive *performance* of the countries examined, over the time period 1996 to 2000. However, they do not provide an insight into the sources of competitive advantage or disadvantage. The individual cost variables and associated returns are outlined in the appendices. This data provides an insight into the sources of competitive *potential* associated with the competitive *performance* of the individual countries. Furthermore, as competitive *potential* is concerned with the availability, quantity and

quality of inputs and how they are formulated to produce superior performance (Pitts and Lagnevik, 1998), the partial productivity indicators presented for each of the commodities are also considered indicators of competitive *potential*. However, it is important to reiterate again the significance of not examining indicators of competitive *potential* and *performance* in isolation. For example, indicators of low physical productivity can not necessarily be inferred to mean low competitive *potential* without reference to comparative indicators of costs of production or profitability, as low production costs may more than compensate for low physical productivity.

4. The Competitiveness of Irish Agriculture (1996-2000)

This section outlines the specific methods and results for the individual commodity analyses: (i) milk (ii) beef (iii) cereals and (iv) sheep.

4.1 Indicators of Competitiveness of Specialist Milk Producers in Ireland and Selected EU Member States (1996-2000)

Introduction

This section of the paper examines specific indicators of cost competitiveness and partial productivity of specialist milk producers in Ireland and selected EU member states, namely: Belgium, Denmark, France, Germany, Italy, the Netherlands and the UK. Country specific information on the extent of intra-EU trade of milk products is not available but over 85% of the EU production of butter and cheese is accounted for by the countries specified (Eurostat, 2003).

The FADN is the main source of the data used for this analysis. Data analysis was confined to specialist dairy farms as defined by FADN (Farm Type 411), on which the standard gross margin from dairying accounts for at least two-thirds of the farm total gross margin. This allows a greater degree of accuracy in the allocation of costs (which are presented on a whole farm basis from FADN) to the dairy enterprise than would be the case if all farms with a milk enterprise were selected for analysis (Fingleton, 1995).

Measurement and Methods

Two separate measures of cost comparisons were used for specialist dairy farms (farm type 411):

- Total costs as a percentage of dairy output, and
- Total costs per unit volume of milk production.

The value of dairy output was calculated as milk receipts plus dairy calf sales. Fingleton (1995) found that the omission of calf output values could inevitably affect dairy enterprise comparisons between countries. Subsequently, it was decided for this analysis that attempts would be made to

include the value of calf output in the analysis. Whole farm calf sales were apportioned to the dairy enterprise based on the dairy cows to other cows ratio[iii]. Due to data constraints it was only possible to include a value for dairy calf sales. It was not possible to impute a charge for calves born from the dairy and transferred to a beef enterprise.

Most studies which examine the costs of milk production are made on a raw milk volume basis which does not account for possible variation in milk constituents between different countries (Fingleton, 1995). Results from these studies using this approach are biased in favour of countries where the levels of milk constituents are relatively low. To overcome this bias Fingleton (1995) measured unit costs per kilogramme of milksolids (i.e. butterfat plus protein). Average fat and protein percentages for each country were used to convert the milk volumes obtained from the FADN data into the equivalent quantities of milksolids. This approach was also adopted in this study. However, a higher weighting was applied to the protein content of milksolids than to the fat content. This weighting factor was applied to distinguish the higher value of protein content.[iv] The average fat and protein percentages used for the analysis are outlined in Appendix II (The Dairy Council, 2001).

In addition to the measures of cost comparison used for the dairy analysis a number of specific cost allocation methods were adopted for the dairy analysis. As mentioned in section 3 above, in the FADN data all costs are specified on a whole farm basis. Consequently, it was necessary to devise a method whereby the costs were apportioned to the dairy activity. Table 1 below outlines the allocation keys used for the purpose of defining costs associated with the dairy enterprise. This allocation method was based on that used by Fingleton (1995) and further developed in a similar study carried out by the FADN (Vard, 2001a).

Table 1 Allocation Keys used to define costs associated with the Dairy Enterprise using FADN data

COSTS ITEMS	ALLOCATION KEYS
Purchased feed for grazing livestock (concentrates & coarse fodder)	% of 'dairy' livestock units in the total of grazing livestock units
Farm-use of non forage crops	% of 'dairy' livestock units in the total of livestock units
Farm-use of forage crops = "Specific forage costs"	% of 'dairy' livestock units in the total of grazing livestock units x
Seeds	% area of fodder crops , other forage crops and temporary grass in the total UAA - after exclusion of fallow lands, areas leased to others, meadows and rough grazing
Fertilisers	% area of fodder crops, other forage crops, temporary grass and meadows in the total UAA - after exclusion of fallow lands, areas leased to others and rough grazing.
Crop protection	% area of fodder crops and other forage crops in the total UAA - after exclusion of fallow lands, temporary grass areas leased to others, meadows and rough grazing.
Other specific livestock costs (e.g. veterinary costs)	% of 'dairy' livestock units in the total of livestock units
Owned land	% of 'dairy' LU in total LU
All other costs: - farming overheads - depreciation - external factor costs (wages, rent and interest paid).	% value of milk and milk products output in the total value of output & direct payments

Table 1 shows that a number of cost items are allocated based on the percentage of 'dairy' livestock units (LU) in the total of either grazing livestock or total LU. The definition of 'dairy' LU's is also based on Vard (2001a) and includes dairy cows, cull dairy cows and a share of total breeding heifers and young females. The share of breeding heifers and young females allocated to the dairy enterprise was based on the proportion of dairy cows plus cull dairy cows in the total

number of cows (dairy cows, cull dairy cows and other cows)[v]. The cull dairy cows and the share of the total breeding heifer and young female population reflects the costs associated with cow replacement. Fingleton (1995) identified the omission of cow replacement costs as a problem in inter country cost comparisons where replacement rates differ between countries.

The allocation of specific costs according to 'dairy' LU percentages was based on methods proposed by Fingleton (1995) and further developed by Vard (2001a). However, Vard (2001a) proposed that owned land should be allocated according to the percentage of milk and milk products in the total value of output and subsides of the whole farm, whereas Fingleton (1995) proposed that owned land should also be allocated according to LU proportions. For this analysis it was decided that Fingletons' approach for owned land was most appropriate based on the work carried out by Fingleton which showed that '*applying the output ratio estimating procedure to all cost items in the FADN data resulted in significantly higher unit costs for milk production for Ireland compared to the unit costs derived directly from the Irish data, where direct costs can be allocated to each farm enterprise'* (p.4).

Another problem area identified by Fingleton (1995) in his analysis of costs and returns for milk production in EU countries was the method in which FADN data records fodder production used on the farm. Unit forage feed costs are recorded at market prices in some countries whereas in other countries they are valued at costs of production. Consequently, it was necessary in this analysis to impute a value for non-fodder crops and fodder crops rather than using the value supplied form the FADN data. The allocation of these costs can be seen in Table 1 above and the calculation of the cost items was based on methods proposed by Vard (2001a). The methods are:

(1) The value of the farm use of non-fodder crops, produced on the farm, such as barley and rye, were retained in the cost item 'crops used for feed'[vi]. However, the value of farm use of all crops used as forage (fodder roots, other forage plants – e.g. silage cereals, temporary grass, meadows and pastures and rough grazing) is excluded.

(2) the cost of fodder crops is based on costs of production represented in specific crop costs (seeds, fertilisers, crop protection) and is estimated on the basis of area. As all types of forage crops do not incur the same specific costs, such as the case where no crop protection is used on temporary grass, the area taken into account varies according to the input. This cost item is called 'specific forage costs' and is shown in Table 1 above.

All other methodological issues for comparing costs of production identified in section 3 above are relevant for the dairy sector, including the valuation of owned resources, calculation of cost items etc.

The partial productivity indicators used in this analysis for the dairy sector were defined by Fingleton (1995). The measures relate to animal, land and labour productivities. They are:

- Milk yield per cow (kg)
- Milksolids per cow (kg)
- Stocking rate (LU/ha)
- Milk production per hectare (kg)[vii]
- Milksolids per hectare (kg) [viii]
- Milk production per labour unit (tonne).

Results

The results for the dairy enterprise are presented in two sections: (i) partial productivity indicators and (ii) comparative costs of production.

Comparison of partial productivity indicators on EU dairy farms

In Figures 1a and 1b below the partial productivity indicators identified above are outlined for the eight EU countries compared in this analysis. The results are presented for all specialist dairy farms in the sample, weighted to present population means. The results presented here for each of the countries is the average for the years 1996 to 2000 and indexed relative to Ireland. The absolute levels of the indicators, for each of the years and for each of the countries are shown in Appendix III, both for all specialist dairy farms and for all specialist dairy farms with 50-99 dairy cows.

Figure 1a ***Partial Productivity Measures for EU countries***

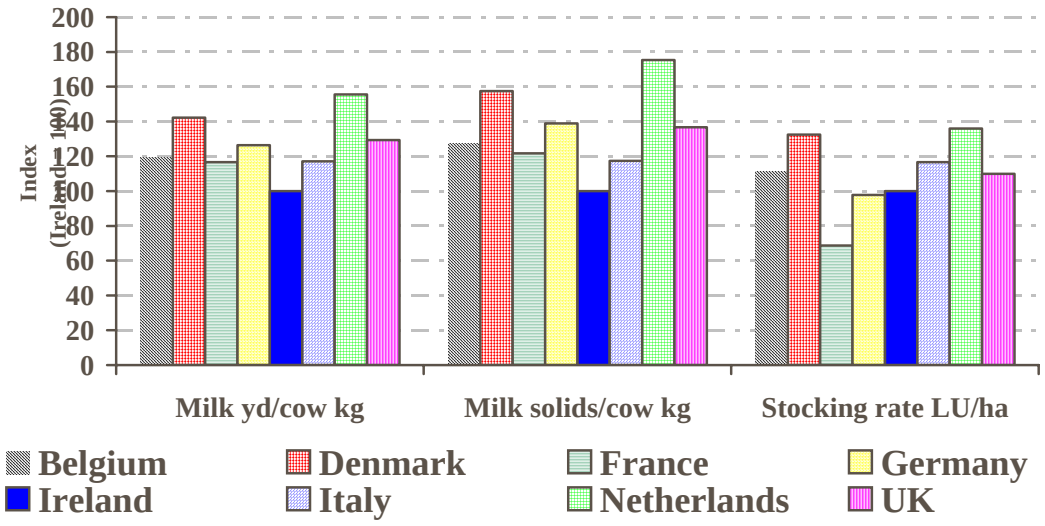
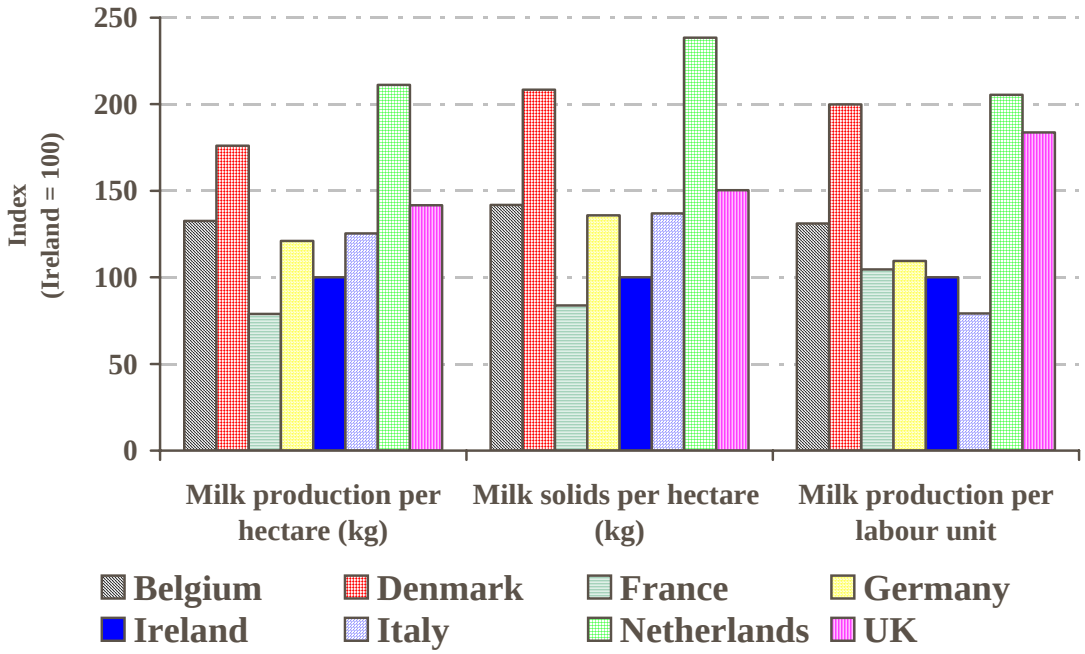


Figure 1a shows that average milk yields per dairy cow were much lower in Ireland relative to the other countries in the analysis. Average yields in the Netherlands and Denmark were substantially higher than the other countries in the analysis. Milk solids per cow were lower in Ireland than in the Netherlands and Denmark, where levels were 76 per cent and 58 per cent higher than Irish dairy herds.

The levels of land productivity in the Netherlands and Denmark were relatively high, with rates 36 per cent and 32 per cent, higher than in Ireland. Only France and Germany had stocking densities lower than Ireland, with densities 31 per cent and 2 per cent, lower than in Ireland.

Figure 1b ***Partial Productivity Measures for EU countries***



The combination of the relatively low stocking densities and milk yields for Ireland are aggregated in the next two measures of productivity. Milk production and milksolids per hectare were relatively low in Ireland with only France exhibiting lower rates. The Netherlands and Denmark again exhibited rates well in excess of the other countries examined, with milk production per hectare 76 per cent higher in Denmark and 111 per cent higher in the Netherlands compared to Ireland. Furthermore, milksolids per hectare were quite substantially higher in other countries relative to Ireland, with levels in Denmark 108 per cent higher and the Netherlands 138 per cent above Ireland.

The final partial productivity measure – milk production per labour unit was again highest in the Netherlands and Denmark, with levels in the UK also relatively high. Italy was the only country that exhibited lower labour productivity measures compared to Ireland, but average levels in France and Germany were very similar to that for Ireland.

All of the results presented in Figures 1a and 1b relate to all specialist dairy farms in the sample, however these results are influenced by distribution differences in the sample farms included in the FADN survey for the different countries (Fingleton, 1995). For this reason the productivity indicators for farms with 50-99 cows were also examined in each of the countries. However, despite the variations in sampling procedures adopted in the FADN survey there was no evidence of pronounced differences in average productivity levels between the sub sample and the whole sample. In general, the productivity rankings between the countries were similar in the two samples but the relative differences between the countries tended to be reduced in the more homogeneous sample of the 50-99 cow farms. This case was particularly evident in the land and labour productivity measures, where the large disparities between the countries in the average sample of farms were reduced in the sample of 50-99 cow farms.

The results presented in Figure 1a and 1b above show the average indicators of partial productivity over the period 1996 to 2000. The results for individual years are presented in Appendix III. A linear regression model was fitted to these results to measure the trend over time for Irish dairy farms in relation to these indicators. The average sample of all specialist dairy farms did not show any significant trend over time. However, the sub sample of specialist dairy farms, with 50-99 dairy cows, did show a significant relationship between time and land productivity. Over the period 1996 to 2000, there was a significant negative relationship between stocking rates, milk production per hectare and milk solids per hectare, for the Irish farms relative to the average of all countries in the analysis[ix].

In conclusion, it appears that the selected productivity measures for Irish dairy herds were generally lower over the period 1996 –2000, compared to other important dairy producers in Europe. These results show a similar pattern to results established for the same EU countries in the period 1990 – 1993 (Fingleton, 1995). Furthermore, land productivity measures for specialist Irish dairy farms declined over the period relative to the average of all countries in the analysis.

Comparison of costs and returns in EU dairy farms

The first measure of comparative costs of production used in this analysis was costs as a percentage of total dairy output. Fingleton (1995) citing *Boyle et al., (1992)*, outlined the relevance of this measure, whereby '…*it reflects the resilience with which a sector of production*

could cope with a cost/price squeeze. If, for example, there was a substantial fall in milk prices, producers locked into a high cost structure would have much lower chances of survival, other things been equal' (p.11). Given that current projections predict that Irish farm milk prices will be 15 per cent lower in 2012 from the average of 2000 to 2002 (Binfield *et al.,* 2003), this approach to measuring competitiveness seems appropriate.

Figure 2 below shows the cost/output results for the five year average, for each of the selected countries, for all specialist dairy farms in the FADN sample. Cash costs and the imputed charges for owned resources are identified. Appendix IV shows the data specified at the individual cost component level for each of the countries, for all specialist dairy farms and for the sub sample of farms that have 50-99 dairy cows.

Figure 2 Economic and Cash Costs for specialist Milk Producers in Europe (1996-2000)

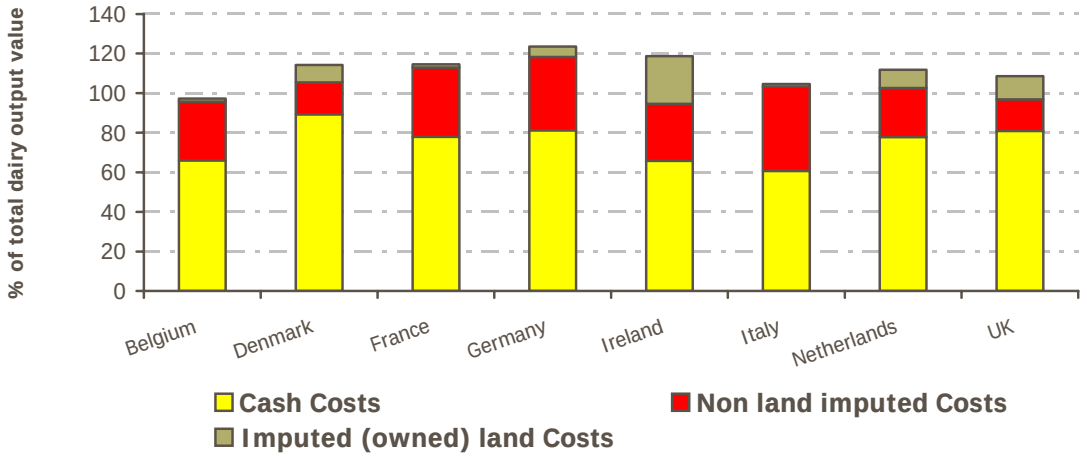


Figure 2 shows that the cash costs as a percentage of output were relatively low in Ireland over the period 1996 to 2000. Italy had the lowest cash costs as a percentage of output at 61 per cent, but the cost structure in Ireland and Belgium was only slightly higher at 66 per cent. The highest cash costs as a percentage of output was experienced in Denmark where cash costs were 89 per cent of total output of the enterprise. Further analysis of the specialist dairy farms that had between 50-99 dairy cows did not show substantial deviation from these results.

When total economic costs are considered the competitive position of the selected countries changes. The competitive advantage experienced by Irish producers worsens when all imputed charges for owned resources are taken into consideration. Total economic costs as a percentage of output were highest in Germany where costs were 124 per cent of the dairy enterprise output. Ireland followed with the second highest total economic costs at 119 per cent of output. The most

significant imputed cost that contributed to the relatively high total economic costs experienced in Ireland over the period was the charge for owned land (see Appendix IV). This was due to the relatively high imputed rental charge coupled with high levels of land ownership in Irish dairy production. The relatively low stocking rates and milk yields per hectare on Irish dairy farms over the period also must be considered as a contributing factor. However, it is worthwhile to note that when the imputed land charge for owned resources is not taken into consideration the relative competitive position of Irish dairy farms remains high, with Irish farms experiencing the lowest cost to output ratio for the period 1996 to 2000.

The lowest total economic costs were experienced in Belgium, where 3 per cent of dairy output remained as profit for dairy producers on average over the five year period (i.e. total economic costs were 97 per cent of total dairy output).

When total economic costs were considered as a percentage of output for specialist dairy farms with 50-99 dairy cows, the rank order changed from the average position shown in Figure 2. Total economic costs for this sample of farms were generally substantially lower then the average farm position. Total economic costs were reduced by 18 per cent for Italian farms when the sample of farms were examined which resulted in Italy replacing Belgium as the lowest economic cost producer. Ireland however, still remained as the second highest total economic cost producer for farms with 50-99 dairy cows. Denmark replaced Germany as the highest total economic cost producer. It is worth noting here again, that when the imputed charge for owned land is excluded from the analysis, Ireland again appears relatively competitive, with only Italy showing marginally lower costs than Ireland.

Based on the costs presented in Figure 2 and Appendix IV a 'competitiveness index' (following Boyle *et al*., 1992; Fingleton, 1995) was developed, whereby the cost:output ratio for Ireland was expressed as a percentage of the simple average of the cost:output ratios for all the countries examined[x]. This index presents conflicting results depending on whether or not the imputed charges for owned land are included in the analysis. Ireland was at a competitive disadvantage relative to the average for all the countries studied, when total economic costs are taken into consideration. Over the period 1996 to 2000, Irish dairy farms had on average 6 per cent higher total economic costs relative to other competing countries in the EU. This was the case for both the average of all specialist dairy producers and for the sub sample of dairy farms with 50-99 dairy cows. However, when the imputed charge for owned land was excluded from the analysis, this index shows that Ireland had a competitive advantage relative to the average for the countries. Over the same time period, Irish dairy farms had on average 9 per cent lower economic costs (excluding owned land charges), relative to other competing countries. Again,

these results seem to indicate that the opportunity cost of land has a major impact on the competitive position of Irish milk producers in the long term.

The second measure of comparative costs and returns used in this analysis was costs (both cash and economic) per kg of milksolids produced. This measure takes into account the variation in the milk constituents (fat and protein) between different countries. The average cash and economic costs per kg of milksolids produced, over the period 1996 to 2000, for each of the countries in the analysis is presented in Figure 3. Further detail on the cost components of the cash and economic costs are presented in Appendix V for all specialist dairy farms and for the sub sample of 50-99 dairy cow farms.

Figure 3 Cash and Economic Costs per kg milksolids – 5year average (1996 – 2000)

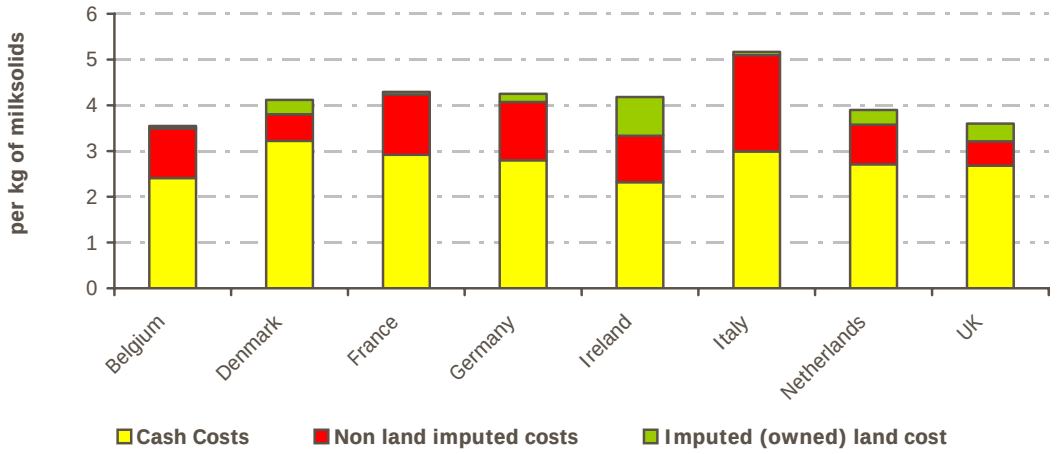


Figure 3 shows that consideration of the milksolids produced, has a considerable influence on the competitive position of the countries examined. Based on total cash costs per kg of milksolids produced, Denmark had the highest and Ireland and the UK had considerably lower average costs. On a total economic cost basis, Belgium and the UK had the lowest costs per kg of milk solids, Ireland was ranked in fifth position and Italy had the highest costs on an economic cost basis. When the sub sample of farms with 50-99 dairy cows were examined (Appendix V) cash costs did not change noticeably but economic costs were reduced significantly for these farms. The magnitude of the differences was much less between the countries[xi]. The ranking between countries changed but Irelands' position in the rank order remained unchanged.

The effect of imputed land costs on the long term competitiveness of Irish milk producers is again highlighted in this analysis. When these costs are excluded from economic costs Ireland appears

to be quite competitive, with only the UK exhibiting lower costs than Ireland during the period 1996 to 2000.

Based on the competitive index of total economic costs, which compares Ireland's position to the average position of the competing countries in the analysis, it appears that Ireland was struggling to maintain competitive position over the time period. When the average sample was examined total economic costs per kg of milk solids were 1 per cent higher than the average, however in the specialist sub sample average costs for Ireland were 1 per cent lower than the average for the competing countries. Furthermore, when imputed charges for owned land were excluded, the competitive position of the average sample and the sub sample for Ireland improved substantially. In both cases costs were approximately 15 per cent lower than the average of the countries examined.

Similar results for specialist dairy farms were also obtained by Boyle (2002) in his analysis of the cost competitiveness, for the 1998/99 accounting year. This is an indication that Irish dairy farms have maintained competitive *performance* since the early 1990's when Fingleton (1995) found that '*…Irish dairy farmers held a continuous and relatively strong competitive advantage in the cost of milk production, over the years 1998/99 to 1992/93, when compared with the costs of production in other EU countries*.' (p.20) and '…*on the basis of using total economic costs as the yardstick of competitiveness, Ireland's position was about the same as the EU average'* (p.18).

Further analysis of the cost structures of the competing countries in the appendices (III, IV) gives an indication of the sources of competitive advantage and disadvantage for Irish milk producers. As was discussed above, the cash cost structure for Irish milk producers over the period was relatively low compared to the other countries that were examined. The cost components seen in the appendices indicates that this was associated in particular with relatively low costs for seeds and plants, crop protection, purchased feedstuffs, depreciation and machinery. However, these relatively low costs were counteracted, in particular, by high costs for fertiliser and imputed charges for owned land. These cost components provide some indication of the sources of competitive advantage and disadvantage associated with milk production in Ireland over the period.

4.2 Indicators of Competitiveness of Specialist Beef Producers in Ireland and Selected EU Member States (1996-2000)

Introduction

This section of the report examines specific indicators of cost competitiveness and partial productivity of specialist beef producers in Ireland and selected EU member states, namely: Ireland, France, Germany and the UK. These countries accounted for over 55% of EU beef production during the period 1996 – 2000 (Eurostat, 2003). The other main beef producing country in the EU-15 during this period was Italy but features as a significant producer because of its veal output. In an attempt to compare harmonised production systems Italy was excluded from the analysis.

The FADN was the main data source used. Data analysis was confined specifically to two categories of specialist holdings within the FADN dataset:

(1) Specialist cattle – mainly rearing (Farm Type 421). The total farm gross margin of this farm type must, by definition, be accounted for by: (i) greater than two-thirds from all cattle; (ii) less than or equal to one-tenth from dairy cows; and (iii) greater than-one third from other cows.
(2) Specialist cattle – mainly fattening (Farm Type 422). The total farm gross margin of this farm type must, by definition, be accounted for by: (i) greater than two-thirds from all cattle; (ii) less than or equal to one-tenth from dairy cows; and (iii) less than or equal to one-third from other cows.

Every effort was made to define relatively homogeneous groups of cattle farms. However, even within Farm Types 421 and 422 there exists a wide range of beef production systems. In the absence of alternative data sources, which document cost and return data for production systems that are categorised by greater degrees of homogeneity, the FADN dataset was selected for the purposes of this analysis. Despite the fact that Murphy *et al.,* (2000) argued against the use of the FADN for the analysis of beef economics based on the heterogeneity of the production systems, Boyle (2002) believed that in absence of alternative datasources the FADN datasheet was the most appropriate. However, Boyle (2002) pointed out that "*The drawbacks with this database…..should be noted. The most obvious one is the absence of separate results for rearing and fattening systems*" (p.82). It is envisaged that the analysis of farm types 421 and 422 which does separate the results for rearing and fattening systems helps to better define the relative economics of beef production system within Europe[xii].

Measurement and Methods

Three separate measures of cost comparison were used for farm types 421 and 422:

- Total costs as a percentage of beef output and allocated direct payments;
- Total costs per forage hectare;
- Total costs per suckler cow LU (Farm Type 421) and total costs per fattening enterprise LU (Farm Type 422).

Beef output and allocated direct payments was defined as: total output from beef and veal plus allocated 'subsidies on 'other cattle'[xiii], 'other livestock subsidies'[xiv], 'environmental subsides[xv], and less favoured areas subsidies (LFA)[xvi].

The suckler cow LU's were determined for the beef rearing system by assuming that all 'other cows', excluding dairy cows, were suckler cows. The fattening enterprise LU's were determined for the beef fattening system by assuming that all 'other cattle' on the farm, excluding dairy cows and a replacement rate for dairy cows[xvii], were allocated to the beef fattening enterprise[xviii].

For the purposes of comparing the relative competitiveness of beef production systems it was not possible to compare costs per unit volume of beef production (e.g. costs per kg of beef) using the FADN data. Data on LU weight at point of sale was not available for the different categories of LU sold for the time period under analysis. Consequently, it was not possible to accurately determine the costs per unit volume of production[xix]. It is anticipated that this indicator of competitiveness may be possible to determine for years after 2000 due to changes in data collection methods after this time. For the purposes of this analysis, this indicator of competitiveness was omitted.

In addition to the measures of cost comparison used for the beef analysis there was also a number of specific cost allocation methods adopted specifically for this enterprise. This allocation method was based on that developed by Vard (2001b).

Table 2 Allocation Keys used to define costs associated with the Beef Enterprise using FADN data

COSTS ITEMS	ALLOCATION KEYS	
	Mainly Rearing *(Farm Type 421)*	*Mainly Fattening* *(Farm Type 422)*
Purchased feed for grazing livestock (concentrates & coarse fodder)	% of 'beef rearing' livestock units in the total of grazing livestock units	% of 'beef fattening' livestock units in the total of grazing livestock units
Farm-use of non forage crops	% of 'beef rearing' livestock units in the total of livestock units	% of 'beef fattening' livestock units in the total of livestock units
Farm-use of forage crops = "Specific forage costs"	% of 'beef rearing' livestock units in the total of grazing livestock units X	% of 'beef fattening' livestock units in the total of grazing livestock units X
Seeds	% area of fodder crops, other forage crops and temporary grass in the total UAA - after exclusion of fallow lands, areas leased to others, meadows and rough grazing	% area of fodder crops, other forage crops and temporary grass in the total UAA - after exclusion of fallow lands, areas leased to others, meadows and rough grazing
Fertilisers	% area of fodder crops, other forage crops, temporary grass and meadows in the total UAA - after exclusion of fallow lands, areas leased to others and rough grazing	% area of fodder crops, other forage crops, temporary grass and meadows in the total UAA - after exclusion of fallow lands, areas leased to others and rough grazing
Crop protection	% area of fodder crops and other forage crops in the total UAA - after exclusion of fallow lands, temporary grass, areas leased to others, meadows and rough grazing.	% area of fodder crops and other forage crops in the total UAA - after exclusion of fallow lands, temporary grass, areas leased to others, meadows and rough grazing.
Other specific livestock costs (e.g. veterinary costs)	% of 'beef rearing' livestock units in the total of livestock units	% of 'beef fattening' livestock units in the total of livestock units
Owned land	% of 'beef rearing' LU in total LU	% of 'beef fattening' LU in total LU
All other costs: - farming overheads - depreciation - external factor costs (wages, rent and interest paid).	% of beef output & allocated direct payments in the total output & direct payments	% of beef output & allocated direct payments in the total output & direct payments

Table 2 shows that a number of cost items are allocated based on the percentage of 'beef rearing' and 'beef fattening' LU in the total of either grazing LU or total LU. 'Beef rearing' LU's include: (i) 'other cows'; and (ii) a proportion of 'breeding heifers', 'female cattle 1-2 years', 'other

cattle less than one year' and 'calves for fattening'[xx]. As was the case with the dairy enterprise (section 4.1) the share of the total breeding heifer and young female population reflects the costs associated with cow replacement.

As previously identified in section 4.1 above for the dairy enterprise, the recording procedures adopted by FADN for fodder production used on the farm proves to be a problem when costs are compared across countries. Consequently, it was necessary to adopt similar principles for the valuation of non-fodder and fodder crops for the beef enterprise as was outlined for the dairy enterprise. All other methodological issues for comparing costs of production identified in section 3 and section 4.1 above are relevant for the beef enterprise.

The partial productivity indicators used in this analysis for the beef sector were initially developed by Boyle *et al.,* (1992) and Boyle (2002). However, the computation of the indicators have been adjusted somewhat from the indicators outlined by Boyle. The measures relate to animal, land and labour productivites:

- Grazing LU per forage area;
- Land productivity – beef output per forage hectare;
- Labour productivity – beef output per Annual Work Unit (AWU).

Beef output was defined as all production output from the beef enterprise plus all allocated direct payments to the beef enterprise. A proportion of the total forage hectares on the whole farm was allocated to the rearing and fattening enterprise based on the percentage of the rearing and fattening LU's in the total of grazing LU. The AWU's for the whole farm were allocated based on the proportion of beef output and direct payments in the total output and direct payments from the whole farm.

Results

The results for the rearing and fattening beef enterprises are presented in two sections: (i) partial productivity indicators and (ii) comparative costs of production.

Comparison of partial productivity indicators on EU beef farms

In Figures 4a and 4b the partial productivity indicators identified above are outlined for the four EU countries compared in this analysis, for the 'mainly rearing' and 'mainly fattening' beef systems, respectively. The results presented for each of the countries is the average for the years 1996 to 2000 and indexed relative to Ireland. The absolute levels of the indicators, for each of the years and for each of the countries are shown in Appendix VI.

Figure 4a Partial Productivity Measures for EU countries – 'Mainly Beef Rearing'

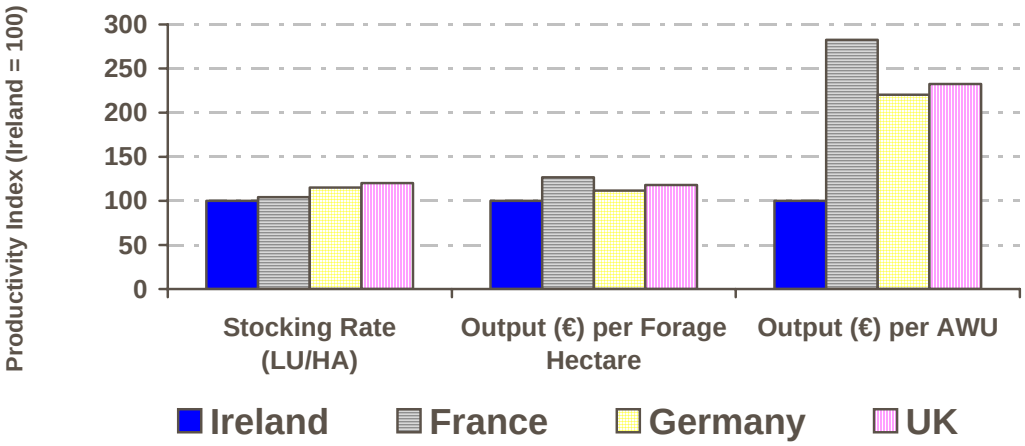


Figure 4a indicates that Ireland's productivity for the time period 1996-2000 was lagging behind its main competitors[xxi]. Stocking rates and output per forage hectare showed relatively minor variation between countries compared to output per labour unit. This indicator of labour productivity showed considerable variation between the countries, with levels in France almost three times the levels recorded in Ireland. The UK and Germany also showed considerably higher levels of labour productivity, compared to Ireland. Boyle (2002) also witnessed wide disparities between partial productivity levels between Ireland and the same set of countries, for specialist beef farms.

Despite the obvious advantage associated with using an average figure in productivity analysis, which negates the impact of atypical or unrepresentative years, it is also important to note significant trends in the data. This is especially true in a period of rapid and radical policy change, which occurred in the period 1996 – 2000, for livestock farming in the EU. Appendix VI shows that despite the fact that productivity indicators on Irish 'mainly beef rearing' farms were on average lower than competing countries, the disparities were decreasing over the period. This was especially evident for output per forage hectare and output per AWU, where Ireland's competitive position was increasing over time[xxii]. This may be associated with the reform of the EU beef regime which became evident during this period. Dunne *et al*., (1997) showed that '*on a per kilogramme of beef basis, Greece, Denmark, France, Germany and Portugal secure DP's at 70 to 80 per cent of the rate for Ireland*' (p.149). The ability of Irish beef producers to secure higher levels of Direct Payments, relative to competing countries, coincides with the increasing productivity levels on these farms over the same period.

Figure 4b Partial Productivity Measures for EU countries – 'Mainly Beef Fattening'

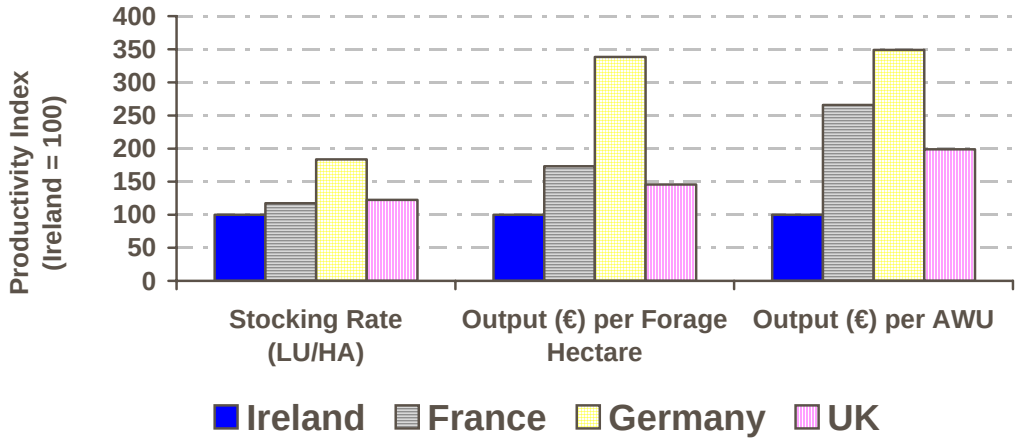


Figure 4b indicates that productivity levels for specialist 'mainly beef fattening' systems were also relatively low in Ireland compared to France, Germany and the UK. Quite substantial disparities existed amongst the four countries in each of the indicators, but, Germany consistently out performed the other three countries. However, Appendix VI again shows that despite the fact that productivity indicators on Irish 'mainly beef fattening' farms were on average lower than competing countries, the disparities were decreasing over the period. This was especially evident for output per forage hectare and output per AWU, where Ireland's competitive position was increasing over time[xxiii]. Ireland's relative productivity compared to the average of all countries, for these two productivity indicators, increased by 7 per cent and 12 per cent, respectively, over the period 1996 -2000.

In conclusion, it appears that the selected productivity measures for Irish specialist beef farms – 'mainly rearing' and 'mainly fattening' were generally lower for the period 1996 –2000, compared to other competing beef producers in Europe. These results are consistent with the findings from Boyle (2002) where Irish specialist 'mainly beef rearing and fattening farms' were analysed relative to the same group of countries in 1989/99. However, it is reassuring to note that these disparities were declining over the period 1996 – 2000.

Comparison of costs and returns in EU beef farms

The first measure of comparative costs of production for specialist beef rearing and fattening farms analysed was costs as a percentage of total beef production output and allocated direct payments.

Figures 5a and 5b show the cost:output ratios for the five year average, for each of the selected countries, for all specialist 'mainly beef rearing' and 'mainly beef fattening' farms, respectively. The individual cost components for each of the countries are outlined in Appendix VII.

Figure 5a Economic and Cash Costs for specialist '*mainly beef rearing' farms* (1996-2000)

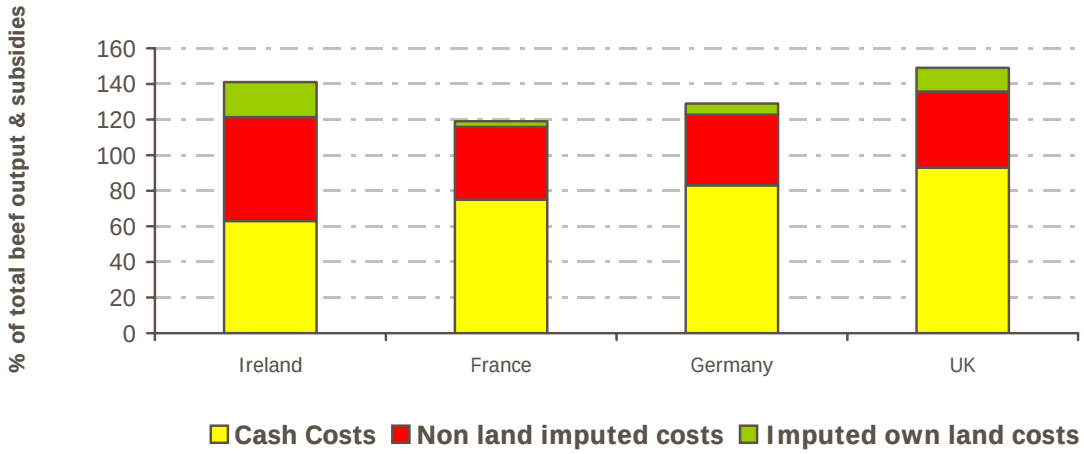


Figure 5a shows the average for the period 1996 to 2000, where considerable variation in cash costs as a percentage of output was evident between the competing countries. The cash cost to output ratio was lowest in Ireland (63 per cent of output) and highest in the UK (93 per cent of output). Appendix VII shows that the relatively low cash cost structure in Ireland was associated with relatively low costs for seeds and plants, energy, other direct inputs, rent, interest and machinery charges. However, when total economic costs were considered the competitive position of the selected countries changed. The competitive advantage experienced by Irish producers disimproved when total economic costs were considered, with Ireland experiencing the second highest economic cost to output ratio (140 per cent). The UK had the highest (150 per cent) and France had the lowest total economic cost to output ratio.

The imputed charges for family labour and owned land for Irish farms significantly altered the competitive position of these farms over the period (Appendix VII). The family labour to output ratio for Irish beef rearing farms was 45 per cent and the owned land cost to output ratio was 20 per cent. These costs were significantly higher than those recorded in competing countries. A large proportion of land is owned on Irish beef farms rather than leased or rented which is more common amongst the competing countries in the analysis. In addition Ireland experienced relatively high land rental charges over the period. This high level of land ownership coupled with comparatively high land rental charges contributed significantly to the high level of economic

costs in Ireland over the period. This land charge coupled with a high imputed cost for owned labour, due to relatively large amounts of own labour employed on Irish beef farms, could be considered as impediments to the longer term competitiveness of Irish beef rearing farms over the longer term. However, this outlook improves when the imputed charge for owned land is excluded from the analysis. On an economic costs basis, which excludes owned land charges, the cost to output ratio for Ireland during the period was the second lowest, with only France exhibiting slightly lower costs.

The longer term outlook for Irish beef rearing farms based on the cost to output ratio can be summarised by the competitiveness index proposed by Boyle *et al.,* (1992). As was explained above, this index expresses the cost:output ratio for Ireland as a percentage of the average of all the countries in the analysis. This competitiveness index confirms that when total economic costs are considered as an indicator of competitiveness over the longer term, Irish beef rearing farms were slightly less competitive (4 per cent) than competing countries examined in this analysis, over the time period examined. However, excluding imputed land charges from this analysis, shows that Irish farms were slightly more competitive (3 per cent) than competing countries.

Figure 5b Economic and Cash Costs for specialist '*mainly beef fattening' farms* (1996-2000)

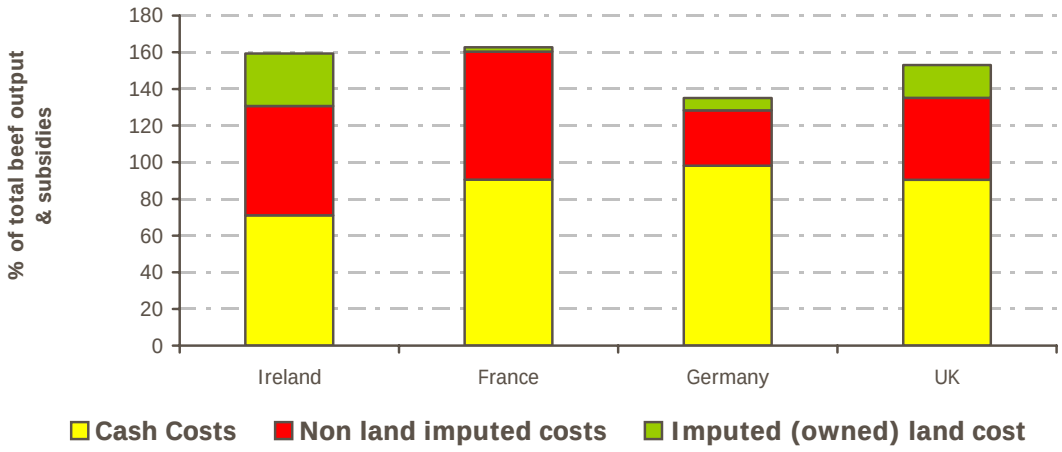


Figure 5b shows cash and economic costs as a percentage of beef output for all specialist beef fattening farms. Consistent with the trend observed in the beef rearing farms, Ireland again appeared as the lowest cash cost producer of beef in the fattening systems compared to the competing countries, with a cash cost to output ratio of 71 per cent. The UK and France both had a cash cost to output ratio of 90 per cent and Germany had the highest cash cost to output ratio

for fattening farms at 98 per cent. Irish fattening systems had relatively low cost expenditure on items similar to the rearing enterprise, but in addition, purchased feedstuffs were relatively lower on Irish fattening systems than in the other countries.

When the total economic cost:output ratio was considered, the ranking between countries for the fattening farms was consistent with the trend evident with the beef rearing farms, with the exception that Irish beef farms now had the highest total economic cost: output ratio of the four competing countries. Again France had the lowest cost:output ratio and Germany the second lowest, but now the UK appears as the third highest economic cost producer and Ireland the highest total economic cost producer. Excluding owned land charges from the analysis reduces the magnitude of the differences between the countries and the UK appears as the highest cost producer.

Based on the competitiveness index, which compares Ireland's total economic costs to output ratio with the average of all countries in the analysis, Ireland appeared to be 10 per cent less competitive over the longer term relative to the competing countries in the beef fattening analysis. Appendix VII shows that again a relatively high imputed charge for family labour and owned land was associated with this comparative disadvantage. When the owned land charge is excluded from the analysis, Ireland's position was about the same as the average of all countries.

Analogies can be drawn between these results and Boyle's (2002) results for specialist 'beef rearing and fattening' farms. Despite the fact that there are differences in the magnitude of the margins over cash and total economic costs in the two sets of results, primarily due to the omission of direct payments from Boyle's (2002) analysis, there was consistency in the deterioration of competitiveness of Irish beef farms from the short to long term. However, it is worthwhile remembering that when owned land charges are excluded from the analysis, Ireland's cost position still appears to be on a par with the average of all countries.

The second indicator of cost competitiveness for beef production was the margin over total costs per forage hectare for both rearing and fattening enterprises (Figure 6a and 6b respectively). Margin over cost was chosen as a more informative indicator of competitiveness compared to cost per hectare. Analysis of costs in isolation from returns per hectare is strongly influenced by relative stocking rates, thus can be a misleading indicator of competitiveness. Murphy *et al.,* (2000) also examined cost and return data per hectare.

Figure 6a Margin over Costs per Hectare for specialist '*mainly beef rearing' farms* (1996-2000)

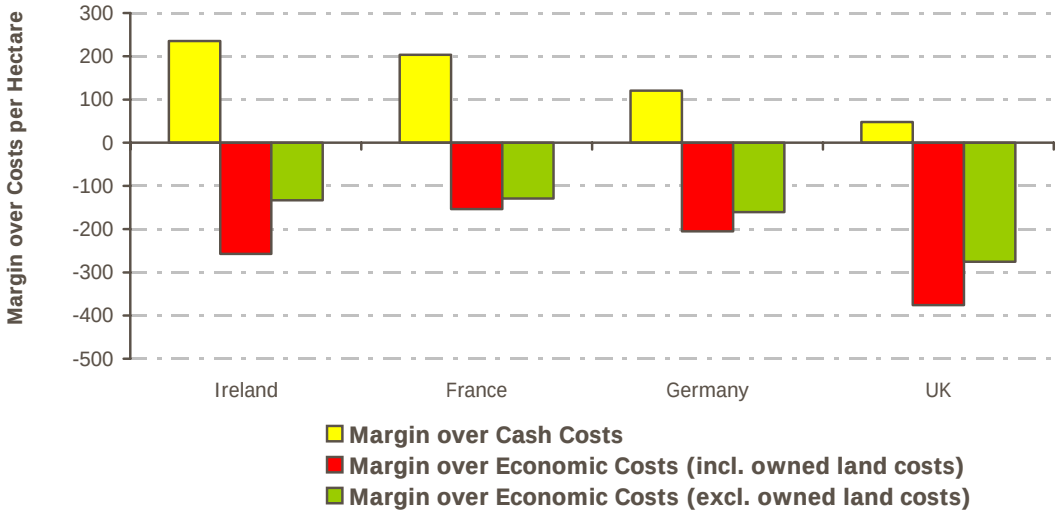


Figure 6a shows a similar ranking between the countries to what was observed when costs were expressed as a percentage of output. Irish beef rearing enterprises exhibited a competitive advantage when cash costs were considered, however when imputed charges for all owned resources were included in the cost structure, this competitive advantage dissipated. The imputed charges for family labour and owned land again eroded competitive positioning for Irish producers. However, it becomes apparent again that if the imputed charges for owned land are excluded from the analysis the longer term competitive position of these farms seems more optimistic.

Figure 6b Margin over Costs per Hectare for specialist '*mainly beef fattening' farms* (1996-2000)

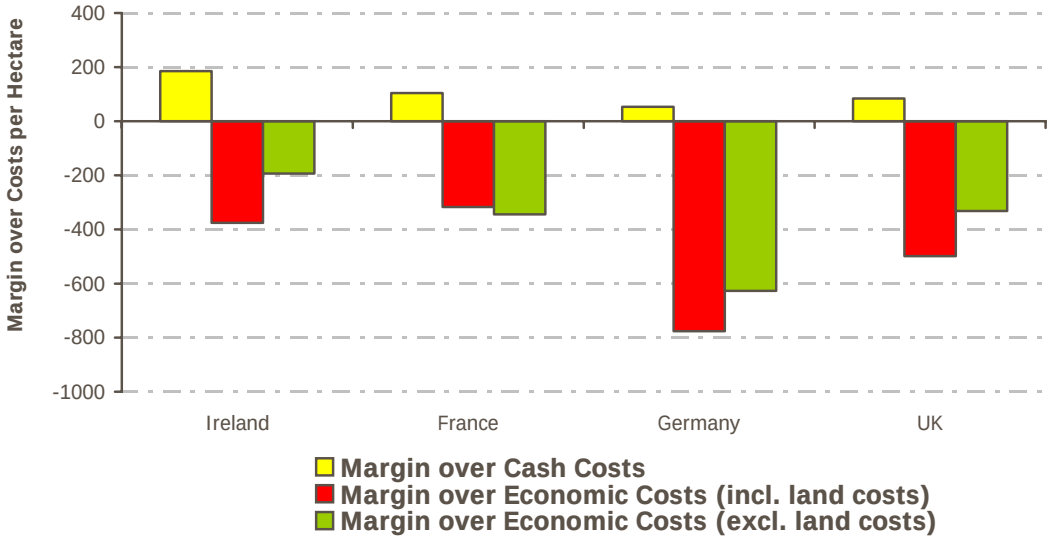


Figure 6b again shows that when only cash costs are considered, Irish beef fattening enterprises appeared to be relatively competitive when compared to the other countries. This competitive position deteriorated when total economic costs were taken into account. France appeared to have the most competitive margin per hectare and Ireland the second most competitive. However, for the first time, Ireland now appears to hold a competitive advantage with reference to the *average* of all countries examined, whereby the competitive index for Ireland in relation to the margin over total economic costs was 27 per cent higher than the average for all countries. Furthermore, when the imputed charge for owned land is excluded from the analysis, Irish farms appear to be the most competitive on an economic cost basis. It is important to remember here that the average size of Irish beef farms is significantly lower than competing countries (Boyle, 2002).

The final measure of cost competitiveness of beef production analysed was margin per suckler cow and per fattening enterprise LU (Figures 7a and 7b).

Figure 7a Margin over Costs per suckler cow for specialist '*mainly beef rearing*' farms (1996-2000)

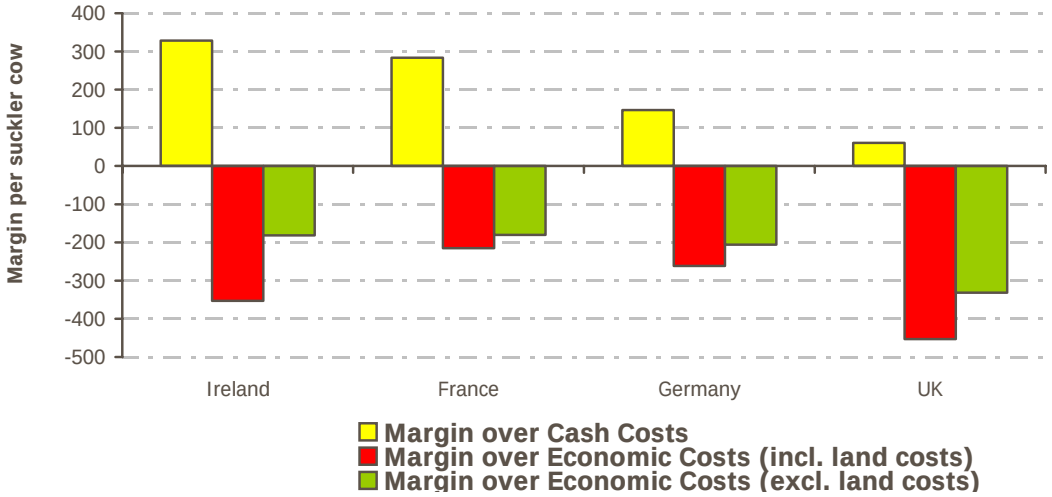


Figure 7a shows that the margin over cash costs is highest for Irish suckler herds compared to the other countries in the analysis but this position worsens when total economic costs are considered when the margin per suckler cow for Ireland is the second lowest. The competitive index for Ireland for margin over economic costs per suckler cow was 10 per cent lower than the average for all countries. Furthermore, when the imputed charges for land were excluded from the analysis, the margin over costs in Ireland again improved substantially.

Figure 7b Margin over Costs per fattening LU for specialist 'mainly beef fattening' farms (1996-2000)

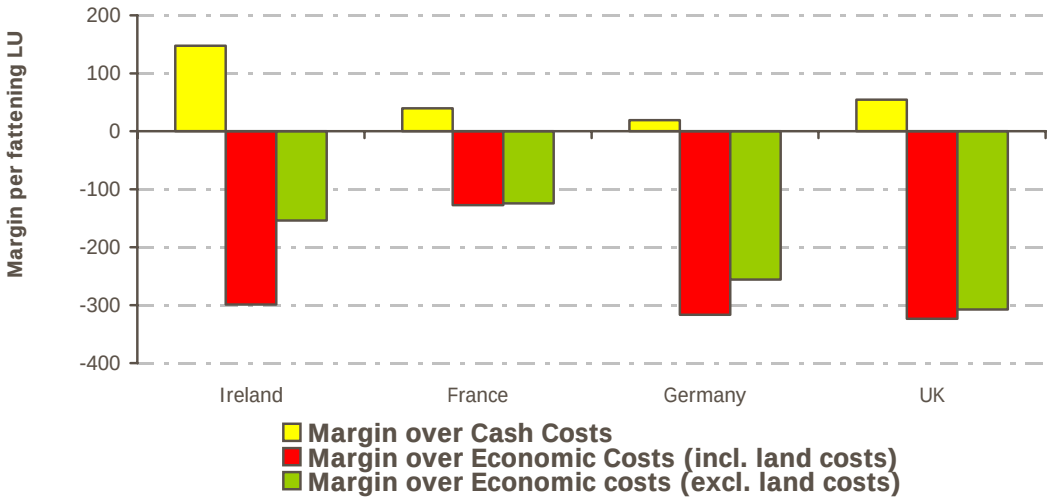


Figure 7b again shows that the margin over cash costs was highest in Ireland over the period. The individual cost items outlined in Appendix IX show that purchased feedstuffs per fattening animal were particularly low over the period relative to the average of all the countries studied.

The ranking between countries for margin over total economic costs per LU was less variable than the other indicators examined. The margin over economic costs for Ireland, the UK and Germany was similar but the margin in France was much higher, which resulted in a competitive index for Ireland 12 per cent lower than the average for all countries. However, when imputed land charges were excluded from this calculation, the competitive index for Ireland was 27 per cent higher than the average for all countries.

Overall these results for the beef rearing and fattening enterprises provide a clear indication that over the period 1996 to 2000, Irish producers had a competitive advantage when cash costs were examined. In particular, Irish beef producers experienced relatively low costs for direct inputs such as seeds and plants, energy, and costs for purchased feedstuffs were particularly low on fattening enterprises. In addition, overhead costs such as depreciation, rent, interest and machinery were also relatively low on Irish beef farms over the period. However, this competitive position was undermined when total economic costs were taken into consideration. The imputed charge for owned land and labour had a large influence on the relative competitive advantage of Irish beef farms. Bearing in mind that total economic costs provides a relative guide to the longer term competitive position of competing countries (Fingleton, 1995), this may be an early warning sign for Irish beef producers. However, when the imputed land charges were excluded from the calculation the longer term outlook for these farms improves substantially.

Another issue which must be considered in view of the longer term competitiveness of Irish beef production is the reliance on direct payments. Boyle (2002) omitted all subsides from his analysis of the competitiveness of Irish beef production. Based on this approach Boyle (2002) found that in 1998/99 that even on a cash costs basis Ireland was relatively uncompetitive, with a competitiveness index showing Ireland had a 13 per cent higher cash cost:output ratio than the average of all countries. These results indicate that in a scenario where direct payments are decoupled from production, the competitive position of Irish beef production could come under serious pressure from the other countries studied. However, this position will be largely determined by the ability of Irish producers to react to the new policy scenario.

To investigate this issue in more detail a number of the cost based indicators of competitiveness were revisited to determine the ability of Irish cattle farmers to survive in a decoupled policy scenario. Figures 8a and 8b below show the average cost to output ratio, for each of the

countries examined, for the years 1996 to 2000, using only the market based margin. The individual results for the years 1996 to 2000 are presented in Appendix X. The results for the alternative indicators of cost competitiveness investigated above for beef systems, were also calculated based on market based margins and did not show substantial deviations from the results presented in Figure 8a, 8b and Appendix X and therefore are not presented here.

Figure 8a Market Based Indicator of Cost Competitiveness for specialist '*mainly beef* rearing' farms (1996-2000)

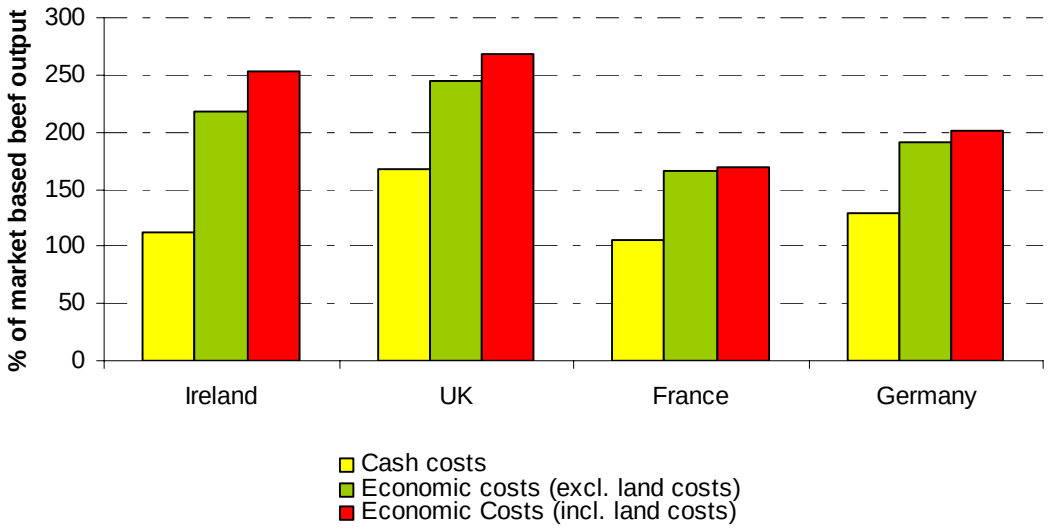
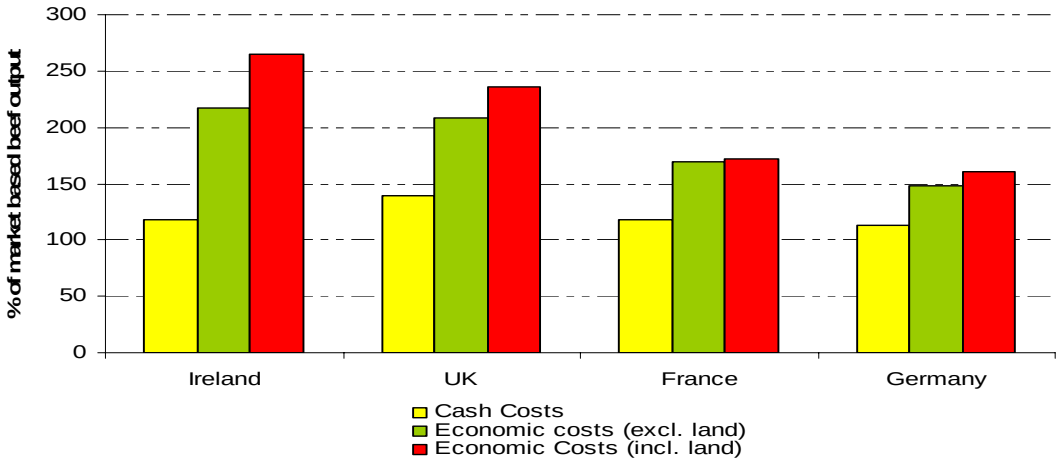


Figure 8a shows that on a market based cash cost margin, Ireland still appears to be relatively competitive over the time period, compared to the other countries in the analysis, despite the fact that France does replace Ireland as the lowest cost producer. However, what is interesting about these results is that on an economic cost basis, Ireland now appears to be relatively uncompetitive even when imputed charges for owned labour are excluded from the calculations. Similar results were also found for 'mainly beef fattening farms' in Figure 8b. However, for these farms, Irelands' relative competitiveness on a cash cost basis is lower than that shown for beef rearing farms but still remains slightly lower than the average for all countries, but the highest economic costs as a percentage of market based output was experienced in Ireland during this period.

Figure 8b Market Based Indicator of Cost Competitiveness for specialist 'mainly beef fattening' farms (1996-2000)



Boyle's findings showed that the competitiveness index for cash costs to output for Ireland, was higher than the average for all countries in the analysis. However, the results in Figures 8a and 8b show that for the period 1996 – 2000 Ireland had on average 12 per cent and 3 per cent lower cash cost to output ratio respectively, compared to the average of all countries in the analysis. This highlights the problem with using single year data for measuring competitiveness. Appendix X shows that 1999 was in fact an atypical year in the period 1996 to 2000. However, it is worthwhile noting that Irelands' competitive position does deteriorate when economic costs are considered as a percentage of market based output, relative to total output (including direct payments).

In addition to the relatively high economic costs experienced in Ireland over the period, Appendix X also shows another worrying trend in relation to development of Ireland's market based competitiveness for specialist beef rearing farms. Appendix X shows that Irelands' market based competitiveness on these farms deteriorated significantly over the period 1996 to 2000. In particular, from 1996 to 1999, Irelands' costs on these farms (including cash and economic) as a percentage of market based output, compared to the average for all countries, deteriorated year on year, and it was only in 2000 when Irelands' relative position improved somewhat.

To conclude, it appears that during the period 1996 – 2000, when market based indicators of competitiveness are considered, the short term competitiveness of Irish beef farms remains favourable, however the longer term outlook for these farms does deteriorate, relative to previous measures of competitiveness. Furthermore, the trend over the period for Irish beef rearing farms relative to the average of all countries, also provides warning signals for these farms going forward. This trend over time did not appear to a significant concern on finishing farms.

4.3 *Indicators of Competitiveness of Cereal Production in Ireland and Selected EU Member States (1996-2000)*

Introduction

This section of the paper examines the costs and returns associated with the production of cereals in Ireland and some comparable EU member states. The EU countries chosen for comparison were the UK, Denmark, France, Germany and Italy. Together these countries accounted for over 78 per cent of the total cereal production within the EU-15 during the period 1996 – 2000 (Eurostat, 2003).

As was the case for the dairy and beef enterprises, the data used in this analysis is from the FADN. The FADN farm classification type used in this analysis was Farm Type 4310 – specialist cereal, oilseed and protein (COP) producers. The FADN classification for COP farms is not as homogeneous as other enterprise systems defined by the Commission, such as specialist dairy (Type 411). Consequently, there is an inherent unavoidable bias introduced as a result of the different cost intensities and output prices commanded by the different products. However, this approach to comparative analysis was defended by Boyle (2002) because '*a crop by crop analysis is impossible to obtain owing to the paucity of the sample at that level of disaggregation. Moreover, since several different varieties of cereals are produced jointly, such a dissaggregated analysis, even if it were feasible, might not be very meaningful*'. Nevertheless, efforts were made to redefine farm type 4310, whereby the economics of cereal enterprises were analysed in isolation from oilseed and protein producers. Oilseed and protein production is more common in other European countries than in Ireland. In France, for example, oilseed and protein production accounted for 25 per cent of cereal, oilseed and protein output combined, from specialist farms, during the period 1996 to 2000. This figure compares to a value of 3 per cent in Ireland over the same period. Consequently, efforts were made to examine the relative competitiveness of cereal production on these farms as distinct from the competitiveness of the whole farm, which by definition specialises in cereals, oilseed and protein production.

Measurement and methods

Three separate measures of cost comparisons were used for comparing the competitiveness of cereal production in the selected member states:

- Total costs as a percentage of the total value of output;
- Total costs per 100kg of production volume[xxiv];
- Total costs per hectare of cereal production.

Measuring costs of production, in terms of output is consistent with traditional production theory, which aims to minimise costs or maximise net revenue per unit output. Since the introduction of direct payments paid on an area basis, it is arguably more relevant to examine costs of production on an area basis, as land is now the most limited factor in production. This is especially relevant where there are national quota limits on the land classified as 'eligible' for tillage production.

Competitiveness in the market place for commodities, such as cereals, is largely determined by costs of production (Boyle, 2002). However, this is not entirely the case as quality differences, transport costs to the point of purchase and access to direct payments are also important. Therefore, it was considered important to examine the competitiveness of cereal production in terms of total costs of production as a percentage of the total value of output. The total value of output in this analysis included both production output and direct payments in the form of Area Aid payments per hectare of production.

As with the previous enterprises examined, it was also necessary to allocate costs to the cereal enterprise to calculate the measures outlined above. Table 3 below outlines the allocation methods used in estimating the costs associated with the cereal enterprise on specialist cereal, oilseed and protein farms.

Table 3 Allocation Keys used to define costs associated with the cereal enterprise on Specialist COP farms, using FADN data

COSTS ITEMS	ALLOCATION KEYS
Specific costs, fixed costs and imputed charges for owned capital and labour	% of cereals production output plus allocated direct payments in the total output & direct payments of the farm.
Owned land	% of cereal acres in total UAA of the whole farm

Table 3 shows that all cost items, apart from owned land, were allocated based on the per cent of cereals production output and allocatable direct payments in the total production output and direct payments of the whole farm. The direct payments allocated to the cereals enterprise was calculated as the cereals area multiplied by the area aid rate per tonne multiplied by the reference yield for each country. In addition to this direct payment, the additional supplement per hectare for durum wheat was calculated for Italy. Over the period 1996-2000, 42 per cent of total cereal area was devoted to durum wheat production in Italy (Eurostat, 2003). Consequently, it was assumed that 42 per cent of the cereal area in Italy over the period was allocated a supplementary durum wheat direct payment (€297 per hectare), which was in turn reflected in the analysis. No other

country in the analysis was allocated a durum wheat supplement based on estimates from Eurostat (2003), which indicated that average durum wheat levels (as a per cent of total cereal production) were relatively low.

Direct payments were taken into consideration in the allocation key for cost items because it was considered that cereal producers based production decisions, and the ensuing allocation of inputs, on the full knowledge that production was coupled to the direct payments. The only exception to this allocation basis was made for owned land. This resource was allocated to the cereal enterprise based on the per cent of cereals in the total UAA of the whole farm.

The indicators of partial productivity used in the determination of productivity of selected resources for cereal production were (i) wheat yield – 100kgs per hectare of wheat area[xxv]; (ii) land productivity – output from cereal production plus allocated direct payments per hectare of land devoted to cereals; and (iii) labour productivity – output from cereal production plus allocated direct payments divided by the total annual work units (AWU) devoted to cereal production.

Results

The results for cereal production are presented in two sections: (i) partial productivity indicators and (ii) comparative costs of production.

Comparison of partial productivity indicators on EU cereal farms

Figure 9 below shows the partial productivity indicators for the EU cereal farms identified above. The results presented here for each of the countries is the average for the years 1996 to 2000 and indexed relative to Ireland. The absolute levels of the indicators, for each of the years and for each of the countries are shown in Appendix XI[xxvi].

Figure 9 Partial Productivity Measures for EU Cereal Farms

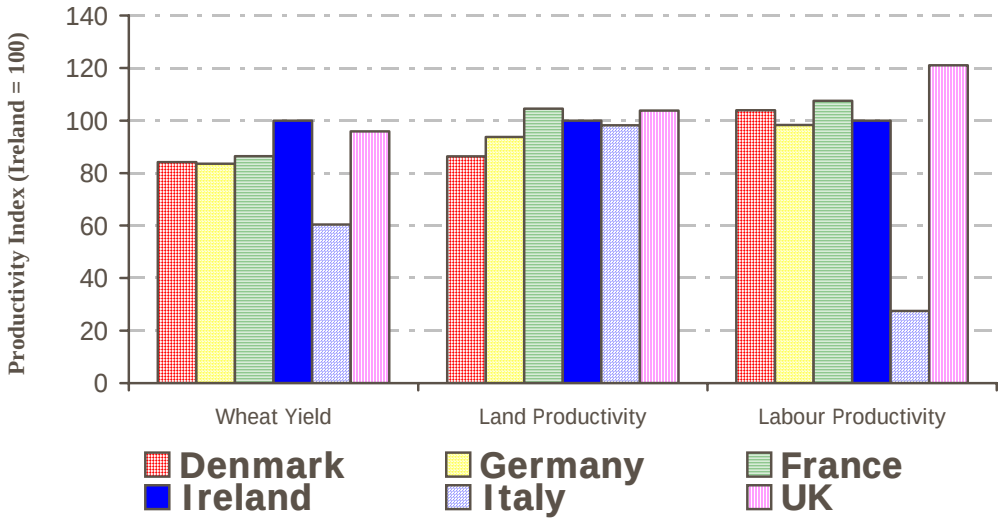


Figure 9 indicates that Ireland's wheat yield[xxvii] was the highest over the period, among the countries examined. Yields in the UK were also relatively high compared to the other countries, with yields in Italy substantially lower than all countries. However, it is important to highlight that substantial volumes of durum wheat is produced in Italy, which attracts higher levels of direct payments relative to other cereal types, which in terms of profitability partially compensates for reduced yields.

Relative differences in land productivity were not as variable as yield. Output per hectare of cereal production was highest in France, closely followed by the UK, with Ireland in third position, followed by Italy, Germany and Denmark. Labour productivity levels, like yield, were also quite variable between the countries examined. The UK had the highest level of output per AWU allocated to the cereal enterprise, with 21 per cent higher output per unit than that recorded in Ireland over the same period. All the other countries in the analysis, apart from Italy, were within 7 percentage points above or below the levels recorded in Ireland, but Italy had substantially lower output per unit labour input with levels over 70 per cent lower than Ireland.

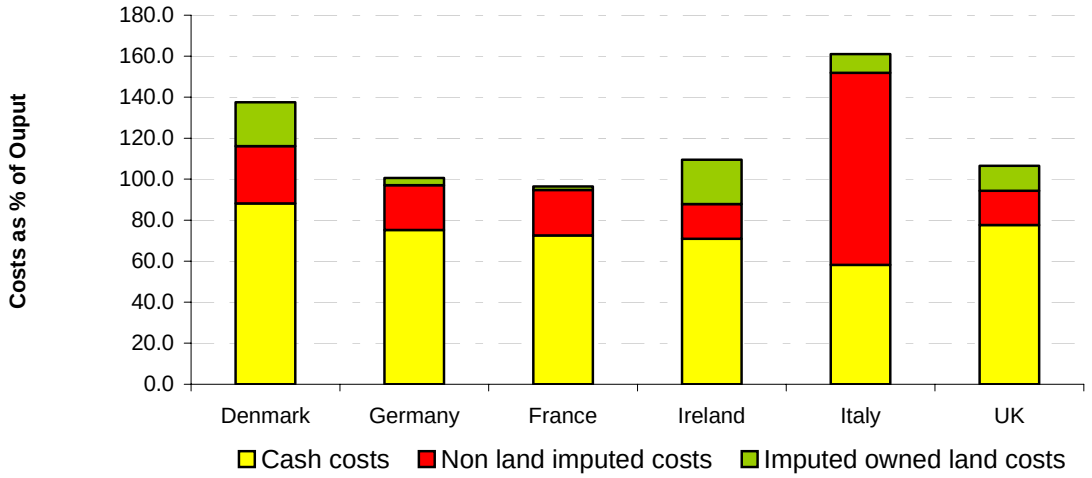
These productivity measures indicate that productivity levels on Irish cereal farms were on average more positive than the results shown for the other enterprises examined. Yields were well in excess of the average of all countries examined and land and labour productivity levels were similar to the average for all countries. These results are consistent with findings from Boyle (2002) where partial productivity indicators for Ireland were higher for cereals than for other commodities analysed.

Furthermore, there was no consistent productivity trend over time observed for Irish cereal farms, relative to the average of all countries. Thorne and Kelly (2003) also found evidence that cereal yields in Ireland did not show any consistent trend during the 1990's.

Comparison of costs and returns on EU cereal farms

The first measure of comparative costs of production for cereal farms was costs as a percentage of total cereal production output and allocated direct payments. Figure 10 shows the five-year average cost:output results for the cereals enterprise for each of the selected countries. The individual cost components for each of the countries is outlined in Appendix XII.

Figure 10 Costs as a % of Output on selected EU Cereal Farms



Figures 10 shows that Irish cereal producers had the second lowest cash costs as a per cent of output and Italy had the lowest cash costs, over the period 1996 to 2000. Cash costs in France, Germany and the UK were also quite similar to the Irish position over the period, with cash costs in Denmark considerably higher than the other countries examined.

When imputed charges for owned resources are taken into account to compare total economic costs, the ranking between countries changes considerably. Imputed charges were substantially higher in Italy than all other countries, which resulted in Italy having the highest total economic costs as a per cent of output compared to the other countries examined. On the other hand, imputed charges for owned resources were considerably less in France than all other countries, which contributed to French producers having the lowest total economic costs as a per cent of output for all countries examined. When total economic costs were considered for Irish cereal producers, the relative competitive advantage displayed, when cash costs were considered,

deteriorated. On a total economic cost basis Irish cereal producers had the third highest cost structure as a per cent of output over the period. However, based on a competitiveness index of economic costs as a per cent of output for Ireland, where the cost: output ratio for Ireland was expressed as a per cent of the average cost: output ratio for the other countries, Irish cereal producers still maintained a competitive advantage relative to the average of the countries examined, with a cost : output ratio that was 7 per cent lower than the average for all countries.

Furthermore, when the imputed charge for owned land is excluded from the analysis, the competitive position of Irish cereal producers is again evident, with costs as a percentage of output lower than all competing countries in the analysis. The imputed charge for owned land over the period accounted for, on average, 22 per cent of the output from cereals on Irish farms, which was substantially higher than in the other countries examined.

These results are consistent with the findings obtained in Boyle (2002) where Irish cereal producers also emerged as a strong competitor when costs were compared with France, Denmark and the UK. As the findings obtained by Boyle were based on costs as a percentage of market based output for the year 1999, it was considered important to replicate this analysis for the years 1996 to 2000. This market based assessment is particularly important for Irish cereal producers given that Irish producers had the highest reference yields (Commission Regulation, No. 2316, 1999) and consequently the highest direct payments per hectare during the years analysed. To determine whether or not Irish producers could possibly maintain competitive position in a policy environment of decoupled payments, costs[xxviii] as a percentage of market based output are presented in Figure 11 below.

Figure 11 Market Based Indicator of Cost Competitiveness for selected cereal farms in the EU (1996-2000)

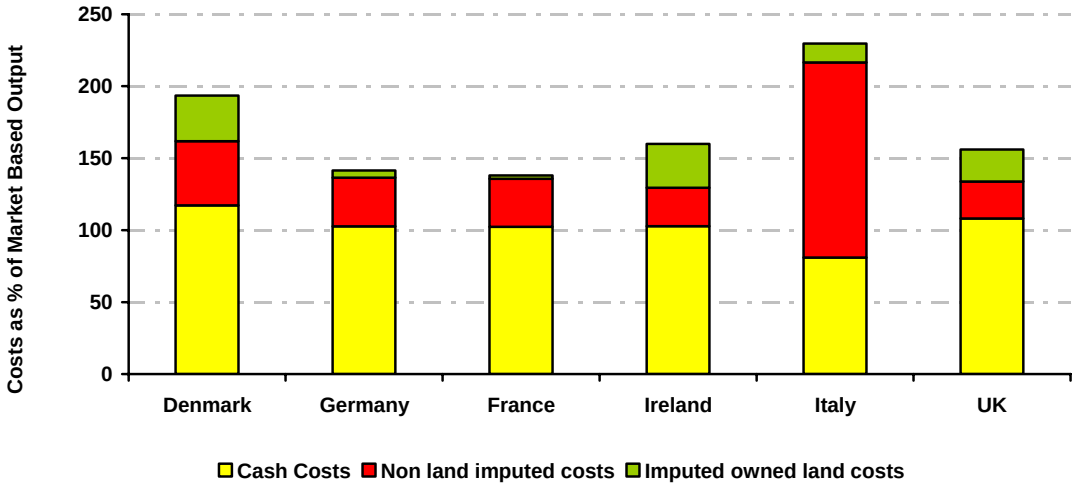
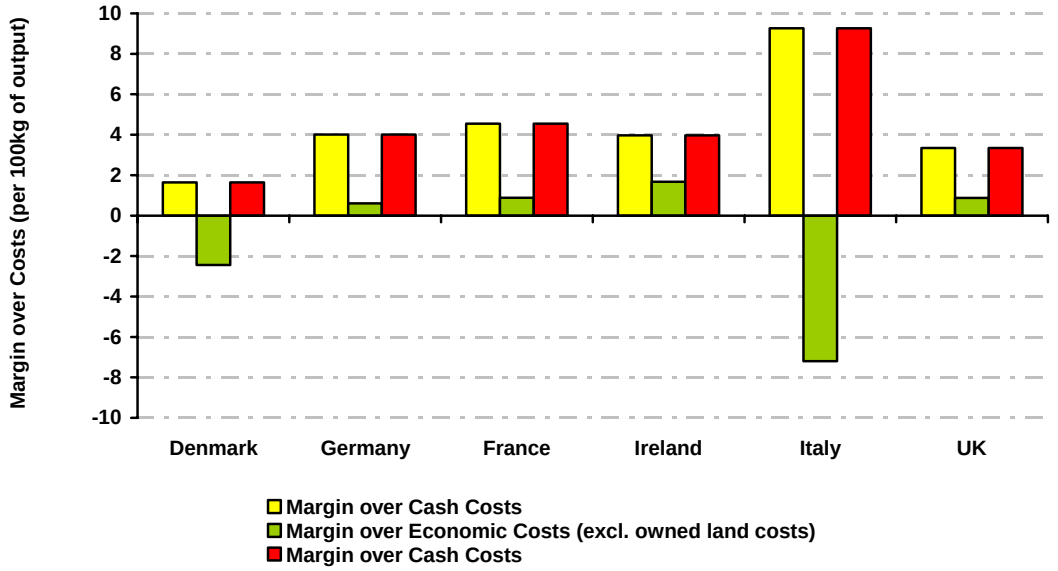


Figure 11 shows that the competitive position of Irish cereal producers was maintained during the period 1996 to 2000, when costs were expressed as a percentage of market based output, as distinct from total output (including direct payments). On a total economic cost basis, Irish cereal producers had 6 per cent lower costs than the average of all countries analysed. Furthermore, when imputed land charges were excluded from the analysis, Irish cereal producers had 15 per cent lower costs relative to the average of all countries. No apparent trend was found in this data over the time period 1996 to 2000.

The second measure of cost competitiveness employed in the analysis was margin over costs per 100kg of product volume. Figure 12 shows the average of these results for the period for all countries examined. Appendix XIII outlines the cost items and revenue per 100kg of product volume for each of the countries.

Figure 12 Cash and Imputed Charges for Selected Cereal Producers in the EU per Hectare (1996-2000)



Similar results are evident in Figure 12 as were seen in Figure 10. The ranking between countries changes when margin over cash costs for the different countries is compared to the margin over total economic costs. The 'best' ranking position for margin over cash costs per 100kgs of cereal output over the period was witnessed in Italy, and the lowest ranking was in Denmark, with the margins in France, Ireland, Germany and the UK quite similar. However, when imputed charges were considered, to measure the margin over total economic costs, Italy moved into the lowest ranking position with France in the highest ranked position. Furthermore, when imputed land charges were excluded from the analysis, Irish cereal producers again appeared to be most competitive compared to all countries examined. Based on the competitiveness index for Ireland of margin over cash and economic costs, Irish producers were slightly below the average on a cash cost basis (-11 per cent) but above average on an economic cost basis (+ 47 per cent and + 80 per cent, including and excluding owned land, respectively). No apparent trend was obvious over the period for Ireland's relative position over this period.

The third measure of cost competitiveness for cereals used in the analysis was cash and economic costs per hectare of cereal production. Figure 13 shows the average of these results for the period for all countries examined. Appendix XIV outlines the cost, revenue and margin per hectare for each of the countries.

Figure 13 Cash and Imputed Charges for Selected Cereal Producers in the EU (1996-2000)

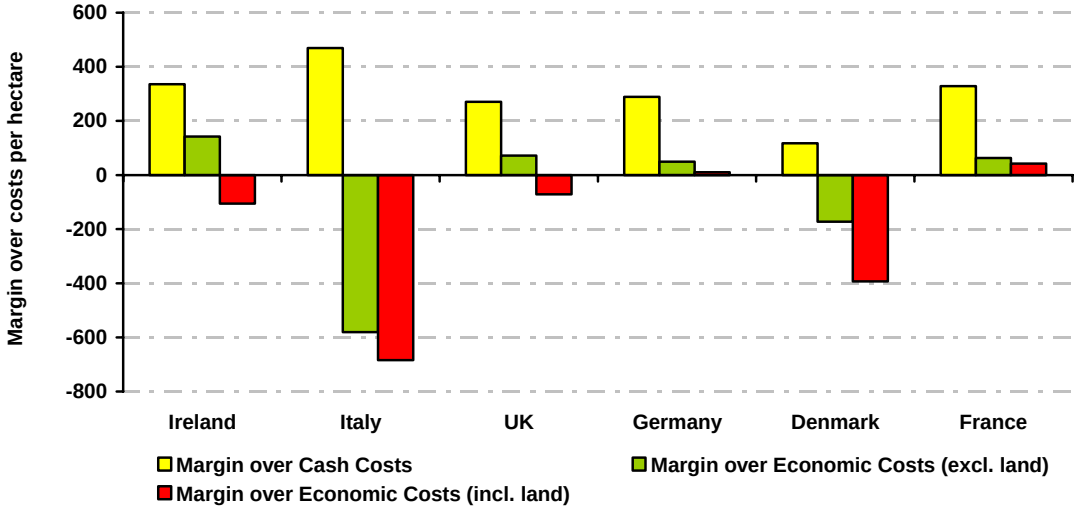


Figure 13 shows results similar to those in Figures 10 and 11. The margin over cash costs per hectare was highest in Italy, followed by Ireland, France, Germany the UK and Denmark. However, Italy again had the lowest margin over total economic costs, followed by Denmark and Ireland had the third lowest margin, with France and Germany the only countries that managed to retain a positive margin over total economic costs. Furthermore, the results presented here show that imputed charges for owned land have a large influence on relative competitiveness. When these imputed land charges are excluded from the analysis, Irish cereal producers had the highest margin per hectare during the period. No obvious trend was associated with Ireland's relative positioning over the period.

The three measures of cost competitiveness indicate that Irish cereal producers maintained a competitive advantage relative to the average of all countries in the analysis, when cash costs and economic costs were considered (excluding imputed charges for owned land). This advantage was less evident when total economic costs were measured relative to cash costs, due to the high imputed charges for owned land in Ireland.

Appendices XII, XIII and XIV show the individual cost items and returns associated with the three measures of cost competitiveness. Analysis of these variables show that the prominent *sources* of competitive advantage associated with Ireland's relatively low cash cost structure, were low machinery costs, other direct inputs, depreciation and paid wages. Low depreciation and machinery charges in Ireland were probably a reflection of the extensive use of contractors' services in Irish cereal production. Kelly and Shanahan (2001) noted that '*this reduces*

depreciation and allows the capture of the economies of scale associated with the use of high capacity machinery when this is used for long periods' (p.5).

In contrast to the above specific cost items, which were relatively lower in Ireland, there were also a few items that were higher in Ireland than the other countries, namely, fertilisers and crop protection materials. This could be associated with high usage levels or the relatively high costs of these items in Ireland. Disease pressure on Irish cereal farms does tend to be higher than in the UK or mainland Europe, thus this could contribute to the high cost associated with crop protection materials. The high cost of fertiliser was also evident in the other commodities analysed and was not peculiar to cereals.

A number of other individual cost items are worth mentioning which are shown in the Appendices. The relatively high interest charges in Denmark can probably be attributed to the Danish method of farm transfer, '*which is by sales and purchase using a mortgage rather than by gift between relatives'* (Kelly and Shanahan, 2001, p.3). The relatively high depreciation charges evident in Italy, which were about 40 per cent higher than the average for all countries in the analysis, was also noticed by Kelly and Shanahan (2001), who said that in comparison to Ireland these producers tended to be less specialised and much smaller in size. Therefore, it could be said that the depreciation charges associated with cereal production in Italy were associated with a relatively small production area, thus the depreciation charges per hectare tend to be higher.

These individual cost items help in identifying the relative strengths and weakness of cereal production in Ireland. In summary, it can be said that over the period Irish cereal producers enjoyed a relative competitive cost advantage compared to the average of all countries in the analysis. In particular, cash costs were relatively low in Ireland, however the cost structure did increase somewhat when total economic costs were considered. In addition to comparatively high competitive positioning in relation to costs, Irish cereal producers also appeared to have relatively high yields over the time period and 'kept up' with the *average* producer in the analysis, in terms of land and labour productivity.

4.4 Indicators of Competitiveness of Sheep Production in Ireland and Selected EU Member States (1996-2000)

Introduction

This section of the paper examines the costs and returns associated with sheep production in Ireland and some comparable EU member states. The EU countries chosen for comparison were the UK and France. The UK was selected as a significant exporting country, important in the context of measuring the competitiveness of sheep production, particularly for Ireland which also exports a high proportion of sheep meat. France was selected for comparative purposes being a major sheep producer and importing country within the EU. Together these countries accounted for over 75 per cent of the total intra-EU (EU-15) exports of sheep and over 55% of total EU slaughterings during the period 1996 – 2000 (Eurostat, 2003).

The data used for analysis was from the FADN and the farm classification type used was Farm Type 4410 – '*specialist sheep'*. This farm type, by definition, is characterised by the standard gross margin for the sheep enterprise on the farm accounting for greater than two-thirds of the whole farm gross margin. As sheep production consists of a wide variety of different production systems, farm type 4410 defined by FADN, could be considered a very generic definition of farming systems, making comparisons between countries difficult. Based on this premise Connolly (1996) in his analysis of the competitiveness of Irish sheep production, confined his research to lowland sheep '*as variation in mountain and hill sheep systems between countries would render such comparisons meaningless'* (p.3). However, Boyle (2002), in his analysis of sheep competitiveness, used farm type 44 – '*specialist sheep, goats and other grazing livestock'*, which is an even more generic farm type than farm type 4410. Furthermore, based on the definition of competitiveness adopted for this analysis, which measures how a country can profitably maintain or increase market share, and does not make a differentiation between the resources employed to achieve competitive position, farm type 4410 is considered an appropriate unit of analysis for this research. In addition, the variation in the quality of resources employed between lowland and hill and mountain sheep systems, is accounted for to some extent, by the valuation of land in the analysis. It is assumed that the rental value of land, which is used as a base for the valuation of owned resources, reflects the quality of the land resource employed on the farm.

One area where the heterogeneity of the farm type under analysis may impede the comparability of results is the link between indicators of partial productivity and cost competitiveness. When comparing indicators of partial productivity across countries where production systems also vary, there is a danger of not comparing like with like. For example, the stocking rate per hectare on hill

and mountain sheep farms will tend to be lower than lowland sheep farms. Therefore, using such indicators of partial productivity as an indication of technical performance or underperformance could be misleading given the fact that costs and returns associated with these production systems are not taken into account. Consequently, the interpretation of the partial productivity indicators outlined for the sheep production systems examined must be treated with caution.

Measurement and methods

Three separate measures of cost comparisons were used for comparing the competitiveness of sheep production in the selected member states:

- Total costs as a percentage of the (i) total value of output (i.e. sheep output plus allocated direct payments) and (ii) the market based value of the output;
- Margin over total costs per 100kg of sheep meat;
- Margin over total costs per forage hectare.

Sheep output and allocated subsides was defined as: total output from sheep (including sheep meat, sheep milk and milk products, and wool) plus allocated 'sheep and goat subsides'[xxix], 'other livestock subsides'[xiv], 'environment subsides'[xv], and less favoured area subsides (LFA)[xvi].

Unlike the analysis for beef production systems, it was possible to compare costs per product volume for the sheep analysis. Despite the fact that the FADN dataset does not record the weight of the livestock sold from farms, it was possible to estimate the production volume of sheep sold from the farm, based on average annual price per kg of sheep meat, obtained from official published sources (EU Commission, 2002). Whereas, on the beef systems examined it was considered that the heterogeneity of the systems defined did not allow for such estimation because information was not available on the age of livestock sold. For the sheep system examined, the price per 100kg of meat sold was based on the EU prices reported for calculating the annual ewe premium.

To calculate the costs per forage hectare for sheep production it was necessary to allocate forage hectares to the sheep enterprise of the farms. This allocation was based on the number of sheep LU in the total of grazing LU on the whole farm. As was the case with the previous enterprises examined, it was also necessary to allocate costs to the sheep enterprise to calculate the measures outlined above. This allocation method is outlined in Table 4 below.

Table 4 Allocation Keys used to define costs associated with sheep production on '*specialist sheep farms'*, using FADN data

COSTS ITEMS	ALLOCATION KEYS
Purchased feed for grazing livestock (concentrates & coarse fodder)	% of 'sheep' livestock units in the total of grazing livestock units
Farm-use of non forage crops	% of 'sheep' livestock units in the total of livestock units
Farm-use of forage crops = "Specific forage costs"	% of 'sheep' livestock units in the total of grazing livestock units x
Seeds	% area of fodder crops, other forage crops and temporary grass in the total UAA - after exclusion of fallow lands, areas leased to others, meadows and rough grazing
Fertilisers	% area of fodder crops, other forage crops, temporary grass and meadows in the total UAA - after exclusion of fallow lands, areas leased to others and rough grazing.
Crop protection	% area of fodder crops and other forage crops in the total UAA - after exclusion of fallow lands, temporary grass, areas leased to others, meadows and rough grazing.
Other specific livestock costs (e.g. veterinary costs)	% of 'sheep' livestock units in the total of livestock units
Owned land	% of 'sheep' LU in total LU
All other costs: - farming overheads - depreciation - external factor costs (wages, rent and interest paid).	% of sheep output & allocated direct payments in the total output & subsidies

Table 4 shows that the allocation methods used for the sheep enterprise follow closely the methods adopted for the dairy and beef enterprises. The LU's for sheep were calculated based on the average number of 'ewes' and 'other sheep', converted to LU equivalent, based on the FADN LU equivalents, which is 0.1 for all sheep (LU/Ha).

The indicators of partial productivity used for the sheep enterprises were (i) stocking rate – sheep LU per allocated forage hectare; (ii) land productivity – sheep production output plus allocated subsides per allocated forage hectare; and (iii) labour productivity – sheep production output plus allocated subsides divided by the total annual work units (AWU) devoted to sheep production.

Results

The results for sheep production are presented in two sections: (i) partial productivity indicators and (ii) comparative costs of production.

Comparison of partial productivity indicators on EU sheep farms

Figure 14 shows the partial productivity indicators for EU sheep farms identified above. The results presented here for each of the countries is the average for the years 1996 to 2000 and indexed relative to Ireland. The absolute levels of the indicators, for each of the years and for each of the countries are shown in Appendix XV[xxx].

Figure 14 Partial Productivity Measures for EU Sheep Farms (1996 – 2000)

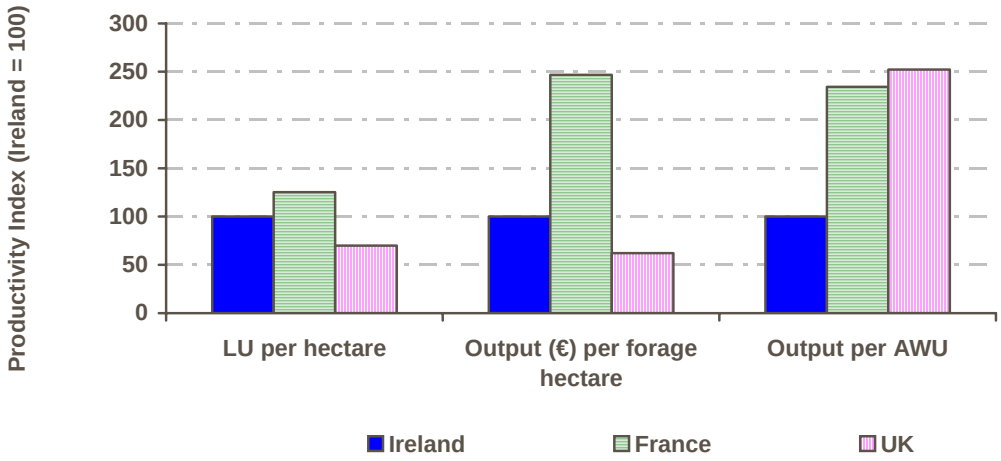
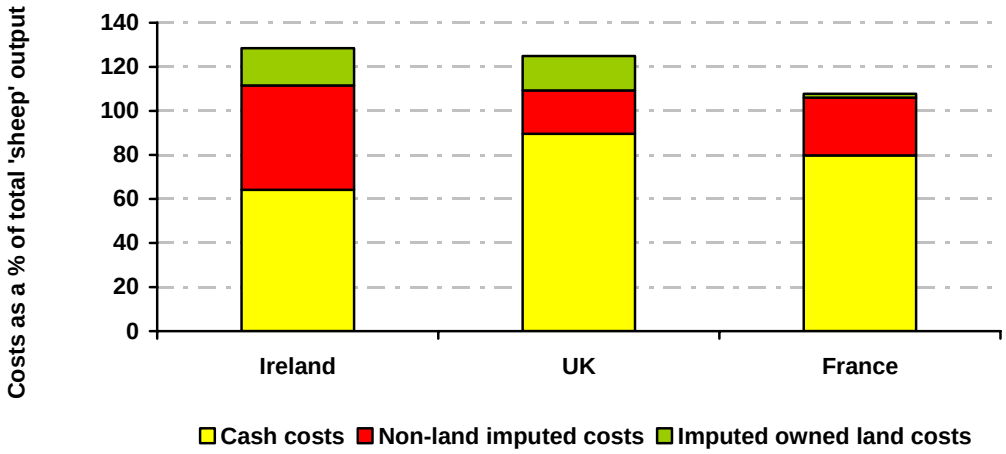


Figure 14 indicates that Ireland and the UK had relatively low stocking rates and land productivity compared to France over the period 1996 to 2000, but Irish sheep farms did have higher technical performance based on these two measures compared to the UK. However, the UK and France both outperformed Ireland in terms of labour productivity. Similar technical performance indicators were obtained by Boyle (2002) in his comparison of sheep productivity levels in 1998/99. The high stocking rates and land productivity levels in France are linked with the intensive indoor rearing of sheep, for the purposes of milk production, which is common in France. This highlights the importance of not drawing strong inferences in relative performance terms from productivity indicators, which do not compare homogeneous farm systems.

Comparison of costs and returns in EU sheep farms

The first measure of comparative costs of production for sheep farms analysed was costs as a percentage of total sheep production output and allocated direct payments. Figure 15 shows the five year average cost:output ratio results for sheep production in each of the selected countries. The individual cost components for each of the countries are outlined in Appendix XVI. No significant trend for Ireland, relative to the average of all countries, was evident during the period 1996 to 2000.

Figure 15 Costs as a % of Output in selected EU Sheep Farms (1996-2000)



Figures 15 shows that Irish sheep producers had the lowest cash costs as a percent of output, followed by France and the UK had the highest cash cost structure over the period 1996 to 2000. Appendix XVI shows that Irish producers, in particular, experienced relatively low costs for seeds and plants, purchased feedstuffs, depreciation and interest. However, when imputed charges for owned resources are taken into account to compare economic costs, the ranking between countries changes considerably. Ireland now appears to have the highest cost structure as a per cent of output and France has the lowest cost structure, however all three countries have economic costs in excess of total output of the sheep enterprise. This is true even when imputed charges for owned land are excluded from the analysis.

When the cost: output ratio for Ireland was expressed as a per cent of the average cost:output ratio for the other countries, the Irish ratio was 6 per cent higher than the average for all countries when total economic costs were considered and 3 per cent higher when imputed land charges were excluded from the analysis. Boyle (2002) also found that Ireland's competitive position deteriorated when total economic costs were expressed as a percentage of market based output, for the single year 1999. Figure 16 below shows the average costs as a percentage of market based output for 1996 to 2000.

Figure 16 Market Based Indicator of Cost Competitiveness for selected sheep farms in the EU (1996-2000)

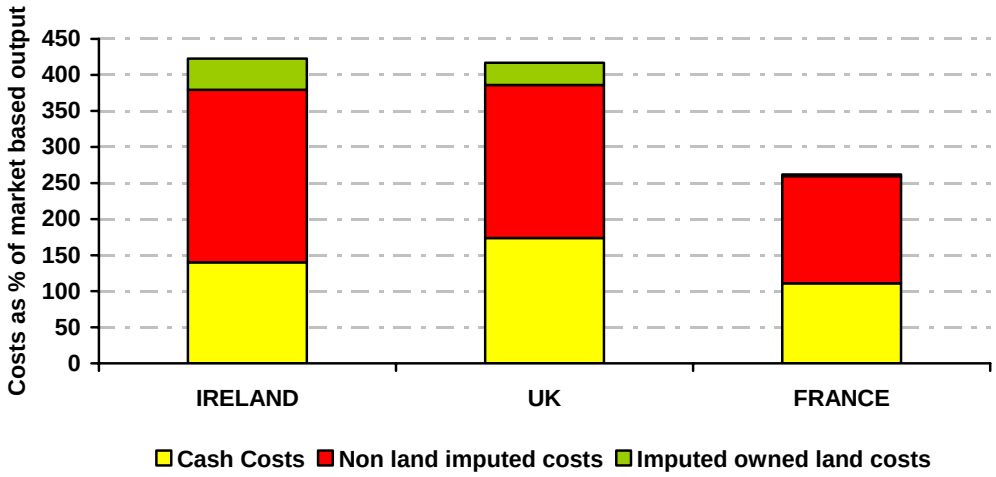
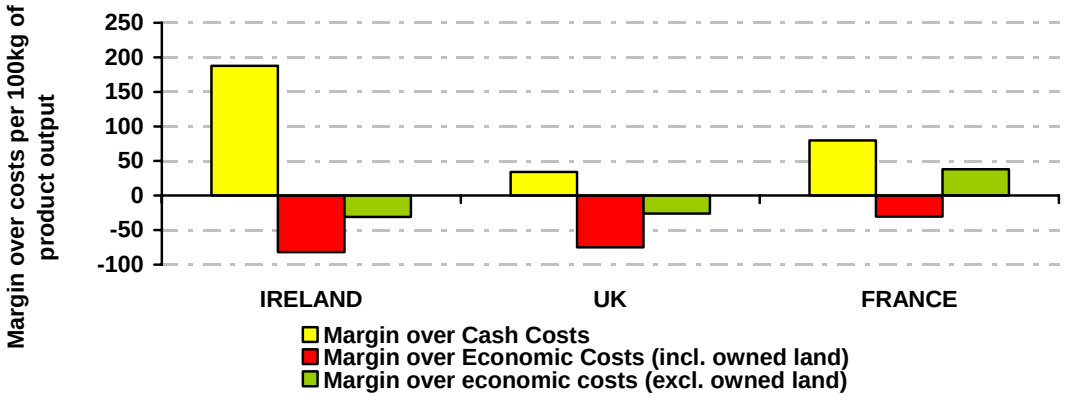


Figure 16 shows that the ranking between the countries changes when costs are expressed as a percentage of market based output instead of total output which takes direct payments into account. Irish sheep producers are replaced by France as the lowest cost producers, but costs remains marginally lower than the average of all countries in the analysis.However, the ranking between countries on an economic cost basis does not change, with Ireland still appearing as the highest cost producer.

The second measure of cost competitiveness employed in the analysis was margin over costs per 100kg of product volume. Figure 17 shows the average of these results for the period for all countries examined. Appendix XVII outlines the cost items and revenue per 100kg of product volume for each of the countries.

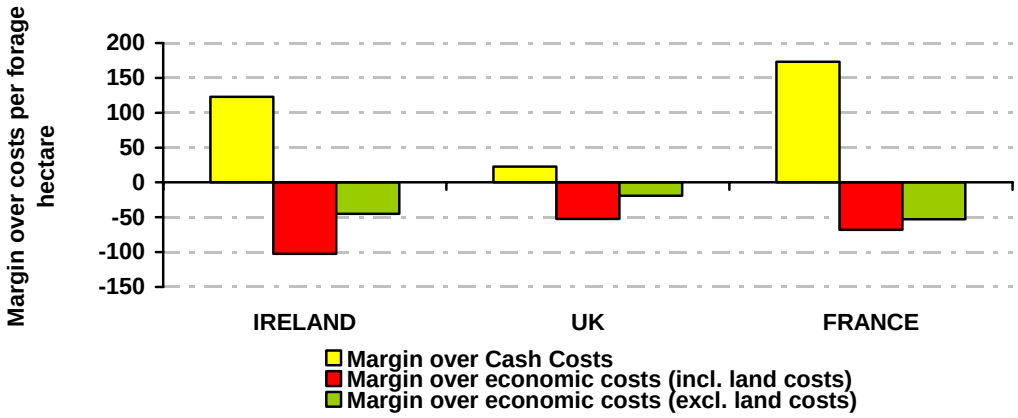
Figure 17 Margin over Costs per 100kg of Product Volume for Selected Sheep Producers in the EU (1996-2000)



Margin over costs shown in Figure 17 show a similar ranking between countries to that shown in Figure 15 above. Irish sheep producers had the highest margin over cash costs per 100kg of output, followed by France and the UK had the lowest margin over cash costs. However, again we see that this comparative advantage for Irish producer dissipates when economic costs are taken into consideration. Based on the competitiveness index for margin over cash costs Ireland had an 87 per cent higher margin than the average of all countries, however this advantage was dissipated when economic costs were considered.

The third measure of cost competitiveness for sheep used in the analysis was cash and economic costs per allocated forage hectare[xxxi]. Figure 18 shows the average of these results for the period for all countries examined. Appendix XVIII outlines the cost, revenue and margin per hectare for each of the countries.

Figure 18 Margin over Costs per Forage Hectare for Selected Sheep Producers in the EU (1996-2000)



The results per hectare are slightly different to the results presented for the previous two measures of cost competitiveness. Margin over cash costs per hectare was highest in France over the period, followed by Ireland and again the UK had the lowest margin over cash costs. When total economic costs were considered Ireland again had the lowest margin, followed by France and the UK. The advantage experienced by French producers in terms of margin over cash costs can be attributed to the high stocking rate per hectare on French sheep farms, which is associated with intensive indoor feeding of sheep for milk production.

The three measures of cost competitiveness show that Ireland's comparative advantage on a cash cost basis deteriorated quite significantly when economic costs were considered. The individual cost items outlined in the Appendices for the sheep analysis shows where the advantages and disadvantages for Irish sheep production were during the period.

In summary, it can be said that over the period 1996-2000 Irish sheep producers enjoyed a relative competitive advantage compared to the UK and France when only cash costs were taken into account. In particular, costs for seeds and plants, purchased feedstuffs, energy, and depreciation were relatively low on Irish sheep farms over the period. However, when economic costs were taken into consideration, the competitive position of Irish sheep farms was the lowest compared to the UK and France. Imputed charges for owned land and family labour were particularly high in Ireland. The imputed charge for labour on Irish sheep farms was double the charge experienced in the UK and France when costs were expressed as a percentage of output. Furthermore, over the period Irish sheep producers relied more heavily on subsides to supplement the revenue of the sheep enterprise, compared to the UK and France. Subsides accounted for 55 per cent of total output from the sheep enterprise in Ireland, 49 per cent in the

UK and 25 per cent in France. Consequently, in a decoupled policy environment it is possible that production on Irish sheep farms could be subject to competitive pressures, as production decisions will be based on the market return rather than market return plus direct payments.

5. Conclusions

In summary, it appears that for the period 1996 to 2000, the competitive position for Ireland, for all four enterprises: milk, beef, cereals and sheep, was positive when cash costs were considered in isolation from imputed charges for owned resources. Figure 19 summarises the Irish position, relative to the other countries examined, for each of the enterprises, when **cash costs** were expressed as a percentage of total output[xxxii].

Figure 19 Cash Costs as a % of Total Output (1996-2000)

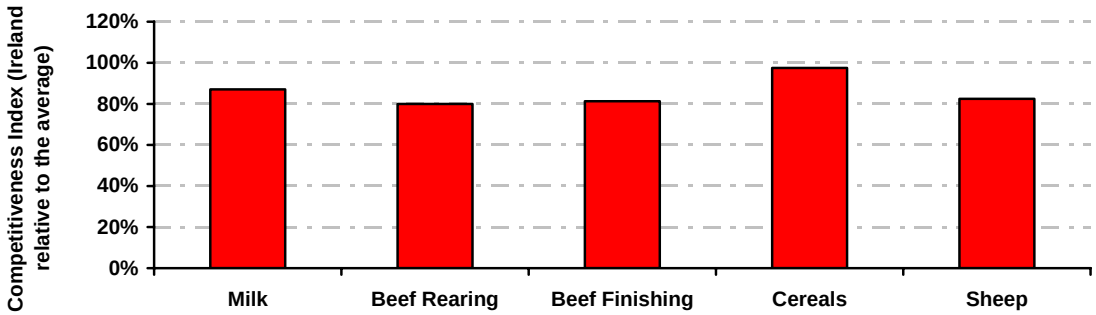


Figure 19 shows that for each of the enterprises examined, Irish producers had lower cash costs as a percentage of output, relative to the average of all countries examined, during the period 1996 – 2000. Furthermore, Irish beef rearing, beef fattening, and sheep farms actually appeared as the lowest cash cost producers (as a per cent of output) compared to the other countries examined in the study. However, when cash costs were measured relative to market based output, the competitive position of Irish beef and sheep farms did deteriorate slightly, but still maintained lower costs as a per cent of output relative to the average of all countries. This is an indication of Ireland's competitiveness in the short run when direct payments are decoupled from production under the reform of the CAP. As the opportunity cost of owned resources are not included in this calculation this indication of future competitiveness can only be considered to be valid in the short term. In the longer term adjustment within the sectors will be a reality which will be dependent on relative resource use and in this situation relative resource costs are needed to understand and analyse the adjustment process.

Consequently, imputed charges for owned resources were considered to examine the longer term outlook for the competitiveness of the sectors. In doing so, the competitive ranking for Irish agriculture slipped relative to the other countries, for all commodities examined. However, in most cases the exclusion of imputed charges for owned land from the analysis reinforced the competitive position of Irish farms. Figure 20 below summarises the Irish position, relative to the

other countries examined, for each of the enterprises, when **economic costs** were expressed as a percentage of total output[xxxii].

Figure 20 Economic Costs as a % of Total Output (1996-2000)

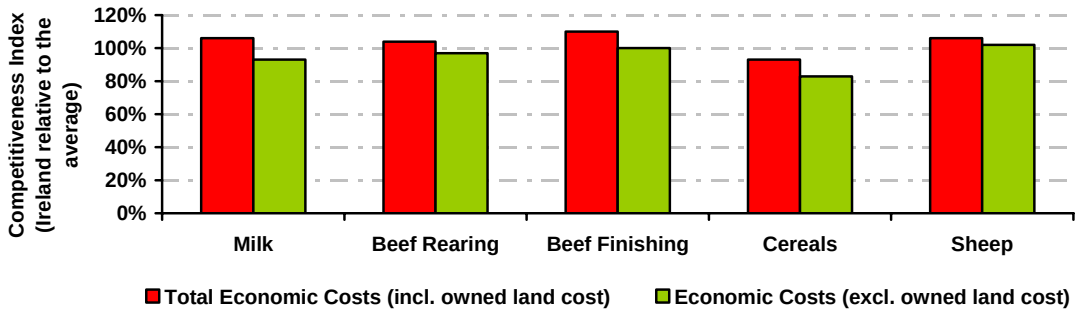


Figure 20 shows that on a total economic cost basis, Irish cereal producers were the only category of farmers that maintained a lower cost (as a percent) of output, relative to the average of all countries. However, when the imputed charge for owned land was excluded from the analysis, all categories, except sheep, maintained a lower cost position, relative to the average of all countries. Furthermore, sheep farms in Ireland had only 2% higher costs as a per cent of output compared to the average of all countries.

It is however, worth noting that on an economic cost basis, (both including and excluding land), Irish beef farms (both rearing and fattening) and sheep farms appeared to be uncompetitive relative to the average of all countries, when costs were expressed as a percentage of market based output. Furthermore, specialist beef rearing farms appeared to experience a deterioration in market based cost competitiveness over the period relative to the average of all countries. This is important in the context of impending reforms to the CAP, when direct payments become decoupled form production. As relative economic costs are considered as '*a relative guide to the longer-term competitive position*' (Fingleton, 1995, p.15) of competing countries, these findings could be considered as warning signals for the future competitive *performance*[xxxiii] of Irish beef and sheep production.

The deterioration of Ireland's competitive position relative to the other countries examined as the unit of measurement changes from cash costs to total economic costs has been demonstrated. A number of factors are important in explaining this deterioration. Boyle (2002) concluded that part of this explanation relates to '*the relatively low scale of primary agricultural activity in Ireland*' (p.177). In this particular study the examination of scale economics was only possible for a sub sample of the dairy farms in the analysis due to data availability. This analysis showed that whilst

the competitive ranking of the countries remained unchanged the magnitude of the differences was much less in this sub sample of farms compared to the national averages. In particular, economic costs on these larger Irish dairy farms were substantially reduced compared to the national average. This result is indicative of the small scale farming that is predominant in the Irish dairy industry relative to competing industries. Furthermore, it could be concluded that larger scale producers in Ireland will be in a superior competitive position relative to the smaller scale producers in the long run, due to their ability to cope with a cost/price squeeze, given current projections for a decline in farm milk prices. The extent of the problem for smaller scale farms will become particularly evident when direct payments are decoupled from production and individual farms will need to base decisions on full economic costs of production including adequate remuneration of owned resources.

To further understand the relative strengths and weakness, which underpinned the relative performance of Irish agriculture over the period, the indicators of competitive *potential* were examined, namely, partial productivity measures and the cost and return variables identified in the appendices. Most of the indicators of partial productivity which were measured for the commodities, indicated that the technical performance of Irish agriculture was lagging behind competing countries. However, productivity levels on Irish cereal farms were on average more positive than the results for the other commodities. In particular Irish wheat yields were well in excess of other competing countries.

In addition to 'average' productivity levels over the period 1996 to 2000, there was also some interesting trends observed during the period. Specialist milk producers in Ireland with 50-99 dairy cows, experienced a decline in land productivity measures from 1996 to 2000, compared to the average of all countries examined. However, on a more positive note, Irish beef rearing and fattening farms improved output per hectare and per AWU relative to the average of all countries examined, which may be explained by preferential access to direct payments during the period.

The cost variables that were identified in the appendices, showed that Ireland had a relative advantage in terms of the cost of particular 'cash cost' items but these particular advantages were outweighed on a total economic cost basis, due to the high imputed cost of owned resources on Irish farms. Certain 'cash cost' items consistently appeared as low cost items across the commodities, such as seed and plant costs, interest charges, depreciation, and fixed asset charges. However, imputed charges for owned land and labour were also consistently high across the commodities for Ireland. It was the relatively high opportunity cost of labour and in particular land that rendered the majority of Ireland's agriculture uncompetitive during the period

1996 to 2000. The relatively high opportunity cost associated with these owned resources in Ireland will become a major issue in the context of further liberalisation of EU agriculture.

The results of this study provide a baseline position against which the change in competitiveness of Irish agriculture can be measured. This is an important development in the process of monitoring the position of Irish agriculture relative to other EU countries. EU enlargement, trade liberalisation in the context of WTO negotiations and impending reform of the CAP will all have major influences on the competitive position of Irish agriculture, which can be monitored against the baseline position outlined by this research.

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Appendix I Literature review and data availability for the identification of a range of indicators to examine the competitiveness of Irish agriculture

Indicator	Features	Source (author, year)	Advantages	Limitations	Availability of Data for Ireland	Ease of International comparison	Comments
Competitive Performance							
Profitability							
Net margin over input costs	• This measure takes account of prices received in addition to costs of production • This measure can be considered as a residual i.e. the margin left over when total revenue and total costs are taken into consideration • Specialist producers are considered a superior unit of analysis for competitiveness studies of this nature.	Connolly (1999) – Sheep Thorne *et al.,* (2002) – Hardy Nursery Stock Murphy et al., (2000) - Beef	• This measure takes into account input prices, output levels and output prices.	• Profitability has been asserted to be a superior indicator of *competitive performance* in the long term due to the theory of *combatitiveness* (Brinkman, 1987). However the opposite case has also been proposed i.e. short term profit can be forfeited in the pursuit of long term market share gains (Kennedy *et al.,* 1997). • Limitations outlined for comparative cost studies have relevance in the context of profitability as an indicator of *competitive performance* as profit is the residual left to firms when costs are paid (see section below on comparative costs of production as an indicator of *competitive potential*).	NFS - FADN	FADN	Both the theoretical characteristics and data requirements of this measure make it a suitable indicator of *competitive performance.*

Indicator	Features	Source (author, year)	Advantages	Limitations	Availability of Data for Ireland	Ease of International comparison	*Comments*
Competitive Potential: Boyle (2002) identified three sources of *competitive potential* : (i) relative total input productivity (ii) relative total input prices and (iii) relative producer output prices (p.38). This section focuses on these three indicators of *competitive potential*.							
Costs of Production & Output Value							
Farm-Gate Prices/ import & export prices/ wholesale prices	• The specific characteristics of a heterogeneous commodity greatly affect price & competitiveness. Therefore it is necessary to find a standardised product for comparison.	Hayes *et al.,* (1991) - Beef	• Output price is taken into consideration • This indicator is useful in the determination of the price wedge between world and domestic prices & as such is an intuitive way of determining how much protection producers receive & thereby indirectly measuring the competitiveness of the industry.	• Input prices and productivity are ignored. Accordingly this measure of competitiveness is only valid in the very short term. • Farm gate prices are not indicative of the ability to compete in the international market as other issues such as disease free status also affect trade. • Transport and marketing costs are not taken into consideration by farm gate prices. • Comparability of data is an obvious concern in comparative price studies of any nature.	Problematic	Problematic	The theoretical base and data requirements of this indicator mitigates against the use of this indicator for the purposes of this research.

Indicator	**Features**	**Source (author, year)**	**Advantages**	**Limitations**	**Availability of Data for Ireland**	**Ease of International comparison**	*Comments*
Competitive Potential continued							
Costs of production per physical unit (of output or production)	• This indicator accords with intuition i.e predominance of cost competitiveness studies in the literature • This can be calculated for each of the main commodities. • Costs can be classified as cash costs or economic costs. The difference between these two measures is the return to owned resources. • The specification of the actual cost components in the total costs of production can assist in the understanding of the factors which influence competitiveness. These components can assist in the estimation of shifts in the supply curve. Shifts in the supply curve and the associated marginal input costs are considered superior indicators of competitiveness relative to aggregate average firm costs (Sharples, 1990).	Ahearn *et al.,* (1990) – Wheat Boyle (2002) – major ag. commodities Boyle *et al.,* (1992) – major ag. commodities Connolly (1999) – Sheep Fingleton (1995) – Dairy Kelly (1999) - Cereals Lara *et al.,* (2002) Le Stum and Camaret (1990) - Wheat Sharples (1990) – theoretical observations	• The opportunity costs of owned resources must be included if this indicator is to be useful in the observation of long run competitiveness issues	• This indicator ignores relative producer output prices and productivity issues are ignored as sources of *competitive potential.* • Volatile exchange rates have a major effect on the results gained from this indicator. • Presentation of average industry costs provides little information for individual farms which are of specific size units. • Allocation of fixed costs in multi enterprise farms is difficult. • Total revenue must include direct payments if current competitiveness is to be accurately reflected	NFS – FADN (It is also possible to use budgeting techniques to determine standards of production and calculate relevant costs but this approach fails to take account of the high variability in actual farm conditions).	FADN (It is also possible to use budgeting techniques to determine standards of production and calculate relevant costs but this approach fails to determine the high variability in actual farm conditions).	This indicator is useful if the following elements are taken into account: - Imputed charge for owned resources - Actual cost components in total costs of production - Direct payments are currently an integral component of FFI on many farm enterprises, thus should be included in total farm revenue. - Standard farm accounts by definition records historic data. Input & output price indices maybe used to more accurately reflect current position & possibly indicate future trends in relation to competitiveness.

Indicator	Features	Source (author, year)	Advantages	Limitations	Availability of Data for Ireland	Ease of International comparison	*Comments*
Competitive Potential continued							
Costs of production as a % of value of output	• This is lower in more efficient sectors. • See features 2-4 for previous indicator.	Thorne *et al.*, (2002) – Hardy Nursery Stock Fingleton (1995) – Dairy Boyle *et al.*, (1992) – All major agricultural commodities Boyle (2002) – major agricultural commodities	• Rather than using costs per physical unit of output this indicator takes account of prices & productivity realised. This overcomes to some degree the criticism of the previous indicator which is an absolute rather than a comparative indicator of competitiveness. • Impact of volatile exchange rates avoided • The opportunity costs of owned resources must be included if this indicator is to be useful in the observation of long run competitiveness issues.	• Allocation of fixed costs in multi enterprise farms is difficult • Total revenue must include direct payments if current competitiveness is to be accurately reflected.	NFS – FADN (It is also possible to use budgeting techniques to determine standards of production and calculate relevant costs and returns but this approach fails to determine the high variability in actual farm conditions).	FADN (It is also possible to use budgeting techniques to determine standards of production and calculate relevant costs and returns but this approach fails to determine the high variability in actual farm conditions).	See comments for previous indicator

Indicator	Features	Source (author, year)	Advantages	Limitations	Availability of Data for Ireland	Ease of International comparison	*Comments*
Competitive Potential **continued**							
Productivity – Total factor productivity (TFP) is a more accurate measure of total farm productivity compared to partial productivity measures but measures of TFP are more difficult to calculate compared to partial productivity measures. However availability of data essentially mitigates against the use of TFP measures.							
Total Factor Productivity	This approach uses a stochastic production frontier approach to measure productivity growth over a period. A production frontier is defined in terms of the maximum output that can be achieved from a set of inputs given the technology available to the farm.	O'Neill *et al*., (2001)	TFP is considered to be a superior indicator of productivity change over time compared to partial productivity indicators.	A panel data set is required for this approach. The NFS is available for the Irish situation but a panel data set is at present not available for international comparison.	National Farm Survey	Panel data set not available	Data requirements mitigate against the use of this approach.

Indicator	Features	Source (author, year)	Advantages	Limitations	Availability of Data for Ireland	Ease of International comparison	*Comments*
***Competitive Potential* continued**							
Partial Productivity	Various partial productivity indicators are available in the literature, specifically: • Technical performance in terms of stocking rate, weaning percentage, mortality rate and carcass weight per hectare • Partial productivity indicators for animals, land and labour • Partial productivity indicator for land i.e. tonne/acre • Partial productivity indicators: land productivity, stocking rate, milk yield, and labour productivity • Various partial productivity indicators • Unit productivity and value productivity for land, labour and capital. Unit productivity = number of ecus of output produced by a unit of factor. Value productivity = number of ecus of output produced by one ecu factor.	Connolly (1999) -Sheep Fingleton (1995) -Dairy Kelly (1999) – Cereals Kearney (1993) – Dairy Boyle (2002) – Dairy, Beef, Cereals,Sheep NFU (1998) – Dairy, cereals, horticulture, beef & sheep and pigs and poultry.	Measurable	"*Since different farmers may use different combinations of fixed inputs partial productivity indicators …can be misleading in comparing relative efficiency between farms*" (O,Neill *et al.,* 2001,p.5)	NFS - FADN	FADN	The calculation of specific partial productivity indicators for specific enterprises is possible.

Appendix II - Average fat and protein percentages for selected EU member states

	Ireland	Germany	France	Italy	Belgium	Netherlands	Denmark	UK
Average butterfat content of milk								
1996	3.59	4.27	4.11	3.62	4.08	4.43	4.35	4.08
1997	3.61	4.24	4.10	3.66	4.07	4.40	4.36	4.07
1998	3.67	4.25	4.12	3.72	4.11	4.40	4.36	4.07
1999	3.70	4.22	4.08	3.69	4.07	4.35	4.34	4.03
2000	3.70	4.22	4.08	3.66	4.09	4.40	4.28	4.01
Average protein content of milk								
1996	3.21	3.42	3.17	3.16	3.43	3.49	3.42	3.29
1997	3.21	3.40	3.24	3.25	3.36	3.46	3.44	3.30
1998	3.24	3.41	3.19	3.26	3.34	3.46	3.44	3.30
1999	3.25	3.42	3.16	3.26	3.33	3.46	3.42	3.30
2000	3.27	3.41	3.18	3.26	3.32	3.46	3.42	3.28

Source: The Dairy Council (2001)

Appendix III – Partial Productivity Indicators for EU Countries (1996-2000)

Average of All Specialist Dairy Farms in the FADN Sample							
	1996	1997	1998	1999	2000	Average	Index Relative to Ireland
Milk yield/cow (kg)							
Belgium	5577.00	5721.00	5678.00	5829.00	5769.00	5714.80	119.43
Denmark	6491.00	6678.00	6788.00	7007.00	7053.00	6803.40	142.18
France	5430.00	5488.00	5564.00	5702.00	5723.00	5581.40	116.64
Germany	5735.00	5912.00	6020.00	6222.00	6344.00	6046.60	126.37
Ireland	4717.00	4678.00	4656.00	4856.00	5018.00	4785.00	100.00
Italy	5321.00	5444.00	5669.00	5774.00	5795.00	5600.60	117.04
Netherlands	7250.00	7371.00	7337.00	7618.00	7630.00	7441.20	155.51
UK	5942.00	6200.00	6145.00	6347.00	6311.00	6189.00	129.34
Milk solid/cow (kg)							
Belgium	514.48	512.60	517.83	528.40	523.25	519.31	127.54
Denmark	615.35	617.72	646.22	663.56	663.69	641.31	157.50
France	481.37	491.72	495.47	502.92	506.49	495.59	121.71
Germany	539.09	552.18	563.77	581.76	592.21	565.80	138.95
Ireland	396.46	394.12	397.16	416.40	431.80	407.19	100.00
Italy	444.84	464.65	488.10	495.41	495.47	477.69	117.31
Netherlands	700.71	706.88	703.62	726.76	731.72	713.94	175.33
UK	535.67	559.24	554.28	569.96	563.57	556.54	136.68
Stocking rate (LU/ha)							
Belgium	2.08	1.99	2.01	2.02	2.05	2.03	111.12
Denmark	2.54	2.48	2.43	2.36	2.28	2.42	132.44
France	1.24	1.24	1.20	1.28	1.31	1.26	68.73
Germany	1.81	1.76	1.77	1.80	1.78	1.78	97.73
Ireland	1.88	1.82	1.83	1.83	1.79	1.83	100.00
Italy	2.20	2.01	1.95	2.18	2.31	2.13	116.63
Netherlands	2.55	2.47	2.50	2.45	2.45	2.48	135.94
UK	2.01	2.00	2.02	2.01	2.00	2.01	109.96
Milk Production/ha (kg)							
Belgium	11621.00	11383.00	11380.00	11743.00	11769.00	11579.00	133.00
Denmark	15288.00	15705.00	15698.00	15303.00	14826.00	15364.00	176.00
France	6640.00	6711.00	6595.00	7162.00	7307.00	6883.00	79.00
Germany	10135.00	10228.00	10445.00	10952.00	11077.00	10567.00	121.00
Ireland	8830.00	8498.00	8493.00	8858.00	8956.00	8727.00	100.00
Italy	10721.00	10133.00	10217.00	11472.00	12147.00	10938.00	125.00
Netherlands	18413.00	18185.00	18266.00	18615.00	18656.00	18427.00	211.00
UK	11904.00	12374.00	12326.00	12656.00	12535.00	12359.00	142.00
Milksolids/ha (kg)							
Belgium	1072.06	1020.39	1038.77	1066.23	1071.93	1053.88	141.77
Denmark	1565.16	1531.33	1567.92	1568.81	1513.74	1549.39	208.42
France	598.42	609.97	596.57	645.50	661.11	622.31	83.71
Germany	976.42	973.49	997.39	1046.82	1055.08	1009.84	135.84
Ireland	743.45	716.48	725.26	760.20	771.59	743.40	100.00
Italy	978.64	933.94	952.65	1080.18	1143.64	1017.81	136.91
Netherlands	1784.20	1744.44	1755.59	1783.04	1793.41	1772.14	238.38
UK	1077.15	1119.44	1117.10	1146.10	1128.81	1117.72	150.35
Milk production/labour unit (tne)							
Belgium	197.38	196.32	202.73	214.51	215.01	205.19	131.12
Denmark	275.05	298.37	307.27	339.09	344.00	312.76	199.86
France	152.49	152.83	160.56	175.45	177.06	163.68	104.59
Germany	162.47	163.19	165.51	181.44	183.49	171.22	109.41
Ireland	146.09	151.43	143.80	165.19	175.93	156.49	100.00
Italy	107.13	113.47	123.68	129.13	145.75	123.83	79.13
Netherlands	301.94	314.60	316.56	335.87	338.66	321.53	205.46
UK	260.08	277.22	278.66	309.45	311.55	287.39	183.65

Average of All Specialist Dairy Farms in the FADN Sample with 50-99 Dairy Cows							
	1996	1997	1998	1999	2000	Average	Index Relative to Ireland
Milk yield/cow (kg)							
Belgium	5540.00	5819.00	5790.00	5920.00	5899.00	5793.60	117.28
Denmark	6583.00	6745.00	6891.00	7061.00	7113.00	6878.60	139.25
France	5837.00	5671.00	5838.00	5904.00	5837.00	5817.40	117.77
Germany	6135.00	6237.00	6426.00	6737.00	6796.00	6466.20	130.90
Ireland	4867.00	4872.00	4911.00	4921.00	5128.00	4939.80	100.00
Italy	5672.00	5533.00	5901.00	6454.00	6191.00	5950.20	120.45
Netherlands	7349.00	7467.00	7486.00	7684.00	7684.00	7534.00	152.52
UK	5838.00	6073.00	5973.00	6057.00	6058.00	5999.80	121.46
Milk solid/cow (kg)							
Belgium	511.07	521.38	528.05	536.65	535.04	526.44	125.24
Denmark	624.07	623.91	656.02	668.68	669.33	648.40	154.26
France	517.45	508.12	519.87	520.73	516.57	516.55	122.89
Germany	576.69	582.54	601.79	629.91	634.41	605.07	143.95
Ireland	409.07	410.47	418.91	421.98	441.26	420.34	100.00
Italy	474.18	472.24	508.08	553.75	529.33	507.52	120.74
Netherlands	710.28	716.09	717.91	733.05	736.90	722.84	171.97
UK	526.30	547.78	538.76	543.92	540.98	539.55	128.36
Stocking rate (LU/ha)							
Belgium	2.22	2.15	2.18	2.19	2.16	2.18	103.40
Denmark	2.46	2.43	2.36	2.31	2.25	2.36	112.04
France	1.41	1.37	1.28	1.37	1.46	1.38	65.30
Germany	1.92	1.89	1.90	1.89	1.90	1.90	90.05
Ireland	2.23	2.11	2.12	2.07	2.01	2.11	100.00
Italy	2.93	2.76	2.84	3.24	3.65	3.08	146.24
Netherlands	2.60	2.52	2.50	2.44	2.44	2.50	118.72
UK	1.99	1.98	1.96	1.93	1.92	1.96	92.85
Milk Production/ha (kg)							
Belgium	12313.00	12437.00	12590.00	12911.00	12670.00	12584.00	121.00
Denmark	14936.00	15484.00	15430.00	14945.00	14610.00	15081.00	145.00
France	8071.00	7688.00	7392.00	7868.00	8213.00	7847.00	75.00
Germany	11412.00	11495.00	11951.00	12331.00	12555.00	11949.00	115.00
Ireland	10834.00	10268.00	10422.00	10177.00	10284.00	10397.00	100.00
Italy	15341.00	14185.00	15285.00	18826.00	20360.00	16799.00	162.00
Netherlands	19081.00	18805.00	18718.00	18745.00	18746.00	18819.00	181.00
UK	11614.00	12033.00	11699.00	11633.00	11543.00	11704.00	113.00
Milksolids/ha (kg)							
Belgium	1135.63	1118.51	1151.10	1176.29	1154.82	1147.27	129.59
Denmark	1536.58	1515.45	1546.90	1544.91	1505.24	1529.82	172.80
France	727.79	696.61	665.72	712.50	751.87	710.90	80.30
Germany	1105.95	1099.41	1142.06	1189.38	1205.16	1148.39	129.72
Ireland	911.97	865.16	889.82	873.31	886.30	885.31	100.00
Italy	1390.12	1303.05	1442.97	1792.24	1929.47	1571.57	177.52
Netherlands	1847.07	1805.94	1797.17	1790.92	1800.48	1808.31	204.26
UK	1048.69	1086.90	1057.56	1049.72	1036.42	1055.86	119.26
Milk production/labour unit (tne)							
Belgium	243.38	246.15	248.75	255.30	257.56	250.23	111.62
Denmark	292.80	320.68	325.71	352.30	358.55	330.01	147.21
France	203.96	204.50	225.07	226.72	224.54	216.96	96.78
Germany	247.18	248.22	256.04	278.25	273.69	260.68	116.28
Ireland	200.38	217.23	223.46	234.33	245.48	224.18	100.00
Italy	175.00	170.74	181.07	211.45	228.36	193.32	86.24
Netherlands	345.00	358.96	353.97	362.41	362.19	356.50	159.03
UK	244.67	258.31	255.12	279.41	284.47	264.40	117.94

Appendix IV – Costs as a Percentage of Total Output for Specialist Dairy Producers in the EU

Costs as a Percentage of Output (Average 1996 – 2000) – Average of the FADN Specialist Dairy Sample								
	Belgium	**Denmark**	**France**	**Germany**	**Ireland**	**Italy**	**Netherlands**	**UK**
Total Inputs								
Intermediate Consumption								
Specific Costs								
Seeds and Plants	1.2	1.3	1.9	0.8	0.3	0.9	0.8	0.6
Fertilizers	3.6	1.7	4.8	2.8	6.1	1.1	2.8	4.1
Crop Protection	0.7	0.7	1.0	0.6	0.1	0.4	0.4	0.3
Feedstuffs for grazing livestock - non-fodder crops	2.0	2.4	3.4	3.7	3.8	6.5	1.1	1.7
Feedstuffs for grazing livestock – purchased	13.6	21.5	13.2	14.0	12.0	26.7	15.7	18.2
Other livestock specific costs	4.5	5.8	4.9	7.2	7.3	3.3	4.5	9.2
Farming Overheads								
Machinery and Building current costs	5.0	8.0	5.6	8.2	7.5	2.1	6.1	5.9
Energy	2.7	2.2	3.9	5.2	2.5	2.9	2.4	3.2
Contract Work	4.1	6.2	7.3	3.6	5.5	0.9	5.1	3.8
Other direct inputs	2.0	2.8	8.8	6.9	2.8	2.3	6.6	5.1
Depreciation	16.1	10.8	14.3	16.3	6.9	9.5	16.8	11.1
External Factors								
Wages Paid	0.2	6.0	0.8	2.8	3.1	1.8	1.2	7.3
Rent Paid	4.3	2.7	5.0	5.9	4.4	1.7	4.8	5.3
Interest paid (less subsidies)	5.8	17.2	3.1	3.4	3.5	0.6	9.6	4.9
IMPUTED COSTS								
Fixed Assets								
Buildings	3.7	11.6	2.6	4.7	3.7	7.3	5.4	0.8
Machinery	2.3	2.9	2.5	3.6	1.7	3.7	2.6	2.6
Breeding Livestock	2.8	1.5	2.8	2.4	2.9	2.8	1.4	2.8
Working Capital								
Non breeding livestock	1.0	0.9	1.0	1.3	1.3	0.8	0.7	1.0
Agri. Product Stocks	0.0	0.3	0.1	0.0	0.3	0.6	0.0	0.0
Other Circulating capital	0.2	1.9	2.6	1.7	2.0	0.9	2.1	0.8
Family Labour	25.4	14.0	26.5	26.7	20.5	27.0	22.3	0.3
Owned Land	1.5	8.8	1.5	5.2	24.1	1.4	9.3	1.2
Total Economic Costs (incl imputed land cost)	97.2	114.1	114.4	123.6	118.7	104.6	111.9	108.5
Total Economic Costs (excl. imputed land cost)	95.7	105.3	112.9	118.4	94.6	103.2	102.6	107.3
Total Cash Costs	66.0	89.3	77.9	81.3	65.8	60.7	77.8	80.9

Costs as a Percentage of Output (Average 1996 – 2000) – Average of Specialist Dairy farms with 50-99 Dairy Cows								
	Belgium	**Denmark**	**France**	**Germany**	**Ireland**	**Italy**	**Netherlands**	**UK**
Total Inputs								
Intermediate Consumption								
Specific Costs								
Seeds and Plants	1.3	1.3	1.9	0.9	0.3	1.0	0.8	0.8
Fertilizers	3.4	1.8	4.6	2.8	6.3	1.1	2.7	2.7
Crop Protection	0.7	0.7	1.0	0.7	0.1	0.5	0.5	0.5
Feedstuffs for grazing livestock - non-fodder crops	2.1	2.5	3.3	2.5	4.1	4.1	1.1	1.1
Feedstuffs for grazing livestock - purchased	13.8	21.1	13.1	14.8	12.2	27.6	15.5	15.5
Other livestock specific costs	4.5	6.0	4.9	7.5	7.3	3.3	4.5	4.5
Farming Overheads					0.0	0.0	0.0	
Machinery and Building current costs	4.6	8.0	5.3	7.3	6.9	1.7	5.9	5.9
Energy	2.6	2.2	3.7	4.7	2.5	2.7	2.4	2.4
Contract Work	4.1	6.2	7.2	4.1	5.4	0.9	5.1	5.1
Other direct inputs	1.6	2.8	8.2	6.0	2.7	2.2	6.0	6.0
Depreciation	16.7	11.1	14.8	14.3	6.6	8.2	17.3	17.3
External Factors	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wages Paid	0.3	5.8	1.3	2.8	3.6	2.3	1.0	1.0
Rent Paid	4.3	2.6	5.8	8.1	4.7	1.8	4.8	4.8
Interest paid (less subsidies)	6.4	18.4	3.3	3.7	3.9	0.6	9.5	9.5
IMPUTED COSTS					0.0	0.0	0.0	
Fixed Assets					0.0	0.0	0.0	
Buildings	4.2	11.5	2.9	4.0	3.3	5.0	5.2	5.2
Machinery	2.4	3.0	2.5	3.1	1.7	3.1	2.7	2.7
Breeding Livestock	2.8	1.6	2.7	2.3	2.8	2.7	1.4	2.8
Working Capital	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non breeding livestock	1.1	0.9	1.0	1.2	1.3	0.7	0.7	1.1
Agri. Product Stocks	0.0	0.4	0.1	0.0	0.3	0.6	0.0	0.0
Other Circulating capital	0.2	1.8	2.4	1.6	2.0	0.9	2.0	0.7
Family Labour	27.0	12.5	18.0	14.6	12.6	15.2	17.8	0.0
Owned Land	1.4	8.8	0.6	4.5	22.2	1.4	7.9	2.0
Total Economic Costs (incl. imputed land cost)	99.2	112.5	105.1	107.9	108.9	87.0	105.3	105.3
Total Economic Costs (excl. imputed land cost)	97.8	103.7	104.5	103.4	86.7	85.6	97.4	103.3
Total Cash Costs	66.5	90.5	78.2	80.2	66.5	58.0	77.0	77.0

Appendix V – Costs per kg milksolids for Specialist Dairy Producers in the EU

Costs (€) per kg milksolids (Average 1996 – 2000) – Average Specialist Dairy Farms from FADN sample								
	Belgium	**Denmark**	**France**	**Germany**	**Ireland**	**Italy**	**Netherlands**	**UK**
Total Inputs								
Intermediate Consumption								
Specific Costs								
Seeds and Plants	0.04	0.05	0.07	0.03	0.01	0.04	0.03	0.02
Fertilizers	0.13	0.06	0.18	0.09	0.22	0.05	0.10	0.14
Crop Protection	0.03	0.03	0.04	0.02	0.00	0.02	0.02	0.01
Feedstuffs for grazing livestock - non-fodder crops	0.07	0.09	0.13	0.13	0.13	0.32	0.04	0.06
Feedstuffs for grazing livestock - purchased	0.50	0.78	0.49	0.48	0.42	1.32	0.55	0.60
Other livestock specific costs	0.17	0.21	0.19	0.25	0.26	0.16	0.16	0.30
Farming Overheads								
Machinery and Building current costs	0.18	0.29	0.21	0.28	0.26	0.10	0.21	0.20
Energy	0.10	0.08	0.15	0.18	0.09	0.14	0.09	0.11
Contract Work	0.15	0.22	0.27	0.12	0.19	0.04	0.18	0.13
Other direct inputs	0.07	0.10	0.33	0.24	0.10	0.11	0.23	0.17
Depreciation	0.59	0.39	0.54	0.56	0.24	0.47	0.59	0.37
External Factors								
Wages Paid	0.01	0.22	0.03	0.10	0.11	0.09	0.04	0.24
Rent Paid	0.16	0.10	0.19	0.20	0.16	0.08	0.17	0.18
Interest paid (less subsidies)	0.21	0.62	0.12	0.12	0.12	0.03	0.33	0.16
IMPUTED COSTS								
Fixed Assets								
Buildings	0.14	0.42	0.10	0.16	0.13	0.36	0.19	0.03
Machinery	0.08	0.10	0.09	0.12	0.06	0.18	0.09	0.09
Breeding Livestock	0.10	0.06	0.11	0.08	0.10	0.14	0.05	0.08
Working Capital	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Non breeding livestock	0.04	0.03	0.04	0.04	0.04	0.04	0.02	0.03
Agri. Product Stocks	0.00	0.01	0.00	0.00	0.01	0.03	0.00	0.01
Other Circulating capital	0.01	0.07	0.10	0.06	0.07	0.05	0.07	0.04
Family Labour	0.93	0.51	0.99	0.92	0.72	1.34	0.78	0.42
Owned Land	0.05	0.32	0.06	0.18	0.85	0.07	0.32	0.39
Total Economic Costs (incl. imputed land cost)	3.54	4.12	4.30	4.25	4.18	5.17	3.90	3.60
Total Economic Cost (excl. imputed land cost)	3.49	3.8	4.24	4.07	3.33	5.1	3.58	3.21
Total Cash Costs	2.41	3.22	2.92	2.80	2.32	2.99	2.71	2.68

Costs (€) per kg milksolids (Average 1996 – 2000) – Average Specialist Dairy Farms with 50-99 Dairy Cows								
	Belgium	**Denmark**	**France**	**Germany**	**Ireland**	**Italy**	**Netherlands**	**UK**
Total Inputs								
Intermediate Consumption								
Specific Costs								
Seeds and Plants	0.05	0.05	0.07	0.03	0.01	0.05	0.03	0.02
Fertilizers	0.13	0.06	0.17	0.10	0.22	0.05	0.09	0.14
Crop Protection	0.03	0.03	0.04	0.02	0.00	0.02	0.02	0.01
Feedstuffs for grazing livestock - non-fodder crops	0.08	0.09	0.12	0.08	0.14	0.20	0.04	0.06
Feedstuffs for grazing livestock - purchased	0.51	0.76	0.50	0.50	0.43	1.33	0.54	0.61
Other livestock specific costs	0.16	0.22	0.19	0.26	0.25	0.16	0.16	0.32
Farming Overheads								
Machinery and Building current costs	0.17	0.29	0.20	0.25	0.24	0.08	0.20	0.19
Energy	0.09	0.08	0.14	0.16	0.09	0.13	0.08	0.11
Contract Work	0.15	0.22	0.28	0.14	0.19	0.04	0.18	0.13
Other direct inputs	0.06	0.10	0.31	0.20	0.09	0.10	0.21	0.18
Depreciation	0.61	0.40	0.56	0.49	0.23	0.39	0.60	0.37
External Factors								
Wages Paid	0.01	0.21	0.05	0.09	0.13	0.11	0.03	0.17
Rent Paid	0.16	0.09	0.22	0.27	0.17	0.09	0.17	0.18
Interest paid (less subsidies)	0.24	0.67	0.12	0.12	0.14	0.03	0.33	0.16
IMPUTED COSTS								
Fixed Assets								
Buildings	0.15	0.41	0.11	0.14	0.12	0.24	0.18	0.02
Machinery	0.09	0.11	0.09	0.10	0.06	0.15	0.10	0.09
Breeding Livestock	0.10	0.06	0.10	0.08	0.10	0.13	0.05	0.08
Working Capital	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Non breeding livestock	0.04	0.03	0.04	0.04	0.05	0.04	0.02	0.03
Agri. Product Stocks	0.00	0.01	0.00	0.00	0.01	0.03	0.00	0.01
Other Circulating capital	0.01	0.07	0.09	0.05	0.07	0.04	0.07	0.04
Family Labour	0.99	0.45	0.68	0.50	0.44	0.73	0.62	0.46
Owned Land	0.05	0.32	0.02	0.15	0.78	0.07	0.28	0.39
Total Economic Costs (incl. imputed land cost)	3.65	4.07	4.01	3.66	3.81	4.18	3.69	3.60
Total Economic Costs (excl. imputed land cost)	3.6	3.75	3.99	3.51	3.03	4.11	3.41	3.21
Total Cash Costs	2.45	3.27	2.98	2.72	2.32	2.78	2.69	2.63

Appendix VI – Partial Productivity Indicators for EU Countries (1996-2000)

Average of Livestock System – 'Mainly Beef Rearing' (Farm Type 411)							
	1996	1997	1998	1999	2000	Average	Index Relative to Ireland
Land Productivity - Stocking Rate (LU/Forage Hectare)							
IRELAND	0.95	0.99	1.14	1.12	1.06	1.05	100.00
FRANCE	1.10	1.09	1.10	1.09	1.11	1.10	104.14
GERMANY	1.18	1.30	1.21	N?A	1.16	1.21	114.98
UK	1.16	1.19	1.30	1.34	1.35	1.27	120.23
Land Productivity - (Output € per Forage Hectare)							
IRELAND	526.84	582.69	611.97	652.30	785.41	631.84	100.00
FRANCE	761.08	772.21	796.06	811.57	863.87	800.96	126.76
GERMANY	651.74	741.20	705.60	N/A	723.88	705.61	111.67
UK	654.37	677.65	668.34	827.78	894.72	744.57	117.84
Labour Productivity - Output € per AWU							
IRELAND	16110.78	18715.00	16644.55	18772.82	22055.77	18459.78	100.00
FRANCE	49705.04	49197.08	52010.37	53355.97	56590.30	52171.75	282.62
GERMANY	37003.95	42036.73	35605.84	N/A	48127.22	40693.44	220.44
UK	40228.89	46776.87	40568.94	42612.69	44426.67	42922.81	232.52

Average of Livestock System – 'Mainly Beef Fattening' (Farm Type 412)							
	1996	1997	1998	1999	2000	Average	Index Relative to Ireland
Land Productivity - Stocking Rate (LU/Forage Hectare)							
IRELAND	1.26	1.26	1.31	1.27	1.20	1.26	100.00
FRANCE	1.25	1.65	1.43	N/A	1.58	1.48	117.38
GERMANY	2.51	2.56	2.26	2.23	2.00	2.31	183.59
UK	1.54	1.49	1.61	1.57	1.50	1.54	122.63
Land Productivity - (Output € per Forage Hectare)							
IRELAND	584.09	655.78	607.51	642.17	708.56	639.62	100.00
FRANCE	987.78	1064.88	1119.26	N/A	1264.62	1109.14	173.41
GERMANY	2410.47	2416.75	1933.12	2037.34	2023.67	2164.27	338.37
UK	819.88	775.65	827.11	1129.00	1109.48	932.22	145.75
Labour Productivity - Output € per AWU							
IRELAND	18719.27	20534.29	18289.52	20794.39	24362.39	20539.97	100.00
FRANCE	58024.59	50963.20	54321.60	N/A	55205.26	54628.66	265.96
GERMANY	74082.14	74790.86	68777.62	69889.29	70862.32	71680.45	348.98
UK	42371.14	41620.00	41895.35	38309.24	40174.04	40873.95	199.00

Appendix VII - Costs as a Percentage of Total Output for Specialist Beef Farms in the EU

Costs as a % of Output – '*mainly beef rearing farms*'				
	Ireland	**UK**	**France**	**Germany**
Total Inputs				
Intermediate Consumption				
Specific Costs				
Seeds and Plants	0.2	0.5	1.4	0.7
Fertilizers	7.5	7.7	6.3	3.4
Crop Protection	0.1	0.1	0.5	0.4
Feedstuffs for grazing livestock - non-fodder crops	0.1	0.8	3.3	2.7
Feedstuffs for grazing livestock – purchased	8.1	15.5	9.7	6.1
Other livestock specific costs	6.6	9.5	5.9	5.7
Farming Overheads				
Machinery and Building current costs	11.1	9.0	6.2	10.5
Energy	2.6	4.5	3.5	6.0
Contract Work	7.2	4.5	4.1	5.2
Other direct inputs	3.8	8.4	8.8	10.6
Depreciation	8.5	19.2	14.2	17.7
External Factors				
Wages Paid	1.0	4.6	1.2	3.0
Rent Paid	3.4	4.3	6.4	6.2
Interest paid (less subsidies)	2.4	4.5	3.2	5.0
IMPUTED COSTS				
Fixed Assets				
Buildings	3.6	0.5	2.1	4.2
Machinery	1.8	3.0	2.4	3.0
Breeding Livestock	4.5	5.0	6.6	5.0
Working Capital				
Non breeding livestock	3.7	3.4	3.8	4.1
Agri. Product Stocks	0.4	0.4	0.2	0.1
Other Circulating capital	1.1	1.7	2.9	1.2
Family Labour	45.4	33.5	26.6	33.2
Owned Land	19.6	13.3	3.1	6.3
Total Economic Costs (incl owned land)	140.3	149.6	119.1	129.2
Total Economic Costs (excl. owned land)	120.7	136.3	116	122.9
Total Cash Costs	62.7	93.2	74.7	83.2

Costs as a % of Output – '*mainly beef fattening farms'*				
	Ireland	**UK**	**France**	**Germany**
Total Inputs				
Intermediate Consumption				
Specific Costs				
Seeds and Plants	0.3	0.5	2.4	2.5
Fertilizers	8.9	8.0	6.8	3.1
Crop Protection	0.1	0.2	1.5	1.8
Feedstuffs for grazing livestock - non-fodder crops	0.4	0.7	3.3	4.2
Feedstuffs for grazing livestock – purchased	12.1	19.8	16.7	30.1
Other livestock specific costs	7.6	9.5	5.8	4.7
Farming Overheads				
Machinery and Building current costs	11.3	8.5	5.5	7.4
Energy	2.7	4.3	5.8	4.9
Contract Work	7.2	4.8	5.4	5.5
Other direct inputs	4.1	8.7	9.6	6.4
Depreciation	8.5	14.8	15.2	15.8
External Factors				
Wages Paid	1.8	3.1	2.0	1.7
Rent Paid	3.4	4.1	5.9	5.6
Interest paid (less subsidies)	2.7	3.5	4.5	4.4
IMPUTED COSTS				
Fixed Assets				
Buildings	3.2	0.4	2.8	4.0
Machinery	1.9	2.7	2.2	2.3
Breeding Livestock	2.4	2.0	2.9	0.3
Working Capital				
Non breeding livestock	7.0	6.3	6.9	6.3
Agri. Product Stocks	0.4	0.6	0.1	0.0
Other Circulating capital	1.3	1.8	2.9	1.5
Family Labour	45.7	34.4	26.4	20.1
Owned Land	28.6	17.9	2.4	6.7
Total Economic Costs (incl. imputed owned land)	158.9	153.0	132.7	135.0
Total Economic Costs (excl. imputed owned land)	130.3	135.1	130.3	128.3
Total Cash Costs	71.1	90.4	90.5	98.1

Appendix VIII - Costs per Forage Hectare for Specialist Beef Farms in the EU

Costs (€) per Forage Hectare– '*mainly beef rearing farms'*				
	Ireland	**UK**	**France**	**Germany**
Total Inputs				
Intermediate Consumption				
Specific Costs				
Seeds and Plants	1.5	3.9	11.3	4.9
Fertilizers	46.7	57.3	50.7	24.2
Crop Protection	0.7	1.0	4.2	3.1
Feedstuffs for grazing livestock - non-fodder crops	0.6	5.6	26.3	19.2
Feedstuffs for grazing livestock – purchased	50.6	115.4	77.8	42.9
Other livestock specific costs	41.6	70.7	47.0	40.7
Farming Overheads				
Machinery and Building current costs	70.1	67.1	50.0	74.2
Energy	16.4	33.8	28.0	42.6
Contract Work	45.8	34.3	33.1	37.0
Other direct inputs	23.8	62.9	70.6	74.8
Depreciation	54.7	144.3	114.3	124.7
External Factors				
Wages Paid	6.8	34.6	10.0	21.5
Rent Paid	22.0	32.6	51.5	44.3
Interest paid (less subsidies)	15.5	34.0	25.6	35.0
IMPUTED COSTS				
Fixed Assets				
Buildings	22.3	3.8	16.7	29.5
Machinery	11.1	22.2	19.1	20.9
Breeding Livestock	27.0	36.6	52.9	35.0
Working Capital				
Non breeding livestock	23.1	24.9	30.5	28.8
Agri. Product Stocks	2.5	3.1	1.3	0.4
Other Circulating capital	7.2	12.3	23.2	8.4
Family Labour	290.7	254.3	214.1	236.0
Owned Land	124.2	100.4	24.6	44.5
Total Economic Costs (incl. imputed owned land)	889.4	1121.1	957.3	914.5
Total Economic Costs (excl. imputed owned land)	765.2	1020.7	932.7	870
Total Cash Costs	396.8	697.7	600.5	588.9

Costs (€) per Forage Hectare– '*mainly beef fattening farms'*				
	Ireland	**UK**	**France**	**Germany**
Total Inputs				
Intermediate Consumption				
Specific Costs				
Seeds and Plants	2.1	4.0	27.2	56.8
Fertilizers	56.5	74.5	75.3	70.2
Crop Protection	0.5	1.6	17.1	41.5
Feedstuffs for grazing livestock - non-fodder crops	2.6	6.2	37.7	94.0
Feedstuffs for grazing livestock - purchased	77.4	187.8	186.6	671.9
Other livestock specific costs	48.5	86.9	65.1	106.7
Farming Overheads				
Machinery and Building current costs	72.1	80.1	62.6	166.0
Energy	17.4	40.7	66.8	109.0
Contract Work	46.6	47.3	60.5	123.2
Other direct inputs	26.1	81.5	109.7	142.5
Depreciation	54.5	140.0	171.9	353.3
External Factors				
Wages Paid	11.2	28.2	23.5	39.9
Rent Paid	21.7	36.1	66.7	124.2
Interest paid (less subsidies)	17.3	32.9	51.1	96.3
IMPUTED COSTS				
Fixed Assets				
Buildings	20.7	3.9	31.8	89.5
Machinery	11.9	23.9	25.2	52.6
Breeding Livestock	15.1	16.4	32.4	6.2
Working Capital				
Non breeding livestock	44.2	57.7	77.8	143.4
Agri. Product Stocks	2.6	5.3	1.4	0.4
Other Circulating capital	8.3	16.2	32.7	33.3
Family Labour	293.3	325.6	298.5	451.4
Owned Land	182.2	167.2	26.9	149.1
Total Economic Costs (incl. imputed owned land)	1015.5	1430.9	1497.3	3025.1
Total Economic Costs (excl. imputed owned land)	833.3	1263.7	1470.4	2876
Total Cash Costs	454.5	847.8	1021.8	2195.5

Appendix IX - Costs per LU for
Specialist Beef Farms in the EU

Costs (€) per Suckler Cow– '*mainly beef rearing farms*'				
	Ireland	**UK**	**France**	**Germany**
Total Inputs				
Intermediate Consumption				
Specific Costs				
Seeds and Plants	2.1	4.7	15.8	6.1
Fertilizers	65.3	70.0	70.8	30.1
Crop Protection	0.9	1.2	5.9	3.8
Feedstuffs for grazing livestock – non-fodder crops	0.8	6.9	36.8	24.0
Feedstuffs for grazing livestock - purchased	70.3	140.4	108.7	54.4
Other livestock specific costs	57.8	85.9	65.6	52.1
Farming Overheads				
Machinery and Building current costs	97.1	81.5	69.8	94.4
Energy	22.7	40.9	39.1	54.1
Contract Work	63.2	41.4	46.2	47.3
Other direct inputs	32.9	76.3	98.7	94.9
Depreciation	76.0	174.9	159.7	157.6
External Factors				
Wages Paid	9.3	42.0	14.0	28.7
Rent Paid	30.2	39.4	71.9	56.4
Interest paid (less subsidies)	21.3	41.1	35.8	44.8
IMPUTED COSTS				
Fixed Assets				
Buildings	31.3	4.5	23.3	37.2
Machinery	15.6	27.1	26.7	26.4
Breeding Livestock	38.6	45.1	73.8	44.1
Working Capital				
Non breeding livestock	32.2	30.5	42.6	36.5
Agri. Product Stocks	3.6	3.8	1.8	0.5
Other Circulating capital	10.1	15.1	32.5	10.7
Family Labour	399.9	307.3	299.0	296.6
Owned Land	171.6	121.6	34.3	55.3
Total Economic Costs (incl. imputed owned land)	889.4	1360.7	1337.0	1156.9
Total Economic Costs (excl. imputed owned land)	717.8	1239.1	1302.7	1101.6
Total Cash Costs	396.8	846.8	838.7	748.7

Costs (€) per fattening LU– '*mainly beef fattening farms'*				
	Ireland	**UK**	**France**	**Germany**
Total Inputs				
Intermediate Consumption				
Specific Costs				
Seeds and Plants	1.7	2.6	9.9	23.0
Fertilizers	45.0	48.4	28.3	28.5
Crop Protection	0.4	1.1	6.4	16.8
Feedstuffs for grazing livestock – non-fodder crops	2.1	4.0	12.9	38.0
Feedstuffs for grazing livestock - purchased	61.6	121.7	68.3	274.7
Other livestock specific costs	38.5	56.2	23.2	43.2
Farming Overheads				
Machinery and Building current costs	57.4	52.0	22.0	66.9
Energy	13.8	26.5	23.1	44.4
Contract Work	37.1	30.8	21.9	50.3
Other direct inputs	20.7	52.9	37.2	58.1
Depreciation	43.5	91.1	60.2	143.8
External Factors				
Wages Paid	9.0	18.3	7.9	15.7
Rent Paid	17.3	23.4	23.3	50.6
Interest paid (less subsidies)	13.7	21.4	17.9	39.4
IMPUTED COSTS				
Fixed Assets				
Buildings	16.5	2.5	10.9	36.5
Machinery	9.5	15.6	8.6	21.1
Breeding Livestock	12.0	10.7	11.8	2.6
Working Capital				
Non breeding livestock	35.2	37.5	27.6	57.9
Agri. Product Stocks	2.1	3.4	0.5	0.2
Other Circulating capital	6.6	10.4	11.3	13.6
Family Labour	233.6	211.4	104.3	182.4
Owned Land	144.9	108.1	9.9	60.7
Total Economic Costs (incl. imputed owned land)	1015.5	928.3	529.6	1228.9
Total Economic Costs (excl. imputed owned land)	870.6	820.2	519.7	1168.2
Total Cash Costs	454.5	550.2	362.6	893.3

Appendix X – Market Based Indicator of Cost Competitiveness for specialist beef farms (1996-2000)

'Mainly Beef Rearing farms'					
	1996	1997	1998	1999	2000
Cash Costs as a % of Market Based Output					
Ireland	105	101	128	121	111
UK	148	155	194	177	163
France	112	105	102	102	112
Germany	142	106	128	N/A	143
Ireland as a % of average	83	87	93	121	84
Economic costs (excl. imputed owned land charges) as a % of Market Based Output					
Ireland	200	191	241	238	218
UK	221	225	279	254	245
France	178	164	160	152	173
Germany	206	171	200	N/A	189
Ireland as a % of average	99	102	109	148	106
Economic costs (incl. imputed owned land charges) as a % of Market Based Output					
Ireland	232	220	283	278	253
UK	240	247	307	279	270
France	183	168	164	156	177
Germany	222	182	211	N/A	192
Ireland as a % of average	106	108	117	156	113

'Mainly Beef Fattening farms'					
	1996	1997	1998	1999	2000
Cash Costs as a % of Market Based Output					
Ireland	116	102	130	122	122
UK	131	144	152	135	134
France	118	112	108	N/A	133
Germany	99	105	113	124	125
Ireland as a % of average	100	88	104	96	95
Economic costs (excl. imputed owned land charges) as a % of Market Based Output					
Ireland	261	234	282	275	269
UK	222	244	267	223	222
France	163	177	159	N/A	190
Germany	146	149	160	178	169
Ireland as a % of average	132	117	130	122	127
Economic costs (incl. imputed owned land charges) as a % of Market Based Output					
Ireland	211	194	228	227	224
UK	198	221	226	198	196
France	160	174	156	N/A	188
Germany	137	138	148	160	156
Ireland as a % of average	120	107	120	116	117

Appendix XI – Partial Productivity Indicators for Selected EU Cereal farms (1996-2000)

	1996	1997	1998	1999	2000	Average	Index Relative to Ireland
Wheat Yield (100kg/ha)							
Denmark	69.5	69.3	71	69.3	75.1	70.84	84.21
Germany	69.9	70.1	68.7	73.9	68.8	70.28	83.55
France	69.3	67.3	78.7	74.2	74.1	72.72	86.45
Ireland	84.5	80.7	77.1	83.6	94.7	84.12	100.00
Italy	49.8	47.6	53.2	51.4	52.2	50.84	60.44
UK	82.5	75.5	77.7	85.3	82.3	80.66	95.89
Land Productivity - (Output € per Cereal Hectare)							
Denmark	1077.64	1003.43	935.85	929.37	990.07	987.27	86.37
Germany	1115.69	1077.63	1008.72	1098.60	1056.16	1071.36	93.72
France	1279.72	1191.52	1185.45	1175.08	1143.82	1195.12	104.55
Ireland	1266.21	1049.87	1017.90	1148.72	1232.78	1143.10	100.00
Italy	1168.66	1121.95	1078.62	1126.40	1115.71	1122.27	98.18
UK	1312.79	1151.44	1103.73	1205.92	1160.53	1186.88	103.83
Labour Productivity - Output € per AWU							
Denmark	78588	84122	78481	88734	104041	86793	103.94
Germany	75649	78951	76170	90645	89126	82108	98.33
France	90230	90516	89890	88326	89961	89785	107.53
Ireland	66878	71773	72135	130609	76106	83500	100.00
Italy	21629	22494	20585	23935	25901	22909	27.44
UK	102827	98985	93069	105764	104771	101083	121.06

Appendix XII - Costs as a % of Output for Selected EU Cereal Farms

	Ireland	Italy	UK	Germany	Denmark	France
Total Inputs						
Intermediate Consumption						
Specific Costs						
Seeds and Plants	4.8	5.5	4.3	3.5	3.7	5.3
Fertilizers	9.9	6.6	7.8	6.7	6.8	9.6
Crop Protection	10.4	3.0	9.0	6.8	4.3	9.3
Other Crop Specific	1.2	0.7	1.8	0.7	1.1	0.2
Farming Overheads	0.0	0.0	0.0	0.0	0.0	0.0
Machinery and Building current costs	6.1	3.4	7.8	7.4	12.3	5.3
Energy	2.6	5.4	3.8	5.3	2.6	3.5
Contract Work	10.3	4.8	4.1	3.5	4.6	3.9
Other direct inputs	2.5	3.4	6.6	7.5	5.3	7.0
Depreciation	5.4	19.5	14.2	14.7	13.5	15.2
External Factors	0.0	0.0	0.0	0.0	0.0	0.0
Wages Paid	2.6	1.9	8.8	6.5	4.6	2.4
Rent Paid	12.3	3.5	5.6	8.7	4.8	7.3
Interest paid (less subsidies)	2.9	0.6	3.9	2.3	20.7	3.3
IMPUTED COSTS	0.0	0.0	0.0	0.0	0.0	0.0
Fixed Assets	0.0	0.0	0.0	0.0	0.0	0.0
Buildings	0.7	6.2	0.5	2.0	16.1	0.7
Machinery	1.9	6.2	3.5	2.7	3.1	2.6
Working Capital	0.0	0.0	0.0	0.0	0.0	0.0
Agri. Product Stocks	0.1	0.6	1.0	0.1	0.9	0.9
Other Circulating capital	1.8	8.4	2.8	1.9	2.5	2.4
Family Labour	15.3	72.8	12.9	17.6	26.0	18.9
Owned Land	21.6	9.2	12.2	3.6	21.4	1.7
Total Economic Cost (incl. imputed owned land cost)	109.5	161.0	106.5	99.0	133.5	96.2
Total Economic Cost (excl. imputed owned land cost)	87.9	151.8	94.3	95.4	112.1	94.5
Total Cash Costs	71.0	58.2	77.6	73.6	84.2	72.4

Appendix XIII – Costs (€) per 100kg of Product Volume for Selected EU Cereals Farms

	Ireland	Italy	UK	Germany	Denmark	France
Total Revenue	**13.59**	**22.12**	**14.72**	**10.96**	**13.95**	**16.50**
Total Inputs						
Specific Costs						
Seeds and Plants	0.65	1.21	0.63	0.55	0.54	0.87
Fertilizers	1.35	1.46	1.15	1.05	0.99	1.60
Crop Protection	1.41	0.66	1.32	1.07	0.63	1.53
Other Crop Specific	0.17	0.15	0.27	0.11	0.16	0.04
Farming Overheads						
Machinery and Building current costs	0.83	0.76	1.14	1.16	1.80	0.88
Energy	0.36	1.19	0.55	0.82	0.37	0.58
Contract Work	1.39	1.06	0.61	0.55	0.67	0.64
Other direct inputs	0.34	0.75	0.96	1.17	0.78	1.15
Depreciation	0.73	4.30	2.08	2.30	1.96	2.52
External Factors						
Wages Paid	0.35	0.42	1.28	1.02	0.67	0.39
Rent Paid	1.66	0.77	0.81	1.36	0.71	1.21
Interest paid (less subsidies)	0.39	0.13	0.57	0.36	3.02	0.55
IMPUTED COSTS						
Fixed Assets						
Buildings	0.10	1.39	0.08	0.31	2.36	0.12
Machinery	0.26	1.38	0.52	0.43	0.46	0.43
Working Capital						
Agri. Product Stocks	0.01	0.13	0.14	0.01	0.13	0.16
Other Circulating capital	0.24	1.83	0.41	0.29	0.36	0.39
Family Labour	2.07	16.03	1.89	2.76	3.80	3.12
Owned Land	2.96	2.02	1.78	0.56	3.12	0.29
Total Economic Cost (incl. imputed owned land cost)	14.87	31.34	15.63	15.52	19.52	15.90
Total Economic Cost (excl. imputed owned land cost)	11.91	29.32	13.85	14.96	16.4	15.61
Total Cash Costs	9.62	12.86	11.38	11.53	12.31	11.95

Appendix XIV – Costs, Revenue and Margin (€) per Hectare for Selected EU Cereal Farms

	Ireland	Italy	UK	Germany	Denmark	France
Total Revenue	1143	1122	1187	1078	987	1195
Specific Costs						
Seeds and Plants	55	62	51	37	38	63
Fertilizers	113	74	92	72	70	115
Crop Protection	118	33	107	73	45	111
Other Crop Specific	14	8	22	8	11	3
Farming Overheads						
Machinery and Building current costs	69	39	92	80	127	63
Energy	31	61	45	56	26	42
Contract Work	116	54	49	37	47	46
Other direct inputs	28	38	78	80	55	84
Depreciation	62	218	167	158	139	182
External Factors						
Wages Paid	30	21	103	70	47	28
Rent Paid	139	39	66	93	50	88
Interest paid (less subsidies)	33	6	46	25	214	40
IMPUTED COSTS						
Fixed Assets						
Buildings	8	70	6	21	167	9
Machinery	22	70	41	30	32	31
Working Capital						
Agri. Product Stocks	1	6	11	1	10	11
Other Circulating capital	20	95	33	20	26	28
Family Labour	175	815	153	192	269	226
Owned Land	248	103	143	39	221	21
Total Economic Cost (incl. imputed owned land cost)	1249	1806	1259	1068	1380	1153
Total Economic Cost (excl. imputed owned land cost)	1001	1703	1116	1029	1159	1132
Total Cash Costs	808	653	917	789	870	866
Margin over Economic Costs (incl. land cost)	-106	-684	-72	10	-393	42
Margin over Economic Costs (excl. land cost)	142	-581	71	49	-172	63
Margin over Cash Costs	335	469	270	288	117	329

XV – Partial Productivity Indicators for Selected EU Sheep Producers (1996-2000)

	1996	1997	1998	1999	2000	Average	Index Relative to Ireland
Stocking Rate (LU/HA)							
Ireland	0.54	0.59	0.75	0.71	0.62	0.64	100.00
France	0.81	0.81	0.93	0.72	0.75	0.81	125.20
UK	0.42	0.45	0.47	0.46	0.45	0.45	69.99
Land Productivity – Output per forage hectare							
Ireland	299	295	370	395	366	345	100
France	779	800	956	788	933	851	247
UK	209	238	206	203	212	214	62
Labour Productivity - output € per AWU							
Ireland	18343	20811	21221	20053	21200	20326	100
France	45702	46738	47426	47033	51257	47631	234
UK	53728	56372	48941	47423	49837	51260	252

XVI – Costs as a Percentage of Output for Selected EU Sheep Producers

(Average1996-2000)

	Costs as a % of Output (Production Output plus Allocated Subsidies)		
	Ireland	**UK**	**France**
Total Inputs			
Specific Costs			
Seeds and Plants	0.23	0.35	1.40
Fertilizers	5.84	5.05	4.56
Crop Protection	0.06	0.18	0.21
Feedstuffs for grazing livestock- non-fodder	0.09	0.16	4.91
Feedstuffs for grazing livestock - purchased	12.76	20.63	16.53
Other livestock specific costs	8.23	11.51	4.19
Farming Overheads	0.00	0.00	0.00
Machinery and Building current costs	11.17	7.32	5.86
Energy	2.81	4.51	3.24
Contract Work	4.25	2.65	4.61
Other direct inputs	4.72	7.21	8.05
Depreciation	7.37	12.81	17.43
External Factors	0.00	0.00	0.00
Wages Paid	2.21	6.49	1.50
Rent Paid	1.81	5.49	4.38
Interest paid (less subsidies)	2.60	5.26	2.87
IMPUTED COSTS	0.00	0.00	0.00
Fixed Assets	0.00	0.00	0.00
Buildings	2.29	0.41	2.95
Machinery	1.53	2.65	2.88
Breeding Livestock	3.46	3.84	3.14
Working Capital	0.00	0.00	0.00
Livestock	2.01	1.95	0.65
Agri. Product Stocks	0.20	0.21	0.24
Other Circulating capital	1.33	2.00	2.47
Family Labour	39.14	13.87	16.83
Owned Land	16.94	15.59	1.76
Total Economic Cost (incl. imputed owned land cost)	128.47	124.87	107.77
Total Economic Cost (excl. imputed owned land cost)	111.53	109.28	106.01
Total Cash Costs	64.16	89.60	79.72

XVII – Costs, Revenue & Margin (€) per 100kg of Product Volume for Selected EU Sheep Producers (Average1996-2000)

	Costs, Revenue & Margin per 100kg of Product Volume		
	Ireland	***UK***	***France***
Total Inputs			
Specific Costs			
Seeds and Plants	0.70	1.08	5.49
Fertilizers	17.13	15.77	17.91
Crop Protection	0.17	0.54	0.80
Feedstuffs for grazing livestock- non-fodder	0.27	0.48	19.25
Feedstuffs for grazing livestock – purchased	37.43	63.88	64.98
Other livestock specific costs	24.08	35.49	16.49
Farming Overheads			
Machinery and Building current costs	32.83	22.64	23.14
Energy	8.23	13.89	12.78
Contract Work	12.36	8.15	18.19
Other direct inputs	13.72	22.18	31.63
Depreciation	21.79	39.43	68.67
External Factors			
Wages Paid	6.29	20.09	5.94
Rent Paid	5.46	16.92	17.23
Interest paid (less subsidies)	7.66	16.23	11.28
IMPUTED COSTS			
Fixed Assets			
Buildings	6.81	1.27	11.65
Machinery	4.61	8.29	11.37
Breeding Livestock	10.45	12.13	12.37
Working Capital			
Livestock	6.00	6.14	2.55
Agri. Product Stocks	0.59	0.66	0.96
Other Circulating capital	3.96	6.26	9.75
Family Labour	112.07	41.78	66.08
Owned Land	50.92	48.91	6.98
Total Economic Cost (incl. imputed owned land cost)	375.87	385.97	424.21
Total Economic Cost (excl. imputed owned land cost)	324.95	337.06	417.23
Total Cash Costs	188.12	276.74	313.78
Revenue per 100kg of product volume (production output plus allocated subsides)	294.16	311.02	393.74
Margin over Economic Cost (incl. imputed owned land cost)	-81.71	-74.95	-30.47
Margin over Economic Cost (excl. imputed owned land cost)	-30.79	-26.04	-23.49
Margin Over Cash Costs	187.75	34.28	79.96

XVIII – Costs, Revenue & Margin (€) per Forage Hectare for Selected EU Sheep Producers (Average1996-2000)

	Costs, Revenue & Margin per Forage Hectare		
	Ireland	***UK***	***France***
Total Inputs			
Specific Costs			
Seeds and Plants	0.80	1.08	11.86
Fertilizers	20.15	15.77	38.65
Crop Protection	0.20	0.54	1.76
Feedstuffs for grazing livestock- non-fodder	0.29	0.48	41.45
Feedstuffs for grazing livestock – purchased	44.30	63.88	140.75
Other livestock specific costs	28.68	35.49	35.55
Farming Overheads			
Machinery and Building current costs	38.78	22.64	49.97
Energy	9.82	13.89	27.58
Contract Work	14.90	8.15	39.29
Other direct inputs	16.46	22.18	68.70
Depreciation	25.54	39.43	148.19
External Factors			
Wages Paid	7.91	20.09	12.74
Rent Paid	6.13	16.92	37.32
Interest paid (less subsidies)	8.91	16.23	24.36
IMPUTED COSTS			
Fixed Assets			
Buildings	7.84	1.27	24.95
Machinery	5.19	8.29	24.34
Breeding Livestock	11.55	12.13	26.52
Working Capital			
Livestock	6.83	6.14	5.45
Agri. Product Stocks	0.68	0.66	2.04
Other Circulating capital	4.56	6.26	20.91
Family Labour	139.98	41.78	145.90
Owned Land	57.47	48.91	15.04
Total Economic Cost (incl. imputed owned land cost)	448.04	385.97	918.96
Total Economic Cost (excl. imputed owned land cost)	390.57	337.06	903.92
Total Cash Costs	222.86	276.74	678.17
Revenue per 100kg of product volume (production output plus allocated subsides)	345.56	311.02	851.04
Margin over Total Economic Cost (incl. imputed owned land cost)	-102.49	-74.95	-67.92
Margin over Total Economic Cost (excl. imputed owned land cost)	-45.01	-26.04	-52.88
Margin Over Cash Costs	122.69	34.28	172.87

End Notes

[i] Based on the theory of competitiveness, Brinkman (1987) identified profitability as a superior indicator of longer term competitiveness, relative to market share. However, the opposite case has also been proposed i.e. short term profit can be forfeited in the pursuit of long term market share gains. Based on this analysis it can be concluded that *"…one 'best' measure of competitiveness may not exist…(but) market share and profitability provide useful insights into overall competitiveness*"(Kennedy *et al*, 1997, p.24). Therefore, ongoing research is currently examining market share based indicators of competitiveness and will be reported separately.

[ii] The determination of an appropriate opportunity cost for own family labour is always an issue in studies which examine costs of production on family farms. The use of the average agricultural wage to value owned family labour may in some instances over value (due to under employment) or under value (due to managerial or entrepreneurial ability) this resource. However, without any further evidence to suggest in which cases such situations arise the average agricultural wage is used in the absence of this additional information.

[iii] The value of calf sales for the year was apportioned to the dairy enterprise based on the allocation key: *dairy cows as a percentage of total cows on the whole farm*.

[iv] A 60% : 40% weighting factor was applied in favour of protein content.

[v] The average number of breeding heifers and young females on the whole farm were allocated to the dairy enterprise based on the allocation key: *dairy cows as a percentage of total cows on the whole farm*

vi The value of the farm use of non-fodder crops produced on the farm (e.g. barley, rye, etc) is retained in the variable 'Crops used for feed', but the value of farm use of all crops used as forage (fodder roots, other fodder plants, e.g. silage cereals, temporary grass, meadows and pastures and rough grazing) is excluded.

[vii] By definition this partial productivity measure will be heavily influenced by relative stocking rates.

[viii] By definition this partial productivity measure will be heavily influenced by relative stocking rates.

[ix] The r^2 and significance level for the linear regression models for land productivity measures were as follows: time and stocking rate (r^2 = .83, significance level = .031) , time and milk production per hectare(r^2 = .89, significance level = .015) and time and milk solids per hectare (r^2 = .85, significance level = .025)

[x] This competitiveness index was constructed following the methodology outlined by Boyle *et al*., (1992); Boyle (2002); and Fingleton (1995). Alternative denominators to a simple average of all countries were investigated but were rejected due to the problems associated with selecting an appropriate measure that would be relevant for all enterprise analysis.

[xi] The standard deviation between the countries for total economic costs per kg of milk solids for all the specialist dairy farms was .51 whereas on the sub sample of 50-99 dairy cow farms the standard deviation was only .22.

[xii] The calculation of relative competitiveness of beef production systems in subsequent years will be monitored. In the event that access to datasources which define beef production with greater degrees of homogeneity (than FADN farm types) become available then the methodology may be

revised. One possible alternative datasource which maybe investigated is the International Farm Comparisons Network (IFCN).

[xiii] All subsidies received for cattle other than dairy cows.

[xiv] All other farm subsides on other livestock or livestock products (includes, exceptionally, the amounts for any of the specific livestock subsidies where such amounts could not be entered under specific categories because of a lack of detailed information).

[xv] Includes (i) Direct aids to agricultural production methods designed to protect the environment and maintain the countryside and (ii) Payments to farmers who are subject to restrictions on agricultural use in areas with environmental restrictions (Council Regulation (EC) No1257/99, Art.16).

[xvi] Compensatory allowances in less-favoured areas (Council Regulation (EC) No.1257/99, Art.14).

[xvii] The replacement rate for the dairy herd was calculated for each individual country based on data provided in the FADN data set.

[xviii] In the fattening enterprise it was not possible to reallocate costs or margins to the beef rearing enterprise. It was assumed that if a beef rearing enterprise was present on the farm (which by definition must be less than or equal to one third of the farm gross margin) the cost and return structure associated with this enterprise was similar to the beef fattening enterprise.

[xix] Based on specific assumptions regarding average annual prices paid for beef in the different countries, Boyle (1992 and 2002) calculated costs per 100kgs of output for beef rearing and fattening enterprises but noted that "*It is certainly not possible to obtain robust costs per 100kgs of output from this datasource*" (Boyle, 2002, p.82).

[xx] The proportion of these LU's allocated to the beef rearing enterprise is based on the allocation key: '*other cows'* (which excludes dairy cows) as a percentage of '*total cows'* on the whole farm.

[xxi] It is important to remember that these indicators are only partial in indicators of productivity and total factor productivity may show different results.

[xxii] The r^2 and significance level for the linear regression models for productivity measures were as follows: time and output per forage hectare (r^2 = .752, significance level = .005) , time and output per AWU (r^2 = .771, significance level = .05).

[xxiii] This relationship was not significant at the 90% level.

[xxiv] The production volume of cereals was calculated based on yield of wheat multiplied by the area of total cereals. Data on the yield of individual cereal crops was not available and the yield of wheat was used as the next best alternative.

[xxv] Due to data limitations this was the only indicator of cereal yield available.

[xxvi] Based on a trend regression analysis there was no apparent significant trend over time in relation to the partial productivity indicators for Irish cereal farms compared to the average of all countries.

[xxvii] It was not possible to standardise wheat yield for moisture content.

[xxviii] In this analysis costs were allocated to the cereal enterprise based on the allocation key: cereals output divided by total production output. This differs from previous measures of cost competitiveness in that direct payments are not taken into account.

[xxix] In addition to the ewe (and goat) premiums, this also includes any subsidies on sheep/goat milk products.

[xxx] Based on a trend regression analysis there was no apparent significant trend over time in relation to the partial productivity indicators for Irish sheep farms compared to the average of all countries.

[xxxi] The number of forage hectares allocated to the sheep enterprise was based on the proportion of sheep LU in the total of grazing LU on the whole farm.

[xxxii] Costs as a % of output was used as a benchmark indicator between the four commodities because it was the only measure of competitiveness that was used in the analysis for all four commodities.

[xxxiii] Costs as a % of output is considered as an indicator of competitive *performance*, namely profitability, because both costs and returns are considered.

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These publications analyse the current position and the future outlook on topics relating to Agri-Food Economics, Marketing and Rural Development. Their main focus is on assessments of future trends and prospects.

1. *The Outlook for Cereals Prices to 2001/02.* P.W. Kelly. 1997.

2. *Nursery Stock Production in the Republic of Ireland.* M.J. Maher, G. Roe, D. Twohig and P.W. Kelly. 1999.

3. *Potential Impact on Ireland of Quota Abolition or Expansion.* RERC, 1999.

4. *Situation and Outlook in Agriculture 1999/00.* L. Connolly, (Ed.). 1999.

5. *Situation and Outlook in Agriculture 2000/01.* L. Connolly, (Ed.). 2000.

6. *Environmental and Animal Welfare Regulations and the Irish Pig Industry.* A. Lara, P.W. Kelly and B. Lynch. 2001.

7. *The* Nursery *Stock Industry in Ireland, 2000.* M J Maher, G Roe, D Twohig and P W Kelly . 2001.

8. *Situation and Outlook in Agriculture 2001/02.* L Connolly, (Ed.). 2001.

9. *Situation and Outlook* in *Agriculture 2002 / 03* L.Connolly,(Ed) 2002

10. *Strategic Directions for the Irish Dairy Industry in a Freer Market*. E. Pitts and P. O'Reilly 2002.

11. *Impact of Implementing the Nitrates Directive on Dairy Farms*. B. Lally, B.Riordan 2002

12. *Situation and Outlook* in *Agriculture 2003/04*.

Conference Proceedings

Bound proceedings of Conferences organised by Rural Economy Research Centre

1. *1995* *Dairy and Beef Industries, Present and Future Perspectives.*
2. *1996* *Competitiveness of the Agricultural and Food Industries.*
3. *1997* *Prospects and Policies in Farming and Food.*
4. *1998* *The Outlook for Irish Agriculture.*
5. *1999* *Agri-Food Millennium Conference.*
6. *2000* *Outlook 2000.*
7. *2000* *Agri-Food Economics Conference.*
8. *2001* *Outlook 2001.*
9. *2001* *Situation and Outlook in Agriculture 2001/02 (see Situation & Outlook Series above).*
10. *2002* *Signposts to Rural Change.*
11. *2002* *Outlook 2002.*
12. *2003* *Outlook 2003.*
13. *2004* *Rural Development Conference 2004.*

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The Competitiveness of Irish Agriculture (1996-2000)

This report examines the competitiveness of agriculture production in selected EU member states, during the period 1996 – 2000. Profitability was selected as a measure of competitive performance and costs of production, value of output and partial productivity indicators were examined as possible sources (potential) of competitive performance.

Using data from the Farm Accountancy Data Network (FADN) the analysis showed that productivity levels on Irish farms for the main commodities was lagging behind competing countries. However, productivity levels on Irish cereal farms were on average more positive than the results for the other commodities.

In terms of profitability, the opportunity cost of owned resources had a major impact on the competitiveness of Irish agriculture over the period. Cash costs as a percentage of total output were relatively low in Ireland, compared to competing countries, but in terms of total economic costs, including an opportunity cost for all owned resources, Ireland had the highest cost structure amongst the countries examined. These findings have implications for Irish farmers in the medium term as direct payments are decoupled form production. Full and partial decoupling of direct payments will force producers to make production decisions based on full economic costs of production, including adequate remuneration for owned resources.