CHAPTER 6

PRODUCTIVITY IN IRISH AGRICULTURE

ALAN MATTHEWS, CAROL NEWMAN AND FIONA THORNE

ABSTRACT

While detailed analysis of the productivity of many sectors of the Irish economy are not possible because of a lack of data, the quality and volume of data on agricultural outputs and inputs allows such an analysis. In this chapter, a picture of the productivity performance of the Irish agriculture sector based on various different measures is presented and compared with the performance of Ireland's key competitors in this area. The measures of partial productivity discussed in this chapter indicate that the technical performance has lagged behind competing countries. In absolute terms, the overall productivity performance of Irish agriculture between 1984 and 2004 was poor.

6.1 Introduction

Farm policy in Ireland has traditionally focused on improving farm incomes, both in absolute terms and relative to average incomes in the non-farm population, and on maintaining as many people as possible working in agriculture. Improving productivity as a policy goal, while not neglected, was not a priority objective. This was particularly the case during the 'MacSharry era' of the EU's Common Agricultural Policy (CAP), which lasted for the decade 1993-2004.[1] This era was characterised by the growing substitution of direct payments for market price support as a way of maintaining farm incomes. In Ireland, direct payments as a proportion of the value of gross agricultural output (including these payments) rose from seven per cent in 1992 to 24 per cent in 2004. As a share of the operating surplus in agriculture (used as a measure of aggregate income from farming), their importance was even higher, rising from 18 to 66 per cent over the same period.

With such a high share of farm income coming in the form of direct payments, it should not be surprising that attention switched from technical improvements in agriculture as a source of increasing income, to ways of maximising premium income. Direct payments were paid on a per hectare or per animal basis; if a farmer increased yield per hectare in cereals or yield per animal in livestock production, it made no difference to premium income which was now the largest contributor to income on the farm. Indeed, eligibility for premium income was conditional on measures to restrain productivity improvements. In cereal production, larger farms were required to set-aside a proportion of their land each year on a rotational basis; in dry stock production, payments were limited by stocking density restrictions and additional payments were made to encourage further extensification. In the milk sector, production quotas had been introduced in 1984. While this, in itself, did not prevent individual farmers from trying to increase their productivity in order to produce their quota entitlement at minimum cost, the accompanying rules restricting the transfer of quotas between farms. This was designed in part to maintain milk production in higher-cost areas of the country as part of a rural development policy and ensured that the total cost of producing the national milk quota remained higher than otherwise would have been the case.

The volume of Irish agricultural output, after increasing steadily since EU accession in 1972, levelled out during the 1990s. This was also the period when growth in the non-agricultural economy surged ahead, particularly after 1994. It is possible that agriculture would not have been able to compete for resources with the rapidly growing non-agricultural sector during this period under any policy scenario, but it is clear that the agricultural sector was engaging in this competition with a heavy weight penalty as a result of the policy environment in place.

This policy environment is now changing rapidly. The 2003 Luxembourg Agreement on CAP reform brought the MacSharry era to an end by decoupling the majority of direct payments from production. These payments are now made to farmers according to entitlements based primarily on the level of payments received in the past, and subject to compliance with good farming practice and various statutory regulations on the environment, food safety and animal welfare. Importantly, farmers are now encouraged to base their production decisions on actual market prices, rather than attempting to maximise premium income.

The level of market prices for the major agricultural commodities is also under downward pressure as a result of policy reform. Farm prices within the EU are heavily supported by a mix of import tariffs and export subsidies. These policy interventions maintain prices for commodities such as beef, butter, skim powder, sugar and so on well above world market levels. In the Doha Round of trade negotiations the EU is negotiating with its trade partners to lower barriers on

market access. It has agreed conditionally, as part of an overall agreement, to abolish export subsidies by 2013 at the latest. While the Doha Round negotiations are currently suspended, the pressure for policy reform is unlikely to ease. Irish farmers will compete in a much lower price environment in the future, even if the dismantling of the CAP's protective regime is still likely to take some time.

Greater attention is now being given to the underlying competitiveness of agriculture in each Member State in an effort to learn how each might fare in the new policy environment. Evidence suggests that, in the past, Ireland has fared badly in terms of technology-based productivity growth, a key component of competitiveness, unlike the majority of other EU countries where productivity growth improved after joining the EU (Leetmaa et al., 2004). Recent work suggests that there has been a further erosion of Ireland's competitiveness in the late 1990s and early 2000s based on a variety of cost competitiveness indicators (Boyle, 2002). These trends have led to some concern about the future viability of farming in Ireland in the face of increasing costs and falling prices.

As a result, understanding the factors driving productivity growth in Irish agriculture is more important than ever as we try to ascertain how Irish farming will fare in a more liberal market environment. In this chapter, recent research analysing various aspects of the productivity performance of Irish agriculture is presented. A number of productivity indicators are considered. One set of indicators are accountancy measures, based on comparing detailed production costs and revenues for representative farms across a number of countries (Boyle, 2002; Thorne 2004; 2006). Production costs are normalised by expressing them as a percentage of the value of output, or per unit of output. The greatest difficulty in comparing production costs across countries lies in the treatment of family-owned resources in agriculture (family labour, family-owned land and capital). For these reasons, the distinction is made between cash costs (the cost of purchased intermediate inputs) and economic costs (which include, in addition, the imputed cost of family-owned resources). These indicators give a good summary of competitiveness outcomes or performance. Changes in these indicators can come about either because of changes in price ratios across countries or because of changes in input-output ratios (productivity). Thus it is important to dig behind these numbers to understand the factors responsible for changes over time.

Productivity change in agriculture is often measured using partial productivity indicators, such as output per unit of labour (labour productivity), output per unit of land (yields), milk yields per cow, or lambs per ewe. These are partial indicators because they compare output to a single input, such as land area or breeding herd. These indicators are easily available, and they are concrete and understandable. However, they can also be misleading because a high level of productivity on one indicator may be due to the generous use of another input. For example, farm labour productivity may be high in one country compared to another, but this may be because of greater use of capital and land. In calculating productivity change, it is desirable to take into account the relationship between the change in output and the change in the use of all inputs. Such a measure is called a Total Factor Productivity (TFP) Index. Such an index can be calculated using aggregate data based on the Economics Accounts for Agriculture (for an Irish example, see Matthews, 2000), or on the basis of farm-level data through statistical estimation of the farm technology and its change over time (O'Neill and Matthews, 2001; Newman and Matthews, 2004).

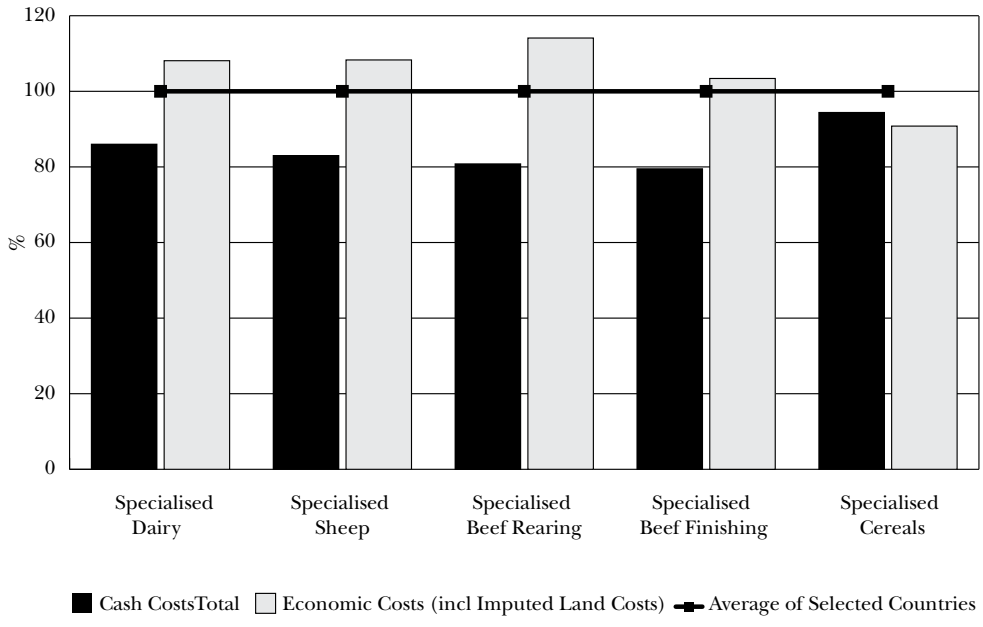
The Agri-Food 2010 Committee concluded in 2000 that there was insufficient work and data in the area of competitiveness (DAFRD, 2000). Following from this report, the Rural Economy Research Centre, Teagasc, responded to the recommendation from the committee for 'the collection and publication on a regular basis of key competitiveness indicators, with appropriate

international comparisons" (DAFRD, 2000: 40). Appropriate indicators of competitiveness were identified and calculated for the years 1996 to 2003. These indicators provide a baseline upon which relative productivity and competitiveness of Irish agriculture can be examined on a regular basis (Thorne, 2004; 2006). A further study of productivity growth in Irish agriculture was supported by the Department of Agriculture and Food's Research Stimulus Fund (Newman and Matthews, 2004). This chapter summarises the findings of these studies in presenting an analysis of productivity growth in Irish agriculture.

6.2 Lessons From Accountancy and Partial Productivity Measures

Figure 6.1 shows the relative competitive performance of the main sectors of Irish agriculture for the period 1996-2003.[2] The European Commission's Farm Accountancy Data Network (FADN) was the primary source of data used in the analysis. Data analysis was confined to specialist dairy, sheep, beef finishing, beef fattening and cereal farms, as defined by FADN, on which the standard gross margin from each of the respective enterprises accounted for at least two-thirds of the farm total gross margin.[3]

Figure 6.1: Cash and Economic Costs as a Percentage of Average of Selected Countries, 1996-2003



6.2.1 Milk Sector

Selected partial productivity measures (milk yield, labour productivity and stocking rate) for Irish dairy herds were generally lower over the period 1996 to 2003, compared to the other countries examined. Furthermore, land productivity measures for Irish farms declined over the period relative to the average of all countries in the analysis.

While partial productivity indicators were worrying for Irish dairy farms, the profitability indicator of competitive performance (costs as a per cent of dairy output value) was positive for Ireland over the period 1996 to 2003 compared to the other countries examined. Italy had the lowest cash costs as a percentage of output (at 60 per cent), but the cost structure in Ireland was only slightly higher (64 per cent). The highest cash costs as a percentage of output were experienced in Denmark where cash costs were 87 per cent of total output of the enterprise. Further analysis of specialist dairy farms that had between 50-99 dairy cows did not show substantial deviation from these results.

However, 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 Ireland for the average size farm at 122 per cent of output. The competitive position of the larger size dairy farms in Ireland was more positive on a total economic cost basis, where total economic costs as a per cent of output value was on a par with the average of other countries. 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. Thus, the opportunity cost of land has a major impact on the competitive position of Irish milk producers in the long term.

6.2.2 Beef Sector

Analysis was undertaken on two categories of specialist cattle holdings: (1) Specialist cattle – mainly rearing; and (2) Specialist cattle – mainly fattening. Ireland's productivity in these two beef systems was generally lower for the period 1996 to 2003 compared to competing beef producers in Europe.

Accountancy indicators for the beef rearing and fattening enterprises show that, over the period 1996 to 2003, Irish producers had a competitive advantage when cash costs were examined. However, the competitive position exhibited by Irish beef farms was much weaker when total economic costs were considered. The imputed charge for owned land and labour had a large negative influence on the relative competitive advantage of Irish beef farms.

The role of direct payments must be considered in evaluating the longer-term competitiveness of Irish beef production systems. To investigate this issue the accountancy 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 to 2003, Irish beef rearing and fattening farms had on average a 15 per cent and four per cent lower cash cost to market based output ratio, respectively, compared to the average of all countries in the analysis. Again, however, Irelands' competitive position deteriorated when economic costs were considered as a percentage of market based output, relative to total output (excluding direct payments).

6.2.3 Cereals Sector

Selected partial productivity indicators on Irish cereal farms were generally more positive than for the other enterprises examined. Yields were well in excess of the average of all countries examined and labour productivity levels were similar to the average for all countries. Furthermore, there was no consistent relative productivity trend over time observed for Irish cereal farms.

Accountancy 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. For example, Irish cereal producers had the second lowest cash cost to output ratio at 73 per cent, compared to the other countries examined. Even when total economic costs were measured Irish cereal producers maintained a competitive advantage compared to the average of all countries. When direct payments were excluded from the analysis, Irish cereal producers remained competitive during the period 1996 to 2003.

6.2.4 Sheep Sector

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 2003, but Irish sheep farms had 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.

Accountancy measures based solely on cash costs show that Irish sheep producers have a comparative advantage compared to France and the UK. 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.

Various measures of cost competitiveness show that Ireland's comparative advantage on a cash cost basis disappeared when economic costs were considered over the period 1996 to 2003. Furthermore, over the period Irish sheep producers relied more heavily on subsidies to supplement the revenue of the sheep enterprise, compared to the UK and France. Consequently, when costs were expressed as a percentage of market based output, Irish producers were surpassed by French producers, who had the lowest cash costs as a percentage of market based output. On an economic cost basis Ireland again emerged as the highest cost producer.

6.3 Lessons From Total Factor Productivity Measures

Newman and Matthews (2004) measured TFP growth in Irish agriculture over the period 1984 to 2000 by estimating econometric models of the production technology in use on Irish farms using data from the National Farm Survey. The study estimates productivity growth by farming system, where each of the four systems examined (dairy, tillage, sheep and cattle) is dominated by a specific enterprise. Total factor productivity growth is decomposed into three elements:

1. Technical change, or the movement in the production frontier over time as a result of research and innovation;
2. Technical efficiency change, or the change in the gap between the efficiency of the 'average' farm and the efficiency of best practice farms; and
3. Scale efficiency change, or the change in efficiency brought about by changes in the scale of operations on farms.

Figure 6.2 presents the overall trend in productivity growth for each farm system while Table 6.1 presents the productivity growth index by system and its decomposition for the 1984 to 2000 period.

Figure 6.2: System-by-System TFP Trend

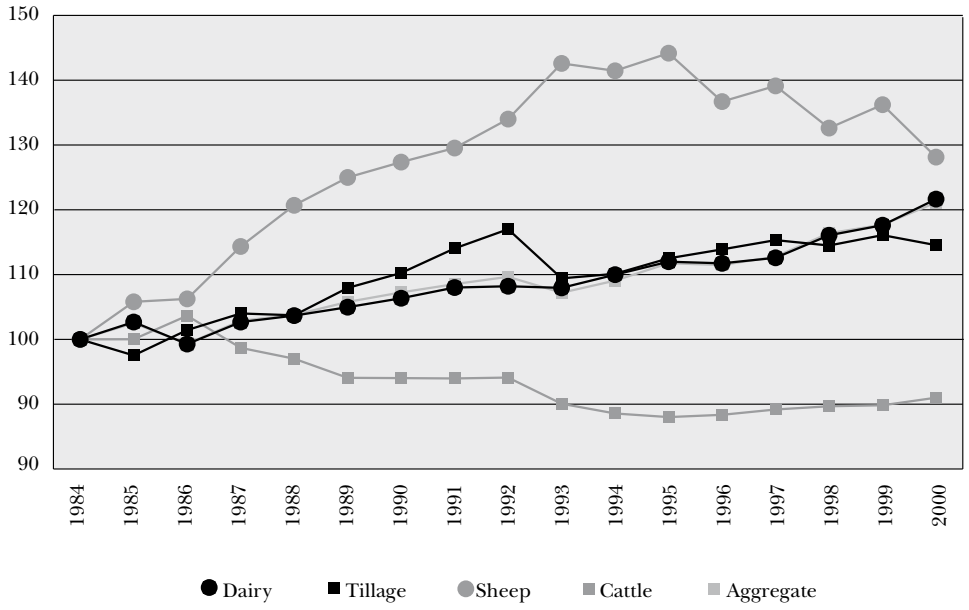


Table 6.1: Productivity Change and Decomposition on Irish Farms, 1984-2000

	Technical Change	Efficiency	Returns to Scale	TFP
Dairy	122.91	99.15	99.82	121.65
	Linear growth rates (per cent)			
1984-2000	1.42	-0.19	-0.01	1.20
1984-1989	0.65	0.24	-0.01	0.89
1989-1995	1.48	-0.49	-0.01	0.95
1995-2000	2.32	0.18	-0.01	2.48
Tillage	137.94	82.46	100.70	114.54
	Linear growth rates (per cent)			
1984-2000	2.40	-0.99	0.07	1.06
1984-1989	3.03	-1.20	0.12	1.74
1989-1995	2.51	-1.49	-0.09	0.31
1995-2000	1.54	-0.60	-0.04	0.45
Sheep	181.68	73.16	96.40	128.13
	Linear growth rates (per cent)			
1984-2000	5.25	-1.63	-0.10	2.14
1984-1989	6.44	-0.41	-0.63	5.08
1989-1995	5.46	-1.28	0.16	3.29
1995-2000	3.34	-3.23	-0.11	-3.00
Cattle	96.59	97.51	96.62	91.00
	Linear growth rates (per cent)			
1984-2000	-0.21	-0.46	-0.21	-0.84
1984-1989	-1.06	0.09	-0.28	-1.25
1989-1995	-0.21	-0.93	-0.13	-1.18
1995-2000	0.65	0.04	-0.09	0.57

Note: Base = 1984 (100.00).

6.3.1 Enterprise Level Analysis

Figure 6.2 shows that the trend in overall productivity growth differs markedly across farm systems. The sheep system exhibits the best performance due to an early burst in productivity growth rates. Total factor productivity grew by 28 per cent over the sample period at a linear rate of 2.1 per cent per annum. However, the decomposition of productivity growth rates into three different time periods illustrates that productivity gains have been exhausted since the mid-1990s. This is, in part, due to an apparent slowing down in the rate of technical change over time, but also due to an increasing gap between efficiency levels on the average sheep farm and best practice farms.

The cattle system, on the other hand, had the poorest performance of all systems.[4] In total, productivity fell by nine per cent over the sample period with negative linear growth of 0.8 per cent per annum. This was mainly due to technical regress between 1984 and 1995 accompanied by negative efficiency growth, particularly between 1989 and 1995. Positive productivity growth between 1995 and 2000 provides evidence of a recovery in the productivity performance of the system in the latter portion of the sample period.

Productivity grew slowly in the dairy farm system at the beginning of the period with productivity gains of 0.9 per cent per annum. However, in more recent years of the sample period productivity grew at a linear rate of almost 2.5 per cent per annum yielding an overall increase in total factor productivity of almost 22 per cent for the sample period as a whole. The overall growth in productivity in the dairy system was driven by technical progress at an average rate of 1.4 per cent per annum, increasing over the sample period. The efficiency gap between the average farm and the best practice farm on the whole remained stable despite a widening in the gap between 1990 and 1997. This may reflect the quickening pace of technical progress observed where leading-edge farmers are innovating more quickly than dairy farmers on average. A noticeable result is the improvement in average efficiency levels evident in the third period while the best practice frontier shifts outward at a linear rate of 2.3 per cent per annum. Not only are the 'best' dairy producers adopting more efficient technologies at an increasing rate, but also the average producers are increasingly managing to keep up. This may reflect structural change in the system, and the more rapid exit of less efficient producers from the industry in the more recent period.

The tillage system shows the reverse pattern with a gradual loss of momentum in productivity gains in the later years of the sample period. This can be attributed to a sharp fall in efficiency levels between 1992 and 1993 coinciding with the introduction of set-aside on tillage farms. Productivity growth recovered somewhat in the last 5 years of the sample with a linear growth rate of 0.5 per cent observed for the 1995 to 2000 period. Productivity growth is driven by technical progress over the sample period at a rapid rate of 2.4 per cent annually but is dampened by a poor average efficiency performance particularly in the middle years of the sample.

6.3.2 Total Productivity Growth in Irish Agriculture

Overall productivity in Irish agriculture grew by 21.1 per cent over the sample period at a linear rate of just over one per cent per annum. Boyle (1987) estimated a total productivity growth rate of just over one per cent for the 1960 to 1982 period suggesting that productivity growth between 1960 and 2000 has remained fairly steady. However, total factor productivity fell from an estimated growth rate of 1.5 per cent for the 1980s to 0.7 per cent for the 1990s. The former is consistent with Bureau et al.'s (1995) estimate of productivity growth of 1.35 per cent annually for the 1973 to 1989 period. The decline in productivity is consistent with Boyle's (2002) study, which identified a significant deterioration in the competitiveness of Irish agricultural production relative to the most efficient world producer of each commodity between 1988/89 and 1998/99. These results are also consistent with other estimates of slowing productivity growth derived using other methodologies. Matthews (2000) found an annual rate of total factor productivity growth in Irish agriculture of 2.3 per cent per annum in the 1980s falling to 0.8 per cent annually in the 1990s. O'Neill et al. (2002), using farm level data and an aggregate model of Irish agriculture, found that productivity growth slowed from an estimated 2.3 per cent annually between 1984 and 1989 to an annual average rate of 1.5 per cent between 1990 and 1998.

6.4 Relevance of Research Findings to Policymakers

6.4.1 Partial Productivity and Accountancy Indicators

The various measures reviewed each focus on different aspects of the productivity story in agriculture. Partial productivity measures are useful in comparing absolute productivity levels across countries, but may be biased because they ignore the use of complementary inputs. Comparative studies of agricultural TFP tend to measure the growth rates of TFP, not relative levels. From a competitiveness perspective, lower productivity levels can be offset by lower production costs or higher output prices, and the accountancy indicators take these factors into account. The cash costs indicator is best interpreted as a short-run indicator of a sector's ability to withstand a price-cost squeeze. The economic costs indicator takes into account, in addition, the opportunity cost of family-owned resources. These will be influenced by developments in the wider economy and thus provide a better basis for assessing the longer-run competitiveness of the sector in relation to its trading partners.

The research on partial productivity and accountancy indicators for Ireland indicates that, over the period 1996 to 2003, the competitive position in Ireland for all four enterprises was positive when cash costs were considered ignoring imputed charges for owned resources.

When the imputed charges for owned resources were considered, the competitive ranking for Irish agriculture deteriorated relative to 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. In addition, the larger sized Irish dairy farms were also more competitive on a total economic cost basis compared to the average sized dairy farm. Thus, part of the explanation of the deterioration of competitive ranking for the average Irish farm when total economic costs are considered relates to 'the relatively low scale of primary agricultural activity in Ireland' (Boyle, 2002: 177). This result is indicative of the small-scale farming that is predominant in the Irish dairy industry relative to competing industries. As Irish dairy farming transforms to larger scale production its competitive position would be strengthened and be better able to cope with a cost/price squeeze, given current projections for a decline in farm milk prices.

Another interesting result which could have implications for Irish agriculture in a decoupled policy environment is evident in the beef and sheep sectors, where Irish beef farms (both rearing and fattening) and sheep farms appeared to be less competitive relative to the average of all countries when costs were expressed as a percentage of market based output. This is important in the context of recent reforms to the CAP, where direct payments have become either fully or partially decoupled from production. As relative economic costs are considered as a relative guide to the longer-term competitive position of competing countries, these findings could be considered as warning signals for the future competitive performance of these sectors of Irish agriculture.

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 and accountancy measures. Most of the indicators of partial productivity 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. While these indicators of productivity were not very

positive for Irish agriculture, it is important to remember that these indicators are only partial productivity measures, and indicators of total factor productivity provide a more informative picture of relative productivity performance.

6.4.2 Total Factor Productivity

Unfortunately, there is no recent data which would allow us to compare the absolute level of TFP in Irish agriculture with levels elsewhere. Data for the period 1973 to 1993 show Ireland lagging well behind the sample of other European countries and the US which were examined (Ball et al., 2001). In 1990, for example, Ireland's TFP was 88 per cent of the US figure, compared to a EU average of 93 per cent. In the past, this productivity disadvantage could be offset by lower factor input costs, but Ireland has now become a high-cost economy. In future, the relative change in TFP will determine the sustainability of Irish agricultural production in a more market-oriented environment.

The research reviewed earlier presents a rather sombre picture. In aggregate, the agricultural sector experienced productivity growth of 21.1 per cent for the 1984 to 2000 period, at a linear rate of just over 1 per cent per annum. There is evidence, furthermore, of a slowdown in growth in the 1990s. The study also shows that clear differences exist in the productivity performance of different farming systems in Ireland. Sheep farming exhibits the most impressive performance due to an early burst in productivity growth rates. However, productivity gains have been exhausted since the mid-1990s and there has been no further productivity growth since then. Dairy farming improved its productivity performance throughout the period, albeit from what might be considered a weak performance in the second half of the 1980s. Tillage also performed well at the beginning of the period but productivity performance has been relatively poor in recent years. Cattle farming performed poorly throughout.

A number of potential explanations are given for the trends observed with some implications for future policy developments presented. In relation to the dairy system, Newman and Matthews (2006) point out that productivity growth of 0.9 per cent annually in the 1984 to 1990 period is the lowest of the three periods examined, and may reflect the productivity cost of the dislocation and adjustments required on dairy farms immediately following the introduction of the quota regime. On this interpretation, the acceleration of productivity growth in subsequent sub-periods may reflect the re-establishment of more 'normal' growth rates as farmers learned to live with the quota regime and as the regime in recent years has become less restrictive.

Similarly, Newman and Matthews (2004) suggest that the relatively poor performance of the tillage system between 1989 and 1995 compared with 1984 and 1989 may reflect the adjustment problems associated with the introduction of the MacSharry reforms to the CAP. More recently, the system has recovered exhibiting faster growth rates between 1995 and 2000.

Explanations for the trend observed in the sheep system are also advanced. After a spectacular productivity performance in the early years, a slowdown in productivity growth was evidenced post-1992. While there was a steady growth in the lambing percentage throughout the whole period, productivity may have been adversely affected after 1992 by the growth of extensification payments and agri-environment payments. Both schemes would have encouraged farmers to make less efficient use of their resources. In the case of the extensification scheme, the incentive was to reduce sheep numbers per hectare in return for higher levels of direct payments. In the case of the Rural Environmental Protection Scheme, higher levels of on-farm costs would be associated with environmental improvements rather than higher levels of physical output, which are not captured in the output variable used in the analysis.

A similar attempt to maximise premium income rather than efficiency or productivity could also explain the cattle system findings. The poor productivity performance of the cattle system was associated with a strong premium-driven expansion in the suckler cow herd from 410,000 in 1981 (when the Suckler Cow Premium was introduced) to peak at just under 1,200,000 in 1998. Extensification payments and stocking rate restrictions required for eligibility for premium payments for male animals post-1992 would also have contributed to the distortion of incentives. If this were the case then the introduction of decoupling in 2005, which eliminates the incentive for farmers to manage their livestock enterprises with a view to maximising direct payment receipts, could lead to a rebound in productivity growth. Evidence from New Zealand suggests that TFP growth averaged only 1.5 per cent annually during its high subsidy period (1972-84) but since the elimination of subsidies has improved to 2.5 per cent per annum (Lattimore, 2006).

6.5 Concluding Remarks

In this chapter a picture of the productivity performance of the Irish agricultural sector based on various different measures has been presented. Of key interest is how well the sector performs relative to its key competitors. The measures of partial productivity discussed in this chapter indicate that the technical performance of Irish agriculture was lagging behind competing countries. Recent data is not available to compare productivity performance with other EU countries on the basis of total factor productivity measures. In absolute terms, however, the overall productivity performance of Irish agriculture between 1984 and 2000 was poor. Hadley (2006), for example, reports rates of technical change in England and Wales for arable farms in the range 3.7 to 5.2 per cent annually, and for livestock farms (excluding pigs and poultry) of between 2.0 and 3.3 per cent.

Eurostat has begun to provide harmonised long-term productivity series for all EU Member States (Eurostat, 2002). In addition to partial measures, it calculates a 'multi-factor' measure. This is defined as the relationship between the growth of output and the growth of a bundle of inputs comprising capital, raw materials and labour, but excluding land. Thus it is close to, but not identical with, a measure of total factor productivity. Results for this multifactor productivity measure can now be compared for most EU countries for the 1990s, although because of the problems of harmonisation, the Irish data refer only to the shorter time period 1995 to 2001. The Irish rate of growth of 1.3 per cent in multi-factor productivity for this shorter period falls below the average of 1.7 per cent over the 1990 to 2001 period achieved for all countries for which results are reported. This confirms the trend presented in this chapter of a below average performance of Irish agriculture. It is unlikely that productivity growth rates of this magnitude will be sufficient to maintain farm incomes in the face of a stagnant or declining price of output and inflationary increases in costs suggesting that more rapid structural change in the sector is inevitable.

Notes

1 The MacSharry CAP reform was implemented in 1993 and was followed in 1999 by the Agenda 2000 reform of the CAP. As this latter reform continued the reform strategy initiated by MacSharry, the entire period covered by these two reforms is called the 'MacSharry era'.
2 The results in this section are based on Thorne (2004 and 2006).
3 The competitive position of Irish (i) dairy farms was compared against Belgium, Denmark, France, Germany, Italy, the Netherlands and the UK; (ii) sheep farms was compared against the UK and France; (iii) beef farms was compared against France, Germany and the UK; and (iv) cereal farms was compared against Denmark, Germany, France, Italy and the UK.
4 Some caution must be exercised in interpreting all results from the model of the Irish cattle system due to data problems associated with measuring the 'volume' of cattle output on farms, which may lead to some bias in the reported results.

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