THE FUTURE OF IRISH DAIRY FARMING
THE IMPLICATIONS OF AGENDA 2000 AND A BOOMING ECONOMY

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ABSTRACT

The future of dairy farming in Ireland is examined. The effects of a strong macro-economy, Agenda 2000 and domestic policy on milk quota transfer are analysed using linear programming and Markov Chain analysis. Results show that all farms are subjected to a price-cost squeeze. Smaller dairy farms are pushed and pulled out of farming. Larger farms survive by expanding operations but do not enjoy the increases in income realised elsewhere in the economy.

INTRODUCTION

This paper examines and projects the implications of a changing economic climate and agricultural policy environment on the management of Irish dairy farms. The effects of these changes are not only analysed from a static perspective, the dynamics of farmers' response to change are also considered.

The Irish economy has changed radically and rapidly in recent years, so much so that it has been compared to the Asian Tiger economies and is sometimes referred to as the "Celtic Tiger". Ireland has experienced exceptional growth, GDP grew by almost 70 per cent from 1990 to 1998. Prior to this Ireland suffered from chronic unemployment coupled with low participation rates and a high age dependency ratio (ESRI, 1999). The growth of the overall economy has had repercussions for agriculture. Nationally the importance of agriculture has diminished. In 1990 agriculture accounted for 10 per cent of GDP and 15 per cent of total employment compared to 5 per cent of GDP and 9 per cent of employment by 1999. This rate of growth is not forecasted to continue but Irish GDP is expected to grow at an annual average rate of 5 per cent to 2005. This paper explores the future of dairy farming in the Celtic Tiger economy and what the implications are for farm management of such strong macroeconomic projections.

The future of dairy farming will be determined not only by the changing economic climate, but also by changing agricultural policies. The MacSharry reforms of the Common Agricultural Policy instigated a widespread restructuring of farming operations in Ireland. Under Agenda 2000 these reforms are widened and deepened and therefore further restructuring in response to policy change is expected. In conjunction with the changes brought about by Agenda 2000, domestic policy in relation to milk quota is also changing in Ireland. Rules governing the transfer of quota have been changed significantly with the objective of making quota more accessible to developing farms. The effects of changing agricultural policy will also be analysed.

The work presented in this paper is part of the FAPRI-Ireland Partnership[1]. This is a research consortium, which has developed both aggregate sector level econometric models of Irish agriculture and farm level programming models of Irish representative farms, in order to analyse the impact of policy change. The sector level models generate estimates of prices and costs, as well as aggregate animal numbers and output volumes. Price and cost estimates from the sector level model are then used in the farm level models to generate information on the farm level impact of policies. This paper will focus only on the output of the farm level models and the effects of policy change on farms.

SETTING THE SCENE TO 2007

The Economic Climate

The most recent projections for the Irish economy (ESRI, 1999) show strong macroeconomic growth being maintained to 2007. Inflation is projected to run at an average of 3 per cent per annum. Labour costs are also set to increase substantially; the average unskilled construction wage rate is projected to increase by 48 per cent from 1998 to 2007 (ESRI, 1999). This is generally accepted as the opportunity cost of labour in Irish agriculture. Projected increases in inflation are likely to affect farmers in two ways. First, farmers can expect substantial increases in production costs and second the purchasing power of incomes earned will be significantly diminished. The projected

[1] This is a partnership between Teagasc, The Irish Agriculture and Food Development Authority, and The Food and Agriculture Policy Research Institute at the University of Missouri, Columbia.

macroeconomic growth will have definite implications for farm management and performance. Projections for various production costs are presented in Table 1.

Table 1: Projections for Production Costs

Costs	Change 1998-2007
Labour	+48%
Veterinary Services	+35%
Energy	+26%
Fertiliser	+5%

Source: ESRI (1999) and Binfield et al. (2000)

Agricultural Policy

The 1999 reform of the CAP has somewhat secured agricultural policy to 2007. The reform known as Agenda 2000 is aimed at distancing agricultural policy even further from price support and increasing direct income support. Obviously there may be pressure for further reform due to WTO agreements, EU enlargement and other budgetary pressures. Since the likely policy changes stemming from these sources are not yet known, the projections are produced under the reforms contained in Agenda 2000.

The price projections used in this analysis are those produced by the FAPRI-Ireland Partnership (Binfield *et al.* 2000). These projections show that the Agenda 2000 milk quota increases lead to a modest reduction in Irish milk prices in the early years. More substantial reductions are likely to occur from 2005/06 as the impacts of increased quota and lower intervention prices feed through to farm level milk prices. By 2007, the Irish milk price is projected to be 15 per cent below 1998 levels. Falling beef prices at the EU level are likely to be reflected in the Irish market. It is projected that the Irish price will stabilise around 14 per cent below the 1998 level from 2002 onwards. The main changes of concern in the cereals sector are the resultant effects on feed prices. Dairy and beef compound feed prices are due to fall by 2 per cent by 2007 (Binfield *et al.* 2000), as EU wheat prices balance above new intervention price.

The Milk Quota Policy

Policies with regard to the transfer of milk quota in Ireland have recently changed. Previously milk quota could not be freely traded and the only means of permanently acquiring quota was to purchase land and quota as a going-concern. Private leasing was a common avenue for temporary expansion. Lease price was determined privately between lessee and lessor. Such arrangements became so common that in 1999 every three active milk producers supported one "sofa producer" (McCarthy 2000).

The new arrangements agreed by the Irish Department of Agriculture, Food and Rural Development require all "sofa producers" leasing out quota for longer than 3 years to recommence production or to sell quota into the restructuring scheme. Active milk producers may then try to acquire quota from the restructuring scheme at a fixed price, 38c per litre in 2000. Allocation of quota from restructuring will be operated on a priority basis, where priority will be determined by quota size, with top priority going to producers with a quota of less than 157,000 litres.

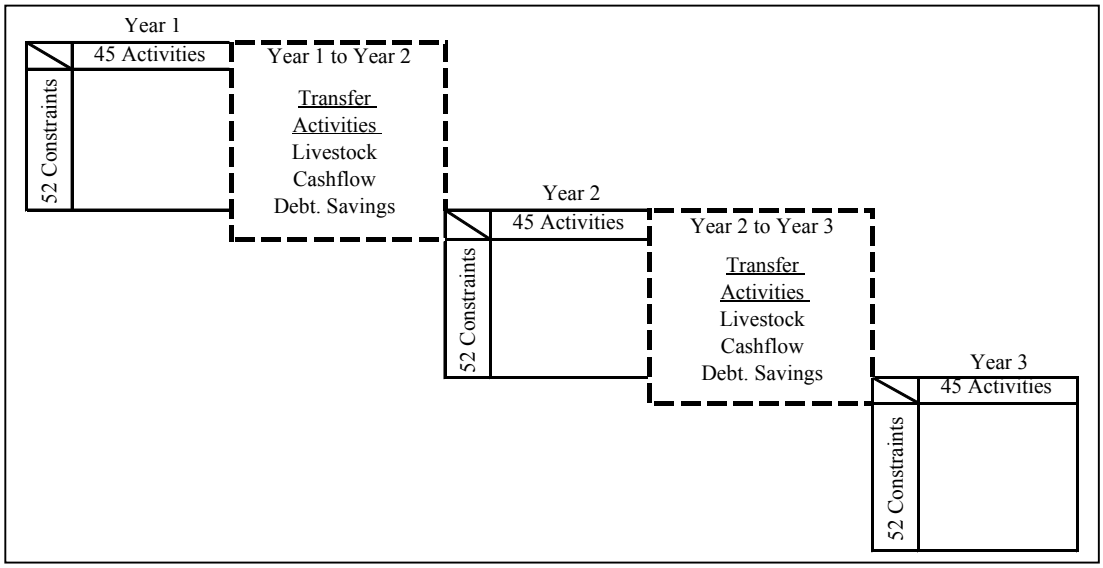
METHODOLOGY

A set of linear programming (LP) models was constructed to analyse farmer response to policy change and the future economic climate. LP operates by maximising or minimising an objective function subject to some specified constraints. In this research, farm net margin is maximised subject to resource constraints such as land and labour, policy constraints such as milk quota and financial constraints such as access to borrowings. The models developed are multi-period, these are particularly useful as they capture the dynamics of change over the projection period and they also demonstrate growth and development of a farm business over a number of years. LP modelling has attracted criticism due to its normative nature but Jones (1982) argues that normative models have particular value in projecting response under conditions, which are outside the range of past experience. There have been many applications of LP in the area of policy analysis, for example Kirke and Moss (1987), Oglethopre (1999) and Kelly et al. (2000).

Model Construction and Calibration

Multi-period LP models were constructed for each representative farm. The models covered an 11-year period, 1996 to 2007. All activities that existed on the farms in 1996 were modelled and all likely activity options were also included. Some of the main activities were dairying, heifer rearing on a one and two year system, cattle rearing of weanlings, stores or finishers, renting and letting land and milk quota, borrowing money, hiring labour and working off the farm. The constraints included land, labour, milk quota, access to capital, livestock housing and milking facilities, living expenses and fixed costs. Some of these constraints such as land, labour and quota could be varied through leasing or letting. The opportunity cost applied for labour was the unskilled construction wage. In total, the model contained 45 activities and 52 constraints. The matrix for each year is a complete static model with the full range of activities and constraints. The series of annual matrices are linked together by using transfer activities giving rise to the block diagonal matrix form as presented in Figure 1.

Figure 1: Schematic Outline of Model Matrix



Data used in the LP models were derived from the Irish National Farm Survey (a member of FADN[2]). The survey records farm level information from a sample of 1,200 farms of various systems and sizes each year, representing a population of about

[2] FADN is The Farm Accountancy Data Network of Europe.

120,000 farms. The data recorded is sufficiently detailed for use in the construction of an LP model.

As previously mentioned, LP incurs criticism due to its normative nature, that is it projects the optimal outcome not the actual one. There are two reasons why the optimal may differ from the actual. The first is a methodological issue. Assumptions such as perfect certainty and instantaneous response may cause divergence between the optimal and actual outcomes. Through historical validation it is possible to minimise these methodological biases. The second reason is farmer-specific and this is more complex. Flemming (1998) identified farmer-specific issues such as aversion to risk and lack of education as reasons why farmers may not be willing or able to optimise. Many of these issues can be quantified in the model but others cannot and therefore the response to a policy scenario may not be the optimal one. This inability to reach the optimal is termed the 'response deficit factor'. Through historical validation it is possible to calculate the response deficit factor and to project it into the future. Based on this, future optimal outcomes can be calibrated by the response deficit factor as a performance correction tool. This will enhance the positivity of the results.

Representative Farms

As all farms cannot be modelled individually, farms were clustered into a number of homogeneous groups and the mean farm from each group was taken to be the "representative" one. Clustering was conducted according to criteria identified by Day (1963) and Buckwell and Hazell (1972). Day's foremost criterion was *"technological homogeneity"* defined as similar resource endowments and constraints, levels of efficiency and managerial abilities. Buckwell and Hazell emphasised the importance of similar expectations of changes in constraints and similar rates of technical innovation. Proxy variables were chosen from the survey to represent the clustering criteria. Cluster and principal component analysis were carried out on the proxy variables. Three-year averages were used to minimise the disturbance of inter-year variations on farms due to exogenous factors such as weather and price volatility. The clustering method used was nearest centroid sorting.

The results of three clusters are presented below, larger representative farms also emanated from the clustering but these are not discussed in this paper. Table 2 shows the main descriptors for each cluster. The number of farms represented nationally is shown in parentheses.

Table 2: Description of Representative Dairy Farms

Descriptors for 1996 (No. of Farms Nationally)	Static (10,800)	Developers (7,900)	Typical (13,200)
Farm net margin	€14,160	€18,415	€28,765
Milk quota (litres)	95,400	103,725	169,200
Change in milk sold (1992-96)	0	+55%	+10%
Milk production per cow (litres)	3,700	4,455	4,590
Total costs per litre	22c	15c	17c

The static and developer clusters although of similar size, differ significantly in terms of their development path over time and also in their technical efficiency. The first group is called static because it has not expanded its dairy production from 1992 to 1996. On the other hand, the developer group has expanded milk production by over 50 per cent. The third group represents 'typical' dairy farms.

Table 2 shows the number of farms represented by each cluster in 1996. A problem that is sometimes associated with representative farms is that their representivity may change over time. To tackle this problem a first order Markov chain process was used for projecting the changing representivity of clusters. First order Markov chain analysis is based on the assumption that transitional probabilities calculated from historical data shall continue in the future. In this application the probabilities are fixed at calculations derived from the 1992-1996 period, with farms in 1992 being assigned to the clusters which were identified for 1996. Therefore it is assumed that any transition that occurred from 1992-1996 will continue to occur in the future. Calculations are based on the rate

of movement of farms between clusters in this sample period. These probability calculations are projected forward to estimate the future representivity of clusters.

Results show that the representivity of the typical dairy farming group is likely to decline while the developer and static groups are likely to increase in representivity. This seems to indicate that farms are either becoming small exiting units or are becoming larger to take advantage of economies of scale. Such polarisation is typical of the agricultural structure of developed countries, (Sandrey and Reynolds 1990).

RESULTS

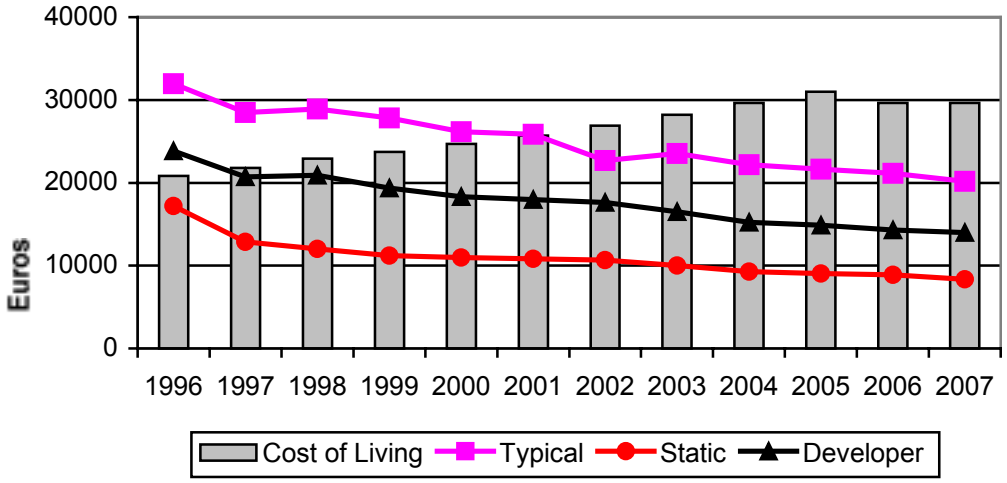
Two forms of projections are presented, the first is static and the second dynamic analyses. The static analysis assumes no farmer response to new situations. It uses a simple spread-sheet budgetary re-pricing model. It highlights the effect on farm net margin if current farming practices are continued. The dynamic analysis identifies farmers' likely response to a new situation and projects the net margin derived from the new farm plan.

Static Analysis

Figure 2 shows the results of the static analysis for the representative dairy farms. Results are expressed in real terms. If there is no farmer response to the prevailing economic climate or new agricultural policies, net margin falls considerably over the projection period. To put projected farm margins in context, the average cost of living of a rural household, as calculated by the Central Statistics Office of Ireland, is also presented. In 1996, two of the three farms earned margins above the cost of living. If there is no response, farm net margin is significantly below the average cost of living for all three farms by 2007.

Reductions in net margin are mostly due to rising costs. With future inflation projected to run at 3 per cent per annum, the cost of production increases significantly. Revenue, i.e. output value plus value of subsidies, is maintained as direct payments, agreed in Agenda 2000, largely compensate for price decreases. With revenue remaining static and costs rising, farms are subject to a price-cost squeeze. This is particularly true in relation to fixed costs. Costs such as labour, energy, machinery, and maintenance of land and buildings are all projected to increase substantially.

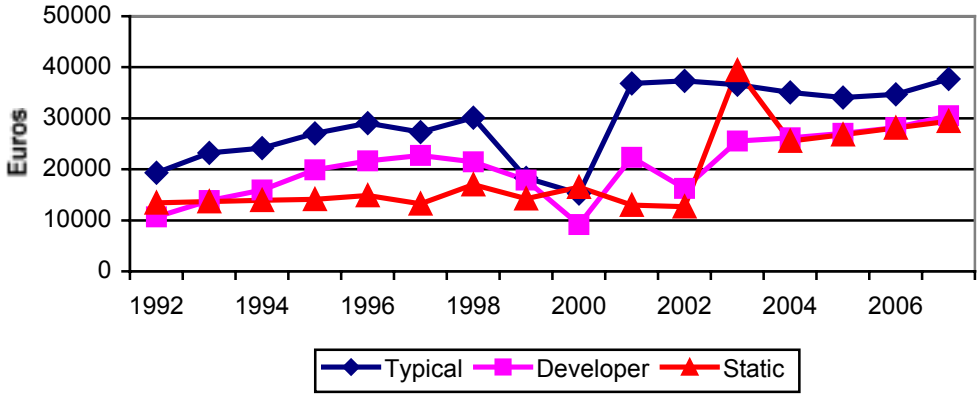
Figure 2: Real Farm Net Margin for Representative Dairy Farms: Static Analysis (No Response)



Dynamic Analysis

The previous analysis was static, as it assumed no farmer response. However, on examination of historical data, it is apparent that farmers react to external forces such as economic and policy changes. This response is usually in the form of profit optimisation. Linear programming models and historical trends have been used to project this response. These projections are outlined below. These results are in nominal terms, i.e. there is no account taken of inflation.

Figure 3: Nominal Farm Net Margin for Representative Dairy Farms: Projected Response



As evident from Figure 3, trends in farm net margin are similar for both typical and developer farms. In 1999 there is a substantial trough in margins. The reasons for this are threefold. First, cattle margins were very poor in 1999. Second, it is projected that additional heifers are reared in anticipation of increasing the dairy herd. Finally, there is investment in housing, with dry-stock housing renovated to accommodate additional dairy cows, again in anticipation of expansion.

In 2000, both the typical and developer farms avail themselves of the new quota transfer arrangements. They both purchase currently leased quota as well as additional quota from the restructuring scheme at 38c a litre. In the years 1999 and 2000 this has a negative impact on the farm net margin because of the associated investment costs. Margins do however recover following this. As both of these farms qualify as priority groups for restructuring, it is likely they would have access to additional quota.

No further expansion of quota is possible on owned resources for the typical farm. Any further expansion would not provide the sufficient return required to justify hired labour and capital investment, both of which are unaffordable in the Celtic Tiger Economy. From 1998 to 2007 this farm increases total quota farmed by 15 per cent. Consequently, farm net margin increases by 30 per cent in nominal terms, 11 per cent in real terms.

The developer farm expands further and purchases 22,500 litres in 2002. This farm has more capacity to expand within its resources than the typical one. It is projected that cattle resources will be substituted for dairying. There is an overall 35 per cent increase in quota farmed from 1996. By 2007 farm net margin is 21 per cent above its 1998 levels, in nominal terms.

Trends in farm net margin differ for the static dairy farms. In 2000 this farm does not purchase currently leased quota. Instead, the farm opts to shed livestock and qualify for the extensification scheme. In 2003, it is projected that this farming group will sell its milk quota into the restructuring pool and quit farming. The motivation for this can be attributed to a combination of factors. Milk price is projected to fall with no sign of future recovery, costs continue to escalate and finally off farm employment is persistently more profitable. Unlike the previous farms, this farm cannot fund

expansion of the dairy enterprise at 38c a litre. Without expansion, farm margins are squeezed and farm net margin is substantially below the cost of living. Figure 3 shows a farm net margin in 2003 of €40,650, this reflects funds received on sale of livestock and quota. Off-farm earnings combined with rental income are more profitable than any form of farming. Earnings achieved off farm are displayed in Figure 3 by the dashed line. As illustrated, off farm income in 2003 is €25,150, a considerable increase over previous margins earned.

DISCUSSION

This paper examines the future of Irish dairy farming in the context of a strong macroeconomy and changing agricultural policies. The policies analysed are Agenda 2000 and Irish national policy on milk quota transfer. It should be noted that there maybe further policy reform that could significantly effect Irish dairy farming, for example WTO agreements, EU enlargement and other budgetary pressures. It is a limitation of this paper that the impact of such policies is not analysed. However, it is the author's belief that these policy reforms would depress output prices and would result in further falls in Irish dairy farm incomes.

Linear programming is used to simulate how farmers are likely to respond to the changing economic and political climate. Although LP is limited by its normative nature, attempts have been made in this research to make results more positive. Results show that the future structure of Irish dairy farming will be significantly different from the current one. Faced with declining margins, not all producers will be able to afford the costs of expansion and those who cannot will exit the sector because of the poor level of income earned.

Under Agenda 2000, the nominal value of farm output is projected to remain at current levels. Strong growth and inflation rates, higher than those experienced in recent years, will result in continued increases in production costs. Farmers who do not respond to the changing economic and political climate will be subjected to a price-cost squeeze and will be operating below the projected cost of living for rural households.

Larger and more progressive farmers will be able to maintain or modestly increase incomes in real terms through expansion of milk quota. However smaller farms, with a quota of 90,000 litres or less, which have a poor historical growth record will be unable to expand milk quota at the fixed restructuring price of 30p per litre. By 2003, it is projected that such farms will sell quota into the restructuring pool and cease farming. The exit of these farmers results from a combination of push and pull factors. Diminishing margins, unaffordable expansion and rising living and production costs push farmers out of the industry. Simultaneously, the attractive sale price of quota and the lure of both higher and faster increases in off farm incomes pull farmers out of the sector. The projected high growth rate for the rest of the economy should ensure an abundance of off-farm employment opportunities. It can be concluded that some 11,000 farmers, over a quarter of all Irish dairy farmers, may find that the future of their farm is not viable.

CONCLUSIONS

This paper highlights the ill effects of inflation on farming and identifies the extent to which dairy farmers must expand production if incomes are to be maintained in real terms. The impact of inflation in terms of production costs and purchasing power of margins earned is evident. The obvious implication of this for farmers is that cost management is more important than ever before. Costs such as labour, energy and veterinary products, in particular, are due to increase more substantially and therefore are the costs that should be managed most carefully.

The underlying theme of the paper is that expansion is necessary for future survival in dairy farming. Thus farmers should, where possible and profitable, acquire additional quota. The implication for policy makers is that if they wish to maintain farm numbers then smaller farmers should be provided with the financial assistance needed to acquire quota. Without this assistance the survival of small farms is unlikely. Alternatively, perhaps policy makers should look at the re-skilling of such farmers for other occupations.

The main conclusion to be drawn from this paper is that the future of dairy farming in Ireland is unlikely to be as bright as that of other sectors of the economy. The most optimistic projections, presented in this paper, see farm net margin increasing by 30 per

cent from 1998 to 2007. Over the same time period, the unskilled construction wage is projected to increase by 48 per cent. Therefore, it is unlikely that any of these dairy farms will achieve increases in income comparable with those projected for the rest of the economy. The future will see a continued divergence between agricultural and industrial wage rates. While the booming Celtic Tiger economy may bring future affluence to many urban households the future of the Irish dairy family farm may not be as prosperous.

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BIOGRAPHICAL NOTE

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