

End Of Project Report RMIS 5138

Estimation and projection of costs and margins in crop enterprises in the Republic of Ireland

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Abstract

This project reports on the farm level crop economics research conducted in the Rural Economy Research Centre (RERC), Teagasc during the period 2003-2006. The research conducted made current estimates and one year ahead forecasts for margins in each of the major crop enterprises in the Republic of Ireland. The enterprise specific information was based on information from the Teagasc National Farm Survey (NFS), supplemented by projections of price, cost and policy information from a variety of other sources. Yield projections were based on past trends and incorporate estimates of expected variability. In addition, the distribution of profitability amongst the population of crop farms has been examined to gain further insights into the farm level situation and outlook for tillage farms based on the results from the NFS data.

These static short run estimates and projections at farm level were also complimented with dynamic projections of the impact of current and proposed policy scenarios on Irish tillage farms. This element of the research compliments the research within the centre, which analyses the impacts at farm level of various policy scenarios on beef and dairy farms (RMIS 4920). The three policy reform scenarios examined during the project included impact analyses for tillage farms on the projected economic effects of the introduction of the Luxembourg Agreement, a possible WTO agreement and the legislative proposals for reform of the Common Market Organisation for sugar. In addition, two separate special studies were also conducted, which included an ex-ante cost/benefit analysis of GM crops for Ireland and a intra-industry financial and technical performance review for the hardy nursery stock industry.

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1. Introduction

This project reports on the farm level crop economics research conducted in the Rural Economy Research Centre (RERC), Teagasc during the period 2003-2006. The research conducted made current estimates and one year ahead forecasts for margins in each of the major crop enterprises in the Republic of Ireland. The enterprise specific information was based on information from the Teagasc National Farm Survey (NFS), supplemented by projections of price, cost and policy information from a variety of other sources. Yield projections were based on past trends and incorporate estimates of expected variability. In addition, the distribution of profitability amongst the population of crop farms has been examined to gain further insights into the farm level situation and outlook for tillage farms based on the results from the NFS data. These short term estimates and projections at farm level for Irish tillage production is not only important from the point of view of producers, but also because cereals are a very important input to the livestock sector, particularly dairy, pigs and poultry.

These static short run estimates and projections at farm level were also complimented with dynamic projections of the impact of current and proposed policy scenarios on Irish tillage farms. This element of the research compliments the research within the centre, which analyses the impacts at farm level of various policy scenarios on beef and dairy farms (RMIS 4920).

The development of the farm level policy analysis research is consistent with the objectives of Teagasc: 'Teagasc research services must: (inter alia), provide a strong scientific basis for competitive, efficient and sustainable primary production' (Teagasc, 2000, p.8). Furthermore, the research objective to examine policy effects at farm level reflects a specific objective of the 'Agri-Food Economics' programme of the Rural Economy Research Centre which highlights the importance of projecting 'the impact of policy developments and changes in the economic performance of farm enterprises'.

In addition to the short term situation and outlook research and medium term projections provided for crop farms, this research project also involved two additional special studies during the period 2003-2006. The first of these special studies involved *an ex-ante prediction of the costs/benefits* that could be expected if a select group of GM crops were cultivated in Ireland. In the major GM crop growing countries (US, China, Canada etc.) economic information on GM crop cultivation is readily available. However, in Europe such information is limited due to the introduction of a de facto moratorium on the import and production of GM foods since 1998.

Though the moratorium was lifted in May 2004 it is anticipated that the commercial cultivation of GM crops in Ireland will not commence for 3-5 years (Anon, 2004). The provision of this intervening time period afforded an opportunity to assess the economic impact GM crop cultivation in Ireland.

The second of these special studies was initiated due to an increase in imports of hardy nursery stock (HNS) plant material into Ireland in recent times and a growing awareness regarding the importance of competitiveness (Maher et al., 2001). Hence, research was conducted on the current size and structure of the industry and intra industry financial and technical performance. The data on size and structure of the industry was based on the survey of the HNS industry which was carried out in 2003 and 2004 and is fourth in the recent series initiated by the Department of Agriculture and Food in 1994 (Maher *et al.*, 1999, Maher *et al.*, 2001). The data on the intra (within) industry financial and technical performance was based on the recently initiated nursery stock E-profit monitor (benchmarking) system.

2. Objectives

- To estimate and project the costs, yields and margins of the major crops in Ireland.
- To apply stochastic estimation methods to the projections of yields to give confidence intervals for the projections.
- To examine the dynamics of the Irish tillage sector at farm level due to the impact of current and proposed policy scenarios.
- To examine of the economics of Genetically Modified (GM) crops versus conventional crop systems.
- The benchmarking of Hardy Nursery Stock (HNS) producers within Ireland, to encourage improvement in competitive practices.

3. Measurement and Methods

3.1 Short term crop estimates and projections

Estimates of the current years' performance before year end and forecasts for the coming year were made for each of the main tillage crops in Ireland. The main data source used for the year end estimates was the National Farm Survey (NFS). The tillage crops for which estimates and projections were made were winter and spring wheat, barley and oats, potatoes and sugar beet. The projections for the coming year were made by adjusting the key cost and return variable estimates for the current year by informed projections.

3.2 Stochastic estimation of crop margin estimates

The stochastic approach to projecting crop margins incorporates the reality of risk. Hence, the stochastic gross margin forecasts are presented as a range of possible outcomes rather than point estimates. This method of presenting forecasts reflects the reality whereby risk is part of the decision making process in crop production. A 90% confidence interval was placed around the 'mean' point estimates to show with 90% confidence what the gross margin return for each crop was likely to be in the coming year, based on historic yield distributions. This exercise identified the upper and lower bounds of forecasted gross margins, which provided additional information to the 'mean' forecasts discussed above.

The stochastic model initially estimated probability distributions for yield, which was considered the key 'risky' variable in crop production. The probability distribution for yield was based on previous actual yields achieved over the past 10 years (based on CSO estimates) and included as an empirical distribution. Variability about the mean yield achieved over the time period was assumed as the stochastic component of the model. In this research the computer software program Simetar© developed at Texas A&M University was used for the computation of the stochastic projections.

3.3 Farm level crop policy analysis

During the time period under analysis three policy reform scenarios were specified: (i) the baseline position of no policy change versus the introduction of full decoupling as specified in the Luxembourg Agreement; (ii) the baseline position of no policy change versus the introduction of a possible WTO reform scenario, which involved among other measures, the abolition of export subsidies for agricultural products with a 50 percent cut in 2007 and a gradual phasing out in equal instalments over the next 9 years; and (iii) the baseline of no policy change versus the impact of legislative reform proposals for the Common Market Organisation (CMO) for Ireland.

3.3.1 The projected impact of the Luxembourg Agreement (LA) on Irish tillage farms (2004)

The projected impact of the LA at farm level was based on two separate datasets, the National Farm Survey (NFS) for the year 2002, and the output from the FAPRI-Ireland partnership aggregate sector model, which were used to determine the farm levels effects of the LA on Irish tillage farms. The sample of 'mainly tillage farms'^{ri} was selected from the NFS and the effect of changing prices, costs, and profitability on these farms was projected, starting in 2005 and ending in 2012.

The analysis of the effects of the policy reforms began by estimating the individual farms' decoupled payment. Following the estimation of the decoupled payment, the net margin for two

the baseline and the reform scenario was calculated for each farm, for each year from 2005 to 2012, taking into the account the change in costs, prices, and yields, as projected in the FAPRI aggregate sector models (*Binfield et al., 2003*).

3.3.2 *The projected impact of a possible WTO outcome (2006)*

The same farm level profit maximisation model as specified above for estimating the impact of the LA on Irish tillage farms was also used to project the impact of the possible WTO reform scenario. However, the existing model was updated using the latest available data from the NFS for the year 2004 and the updated baseline and scenario models from the FAPRI aggregate model (*Binfield et al., 2006*).

3.3.3 *The projected impact of reform of the common market organisation for sugar (2005)*

The economic impact of the baseline position of no policy change was compared against the projected impact of two scenarios (i) the *Commission Communication* of 14th July 2004 and (ii) the *Legislative Proposals* of 22nd July 2005, using data from the Teagasc National Farm Survey (NFS). In particular, the distributional economic impact of the proposals for the population of Irish sugar beet producers was examined to determine the ability of producers to continue in production given magnitude of the reform package.

Data from the 2003 NFS was used to determine the likely impact of the proposed reform, from which 68 individual sugar beet producers were represented. This data was then weighted based on a constructed weighting system to represent the national population of sugar beet producers (3,700 producers).

Initially, the gross margin for the baseline scenario and the two policy reform scenarios was calculated for each farm, for each year from 2005 to 2012, taking into the account the change in costs, prices, and yields, as projected in the FAPRI aggregate sector models. This analysis facilitated the determination of the net impact of the two policy reform scenarios on the gross margin of the individual farms. Following this analysis, the 'entitlement farming' option was considered, whereby the land could be maintained and variable and fixed maintenance costs taken into account. The examination of this farming option allowed the determination of the possible number of active sugar beet producers likely by 2010.

3.4 *The economics of GM crops versus conventional crops*

In order to evaluate the economic impact in Ireland of the adoption of GM technology and on the use of products derived from GMOs two separate scenarios were defined: (i) the economic implications of only allowing certified GM free (cGMF) imports of livestock feed ingredients versus the baseline position whereby it is probable that some, and possibly a large proportion, of feed ingredient imports are from genetically modified varieties of cereals and oilseed plants; and (ii) the economic implications for farm profitability of decreased feedstuff costs and output prices, ensuing from the introduction of GM crop varieties into Irish tillage crop systems, versus the baseline position of a continuation of the status quo whereby no GM crop varieties are grown in Ireland.

The impact of likely price premia differences between cGMF and non cGMF compound feed on farm business profitability in the dairy and beef sectors, in terms of margins per cow and per head were examined. The impact on representative livestock farms was derived by applying (1) the estimated feed ingredient price effects, these were obtained from a comprehensive review of the literature on price differences for GM and non-GM free feed ingredients and (2) using information on average proportions of maize and soybean ingredients in livestock feed rations, defined from consultation with industry experts. The enterprise gross margin data for the representative livestock farms were based on National Farm Survey (NFS) data for the year 2003. Three specific representative specialist dairy, beef rearing and beef finishing farms were identified: (1) 'less efficient producers' (bottom 1/3 of producers in gross margin terms); (2) 'average producers' (middle 1/3 of producers in gross margin terms), and (3) 'more efficient producers' (top 1/3 of producers in gross margin terms).

For the second scenario, to examine the economic cost benefit analysis of GM crop cultivation in Ireland, the cropping regimes of the five hypothetical crops: (i) herbicide tolerant sugar beet (GMHT), (ii) *Septoria* resistant winter wheat (GMSR), (iii) *Fusarium* resistant winter wheat (GMFR), (iv) *Rhynchosporium* resistant spring barley (GMRR), and (v) *Phytophthora infestans* resistant potato, were compared with equivalent, hypothetical GM scenarios. All figures for the conventional cropping systems were based on crop production data for Ireland and include variable and some element of fixed costs: materials (seed, fertilisers, herbicides, fungicides, insecticides, growth regulators), machinery hire (ploughing, tilling, sowing, spraying, fertiliser spreading, harvesting) and miscellaneous costs (interest @ 7% and transport), (O' Mahony, 2002; Teagasc, 2002; O' Mahony, 2003; Teagasc, 2003). The estimates for the GM cropping systems were based on a comprehensive literature review which provided ex-ante crop margin estimates. Further detail on these assumptions are available in Thorne *et al.*, (2005).

Finally, it is important to note that in each of the scenarios defined below, the estimates provided were based on a combination of computer modelling and expert opinion. Hence, as outlined by Bock *et al.*, (2002) this method of estimating the impact of the adoption of GM technologies has a strong relative value (i.e. they are useful in predicting the effect of a change in farming practices) but the absolute figures obtained have to be taken with care since the models have not yet fully been adjusted with field data.

3.5 Benchmarking of HNS producers

In late 2004 and early 2005 Teagasc advisory and research personnel initiated a nursery stock E-Profit monitor system similar to those systems which are currently available for the other sectors within agriculture: namely, dairy, beef, sheep and tillage. During a pilot programme, which received financial assistance from the IFA Skillnet programme a number of nurseries were visited and financial and technical performance gathered. The main objective of this pilot programme was to determine if the previously constructed E-profit monitor programme was suitable for the industry and whether or not meaningful results could be obtained for intra industry comparative analysis purposes. While participation rates in the initial pilot programme and subsequent uptake of the programme has been limited to date, the programme has provided participants with meaningful comparative data from which business performance can be examined.

Similar to existing E-profit monitor systems the main objectives of the programme are (i) to provide participants with a tool for measuring their individual nursery against others and (ii) to identify how individual nurseries can improve performance and grow their business.

4. Results

4.1 Short term crop estimates and projections

The latest time period for which the short term crop estimates and projections were made was 2003-2005, and trends in gross margins for the main tillage crops between these years is shown in Table 1. To ensure comparison of 'like with like' all data presented in this table include direct payments and forecasted entitlement values per hectare for cereal crops.

Table 1: Trends in gross margins (*including direct payments and forecasted entitlement values*) for the main tillage crops 2003 to 2005 (€ per hectare)

	2003¹	2004²	2005³
Winter wheat	840	922	887
Winter barley	759	702	707
Winter oats	620	566	603
Spring wheat	783	756	717
Malting barley	689	722	633
Spring feeding barley	598	638	551
Spring oats	667	576	590
Sugar beet	1260	1413	1179
Potatoes	2469	2623	3067

¹ National Farm Survey, ² Estimated, ³ Forecast

Source: Thorne (2004a)

The estimated gross margins of all major cereal crops, increased in 2004, compared to 2003, which was mainly attributed to an increase in average yields for the aforementioned crops. This increase in gross margin occurred despite a slight increase in costs and decrease in direct payments and average farm gate cereal prices. However, the 'mean' gross margin forecast for 2005 for all crops, except Spring wheat, showed the opposite trend in gross margin, as to that witnessed between 2003 and 2004. All major crops that experienced an increase in gross margin between 2003 and 2004, were forecasted to experience a decline in gross margin in 2005, over 2004 levels.

In the context of decoupled payments the role of risk in decision making becomes increasingly important. The average figures in Table 1 above are based on the assumption that average yields are achieved in 2005. However, deviations from average yields in the era of decoupled payments have the potential to impact significantly on net farm income. Hence, Table 2 below shows the probability that the net margin associated with cereal production is less than or greater than the income from the SFP per hectare, given the historic distribution of yields that has occurred over the past number of years.

Table 2 Probability estimates for net margins from cereal production versus 'entitlement farming'¹ (2005)

	Average producer			Less efficient producers (Bottom 1/3 of producers)		
	< SFP Income	€25 per hectare > than SFP income	> SFP Income	< SFP Income	€25 per hectare > than SFP income	> SFP Income
Winter wheat			100%	-	-	100%
Winter barley			100%	-	-	100%
Winter oats	15%	10%	75%	34%	9%	57%
Spring wheat			100%	-	10%	90%
Malting barley			100%	6%	11%	83%
Spring feed barley		6%	94%	46%	9%	45%
Spring oats	14%	3%	83%	73%	13%	14%

Source: Thorne (2004a)

Table 2 shows that there was a high probability that the returns from cereal production in 2005, for the average producer, would be higher than the returns from 'entitlement farming' alone. For example, the average spring barley producer who achieved an average yield of 7.5 tonnes per hectare in 2004, had a 94% probability that the returns from growing the crop in 2005 would be higher than the 'entitlement farming' option.

However, for the less efficient producers shown in table 2 there was a higher probability that the returns from 'entitlement farming' would be higher than the returns from productive farming. For example, a spring barley producer who was less efficient than the average, with yields of 5.6 tonnes per hectare in 2004, had only a 45% probability that the returns from the crop in 2005 would be higher than the 'entitlement farming' option. Furthermore, there was a 46% probability

¹ Entitlement farming is assumed to represent the farming situation whereby the land is used only to activate and draw down the SFP. No cereal crops are grown on the farm and the land is maintained in good agri - environmental condition.

that the returns from growing the crop would be lower than the 'entitlement farming' option and a 9% probability that the margin over 'entitlement farming' would be as low as €25 per hectare.

Hence, it is important to remember, especially in the context of decoupled payments, that any yield variation from the average estimates used in the above forecasts could have a significant impact on net farm income. Hence, the probability forecasts used to project the impact of yield variations used in this analysis should be considered important, especially for the less technically efficient producers. This research has shown that alternative farm profiles should be considered by the risk adverse producer who has struggled to maintain average yields in the past number of years.

4.2 *The projected impact of the Luxembourg Agreement (LA) on Irish tillage farms (2004)*

The farm level model showed that the average tillage farmer would receive the highest Single Farm Payment and highest entitlement value per hectare post decoupling, compared to other farming systems (Table 3).

Table 3: Single farm payment estimates for farm systems in 2007*

Farm Systems	Dairy	Dairy and Other	Cattle rearing	Cattle Other	Sheep	Mainly Tillage
Single farm payment	€13,199	€18,972	€10,392	€14,146	€9,765	€21,526

Source: Thorne (2004b)

*After deductions are made as outlined in the Luxembourg Agreement and full dairy compensation is paid.

The profitability effects of the LA for Irish tillage farms showed that the 'standing still' farm profile was not a viable option. This research showed that if farmers retained the same farm profile that existed pre decoupling then these farms would experience a decline in profitability, as a direct result of the introduction of the LA. In 2005 average profitability was projected to be 5% lower decreasing to 7% lower in 2012 as a result of the introduction of the LA, if and only if they remain 'standing still' (Figure 1).

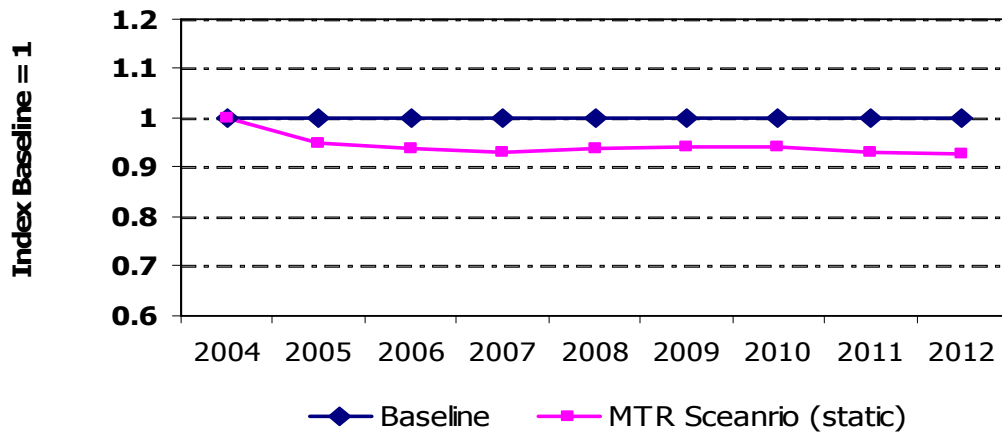


Figure 1: Projections of average tillage farm profitability (baseline versus the LA *static* scenario)

Source: Thorne (2004b)

When 'entitlement farming' (giving up production of cereals, oilseed and protein, and just farming the decoupled payments) was presented as an option for tillage farmers the net result was that farm profitability could be 6% higher than the baseline of no policy change by 2012. In 2005, 20% of tillage farmers, rising to 36% of tillage farmers in 2012, would be 'better off' if they became 'entitlement farmers' rather than continuing to produce cereal, oilseed and protein crops. However, even when some farmers opt for 'entitlement farming' there still remains 67% of tillage farmers in 2012 that will be worse off as a result of the introduction of the new policy (Figure 2).

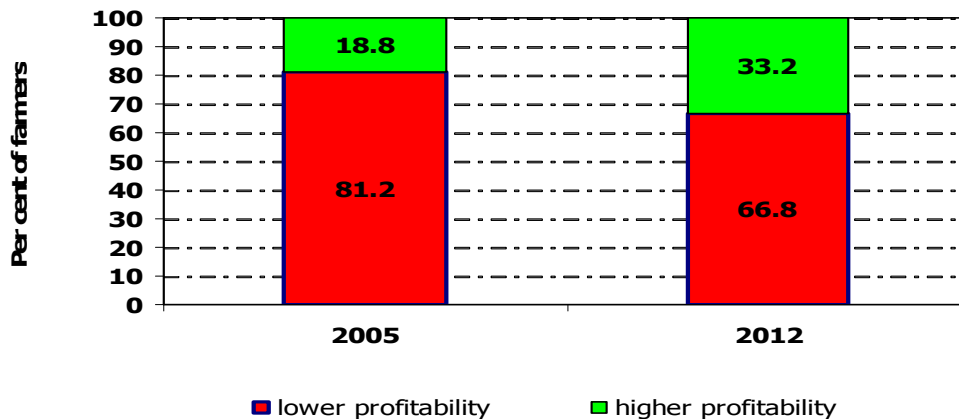


Figure 2: Profitability effects due to the LA (dynamic scenario), by percentage of farmers (2005 & 2012)

Source: Thorne (2004b)

When summer grazing and REPS farming were included as possible options for tillage farmers, in addition to 'standing still' and 'entitlement farming', the results were a lot more positive. In this case, 70 per cent of tillage farmers could increase their profitability by 2012, relative to the baseline (Figure 3).

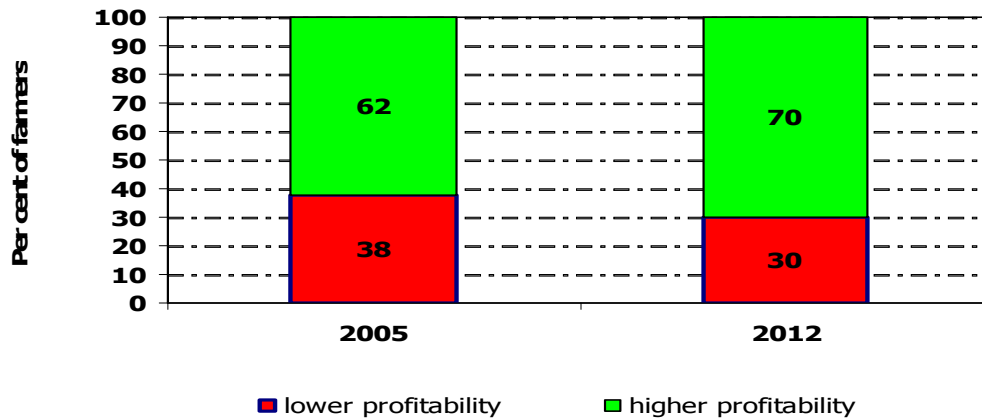


Figure 3 Profitability effects due to the LA (alternatives scenario), by percentage of farmers (2005 & 2012)

Source: Thorne (2004b)

In summary, the projected impact of the LA on Irish tillage farms showed that it appears that there were a number of options available to tillage farmers, that would increase farm profitability post decoupling. Hence, the major challenge facing tillage farms post decoupling would be the flexibility of switching between enterprises.

4.3 *The projected impact of a possible WTO outcome (2006)*

This research reviewed the current state of the farming population in Ireland using National Farm Survey data from 2004. The results showed that approximately 54 percent of tillage farms were economically viable businesses in 2004. A large number of the economically non-viable businesses may have been sustainable due to the presence of other income in the farm household. However, 27 percent of tillage farming households were identified as being economically vulnerable (Figure 4).

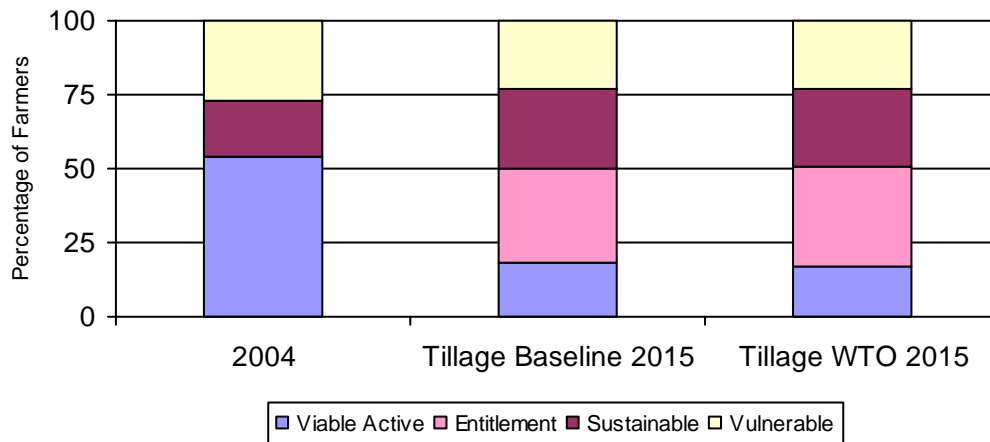


Figure 4 Composition of Tillage Farming Population – 2004 and 2015

Source: Hennessy and Thorne (2006)

The implications of a possible WTO reform for the future of farming in Ireland showed that in the tillage sector, approximately 35 percent of producers would be unable to return a positive gross margin in 2015 when export subsidies were abolished. These farmers would find it more profitable to retain their land only to claim their decoupled payments or alternatively to lease out their land if they can earn rent that exceeds their decoupled payment.

The declining returns to production on tillage farms is also projected to increase the likelihood of farmers participating in off-farm employment. In the tillage farming sector the number of farm operators employed off-farm in 2004 was 38 percent and it is projected that this will increase to 50 percent by 2015. This increase in off farm employment is projected to occur as the demography of the farming sector changes, the returns to production decline and the payments that were previously linked to production are decoupled.

It was also projected that by 2015 following a WTO reform, just 17 percent of cereal farms would be classified as economically viable businesses. This compares to 54 percent of cereal farms at present and 18 percent of cereal farmers in 2015 if there is no WTO reform, i.e. the baseline situation. Furthermore, a substantial 35 percent of tillage farmers increase their income by using their land only to claim decoupled payments. The substantial reduction in the number of viable active tillage farms can in part be attributed to the demise of the sugar beet industry in Ireland. In addition, the number of economically vulnerable farms is projected to decline over time. The demographic make up of the tillage farming population changes and a greater number of young farmers choose to supplement their farm income with off-farm employment. The number of

economically vulnerable farms is projected to decline from 27 percent at present in the tillage sector to 23 percent in the tillage sector.

The results outlined above suggest a bleak future for farming in Ireland following the policy reform, with the number of viable farms projected to decline significantly, the number of farmers unable to produce a positive market return on their land to increase as well as the number of farm households relying on income from outside the sector. The findings present a serious challenge for policy makers and for those involved in planning for the future of Irish agriculture or developing a new model of Irish agriculture that can be sustainable in an era of free trade.

4.4 *The projected impact of reform of the common market organisation for sugar (2005)*

Figure 5 shows the projected impact on farm gross margin of the alternative policy reforms. These gross margin estimates do not include the decoupled direct payment which is included in both reform proposals because these payments are decoupled from production and not deemed to have an influence on the production decision at farm level.

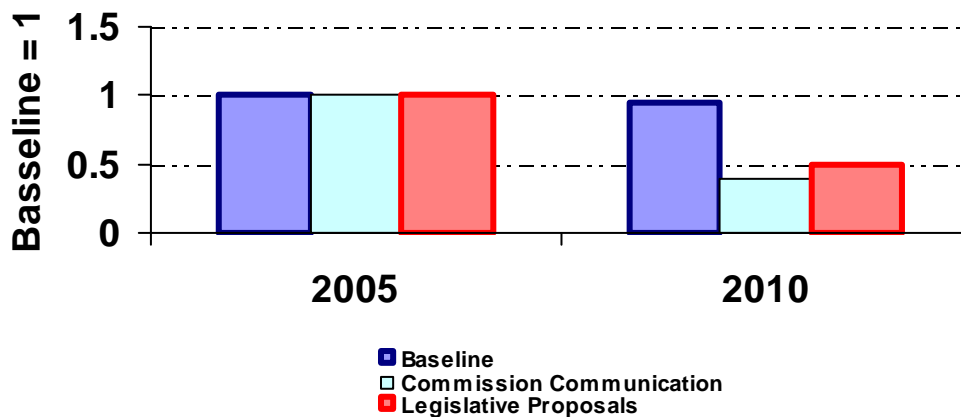


Figure 5 Effect of policy reform on farm gross margin

Source: Hennessy and Thorne (2006)

In addition to the projected impact on farm gross margin, an additional analysis was conducted to determine the likely number of producers that might continue growing sugar beet post policy reform (Figure 6).

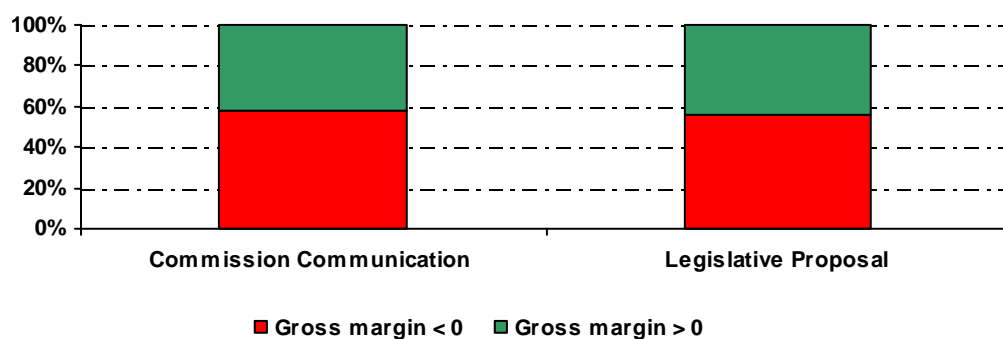


Figure 6 Projected number of sugar beet producers with positive & negative gross margins by 2010

Source: Thorne (2006)

Figure 6 shows that by 2010 over half of existing sugar beet producers would be better ceasing to produce sugar beet and claiming their decoupled direct payment and leaving their land fallow. Furthermore, this analysis does not consider alternative land uses such as winter wheat or spring barley production. Hence, it is anticipated that this figure could rise significantly if alternative uses were considered.

This analysis suggested that the proposed policy reform of the common market organisation for sugar would encourage the majority of Irish sugar beet producers to exit sugar beet production. Given that the legislative proposals for reform published in July 2005 provided for a significant reform package for sugar beet processors it was anticipated that the Irish sugar beet industry was likely to suffer from impending policy changes.

4.5 The economics of GM crops versus conventional crops

Presently, no GM crops are cultivated in Ireland. It is anticipated however that the introduction of co-existence guidelines could encourage the uptake of certain GM varieties (Flannery *et al.*, 2005). Hence, the objective of this research was to comparatively assess the costs and benefits of that uptake through the selection of hypothetical GM crops. In addition, the economic impact of a ban on GM feed materials for the livestock industry was also assessed. However, it should be noted that the imposition of a ban on the cultivation of GM crops or on the importation of GM feed is not open to any Member State, including Ireland; the GM free scenarios that are considered in the analysis can only be achieved on the basis of voluntary decisions made by the industry. The costs and benefits associated with the cultivation of these crops and the

aforementioned ban on GM livestock feed ingredients was examined on a gross margin per hectare and per head basis for representative crop, dairy and beef farms.

The economic implications of a ban on imported livestock feed material, in particular soybean and maize, that contains GM products was assessed for specialist dairy and beef farms. Ensuring livestock products that are produced using identity preserved GM-free soybean and maize ingredients in livestock feed is a potentially complex and costly procedure. Such systems already exist for a number of products, including maize and soybeans. However, it is anticipated that in the short to medium term that supplies of IP GM free sources of soybean and maize will become scarce due to an increase in global plantings of GM material. Hence, it is assumed that the net effect will be a widening of the differential between GM and non GM product prices due to (i) the cost reducing effect of the new technology and (ii) IP costs associated with GM free crops.

The uptake of GM crop technology was assessed using two synthetic scenarios: (i) Adoption MAX where 100% of crop producers were assumed to adopt the new technology and (ii) Intermediate Adoption Scenario where 30% of the more progressive crop producers were assumed to adopt the new technology. For each of these scenarios five hypothetical crops were examined: (i) herbicide tolerant sugar beet (GMHT), (ii) *Septoria* resistant winter wheat (GMSR), (iii) *Fusarium* resistant winter wheat (GMFR), (iv) *Rhynchosporium* resistant spring barley (GMRR), and (v) *Phytophthora infestans* resistant potato. The costs and benefits of the new technology were assessed for representative crop and livestock farms. Furthermore, an exploratory analysis was conducted to determine the economic feasibility of the use of GM oilseed rape for the production of biofuel. However, the completion of a production cost impact analyses for this particular crop was deemed to be extremely sensitive to baseline data, hence, the methods employed in this analyses were not considered appropriate for this purpose.

The results showed that the aggregate impact of a ban on non-cGMF livestock feed ingredients is estimated to reduce farm income earned by specialist dairy producers by between €2,8 million and €17,7 million when compared with the baseline position where no ban is imposed (the status quo ante); For specialist beef farms in aggregate between €4,8 million and €18,6 million. At farm level, the results indicated that the 'less efficient' producers would lose more from a ban on the inclusion of non-cGMF feed ingredients. This is associated with relatively higher feed costs as a percentage of output on these farms.

Furthermore, as a result of 100% adoption rates of GM crop (Adoption MAX Scenario) technologies the aggregate impact was estimated to be between €336,737 and €1,701,963 for winter wheat and between €107,474 and €545,273 for spring barley producers. At farm level, the

potential aggregate increase in profit associated with the two winter wheat GM traits was estimated at between 1.58% and 7.75% per hectare and between 0.29% and 1.48% for spring barley producers, compared to the baseline conventional crop. Furthermore, based on the assumption of 30% adoption rates of the new technology, the increase in costs for conventional producers associated with identify preservation could result in gross margin differentials of between 17.24% and 24.05% for winter wheat producers and between 14.89% and 16.25% for spring barley producers.

The aggregate impact for specialist dairy and beef producers of the introduction of the new crop technologies was estimated at between €248,000 and €445,000 for the Adoption MAX scenario and between €149,000 and €260,000 for the Intermediate Adoption scenario.

In summary, this analysis provided an assessment of the likely impact on profitability of a ban on the use and production of GM crops in Ireland, from which it is clear that the likely costs to the livestock industry in particular are significant, when a total ban on the import and cultivation of GM crops is considered. While the net benefit, for crop, livestock and dairy farms, resulting from the growing of GM cereal crops was quite minor compared to the benefits arising from the use of imported sources of GM soybean and maize, it is important not to consider these two scenarios in isolation from each other. If a ban on the presence of GM feed material is present in Ireland, it must be assumed that this ban will relate to the importation and the production within Ireland of GM crop material. Hence, the net economic benefit of the two GM free scenarios must be considered in aggregate (for cereal farms and specialist dairy and beef farms), which has been estimated with 90% confidence to be between €8,3 million and €38,9 million per annum. Further details of this research are available in Thorne *et al.*, (2005).

It is important to note that this report does not attempt to forecast changes in market prices or demand due to increased levels of GM crop technology adoption by agriculture in Ireland and/or overseas. Hence, the results of the study cannot be used to forecast either future market prices or the demand for GM and non-GM crops. Nevertheless, the methods used in evaluating the impact of the scenarios outlined have a strong relative value (i.e. it is of most use in predicting the effect of a change in farming practices), however the absolute figures obtained should be used with care since the models have not yet fully been adjusted with field and market data.

4.6 *Benchmarking of HNS producers*

The results presented below refer to the 2003 accounting year and include data on (i) gross profitability (ii) specific cost analysis (iii) production staff costs (iv) analysis of overheads and (v) net profit analysis.

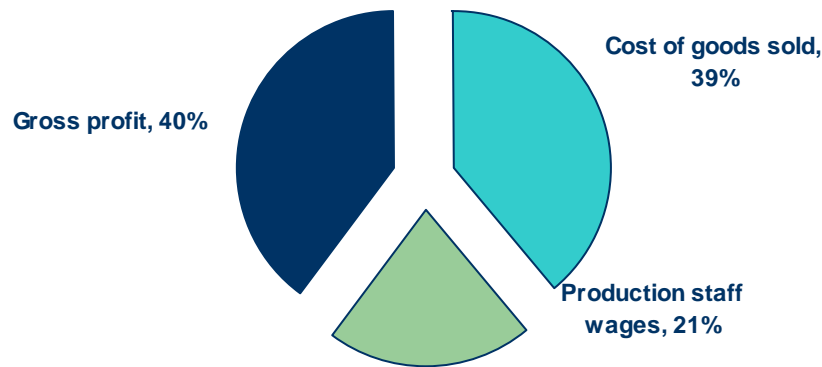


Figure 7 Average gross profitability 2003 (as a per cent of total nursery income)

Figure 7 shows that the average gross profit in 2003 for all participant nurseries in the programme was 40% of total nursery income. Costs of goods sold were 39% of total nursery income and production staff wages were 21% of total nursery income.

In order to determine net profit levels a further analysis of overhead costs was conducted. Total overheads as a percent of total nursery output was on average 29 per cent. Hence, net profit as a per cent of total output was equal to 11%. Furthermore, in order to compare nurseries of alternative sizes it was necessary to compute a return to all owned labour employed on the nursery. In addition, imputing costs for owned labour on the nursery facilitates the determination of long run competitiveness. In the short run, the use of own production factors on a family run nursery can provide flexibility in the case of low returns when the family can chose to forgo income. However, in the long run opportunity costs must be considered because the potential successors of the nursery will, in most cases, make a decision on the alternative use of own production factors, in particular their own labour input, before taking over the nursery. The results for net nursery income, taking account of the imputed charge for owned labour, are outlined in Table 3, which shows that 7% of nursery income is available to reward other owned resources, in addition to labour, or to re-invest in the business.

Table 3. Net Nursery Income Indicators (2003)

Net Nursery Income Indicator	(€ per owner)
Net profit per owner before owners' salaries	77,6823
Less notional salary for owners (€12.50 per owner working-hour)	24,512
Equals net profit /owner after notional salary for the owners	53,171
Net Profit after notional salary for owner per cent of total output	7%

While participation rates in the initial pilot programme and subsequent uptake of the programme has been limited to date, the programme has provided participants with meaningful comparative data from which business performance can be examined. Hence, it is anticipated that given improved participation rates in the future more meaningful and disaggregated comparative statistics may be provided.

5. Key Findings

- The majority of tillage farmers anticipated that the Luxembourg Agreement would not have a significant effect on their farming operations. Most farmers believed that it would not affect their overall farm income, level of cereal production, area of land rented or the enterprise mix of the farm.
- The average tillage farmer was projected to receive the highest Single Farm Payment and highest entitlement value per hectare post decoupling, compared to other farming systems as a result of decoupling.
- The 'standing still' farm profile was not considered a viable option for tillage farmers following the introduction of decoupled payments. This research showed that if farmers retained the same farm profile that existed pre decoupling then these farms would experience a decline in profitability, as a direct result of the introduction of the MTR. For 2005 average profitability was estimated to be 5% lower decreasing to 7% lower in 2012 as a result of the introduction of the decoupled payments, if and only if they remain 'standing still'.
- When 'entitlement farming' (giving up production of cereals, oilseed and protein, and just farming the decoupled payments) was presented as an option for tillage farmers it was

projected that farm profitability could be 6% higher than the baseline of no policy change by 2012. In 2005, 20% of tillage farmers, rising to 36% of tillage farmers in 2012, would be 'better off' if they became 'entitlement farmers' rather than continuing to produce cereal, oilseed and protein crops.

- In an environment where direct payments are completely decoupled from production, farmers may engage in an 'entitlement farming' system, that is retain their land only to activate the decoupled payment and not actually produce any tangible goods. This research has examined the effect of production risk on the economic trade off between 'entitlement farming' and conventional farming. A stochastic budgeting modeling approach was developed to measure the probability that the returns to the 'entitlement farming' system could exceed the profit emanating from a conventional farming system given production risk. The results showed that for the less efficient representative farm, that there was a very low probability that profits from conventional farming systems would be higher than the 'entitlement farming' option.
- This research projected that by 2015 following a WTO reform, just 17 percent of cereal farms would be classified as economically viable businesses. This compares to 54 percent of cereal farms in 2004 and 18 percent of cereal farmers in 2015 if there is no WTO reform, i.e. the baseline situation. Furthermore, a substantial 35 percent of tillage farmers increase their income by using their land only to claim decoupled payments. In addition, the number of economically vulnerable farms is projected to decline over time. The demographic make up of the tillage farming population changes and a greater number of young farmers choose to supplement their farm income with off-farm employment. The number of economically vulnerable farms is projected to decline from 27 percent in 2004 in the cereals sector to 23 percent in the tillage sector.
- Following a projected impact assessment of the net economic impact of the legislative proposals for reform for the sugar sector at farm level in Ireland in 2005, it was concluded that by 2010 over half of existing sugar beet producers (in 2004) would be better ceasing to produce sugar beet and claiming their decoupled direct payment and leaving their land fallow. Hence, it is anticipated that this analysis suggested that the proposed policy reform of the common market organisation for sugar would encourage the majority of Irish sugar beet producers to exit sugar beet production. Given that the legislative proposals for reform published in July 2005 also provided for a significant

reform package for sugar beet processors it was anticipated that the Irish sugar beet industry was likely to suffer from impending policy changes.

- Following an ex-ante assessment of the likely impact on profitability of a ban on the use and production of GM crops in Ireland, it is clear that the likely costs to the livestock industry in particular are significant, when a total ban on the import and cultivation of GM crops is considered. While the net benefit, for crop, livestock and dairy farms, resulting from the growing of GM cereal crops was quite minor compared to the benefits arising from the use of imported sources of GM soybean and maize, it was considered important not to consider these two scenarios in isolation from each other. If a ban on the presence of GM feed material is present in Ireland, it must be assumed that this ban will relate to the importation and the production within Ireland of GM crop material. Hence, the net economic benefit of the two GM free scenarios must be considered in aggregate (for cereal farms and specialist dairy and beef farms), which was estimated with 90% confidence to be between €8,3 million and €38,9 million per annum.

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