

Friday November 25th – AESI Young Researcher Seminar 2011

09.30	Introduction and Tea/Coffee	
	First Years (10 min presentation + 5 min questions)	Chair: David Stead
9.45	Young farmer innovation practices for agricultural and rural development.	Jessica McKillop
10.00	Promoting innovation in Irish food processing firms – exploring the role of intermediaries in the innovation networks.	Beste Yildiz
	Second Years plus (15 min presentation + 5 min questions)	Chair: Sinéad McCarthy
10.15	Healthy food choices: the role of front of pack nutritional labelling format.	Hannah Brown
10.35	Market segmentation using theory-driven predictive methods A strategy for targeting the health segment.	Paul Naughton
10.55	Intra-household calorific food choices: incorporating latent attitudes in the decision-making structure.	Vikki O'Neill
11.15	Tea/Coffee Break	
		Chair: Trevor Donnellan
11.40	Innovation performance of Ireland's dairy product exports.	Christina Ryan
12.00	An analysis of the factors associated with technical and scale efficiency of Irish dairy farms.	Eoin Kelly
12.20	Modelling the impact of changes in regional and national milk supply on the Irish dairy processing sector.	Carrie Quinlan
12.40	Simulation model of Irish dairy calf to beef systems.	Austen Ashfield
13.00	Lunch	
		Chair: Bill Brown
14.00	Electricity prices and generator behaviour in gross pool electricity markets.	Amy O'Mahoney
14.20	Measuring the marginal abatement cost of reducing nitrogen pollution in agriculture.	Aksana Chyzheuskaya
14.40	Spatial modelling of GHG emissions: assisting local government/agencies in the effective implementation of Irish climate change policy.	Eoin Grealis
15.00	Soil testing on Irish farms.	Edel Kelly
15.20	Judges' Deliberations (Wilfrid Legg & Larry Harte) Tea/Coffee & Presentation of Prizes	
15.45	Close	

Jessica McKillop (1st year PhD Candidate)

Supervisors Dr. Kevin Heanue (Teagasc) & Dr. Jim Kinsella (UCD)

Title: Young farmer innovation practices for agricultural and rural development

Research questions

1. What kind of innovation is taking place among the young farming community in Ireland?
2. What are the significant factors which determine young farmer involvement in innovation practices?
3. To what extent is the generation and exchange of knowledge as well as its application/s by young farmers influenced by social networks?
4. How useful is the innovation systems framework for understanding young farmer innovation?

Motivation for the work

Food security will be one of this century's key global challenges. Current trends in population, food demand and climate change could lead to a global crisis in the coming decades unless action is taken now. The world population will increase in the coming decades (approximately 9 billion people by 2050) and an absolute demand for food will rise. The demand for agricultural and food products caused by such a rising population will be heightened in the next half-century. Climate change is also going to have an impact on food and agricultural production. Rising temperatures, different rainfall patterns and more frequent disasters will affect crop and livestock production etc. The need to overcome problems associated with climate change will challenge agricultural production which depends on inputs from fossil fuels and therefore contribute to increased greenhouse gas (GHG) emissions (Royal Society: 2009).

The Food Harvest Report 2020 outlines target levels of growth for each sector of the agricultural economy. For example, the dairy sector is expected to increase its milk production by 50% and the beef sector is to increase its output value in similar terms. The abolition of milk quotas in 2015 should facilitate such expansion for the dairy sector. Although full time farming income increased by 75% from 2009 to 2010 according to the NFS (2010), this increase only restored income lost over the previous years. Finally, the numbers of farmers with an off-farm job have declined due to the lack of opportunities in the current economy and, therefore, there is an increased reliance by farmers on their farming activity as a main source of income. These factors combined ensure that agricultural development must be at forefront of future planning to ensure a sustainable livelihood for all involved. In particular young farmers are important for the future of farming in order to ensure agriculture is productive and can compete in world markets whilst at the same time remaining sustainable and giving young farmers an income. A recent survey conducted by Macra ne Feirme (2011) highlights that amongst their members, there exists a desire to expand and increase output. Eighty six percent of young dairy farmers and 75% of young beef farmers intend to expand their business. The results are broadly similar across other farming enterprises.

Methodology

While the innovation systems (IS) approach is the main framework for this study, the method of social network analysis may be a useful tool to incorporate into the research. Social network analysis (SNA) is a beneficial tool for mapping innovation systems because of its analytical focus on relationships and interactions between people and groups and its ability to capture knowledge flows and other attributes within such interactions (Spielman et. al.: 2011). It is recognised that networks play a crucial role in promoting the development of innovations within and across firms as well as playing a key role in the diffusion of innovations within and across sectors (Pittaway et.

al.: 2004). Therefore, it is proposed that the IS approach along with SNA will be compatible as methods.

Data collection will include surveys, case studies and semi-structured interviews. The focus of this research will be on dairy and beef farming systems and so case studies will include dairy and beef farmers from two distinct regions in the country. Locations for the case studies will be selected after the quantitative data has been assessed along with analysis NFS data. Case studies will allow for comparative research across different locations in the country and by farming system. Semi-structured interviews will be undertaken, to ensure consistency across organisations, with representatives from organisations such as Teagasc, Macra ne Feirme, IFA, Department of Agriculture, Fisheries and Food as well as representatives from local rural development groups.

Analysis/key findings

To date, my research has focused on two main issues; defining young farmers and defining innovation. My presentation will focus on the results of a literature review of these issues. Currently, the study proposes to define young farmers as those between the ages 18-35 as this is the main regulatory definition used in terms of applying for schemes, grants etc and is used by the Department of Agriculture, Fisheries and Food. Whilst there are other ways of defining young farmers i.e. in terms of length of time farming i.e. experience, length of time farming based on a proxy such as highest educational achievement in agriculture or when a farmer bought or inherited land for farming use, it is felt that the definition of 18-35 is appropriate for this study.

Innovation is defined in numerous ways throughout the literature. Schumpeter's defined innovation as "new combinations of existing resources" (Fagerberg: 2005:6) while Schmookler (1966) argued that the distinction between 'product technology' and 'production technology' is critical for our understanding of innovation (cited in Fagerberg: 2005:7). The former refers to knowledge about how to create or improve products and the latter about how to produce them. Leeuwis (2004) defines "innovation as a 'new way of doing things' or 'even doing new things' but it can only be considered an innovation if it actually works in practice" (p12).

The definition of innovation used in this research is one which has emerged from the innovation systems literature. The innovation systems approach refers to innovation as a more "systematic, interactive and evolutionary term whereby networks of organisations, together with the institutions and policies that affect their innovative behaviour and performance, bring new products, new processes and new forms of organisation into economic use" (Hall: 2006:7). It focuses on all the actors and their interaction in the innovation process. It goes beyond the creation of knowledge and is not purely about discovery and imagination but rather innovation is seen in a social and economic sense (World Bank: 2006).

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Promoting Innovation in Irish Food Processing Firms – Exploring the Role of Intermediaries in the Innovation Networks

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It is well recognised that innovation is essential for competitiveness and sustainability (Batt and Purchase, 2004; Cantner and Graf, 2006; Hoang and Antoncic, 2003; Yusuf, 2008). However, business innovation is increasingly dependent not only on building internal capabilities within firms, but also on developing appropriate external relationships, which can be achieved through networks. In essence, situating in a network can help firms to access external resources and overcome internal constraints, as well as enabling survival and growth (Henchion and Sorenson, 2011; Lechner et al., 2006). These network benefits are especially essential in periods of rapid and uncertain economic and technological change, as currently exist in the agri-food sector in Ireland (Das and Teng, 2000; Hagedoorn, 2002; Acs et al., 1996).

The main issue that is driving this research is as follows: The agri-food industry in Ireland, which accounts for 8% of GDP, is characterised by low levels of innovation and high new product failure rates. (Department of Agriculture, Fisheries and Food, 2009 & 2011). Part of the explanation for this is that the sector is dominated by small and medium sized enterprises (SMEs), which are less likely than larger firms to engage in inter-firm cooperation for innovation (Roper and Hewitt-Dundas, 2005). The reasons proposed for this include a greater inability to identify appropriate partners and a sub-optimal knowledge base with which to absorb external knowledge (Mowery et al., 1996; Lane et al., 2001).

In overcoming the problems faced by SMEs in engaging and benefiting from networks, attention has increasingly focused on 'intermediary' organisations. (Howells, 2006; Yusuf, 2008). Intermediaries may be public bodies such as public enterprises, university departments, research councils, etc. or private bodies such as sector bodies, independent consultants, support agencies, etc. Their roles are varied but can be classified as either supporting and mediating knowledge and technology transfers within a network which can be named as innovation support roles, or they may facilitate network activities such as governance, regulation of network actors' behaviours and legal and negotiation functions, described as network facilitation roles.

This research project is concerned with the agri-food innovation system in Ireland, in identifying ways in which effective networking between organisations can be strengthened. Specifically, the research seeks to explore the evolving role of intermediaries and to observe the effect of their presence and the roles they fulfil in a network. It will do so by profiling the agri-food innovation sector in Ireland and exploring how best intermediary organisations can help firms overcome barriers to networking at different stages of the innovation process.

The proposed research methodology is as follows:

- (1) Literature review of the nature and role of intermediary organisations in innovation networks and the application of this in the Irish agri-food sector
- (2) Qualitative and quantitative data collection. Qualitative data collection comprises questionnaires with Irish food companies to examine their participation in innovation networks and their engagement with intermediary organisations. Quantitative data

collection consists of in depth interviews with food companies and intermediaries to explore the knowledge transfer process throughout the innovation value chain and how this process can be maximised to promote increased rates of innovation and new product success.

- (3) Data analysis, write-up of findings, critique of the literature in line with findings and conclusions/implications chapter.

Keywords: intermediaries, innovation, networks, Irish food industry, SMEs

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Hannah Brown, PhD student

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Research title/question

Healthy food choices: the role of front of pack nutritional labelling format.

Motivation for the work

Increasing levels of overweight and obesity have signalled a need for population dietary change in many developed societies. Food choice is a fundamental factor in weight control and one such tool used as a preventative measure to assist consumers in making healthy food choice decisions is front of pack (FOP) nutritional food labelling. This paper explores the influence of FOP nutritional food labelling format on consumer food choices.

Methodology

We examine the effects of FOP label format from data elicited using discrete choice experiment methodology. A specially designed questionnaire was developed and the data collected via face-to-face interview by professional interviewers.

The discrete choice experiment consisted of a panel of sixteen choice sets per respondent. Each choice set contained two experimentally designed alternatives labelled Food Basket A and Food Basket B and the respondent's status quo labelled your current food basket. Each alternative was described in terms of its nutritional attributes, common to FOP labels; fat, saturated fat, salt and sugar, as well as a price attribute. The survey also collected information from each respondent on attitudes to food and nutrition, socio-economic and demographic characteristics.

Using a multinomial logit model we explore differences in scale and respondent willingness to pay for healthier food testing for significant effects between formats which require differing levels of cognitive effort.

Analysis

Results indicate that stated preferences vary significantly between the formats respondents were faced with. This is evidence that even with the same information, preference discrepancies will occur, due to an increased cognitive burden on respondents. This has huge implications for food labeling policy.

Key findings

FOP labelling format appears to have an influence on consumer's ability to make healthier food choices. A consistent approach to FOP labelling may result in less consumer confusion, increased FOP label use and subsequent population health gains. These findings offer an independent evaluation and contribute to the significant debate on front of pack food labeling as to which is the most appropriate and leads to the healthiest food choices.

PhD Supervisors: Dr Danny Campbell, Professor George Hutchinson, Dr Alberto Longo

Market segmentation using theory-driven predictive methods: A strategy for targeting the health segment

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According to the Food Harvest 2020 report, the Irish food and drink industry must develop strategies to target mature markets, such as Ireland the US and the EU. These markets are characterised by consumers who increasingly seek out and pay a premium for products with health attributes. Healthy eating is often regarded as self-directed health behaviour given that individuals can take responsibility for their own wellbeing. In achieving a healthy, balanced, diet people often need to make healthy dietary changes. The first step towards dietary change is to form good intentions. However, research shows that good intentions alone, time and again, do not lead to good behaviour. Therefore, with regards to healthy eating, it is important to identify post-intentional factors that facilitate the transition of good intentions into good behaviour. Segmenting a population based on post-intentional factors should provide new consumer insights that may prove beneficial for targeting consumers motivated to eat a healthier diet. This paper reports the study of a representative sample of Irish adults (n = 509) regarding consumption of confectionery foods and healthy dietary change. The target behaviour was selected in the context of industry trends which point to a continued focus on obesity and health along with initiatives to reduce sugar in products without affecting taste. The objective of the research was to compare predictive segmentation models to determine the most effective methods for targeting different cohorts of consumers with healthier foods. Four predictive segmentation models were estimated using logistic regression analysis. The segments in each model were profiled using descriptive statistics and independent sample t-tests. The variables that influenced healthy dietary change differed across the models. In the population model healthy dietary change was significantly associated with dietary control, planning behaviour, monitoring behaviour, and perceived need. The strength and significance of these variables varied across the demographic segments in model 2, the behavioural segments in model 3, and the post-hoc segments in model 4. Segment profiling showed discernible differences between men and women as well as younger and older adults. These findings suggest that effective marketing strategies targeted at the health segment should be underpinned by initiatives that facilitate dietary planning, dietary monitoring and dietary control.

Keywords

Healthy eating, Consumer behaviour, Market segmentation, Sugar consumption

Intra-household calorific food choices: incorporating latent attitudes in the decision-making structure

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*(Financial support provided by the Institute for a Sustainable World, Queen's University Belfast)

Abstract

Purpose:

The research makes use of stated choice data to explore factors associated with household calorific food choices by incorporating insight into decision-making in multi-person households.

Methods:

The field of choice modelling has evolved over recent years, with numerous developments that aim to realign modelled behaviour with real world behaviour. This research is concerned with two such developments: (i) the incorporation of latent attitudes, and, (ii) the recognition that not all real life decisions are made by a single person, but in consultation with other agents.

Studies that scrutinise 'household' preferences often elicit each member's preferences both individually and as a group. The individual preferences can be weighted, according to some predetermined rule, in order to gain insight into the joint decision-making process. More often this rule will incorporate some socio-economic variables, which provides a basis for assigning each member with a weight (often referred to as a 'bargaining coefficient') according to their 'status' within the household. The hypothesis put forward in this research is that, analogous to individual choice processes, joint decisions are driven in part by latent (i.e., unobserved) attitudes. In this research a series of attitudinal questions are asked to the household decision-makers which are aimed at establishing the household decision-making structure for each sampled household. There are likely to be at least three subgroups of household decision-making structures: (i) households with a dominant decision-maker, or dictator (akin to the unitary model), (ii) households where the dominance oscillates in accordance with the household member who maintains the strongest attitude for the specific decision, and, (iii) households where compromises between the household members are made for all decisions.

Results:

An empirical dataset, obtained from a random sample of 324 Northern Ireland households, was collected to elicit intra-household trade-offs between foods described using different levels of calories, cooking time (convenience), cost and type. Results indicate that latent variables are important predictors for explaining the household decision-making structure and that they can help to identify the dominant decision-maker relating to household food choices. As a consequence, we find that the inclusion of this information reduces the bias often associated unitary model assumptions.

Conclusions:

In conclusion, incorporating the latent attitudes and choices made by different members of the household is shown to add additional insights into household decision-making.

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Innovation Performance of Ireland's Dairy Product Exports

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This paper reports on the relative performance of Irish dairy products on global markets. Eighty five percent of Irish dairy produce is exported (Department of Agriculture, Fishery and Food, 2010a). In 2010, dairy product exports were valued at €2.3bn, accounting for 29% of all agri-food exports (Department of Agriculture Fisheries and Food, 2011). Irish exports go to over 200 destinations worldwide. Presently, the market outlook for the sector is positive due to the expected rise in global demand for dairy products and increases in Irish milk supplies with the abolition of EU dairy quotas in 2015 (Department of Agriculture Fisheries and Food, 2010b). A focus on innovation in dairy products is key to delivering on these opportunities. However, engaging in innovation, by itself, may not be enough to increase or sustain market position if the rate of innovation is lower than competitors. The process of how fast a sector is innovating relative to its competitors is referred to as upgrading. This paper analyses the upgrading performance of three categories of Irish dairy products –butter, cheese and infant milk powder - using international trade data.

The overarching aim of my research is to provide insight into the innovation capacity of a dairy value chain using an innovation systems perspective. The analysis in this paper provides a rationale for choosing a particular dairy value chain based on a comparison of three value chain's relative innovation performance in global markets. It will also help focus the innovation system analysis and triangulate future information received. As the primary task of my research is to understand the underlying conditions necessary to promote innovation, measuring the outcome of innovation processes is important. This paper identifies innovation performance of each product type by means of four possible outcomes – failed product upgrading, product upgrading, product and process downgrading and process competition.

The methodology used is based on the framework developed in Kaplinsky and Readman (2005). In that paper, a schema for assessing product and process upgrading and downgrading is developed by combining import unit price and market share measures to devise a metric of upgrading. The analysis looks at changes over time and employs the highest level of disaggregation of product classification available on global trade statistics. This study of dairy product value chains is confined to the time period 2000 and 2010 and uses Eurostat COMEXT and United Nations COMTRADE databases.

Ireland's strongest performing export dairy categories in terms of value in 2010 were butter, cheese and food preparations for infant use. Their combined value accounted for 78% of total dairy produce traded on global markets. Applying the metric of upgrading to each of the three product categories the results conclude that there are good and bad innovation performers across the categories. Ireland's most valuable dairy export, food preparations for infant use has experienced failed product upgrading in two of its largest markets, Asia and Europe between 2000 and 2010. This occurs when producers fail to offset rising unit prices by attractive products and thus lose market share. Various butter and cheese product categories record different

upgrading performance. For example, cheddar (not grated, powdered or for processing), Ireland's most valuable cheese export experienced process competitiveness. Cheddar which gained market share achieved so by reducing unit price. It is unclear whether this is a consequence of process innovation, falling input costs or a decline in producer incomes.

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An analysis of the factors associated with technical and scale efficiency of Irish dairy farms

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Abstract

The objectives of this study were firstly to estimate the levels of technical and scale efficiency for a sample of pasture based Irish dairy producers. Secondly, to determine the optimum scale of the sample including the identification of factors that contributed to having optimum scale. Thirdly, to determine whether technical and scale efficiency changed with differing levels of farm size, intensification and specialisation. Efficiency scores were calculated using Data Envelopment Analysis (DEA). Technical efficiency was on average 0.757 under constant returns to scale (CRS), 0.799 under variable returns to scale (VRS) and scale efficiency was estimated at 0.951. The optimum scale on Irish dairy farms was found to be 80 cows farming 41 hectares of land. Twelve per cent of the sample was operating at optimum scale (CRS). Fifty six percent of the sample was operating below optimum scale and 32% of the sample was operating above optimum scale. Overall optimum scale was associated with production systems operating with larger land area, with reduced proportion of rented land, increased amounts of hired labour, a higher quantity of quota and achieving a longer grazing season. It was also shown that increasing farm size, intensification and dairy specialisation increases technical and scale efficiency at farm level.

Keywords: scale efficiency, data envelopment analysis, dairy systems, Ireland

Modelling the Impact of changes in Regional and National Milk Supply on the Irish Dairy Processing Sector

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The support received through the Walsh Fellowship from Teagasc and the Department of Agriculture, Fisheries and Food Stimulus fund for this research is gratefully acknowledged.

Key words: Milk Quota Abolition, Processing Costs, Milk Transport Costs, Industry Organisation

Abstract

In the European Union under the Common Agricultural Policy (CAP) milk production was restricted by milk quotas since 1984. However, due to changes in the Common Agricultural Policy (CAP), milk quotas will be abolished by 2015. Therefore, the European Union dairy sector will soon face an opportunity, for the first time in a generation, to expand. A number of studies have shown that milk production in Ireland will increase significantly post quotas (Lips and Reider 2005, Donnellan and Hennessey 2007, Department of Agriculture, Fisheries and Food 2010).

Expansion in national milk output will present major new challenges for the Irish dairy sector. The potential for growth at farm level has implications for the processing sector. At present current processing facilities nationally are nearly at full capacity at peak supply. An increase in output with the current grass based system of production will increase the requirement for additional transport and processing facilities.

Background

The abolition of milk quotas throughout Europe in 2015 presents Ireland with a huge opportunity to expand the national milk output in Ireland. Lips and Reider (2005) showed that the potential for increased milk production post milk quotas was comparatively greater in Ireland (38.6%) relative to the average of all EU member states. Donnellan and Hennessey (2007) also revealed that Ireland had capacity to increase milk supply by 20% using existing resources on dairy farms. A recently published Irish Department of Agriculture report (Department of Agriculture and Food) (DAFF). The DAFF "Food Harvest 2020" report forecasted a 50% increase in milk production by 2020 (DAFF, 2010).

Many reported conducted on behalf of the Irish dairy industry (Promar and Prospectus 2009 and Bord Bia 2010) have commented that the Irish dairy industry structure is fragmented and outdated. They have recommended that key players in the industry must adopt a collaborative and integrated approach to processing additional milk supply post milk quota abolition. This would entail dairy companies co-operating when building new sites or expanding existing sites that will process the additional milk supply.

Objective and Research Question

The specific objectives of this study were firstly, to project the national and regional supply of milk in 2020 and to compare this with the current milk processing capacity. Secondly, to formulate expansion strategies for the Irish dairy sector as a whole post milk quota abolition.

Methodology

Firstly, FAPRI-Ireland farm level model was used to estimate the regional increases in milk production post quota abolition. Secondly, a milk transport simulation model was developed to facilitate the investigation of the effect of alternative industry development scenarios on milk transport costs. Thirdly, processing cost curves for butter, cheese and powder were estimated. Finally, a mixed integer model was used to identify an optimum least cost configuration for Irish dairying post milk quota abolition.

Results and Conclusions

The analysis evaluated expansion levels at a number of different milk prices and projected an increase of 45% by 2020 at a milk price of 28c/l, with the vast majority of this expansion in the south of the Country.

Based on current processing capacity nationally, there would be a requirement to construct additional processing capacity to process the milk at peak. The milk transport model was used to identify the optimal locations for expansion of existing facilities as well as building new Greenfield milk processing facilities (with 29 different locations evaluated). When the additional milk supply in 2020 was routed to 1 site currently in operation, Mitchelstown was found to be the site with the lowest milk transport costs which equated to 1.01 cent/litre with all existing milk routed to its existing original milk plants. When two existing sites were expanded instead of one, the two optimum expanded sites became Mitchelstown and Macroom with transport costs of 0.97 cent/litre. When three sites were expanded the three optimum expanded sites became Mitchelstown, Macroom and Ballyragget with transport costs of 0.94 cent/litre.

In the study Glanmire was found to be the least cost Greenfield location with national transport costs of 1.01 cent per litre with all existing milk routed to its existing original milk plants. Other Greenfield sites examined included Dungarvan, Croom, Horse and Jockey and Belview Port with transport costs of 1.03cent/litre, 1.04 cent/litre, 1.07 cent/litre and 1.10cent/litre respectively.

The next phase of this analysis is integrating the effect of plant scale and operating costs with milk transport cost. It is hoped that provisional results will be available on plant scale for the conference.

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Simulation model of Irish dairy calf to beef systems

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Introduction/ Motivation

The Irish beef sector is an important contributor to the Irish agri-economy (Riordan, 2008) with beef exports accounting for 19% of total agri-food exports in 2010 (Bord Bia, 2011). Despite its importance to the Irish economy, the profitability of Irish beef farms remains low with an average net margin for non-breeding cattle farms in 2010 of €220 ha⁻¹ (Hennessy et al., 2011). Production systems are heavily influenced by market and agricultural policy, however, improvements in production efficiency, which can be managed by the farmer, has been shown to have a major influence on profitability (Crosson et al., 2006). Mathematical models have been used by many authors for investigating agricultural systems (Tess and Kolstad, 2000; Gradiz et al., 2007). However, there is a paucity of whole farm models on dairy calf-to-beef production systems which can be used to determine the effects of policy, market and technical changes on the profitability of such systems.

Research question

The objectives of this study are to:

1. Develop a model of dairy calf-to-beef production systems that incorporates the main breed categories and systems of production found on Irish farms,
2. Apply the model to investigate key technical and financial (carcass weight/ha, gross margin/ha and net margin/ha) aspects of these systems, and
3. Use this model to investigate market and policy scenarios, identify profitability ranges, improve existing systems and determine the potential of new systems.

Furthermore, this study will lead to greater understanding of dairy calf-to-beef production systems and provide economic data to justify any changes to current systems that is required.

Methodology

The Grange Dairy Beef Systems Model (GDBSM) is a whole-farm systems, static, single-year deterministic simulation model. Production systems modelled are based on three breed groups which represent progeny of Holstein/Friesian dairy cows bred to Belgian Blue (BB), Aberdeen Angus (AA) and Holstein/Friesian (FR) sires. The model can simulate three genders, bull, steer and heifer, and a range of finishing ages from 15 to 30 months of age depending on breed and gender. Dietary components consist of grazed grass, grass silage and concentrates with feed budgets modelled on a monthly basis to allow for the seasonal variation in animal diets throughout the year. The model consists of four sub-models; farm system, animal nutrition, feed supply and economics.

Analysis and results

For this study the model was used to simulate three breeds (BB, FR and AA) finished as steers indoors at 24 months of age or outdoors at 20 months of age for AA animals and 28 months of age for BB and FR animals. A 10% change in beef, fertiliser and concentrate price was also considered to determine their effects on profitability. The most profitable system was slaughtering BB animals at 28 months of age (Table 2). Slaughtering at 28 months of age was more profitable than slaughtering at 24 months of age for BB and FR animals (gross margin increased by 31% and 21% respectively). A 10 % change in beef, concentrate and fertiliser price caused net margin per hectare to change by an average of €198, €37 and €10 respectively.

Conclusion

It has been shown that GDBSM can be used to model dairy calf-to-beef production systems and sensitivity of these systems to price changes. The most profitable systems were BB animals and finishing outdoors. Beef price had the largest effect on net margin. However, net margin still remained low at a maximum of €11,952 for BB steers slaughtered at 28 months of age.

Table 1. Physical results of scenarios investigated using Grange Dairy Beef Systems Model

Scenario	AA ¹		FR ²		BB ³	
Age slaughter (months)	20	24	24	28	24	28
Area farmed (ha)	50.0	50.0	50.0	50.0	50.0	50.0
Grazing area (ha)	36.6	18.5	18.4	23.5	16.8	20.4
Silage harvest area (ha) ⁴	13.3	31.5	31.6	26.5	33.2	29.5
Grazed grass consumed per animal (kg DM)	2202.9	2301.2	2364.6	3819.1	2295.2	3475.0
Grass silage consumed per animal (kg DM)	431.9	1386.3	1390.6	1479.3	1462.0	1653.3
Concentrates fed per animal (kg)	386.6	695.5	792.4	413.0	753.2	334.7
Inorganic N applied (kg N ha ⁻¹)	79.1	86.1	88.9	107.9	89.8	99.9
Organic N applied (kg N ha ⁻¹)	169.6	169.5	169.7	169.7	169.5	169.7
Number purchased (head)	149.2	110.3	110.5	87.5	110.3	88.4
Number finished (head)	140.0	102.8	103.0	81.0	102.8	81.0
Liveweight output (kg ha ⁻¹)	1368.9	1230.0	1231.7	1054.1	1290.2	1093.0
Carcass output (kg head ⁻¹)	269	323	322	358	352	387
Carcass output (kg ha ⁻¹)	751.8	664.0	662.3	579.9	723.6	626.7

¹AA = Aberdeen Angus; ²FR = Holstein/Friesian; ³BB = Belgium Blue; ⁴Includes aftermath grazing.

Table 2. Financial results of scenarios investigated using Grange Dairy Beef Systems Model

Scenario	AA ¹		FR ²		BB ³	
Age slaughter (months)	20	24	24	28	24	28
Gross output (€'000/farm)	74.9	78.7	86.0	78.0	91.0	81.4
Variable Costs (€'000/farm)	44.9	53.2	56.6	39.4	55.8	38.8
Gross margin (€'000/farm)	30.0	25.5	29.4	38.6	35.2	42.6
Fixed costs (€'000/farm)	31.8	30.5	29.9	30.0	30.5	30.6
Net margin (€'000/farm)	-1.8	-5.0	-0.5	8.6	4.6	12.0
Sensitivity (impact on net margin per farm) ⁴						
Beef price (+/- 10%)	10.3	9.9	9.7	8.6	11.2	9.8
Fertiliser price (+/- 10%)	0.4	0.4	0.4	0.6	0.4	0.6
Concentrate price (+/- 10%)	1.7	2.3	2.7	1.1	2.5	1.0

¹AA = Aberdeen Angus; ²FR = Holstein/Friesian; ³BB = Belgium Blue; ⁴base beef price (R3 steer) €3.05 kg⁻¹; base fertiliser price: CAN €253 t⁻¹, Urea €332 t⁻¹, 0-10-20 grazing €406 t⁻¹, 0-7-30 silage €383 t⁻¹; base concentrate price: calf concentrates €278 t⁻¹, yearling and finisher concentrates €250 t⁻¹.

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Electricity Prices and Generator Behaviour in Gross Pool Electricity Markets

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Abstract:

This paper is part of a series considering “The Costs and Benefits of Co-Firing Peat with Biomass”. An in depth analysis of the electricity market the structure is required in order to truly reflect the potential electricity market impacts of biomass going forward.

Electricity market liberalisation has become common practice internationally. The justification for this process has been to enhance competition in a market traditionally characterised by statutory monopolies in an attempt to reduce costs to end-users. This paper endeavours to see whether a pool market achieves this goal of increasing competition and reducing electricity prices. Here the electricity market is set up as a sealed bid second price auction. Theory predicts that such markets should result with firms bidding their marginal cost, thereby resulting in an efficient outcome and lower costs to consumers. The Irish electricity system with a gross pool market experiences among the highest electricity prices in Europe. Thus, we analyse the Irish pool system econometrically in order to test if the high electricity prices seen there are due to participants bidding outside of market rules or out of line with theory. Results indicate that the Irish pool system appears to be working efficiently and that generators are bidding their true marginal costs. Thus, the pool element of the market structure does not explain the high electricity prices experienced in Ireland.

Keywords: Electricity Markets; Auction Theory; Multiple Regression Analysis

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¹ This work was conducted in association with Teagasc under the Walsh Fellowship Programme and the Electricity Research Centre (ERC). The ERC is supported by the Commission for Energy Regulation, Bord Gáis Energy, Bord na Móna Energy, Cylon Controls, EirGrid, ESB Energy International, ESB Energy Solutions, ESB Networks, Gaelectric, Siemens, SSE Renewables, SWS Energy and Viridian Power & Energy.

Measuring the Marginal Abatement Cost of Reducing Nitrogen Pollution in Agriculture

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Abstract

With the deadline identified by the Water Framework Directive (2000/60/EC) approaching in 2015 there is a rising pressure on the policymakers to introduce new regulations protecting water resources. Agriculture - the sector identified as a major contributor of diffuse pollutants to waters - will feel the most pressure to reduce pollutants loads. This paper produces Marginal Abatement Cost Curves for eight different policy measures to reduce nitrate leaching from agricultural land to dairy farmers in Ireland: 1) reduction of fertiliser application by 10%; 2) reduction of fertiliser application by 20%; 3) LU reduction to achieve N 170 kg/ha; 4) reduction of stocking rates by 20%; 5) utilisation of new more expansive feeds to reduce N dietary intake; 6) fencing off streams; 7) higher performing dairy breeds; 8) efficient slurry application. The results of the study are not surprising and indicate that there will be reductions in farm gross margins across all policy measures. However, MAC varies across all measures and aggregate MAC does not reflect the heterogeneity of impacts across individual farms. This paper shows that any measure introduced in command-control fashion will not yield the efficient results.



“Spatial Modelling of GHG Emissions: Assisting Local Government/Agencies in the effective implementation of Irish Climate Change Policy”

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Introduction

In the context of Ireland’s international and EU commitments, we first outline the current Irish Climate Change Policy Framework and reflect on the effectiveness of that policy with regard to its dissemination. We then consider the role of Local Authorities and inter-jurisdictional state agencies with regards to the effective implementation of climate change policy. Examining the literature we then discuss the barriers to progress for local authorities and agencies focusing on the information deficit on a local baseline GHG emissions inventory against which these local authorities and agencies can assess progress on mitigation strategies. We then submit a proposal for spatially disaggregated emissions inventory which would allow local authorities and agencies to test the effectiveness of proposed mitigation strategies and would potentially enable them to make informed cost-benefit decisions against competing mitigation proposals.

Motivation for Work

Significant progress has been made in the formation of climate change policy at national and international level. However, broad national and international policy goals such as those contained in the Irish National Climate Change Strategies (Department of Environment, 2000; 2007) and the EU Commissions 20-20-20⁴ project (European Commission, 2008) ultimately require the co-operation of local and regional authorities such as the county, city and town councils if they are to be successfully implemented (Allman *et al.*, 2004). There is however, an information deficit that authorities suffer from. The establishment of a baseline emissions inventory against which progress on climate change mitigation efforts can be measured is identified by the International Council for Local Environmental Initiatives (ICLEI) as the first of 5 steps towards sustainable cities (ICLEI, 2006). Moreover, it has been suggested that there is a need for an analytical policy tool to assist local authorities in choosing appropriate mitigation and/or adaptation options (Laukkonen *et al.*, 2009).

The construction of a spatial analytical tool for modelling local/regional GHG emissions will provide local authorities with a considerable amount of information on sources and sinks and

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⁴ 20% EU-wide reduction in GHG emissions on 2005 levels, 20% reduction in projected EU energy and 20% of energy to come from renewable resources in the EU by 2020

create the potential for the development of specifically tailored abatement strategies by local authorities.

Methodology

The model draws on the Teagasc SMILE project, developed by the Rural Economy Development Programme; a household socio-economic assessment spatial micro-simulation model which will facilitate the simulation of multi-sectoral greenhouse gas emissions at the electoral district level. Emissions will be modelled on a sector by sector basis by applying updated emissions factors to spatially referenced simulated household consumption variables.

The establishment of a baseline emissions model will enable us to assess the effectiveness/suitability of mitigation and adaptation options while also examining the resultant spatially heterogeneous re-distributive impacts of policies.

Key Project Goals

- To develop a spatial model of household GHG emissions.
- To model the impacts, both environmental and socio-economic, of policy implementation at the local level
- To assess the likely effectiveness of agri-mitigation and adaptation options

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Soil Testing on Irish Dairy Farms

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Soil is the foundation for almost all land uses (Herrick 2000). It is a vital non-renewable natural resource which requires sustainable management to ensure the production of food and fibre, nutrient retention and forms an essential component of the water cycle in the future (Creamer, et al. 2010). Knowledge of the soil is an essential element in maintaining soil quality and sustainable soil management.

Against the backdrop of EU legislation⁵ and recent analysis of Irish soil quality, this analysis investigates the farm and farmer characteristics associated with soil testing among Irish farmers. Nationally almost 70% of farmers test their soil (NFS 2009). The purpose of routine soil sampling is to determine the nutrient status and the PH of the soil (Gallagher and Herlihy 1963) it is not legally required that all farmers soil test. Research carried out by Stan Lalor⁶ shows approximately 50% of soil samples taken by Teagasc 2007-2010 have low fertility (Hynes 2011). The index for available potassium and phosphorous in soil ranges from 1-4⁷. In the case of farmers who do not soil test, the DAFF⁸ estimate soil nutrient level to have an index of 3 and make recommendations on that basis. With only 30% of all samples taken from Johnstown castle actually at the desired index, there is a 70% chance of being wrong (Hynes 2011). According to Irish legislation (SI 101 2009) it is the general duty of the occupier to ensure compliance with the regulations. To optimise grass growth it is necessary to have the macro nutrients⁹ available for plant growth at index level 3. Stan Lalors' work shows only 28% of soil tested in the dairy sector in 2010 at that optimum. Furthermore a recent study shows the average Ph of Irish grassland mineral soil at 5.4 while the target Ph is recommended to reach 6.2 (Tunney, et al. 2010). These figures question the accurate implementation of soil test results.

Cost reduction should be a key objective on any farm as it results in increased profit. Soil testing allows for optimum decisions to be made about critical input cost such as fertilizer use. Generally the Irish dairy sector returns are calculated on a per cow basis while the potential performance of the land remains underutilized (Snell 2011). Land management practices such as nutrient management and grassland management are specifically focused on utilizing land as a resource. The challenge is to achieve the targets set out in the Teagasc 2020 report given the abolition of EU quota in 2015 with minimal environmental impacts. The efficient use of resources in agriculture is an area where improvements can be made. The production and efficient use of grass therefore is a vital resource.

⁵ Water Frameworks Directive (WFD; Official Journal of the European Community, 2000) and the Nitrates Directive (European Council, 1991)

⁶ Research Officer, Teagasc Johnstown Castle

⁷ Developed by Teagasc's Johnstown Castle through extensive studies carried out (Schulte 2006).

⁸ Department of Agriculture Food and Forestry

⁹ Nitrogen (N), Potassium (K) and Phosphorus (P)

Methodology

The empirical analysis is based on data from the national farm survey (NFS). The NFS, carried out annually by the surveys department of Teagasc¹⁰ is reflective of the national position. The analysis uses a probit model. This type of analysis allows for the exploration of how explanatory variables, in this case various farm and farmer characteristics, affect the probability of an event occurring (Long and Freese 2006). The event in this case is soil testing.

Motivation for work

This work is part of a broader research project exploring the adoption of practices that impact on optimum grassland management. More specifically, the probit analysis of soil testing behaviour described above will be complemented by future qualitative work, which will examine in more depth *why* the explanatory variables are influential. The overarching theoretical framework used for the soil testing analysis is the evolutionary theory of the firm. This theory is based on resources, stock of human skill knowledge and organisational routines (Caniels and Romjin 2005). This work incorporates the work of the major seminal contributors to the literature: Penrose (1959), Cyert and March (1963) and Nelson and Winter (1982) among others. Overall the primary focus is on the process and motivations for adoption. This will be the focus of the qualitative work which is likely to be interview based. The purpose of this paper is to identify what influential factors effect soil testing on Irish dairy farms.

Results and Key Findings

The preliminary probit analysis has shown as expected and is in line with literature. There is a negative association between age and adoption. The land (farm size) and policy (REPS & SFP) associated variables strongly correlate with the decision to soil test. The statistically significant relationship with REPS is a compliance effect where soil testing is compulsory. The larger the size of the farm and the more land under crops and pasture the stronger the positive relationship is with soil testing again seen in the gross output and gross margin of the farm. The value added of this work will be realised in the qualitative interviews which will give insight into decision making and built on the quantitative work here in establishing how soil test results are used on the farm.

Key Advisors: Cathal Buckley ; Stan Lalor

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¹⁰ http://www.agresearch.teagasc.ie/lerc/farm_surveys.asp

