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Book of Abstracts

Agricultural Economics Society of Ireland

Thursday 12th May		
13:45-15:15	**Contributed Papers 1**	
	Sustainability *(25 min presentations and 5 min discussions)*	
Chair: Emma Dillon Room: LCI-G006 (Seminar Room 5)	Drivers of sustainability at farm level; is there a divide between environmental and economic objectives? A case study of Irish dairy farms	Michele McCormack (Teagasc)
	Food preferences of Irish consumers in the face of environmental pressures	Wellington Osawe (ESRI)
	SFSC development in Europe - an analysis of consumer motivations and barriers	Oluwayemisi Olomo (Teagasc)
	Attitudes, Perception, Motivations *(18 min presentations and 4 min discussions)*	
Chair: Lorraine Balaine Room: LCI-G008 (Seminar Room 2)	A Comparison of Landowner and Stakeholder Attitudes to Agri-Environmental Contracts – Evidence from Ireland and the Netherlands	Tracy Bradfield (UCC)
	For better or worse — Exploring German farmers' motives to keep red dairy cattle breeds by using Q-Methodology	Julia Anette Schreiner (University of Kiel, Germany)
	Revealing farmers' perceptions towards private, public and community stakeholders for biodiversity-related decision-making via Perception Matrices	Verena Scherfranz* (BOKU)
	Study on Economic and Social Drivers of Farm Succession in Ireland	Mika Shin (Teagasc)

Drivers of sustainability at farm level; is there a divide between environmental and economic objectives? A case study of Irish dairy farms

Michele McCormack

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Abstract

Agricultural sustainability has been to the forefront of many research agendas concerning the need to balance environmental issues surrounding climate change and biodiversity loss, with the need to provide food and an adequate income for farm families. Sustainability, in this respect involves a multi criteria of measures which include economic, environmental and social sustainability. While there are a number of difficulties in measuring these objectives, there also seems to be a conflict, in particular, is it possible for farms to be both environmentally and economically sustainable? In this paper we examine the economic and environmental credentials of Irish dairy farms using Teagasc National Farm Survey data. Farms are categorised separately in terms of economic and environmental sustainability indicators. We investigate the socio-economic drivers of farms that are either mostly environmental or mostly economically sustainable.

Methods

The generalized ordered logit model

This study uses the Generalised Ordered Logit Model (Gologit) to study the determinants of farm level performance in relation to environmental and economic sustainability. The Gologit model can be written as:

$$P(Y_i > j) = g(X\beta) = \frac{\exp(\alpha_j + X_i\beta_j)}{1+\exp(\alpha_j + X_i\beta_j)}, \quad j=1,2, …, M-1$$

Where α_j, are the intercept, β_j are the logit coefficients M is the number of categories of the ordinal dependent variable, in this paper M = 3. From the above it can be determined that the probabilities that farm i will fall into any category from 1, … , M, are equal to

$$P(Y_i = 1) = 1 - g(X_i\beta_j)$$

$$P(Y_i = j) = g(X_i\beta_{j-1}) - g(X_i\beta_j) \quad j=2, …, M-1$$

PYi= M= gXi M-1

The Gologit model estimates the odds of being in a certain category relative to being in the previous category. The Gologit as has advantages over the normal Ordered Logit Model because it helps to overcome the parallel lines assumption which is often violated (Williams, 2016).

Results

1. **Nitrogen Balance Ha$_{-1}$ and Market Gross Margin Ha$_{-1}$ on Irish dairy farms 2010-2019**
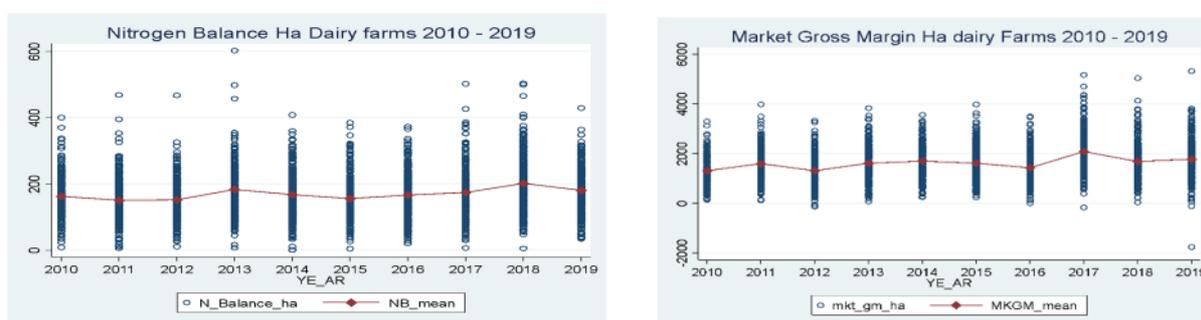
1. **Market Gross Margin Ha$_{-1}$ and N Balances Ha$_{-1}$ for top middle and bottom performing dairy farms**

	NB Bottom	NB Middle	NB Top	Total
MGM Bottom	621.53 ENV	296.80	138.76	1,057.09
MGM Middle	303.90	389.82 INBETWEEN	304.09	997.80
MGM Top	119.86	326.17	573.08 ECON	1,019.10
Total	1045.28	1012.79	1015.93	3074.00

Note: Low N balances are an indicator of farms performing well on environmental metrics

Literature

Williams, R. (2016). Understanding and interpreting generalized ordered logit models. *The Journal of Mathematical Sociology, 40*(1), 7-20.

Food preferences of Irish consumers in the face of environmental pressures

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Abstract

This paper explores heterogeneity in food preferences among Irish consumers in the face of environmental pressures associated with food production. A latent class model is employed to identify and characterise distinct consumer segments as a function of consumer's preferences, beliefs and attitudes to environmental implications of food production. Results suggest that latent segments of environmentally-conscious consumers can be differentiated from price-sensitive segments with the latter more prone to certain evolved personal beliefs and attitudes to environmental implications of food production compared to the former.

Introduction

Food and dietary habits of consumers globally have changed rapidly over the last decade due partly to a growing consumers' interest in attributes of food other than taste, quality, brand etc. For example, consumers are beginning to realise that their food choices have environmental implications (Vermeulen et al., 2011; Banterle et al., 2013). Therefore, interest is growing on the environmental attributes in food products (Steiner et al., 2017; Lombardi et al., 2017; Rost et al., 2008; Weber and Matthews, 2008). The changing food preference may reflect a growing interest in sustainable use of resources as well as a desire to support climate change mitigation efforts (Reisch et al., 2021). In Ireland for instance, anecdotal evidence suggests a rapid shift in consumer preferences from meat-based food to plant-based with the percentage of vegetarians rising from about 0.5% in 1994 to an estimated 8% in recent times (Leahy et al., 2010; Bord Bia´, 2018). However, the extent to which Irish consumers value certain environmental attributes in food and their preferences for such foods (including possible heterogeneity within subgroups of the population) is still unknown. Better understanding of existing preferences at this time, and the relative weighting that people place on various environmental attributes of food will be important evidence-base to support future policies. This is important because, ultimately shifting consumer preferences may have

significant implications for the entire food supply chain as well as policies to mitigate challenges posed by climate change.

In this paper, we use a nationally representative data of Irish consumers to examine food preferences for environmental-related food attributes and then estimate willingness to pay (WTP) for three food products (meat – beef and chicken, and vegetable). Our emphasis is related to consumers' preferences for the amount of carbon footprints, water use intensity and the potential risk to water quality which defines the ecological footprint associated with the production of the food. Our hypothesis is that consumers with preferences for environmental attributes in food (e.g., carbon footprint, water use intensity etc.) will adjust their food purchase and consumption patterns in line with the presence (or absence) of these attributes, assuming all other relevant quality attributes are present (Grebitus et al., 2015). The concept of food's ecological impact relates to the amount of CO_2 generated and water used in the food supply chain (production, processing, storage, packaging, and distribution). We expand this notion of ecological footprint of food production to include the potential risk to water quality from excessive nutrients associated with farming, particularly in regard to farmyards and other places where animals congregate as well as diffuse pollution relating to runoff from land into waterbodies (O'Boyle et al., 2019). We evaluate consumers' preferences and estimate WTP using an empirical approach that allows for censoring in our response data as well as detect respondents who used simplified heuristics (rule-of-thumb strategies) in their choice decisions such as ignoring any of the attributes when making choices in the different choice occasions. Ignoring any of the attributes in the choice occasion implies non-compensatory behaviour (Scarpa et al., 2009) and failure to account for this censoring may lead to inconsistent and biased welfare estimates (Scarpa et al., 2009; Campbell et al., 2008).

Methodology

We use a stated preference choice experiment (CE) to estimate consumers' WTP for several ecological attributes in food products. We target a nationally representative sample of Irish adults over 18 years of age with respect to gender, age, education, and county (region). We screen out individuals that occasionally or never purchase food for the household as well as those who do not eat their main meal at home as a normal habit, as their responses would probably provide little insight into WTP for food with emphasis on ecological footprint

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associated with food production. We then use response data to estimate a random utility maximization model (McFadden, 1974) based on a discrete preference mixing (Greene and Hensher, 2003) and calculate consumers' WTP for these attributes.

Respondents provide answers relating to their beliefs and preferences broadly related to food production and its impact on the environment and climate change based on a 3-point Likert scale that ranged from agree to disagree. We also included an attention filter ("trick") question to test data quality where respondents are asked an arbitrary question to simply tick "Option B" to remove respondents who simply click the questionnaire without paying attention to the questions asked. In addition to these and the CE, the questionnaire included questions that elicit the socio-demographic characteristics of the respondents.

Results

Our preliminary results indicate that Irish consumers can be differentiated in terms of those who are environmentally oriented (32%-beef, 30%-chicken and 72%-vegetable) as well as those who are more price sensitive (68%-beef, 70% and 28%-vegetable). However, both segments of the population have a positive WTP for food produced with consideration for the environment. That is, on average, Irish consumers prefer food produced with less carbon footprint, less water use and risk to water quality. Furthermore, the ecologically oriented consumers tend to be less prone to certain evolved personal beliefs and attitudes to environmental implications of food production compared to the latter segments of consumers.

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SFSC development in Europe - an analysis of consumer motivations and barriers

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Abstract

Short Food Supply Chains (SFSCs) represent a suitable alternative to conventional food supply chains and they are gaining popularity throughout Europe. Some short chains follow traditional formats such as farm sales and farmers' markets, while others adopt more contemporary approaches such as community supported agriculture, box schemes, online sales and food hubs. There are however many and varied barriers associated with successfully establishing and maintaining SFSCs. This is because short chains differ substantially in their approaches, motivations, actors, and operation.

The studies with the most detailed overviews of barriers associated with SFSCs are found mainly in grey literature such as EU funded reports and for the most part they do not distinguish between the barriers experienced by different types of SFSCs. In addition, such studies tend to take on a producer perspective, which is oftentimes conflated with consumer perspectives. As a result, consumer perspectives concerning SFSCs are not clearly articulated in literature. This paper seeks to provide insights into the consumer –specific barriers that inhibit the development of SFSCs by examining the attitudes and perceptions of consumers towards food from SFSCs as well as the factors that inhibit the consumers' purchase of SFSC foods.

In order to investigate consumer perceptions towards foods from SFSCs, general and consumer –specific barriers associated with the development of SFSCs are first identified in literature. Consumer motivations related to the purchase of SFSFC products are then identified, followed by the development of an online pan – European survey based on the barriers and motivations identified from literature. The survey is conducted across 12 countries in Europe in the EU funded project, agroBRIDGES and the findings indicate that the

major motivation for consumers when purchasing SFSC products is Quality attributes of the product in terms of taste, freshness and healthiness. Other consumer motivations for the purchase of SFSC products include food safety concerns, support of local farmers and producers and support of the local economy. In addition, the findings suggest that a major barrier to the purchase of SFSC products by consumers is the lack of local outlets (i.e. markets, stalls, shops or restaurants) that sell SFSC products. Having identified the consumer-specific barriers, this paper also identifies a number of Good Practices that can help to mitigate these identified barriers.

The paper contributes to theoretical knowledge in SFSC literature by providing an update on barriers associated with the development of SFSCs. The paper also provides insights into the buying behaviours and food consumption patterns of SFSC consumers which has practical implications for SFSC food producers interested in larger EU markets for their products. The paper also presents a number of Good Practices across Europe which address a number of key consumer needs, primary among which is access.

Keywords: *Short Food Supply Chains, consumer perceptions, barriers, Europe*

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A Comparison of Landowner and Stakeholder Attitudes to Agri-Environmental Contracts –

Evidence from Ireland and the Netherlands

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Extended Abstract

As part of a Horizon 2020 funded project called CONSOLE, data is collected on the attitudes of landowners and stakeholders to types of agri-environmental contracts. The objective of the research is to improve the contract design of environmental programmes. The types of contracts analysed are results-based, collective action, value chain and land tenure.

This paper compares literature and data from Ireland and the Netherlands which are both net exporters of agricultural produce. The two countries differ in that produce in Ireland is predominately from grass-fed livestock with Irish agriculture facing concerns over ruminant emissions. The Netherlands produces mainly non-grass-based meat and dairy produce. In terms of economic value, the flowers and bulbs are the greatest export. The Netherlands is recognised for its innovative and sustainable production methods. However, the Dutch government aims to cut nitrogen pollution.

A statistical approach is adopted to assess the results of landowner and stakeholder surveys. This includes the use of Probit models to measure varying level of attractiveness/agreement to options that are posed to respondents. This is supported by qualitative analysis of discussion from recent stakeholder events. Both quantitative and qualitative approaches are included to generate a thorough understanding of this important topic.

The results show that landowners in both countries highly rate annual compensation as a factor that increases their willingness to enrol in an environmental programme. Irish landowners are strongly in favour of results-based contracts based on their understandability, applicability and economic benefit. Dutch landowners have a different outlook as they see

land tenure contracts as being the most understandable and applicable, and value chain contracts are perceived to have the greatest economic benefit.

Irish landowners feel that results-based contracts are the most beneficial for the improvement of biodiversity and water conservation, respectively. In Ireland, tillage and forestry landowners are the most open to different types of contracts while the livestock sector is the most hesitant. Amongst these livestock owners, results-based contracts with self-chosen measures are the preferred contract type. This is likely due to a concern over a potential loss of high earnings, with the dairy sector being most at risk. Differences in the results between the two countries can be explained by the fact Ireland's existing contracts to protect public goods are pre-dominantly results-based, potentially creating a bias towards this type of contract. Ireland has a low level of land rental which is typically on short-term contracts, which explains why, unlike the Netherlands, land tenure contracts for environmental practices are not attractive.

From the data and discussion at stakeholder events, it is clear that sufficient financial compensation will be crucial to the adoption of environmental practices by landowners. Compared to landowners, stakeholders have a greater understanding of various contract types. Stakeholders also deem them to be more applicable and economically beneficial. It is important that knowledge transfer is effective, especially with regards to the new Common Agricultural Policy which is expected to be heavily focussed on improving farms' environmental sustainability.

For better or worse — Exploring German farmers' motives to keep red dairy cattle breeds by using Q-Methodology

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Abstract

Even though population sizes have declined in recent years, there are still some farmers that hold on to traditional red cattle breeds. It is often assumed that more popular breeds like Holstein Friesian yield more milk and have better performances in productive breeding traits and are thus favoured. In Germany, 41 % of the 11.3 million heads of cattle belong to the Holstein Friesian breed, another 26 % to Fleckvieh and German Braunvieh (BMEL, 2020). However, for farmers keeping older breeds, other traits like robustness and traditional motives play a significant role in choosing this breed. It is also evident, that the genetic diversity of less productive breeds may contribute to current or future traits of interest (Notter 1999; Bruford et al. 2003; Toro et al. 2008; Groeneveld et al. 2010), they are considered essential for maintaining future breeding options.

The objective of this paper is twofold. The first aim was to compare the biological and economic performance of red dairy breeds vis-à-vis Holstein Friesian cows. Based on available data, we analysed differences between German Red and White Coloured Dual Purpose together with Angler cows and Holstein cows. The second objective was to shed light on the reasons and motivations why farmers continue to keep red breeds against the mainstream of converting to high-yielding Holstein Friesians.

With respect to the first objective, a t-test comparing the mean values of key performance indicators revealed significant differences only in single parameters. Thus, only the fat and protein content of the milk indicates slight advantages for farms with red breeds compared to Holstein cows. The calculated mean values in milk yield are significantly lower in the red breeds than in Holstein Friesian. Our results indicate that red breeds certainly have their

advantages when especially the composition of the milk plays an important role for marketing e.g. cheese production.

Regarding the second objective, four groups with different subjective motives to keep red breeds could be identified by a factor analysis integrated into the Q-Methodology (Watts & Stenner, 2012). Thirty statements were presented to respondents and had to be sorted according to the respondents' degree of consent. Our concourse of statements was developed through comprehensive research: content analyses of websites of different breeding organisations, quotes from qualitative interviews and blogs. Many individual viewpoints of 66 farmers are reduced to only a few "factors" or groups of respondents which are claimed to represent shared ways of thinking. The largest group of farmers prefer the "robust and uncomplicated" properties of red breeds. They especially value the double purpose providing both milk and meat production and are convinced that their breed fits the medium sized farms and pasture farming much better than others. Within this group are also part-time farmers and significant smaller farms. From the sorting of statements, we learned that their conviction is not influenced by the social environment or lack of knowledge of keeping a high-yielding breed. The second largest group we call the „performance-oriented farmers" who value low veterinary costs of red breeds and an overall better health status as well as robust black claws. These farmers are convinced that their breed is a high-performance breed too, and they sell breeding animals significantly more often abroad. The two remaining groups are characterised as farmers who appreciate their breed for emotional and cultural reasons. The "allrounders" mention also the importance of a high fat and protein content that is typical of red breed milk, and for "emotional farmers", the red colour is particularly valuable and the breed is inextricably linked to the region and their own farm. We conclude that not only productive motives affect the decision to keep traditional red breeds but also, to a certain extent, reasons that are rather related to cultural as well as emotional aspects.

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Revealing farmers' perceptions towards private, public and community stakeholders for biodiversity-related decision-making via Perception Matrices

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Introduction

Implementing more biodiversity-friendly farming practices can contribute to reduce the ongoing loss of global biodiversity (IPBES, 2019). To encourage farmers' adoption of environmentally sustainable practices, e.g. through uptake of agri-environmental schemes or other voluntary initiatives, a profound understanding of their decision-making and preferences is required (Espinosa-Goded et al., 2010; European Commission, 2019; Dessart et al, 2019). While public, private and community stakeholders have been shown to influence their decision-making (e.g.: Häfner and Piorr, 2021; Bakker et al., 2021; Stuart et al., 2018), little attention has been paid to farmers' perceptions towards these actors in informing specifically biodiversity-related decision-making. Considering that various cognitive-psychological factors, such as perceptions, are powerful in predicting farmers' pro-environmental decision-making (e.g: Dessart et al., 2019), this results in substantial need for further research. To contribute to filling this research gap, our study aims to systematically and comparatively elicit and analyse farmers' perceptions towards these stakeholders and to identify the positively perceived stakeholders along the entire primary production value chain to inform the design of inclusive, potentially more widely accepted, pro-biodiversity initiatives.

To meet this aim, we surveyed farmers across ten European countries using Perception Matrices (PMs) as described by Moon et al. (2017). This methodological approach reveals individuals' implicit perceptions relative to various stakeholders, resulting in compact, comparable quantitative data. While PMs have been demonstrated as a valuable tool for eliciting stakeholders' perceptions in Australian environmental policy (Moon et al., 2017), they have not yet been applied to reveal farmers' views regarding various stakeholders nor

to uncover potential differences of perceptions in multi-national settings. Therefore, this study concurrently aims to introduce PMs to the field of agricultural pro-environmental behavioural research facilitating its further practical use.

Methodology and data collection

PMs, as described by Moon et al. (2017), are based on the Repertory Grid technique (RGT) introduced by Kelly (1955). As a constructionist tool, RGT aims to reveal individuals' construing of their environment by systematically identifying and then rating "elements" (objects) against "constructs" (descriptors), commonly on a quantitative scale (Moon et al., 2017). PMs share this structure and rating procedure; however, as an objectivist approach, constructs and elements are pre-defined by the investigator, permitting quantitative between-subject comparisons (Moon et al., 2017).

In this study, the definition of elements (i.e. stakeholders) and constructs (i.e. perception statements) was based on a multi-actor approach guaranteeing agricultural, regional and scientific relevance of the matrix. In a first step, RGT was applied guiding three practicing farmers to uncover their personally relevant stakeholders and corresponding perception ratings. In parallel, project partners in the study areas proposed further stakeholders and perception statements reflecting regional conditions. Subsequent to summarizing the elicited components, the authors complemented and adapted them from a socio-economic perspective. After checks for redundancy and practicability, this process resulted in a PM including 12 stakeholders/columns and 8 perception statements/rows, i.e. non-profit stakeholders, stakeholders representing the value chain and societal subsets as well as biodiversity-related and general perception statements such as trustworthiness or objectiveness. To define the quantitative rating scales, each construct was worded as a negative (1-point end of scale; e.g. "not trustworthy") and a positive pole (5-point end of scale; e.g. "trustworthy").

After pre-testing (n = 2), the PM was completed in winter 2021/22 in ten European countries (UK, NL, FR, CH, RO, HU, PT, SE, ES, EE) resulting in a preliminary sample of n = 44 (*final data set: n = 50*). To identify patterns in PM ratings, descriptive statistics and non-parametric randomization tests (RT) comparing pairwise differences in means were applied in R,

conducting 10.000 repeats (largely following the procedure described by Santangelo (s.a.)).
In contrast to ANOVA or t-tests, RTs are suitable for analysing non-independent, within-subject data (Craig and Fisher, 2019) originating from *single* farmers evaluating *several* stakeholders.

Preliminary Results

The pairwise comparison of stakeholders via RT reveals that some are perceived significantly differently from one another (e.g. *government* vs. *researchers* regarding the perception "biodiversity is (not) one of their major goals"), whereas some are perceived similarly (e.g. *agricultural farm advisors* vs. *other farmers* regarding the perception "(do not) treat me as a partner"). Differences in perceptions seem to depend on both perception statement and stakeholders under question. Through calculating the rating means for each stakeholder across all perception statements and countries, we were able to identify the overall most positively and negatively perceived stakeholders. Through calculating the means for biodiversity-related and general perception statements separately and comparing all perception ratings pairwise via RT for each stakeholder individually, we could demonstrate that farmers have significantly different, partly ambivalent perceptions for one and the same stakeholder (e.g. *farm input suppliers*).

Preliminary conclusions and outlook

Farmers seem to have disproportionately large scepticism towards farm input suppliers regarding their pro-biodiversity behaviour, although they might nonetheless be a trusted stakeholder. This finding indicates that positive general perceptions towards certain stakeholders, e.g. high trust, might not be sufficient for involving them in a specific, i.e. pro-biodiversity, initiative design. Stakeholders not primarily associated with profit-making (e.g. *government, researchers*) were perceived in highly variable ways in between-stakeholder comparison but were rated more consistently regarding general and biodiversity-related aspects. Further in-depth analyses are required to explain these results also considering halo effects potentially pre-determining perception ratings (Thorndike, 1920). Surprising differences in ratings we expected to be similar (e.g. *trust* and *objectiveness* being perceived

– at least partly – <u>significantly differently</u>) again highlight this study's importance of exploring farmers' perceptions to avoid uninformed conclusions and predict their decisions more accurately.

Whereas research techniques such as RGT are suitable to gain a deep understanding of highly individual decision-making processes, the presented PM approach allows for *quantitative* comparison of stakeholder perceptions *between* farmers. This tool also enables the authors to geographically and socio-economically cluster the farmers and compare their perceptions correspondingly, e.g. for Eastern versus Western European countries or organic versus conventional farmers. For policy-making, this approach can therefore help to design more attractive pro-biodiversity initiatives on both regional and beyond-regional level by advising which stakeholders to involve generally or in different tasks. For stakeholders themselves, this methodological approach allows for assessing their image amongst farmers and, in consequence, as an indication which stakeholder characteristics – as reflected by the comprised perception statements – to strengthen to improve collaboration.

Study on Economic and Social Drivers of Farm Succession in Ireland

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Introduction

The importance of sustainable farming, including economic, environmental, and social dimensions, is recognised as central to delivering the key objectives of the Common Agricultural Policy (CAP). A decreasing number of younger farmers and the ageing of the farm population is evident in Ireland (Meredith and Crowley 2017) and across Europe (May et al 2019). The share of farm holders aged 65 or over is almost one-third compared to one-fifth in 1991 (CSO 2021).

Farm household demography is widely recognised as one of the most significant factors in farm succession. Much research has been done on the question of farm succession and non-succession highlighting important explanatory factors such as farm size, composition of household members, farmers' education, and economic viability (Kimhi and López, 1999; Stiglbauer and Weiss 2000; Glauben 2006; Cavicchioli et al 2015).

Despite wide recognition of the issue, there is still space in the academic literature for further exploration of the potential association between social sustainability and farm succession. Abdala et al. (2020) identify relation between farm succession and social factors, which promote or inhibit the discussion between farm holders and potential successors in the case of Brazil.

While farm/farmer factors may be relevant to understanding farm succession, their effect must be understood with an appreciation for the long duration of succession processes containing development of successor's identity (Fischer and Burton 2014). The objective of our study is to investigate the social and economic determinants of farm succession in Ireland with emphasis on social aspects.

Method

Teagasc National Farm survey (NFS) data from 2018 is primarily used to undertake the analysis. This data contains detailed information about farms and information about farm succession including whether or not farm holders have identified a successor. Additionally, the Teagasc Land Use questionnaire from 2014 was used to validate the findings from the 2018 NFS data. This 2014 questionnaire was undertaken with a stratified random sample of Irish farmers.

We model the drivers and barriers of farm succession using the probit model with the dependent variable being the presence of a chosen successor. The choice of independent variables is based on the need to account for farm, family and social factors. Farmer age, land quality and an interaction between the presence of a dairy enterprise and the size of land ownership are included as possible explanatory factors.

Many of these independent variables tend not to vary much in value over time and this reduces the potential problem of reverse causality. We attempt to account for the influence of past household composition by the inclusion of lagged independent variable using data from the 2013 Teagasc NFS. The NFS 2018 data provides information about social factors including isolation (defined as living alone) and the presence of workload stress/pressure. These social variables are an important consideration despite the possibility of endogeneity. Marginal effects are calculated to show the change in the probability of succession due to a change in the value of the independent variables.

Results

Preliminary results indicate farm size is not significant for non-dairy, but significant for dairy farms. This indicates that only larger dairy farmer result in a higher probability of farm succession.) In addition, the lagged independent variable for the presence of young adults in the farm household was positive and significant. This confirms that past household composition influences farm succession over time. This was also confirmed in the data from the 2014 land use survey. Farmer agricultural education is also positive in 2018.

The results point to the importance of social factors including excessive workload and isolation. Those farmers reporting a higher workload and/or related stress are less likely to have identified a successor. This is in line with previous research by May et al (2019) who found that farmers who experience hardship on their farm may be reluctant to encourage their children to choose a career as a farmer. This could also indicate that children who witness their parents suffering excessive workload might discourage them from taking over the farm.

Discussion and conclusion

Our study highlights the difficulties of identifying successors where farmers feel stress/anxiety in relation to workload. In developing pathways for generational renewal, some factors influence succession decision-making over a long-time frame (Lobley 2010). Social factors can have evolve over time and negative social factors can potentially break endogenous succession cycle. Therefore, it is necessary to mitigate hardship at different stages of the farm succession process. Our study also finds that farmers living alone and farmers with no children or young people living in the household are less likely to have identified a successor. Policy measures can target the situation for older farmers without strong family networks and older farmers with excessive workloads. This can enable older farmers to stay in farming while sharing the workload with an identified successor.

A limitation of this study is that the analysis is based on information provided by farmers as to whether or not the farmer has identified a successor and is not based on actual evidence of same. That said, the vast majority (about 99%) of farm holders who have a chosen successor have discussed the matter with the identified successor, confirming to some degree the accuracy of the data in relation to the identification of a successor.

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Friday 13 May		
9:30-11:00	**Contributed Paper Session 2**	
	Land Lease *(25 min presentations and 5 min discussions)*	
Chair: Myles Patton Room: LCI-G007 (Seminar Room 3)	Challenges and Opportunities of Long term land leasing in Northern Ireland: A stakeholder perspective	Ronan McCarry (AFBI)
	Empirical Analysis of Factors Influencing Long Term Land Leasing in Northern Ireland	Adewale Adenuga (AFBI)
	Understanding the Agricultural Land Leasing Market in Ireland: A Transaction Cost Approach	Jason Loughrey (Teagasc)
	Productivity/Efficiency *(18 min presentations and 4 min discussions)*	
Chair: Michele McCormack Room: LCI-G006 (Seminar room 5)	Capital Misalloction, Agricultural Subsidies and Productivity: A European Perspective	Bruno Morando (Maynooth University)
	Technical efficiency and equity effects of environmental payments in Ireland	Miguel Tovar Reaños (ESRI)
	Regional technical efficiency rankings and their determinants in the Irish dairy industry: a stochastic metafrontier analysis	Lungelo Prince Cele* (UCC)
	Drivers of technical efficiency in the Irish crops sector	Fiona Thorne (Teagasc)

Challenges and Opportunities of Long term land leasing in Northern Ireland: A stakeholder perspective

Ronan McCarry, Adewale H. Adenuga and Claire Jack

Economics Research Branch, Agri-Food and Biosciences Institute, 18a Newforge Lane, Belfast, BT9 5PX, UK

Abstract

Land rental systems play an important role in shaping farmers' land-use decisions in terms of providing sufficient incentives to increase their productivity, efficiencies and environmental sustainability. An insecure land rental system (inability of farmers to access and use land over a longer time frame) may impact farmers' motivation in investing in land development, consequently resulting in reduced farm-level productivity. In both Northern Ireland and the Republic of Ireland the current traditional short term land rental system is conacre, where contracts are nominally held for 11 months or 364 days. There is a general consensus that this conacre system creates uncertainty, hinders farm expansion and could constrain the region's agri-food sector competitiveness. The aim of this study is to explore the challenges and opportunities of long term land leasing in Northern Ireland from a stakeholder perspective and to suggest policies to encourage long term land leasing.

Keywords: Land leasing; Conacre; Tenure security; Land use

Introduction

The importance of the role that land rental systems play on agricultural economies and farm businesses investment decisions is well documented. Land rental systems play an important role in shaping farmers' land-use decisions in terms of providing sufficient incentives to increase their efficiencies, productivity and environmental sustainability. In Northern Ireland, the preferred land rental contract is conacre, a system where land is leased for 11 months or 364 days and is often "rolled over" annually, were the same contract is agreed upon year on year. Although conacre and other forms of short term land rental systems offer flexibility between landowners and those renting the land, the uncertainty of tenure linked to the

system does not allow those farmers who rent the land to make longer-term investment planning and decisions. This is particularly the case around sustainable land management practices and productivity improvements. At an aggregate level, this ultimately impacts on the overall competitiveness of the agri-food sector.

The objective of this study is to explore the challenges and opportunities of long term land leasing in Northern Ireland and to identify ways in which farmers can be encouraged to take up long term land leasing.

Methodology

To achieve the study objective, we employed qualitative analytical technique. Using a semi-structured questionnaire, qualitative data was sourced from highly experienced and relevant stakeholders who are representative of a range of stakeholder organisations in the Northern Ireland agricultural sector. In-depth interviews, surveys, informal conversations and focus group discussions were conducted. Four stakeholder interviews were held with experienced experts from differing backgrounds in agriculture. The stakeholders ranged from experienced farm business development group leaders to policy makers including farmers Unions, representatives of land mobility schemes and the Rural Valuers Association. Each semi-structured interview focused on the participant's opinions and perspectives around a number of questions regarding conacre and long term land leasing as well as the benefits, barriers and incentives to encouraging long term land leasing. Careful consideration was taken to ensure sufficient variation among participants of the focus group discussion so as to stimulate discussion and the interviews were conducted mainly through Cisco Webex video conferencing platform.

Results

The study found that despite their different backgrounds, stakeholders shared similar opinions on the difference between conacre and long term land leases and the effects each had on Northern Ireland's agricultural economy. There was also overlap on the perceived benefits of long term land leasing however differences appeared on questions surrounding

the best method of motivating and incentivising participation of landowners in leasing land out with longer contracts. Cautionary observations were also given on the use of regulations as well as the reliance of cross-country comparisons between land leasing in Northern Ireland and other countries, due to Northern Ireland's unique agricultural economy where small farm businesses are the norm.

Conclusions

This study provides a useful insight into Northern Irelands land leasing policies as well as the possible benefits that incentivising long term land leasing would have on the agricultural economy. Key stakeholder interviews were held to determine the perspectives of experienced experts on the topic. Findings indicate the perceived benefits that long term land leasing would provide to farm businesses in Northern Ireland, as well as possible barriers and incentives to encourage the uptake of long term land leases.

Empirical Analysis of Factors Influencing Long Term Land Leasing in Northern Ireland

Adewale H. Adenuga, Ronan McCarry and Claire Jack

Economics Research Branch, Agri-Food and Biosciences Institute, 18a Newforge Lane, Belfast, BT9 5PX, UK

Abstract

Farmers are often required to make long term strategic decisions around enterprise type, investments around farm expansion and land-use. An insecure land rental system (inability of farmers to access and use land over a longer time frame) may have a tendency to demotivate farmers in relation to their decision making and investments in land development, consequently resulting in reduced farm-level productivity. The prevalence of rental agreements based on the traditional conacre system, which is short-term land rental system unique to Ireland is believed to be a limiting factor in the development of agriculture in Northern Ireland. The system (nominally for 11 months or 364 days) permits land to be let to other farmers without the need for either party to enter a long term commitment. Currently around one third (about 300,000 hectares) of agricultural land in Northern Ireland is being farmed under conacre agreements.

Although the conacre system in the past was considered to offer flexibility between landowner and those farmers renting the land, the uncertainty of tenure linked to the system does not allow for farmers renting the land to make longer-term investment planning and decisions; particularly around sustainable land management practices and productivity improvements. This is a particularly important issue given the increasingly aging farming population in Northern Ireland in a sector that requires implementing new technologies and best farming practices to stay competitive. Moreover, from an environmental perspective, there is a question as to whether the conacre system may be having a negative impact on the environmental stewardship of conacre land; for example, as a potential barrier to the uptake of environmental land management practices.

In respect of the above, the study seek to empirically examine the factors that influence farmers' adoption of long term land leasing both from the supply and demand side. Specifically, the study aim to analyse the characteristics of farmers and land owners in relation to their land leasing intentions. This study will provide insights into the complex motivations

underlying farmers' land rental preferences. This will be useful in providing the requisite evidence base to inform the formulation of policies targeted at encouraging farmers and land owners to take up long term land leasing.

To achieve the study objective, we will be developing a bivariate probit model to empirically investigate the socio-economic factors influencing the decision of farmers to take up long term land leasing both from the supply and demand side. The bivariate probit model extends from the standard binary probit model and is a joint model for two binary outcomes. The estimation of a bivariate model is more efficient because it not only nests individual univariate models but also enables us to determine jointness of the decision making process by providing an estimate of the correlation between the error terms of the two univariate model. The data to be used for analysis is obtained through the administration of 4000 detailed pre-tested questionnaire. The survey was implemented as a mixed-mode, web-based and mail, survey which took place between December 2021 and February 2022 following best practices and principles. The farmers were grouped into strata based on farm types and land ownership/rental status such that there were have six strata, namely: Farmers that farm on owned land only, farmers that farm on owned and rented land, Farmers that farm on owned and rented land but also let out land, Farmers that farm on owned land only but also let out land, Farmers that farm only on rented land and farms that have let out all their land. A total of 1677 completed questionnaires have been returned which include 1200 paper questionnaires and 477 completed online. The data will be analysed using the methodology highlighted above and results will be presented at the conference.

Understanding the Agricultural Land Leasing Market in Ireland: A Transaction Cost Approach

Laura Onofri[1], Samuele Trestini[1], Fateh Mamine[2], Jason Loughrey[3]

1. *University of Padova*
2. *INRA*
3. *Rural Economy and Development Programme, Teagasc*

Abstract

Formal written land leasing contracts offer an alternative to land purchase for those farmers wishing to expand their land area and provide greater security relative to informal short-term rental agreements and are particularly important for beginning farmers with resources insufficient to purchase land. Formal land leasing contracts vary in terms of their duration but there is limited understanding about the determinants of contract duration in developed countries. In this research, we use econometric techniques and transaction level data to explore the determinants of duration for agricultural land lease contracts for two regions in Ireland i.e. the West region and the South-East region. The dataset for this research is based on a large sample of land leasing transactions from the Property Services Regulatory Authority (PSRA) in Ireland with information about transactions from 2013 to the onset of the COVID-19 pandemic in March 2020. The research represents an empirical test of the Transaction Costs Economics (TCE) theory with analysis of the factors affecting the duration provision of agricultural land lease contracts. While the standard neo-classical model emphasizes the roles of uncertainty and incentive alignment, the transaction cost approach views contracts as devices for reducing wasteful activities around the negotiation of surplus and the structuring of ex-post adjustments. Transaction costs include those associated with information, the negotiation and writing of contracts and their supervision, enforcement, and resolution in case of conflicts. The research is undertaken to assess how (and how much) contract provisions affect the contract duration. We adopt the two-stage least squares (2SLS) estimation techniques for operationalizing the relationship between contract duration and contractual provisions. Results indicate that the legal status of the tenant is a significant factor in influencing the duration. If the tenant is an individual (and not an organization, for instance a company), the contract duration is shorter. This may occur because contracts with individuals are less complex relative to contracts with organization tenants. Another interpretation is that the tendency for organization tenants to partake in contracts of longer

duration could be due to the ability of such tenants to undertake the transaction costs. Provisions such as break clauses appear positively related to duration and confirm the theoretical expectation that long-term contracts create a demand for processes that enable adaptation over the course of long-term exchange.

Capital Misallocation, Agricultural Subsidies and Productivity: A European Perspective.

Bruno Morando[1] and Carol Newman[2]

[1]Maynooth University

[2]Trinity College Dublin

Abstract

Resource misallocation is an important source of aggregate productivity loss, yet to date there is a notable dearth of studies exploring the nature and extent of misallocation in the agricultural sector of developed economies. In this paper, we analyse resource misallocation in the European agricultural sector. We quantify the impact of capital misallocation on aggregate productivity and examine the extent to which such misallocation can be attributed to farm-specific subsidies. We find that capital misallocation contributed to a 21 percent loss in productivity in the sector between 2001 and 2010. We can attribute about one third of this loss to distortionary government subsidies which disproportionately benefit relatively less productive farms. We find no evidence that the decoupling of subsidies from production in the mid-2000s reduced their distortionary effect. Our results provide an important benchmark for understanding misallocation in the context of a modern developed agricultural sector and other industries that benefit from potentially distortionary government supports.

Technical efficiency and equity effects of environmental payments in Ireland

Miguel A. Tovar Reaños and Maria Martinez Cillero

Economic and Social Research Institute, Dublin

Abstract

Introduction

In this paper, we investigate the relationship between farm level competitiveness, proxied by farm level technical efficiency estimates (Latruffe, 2010), and past and present CAP agri-environmental subsidies. In order to explore this relationship, we first apply standard Stochastic Frontier Analysis (SFA) to estimate farm level technical efficiency scores and the effect of subsidies on these estimates. Second, we also analyse environmental efficiency by applying a modified SFA approach (Jin and Kim, 2019). Under this alternative specification, a policy maker will seek to keep observed levels of methane production under the maximum (i.e., frontier) level computed through SFA. We focus on methane production since 58% of Irish emissions from agriculture in 2019 corresponded to this gas, produced by the rumen of cattle animals.

Data

We use an unbalanced panel of National Farm Survey (NFS) farm level financial data, and include farms classified as specialist dairy and beef producers. We find mixed evidence regarding the relationship between agri-environmental payments and farm efficiency.

Results

Our estimates show that payments under the Rural Environment Protection Scheme (REPS) had a negative impact on the technical efficiency of both types of farms; however, schemes that are more recent had a positive impact on the efficiency of dairy farms only. We also find a negative relationship between the GLAS and methane efficiency for beef farms, suggesting that beef farms receiving these payments operate closer to the methane emissions frontier.

We carry out a simulation exercise where we reduce decoupled support and increase GLAS subsidies, using three mechanisms to re-allocate these resources. Under the first mechanism, we use a flat allocation mechanism where each recipient of the GLAS payment receives the same amount from the additional revenue. Then under a second mechanism, GLAS recipients obtain additional resources when they have a stocking rate below the sample median. Finally, under our third mechanism, additional GLAS payments are distributed in direct proportion to received GLAS subsidies. Under these scenarios, we compute changes in technical efficiency, methane efficiency, and income inequality induced by this hypothetical transfer of funds across Pillars.

Our simulation results show that increases in GLAS financed by decoupled payments can potentially improve competitiveness (i.e. technical efficiency) and environmental performance (i.e. methane efficiency. Regarding improvements in technical efficiency, we find that while the proportional allocation of additional GLAS payments is preferred for dairy farms, the stocking rate allocation is preferred for beef farms. However, as for environmental gains, the proportional distribution of additional GLAS payments has the best performance for both farm types. Our results show that when additional GLAS payments are allocated in direct proportion to the observed share of the total GLAS payments, concerning competitiveness and environmental gains, it does not matter whether the payments are financed by reducing the size of the total decoupled payments or by using a non- revenue neutrality strategy as long as the distribution is not affected. As for the effects on income inequality, increasing GLAS can potentially decrease income inequality under the analysed scenarios for beef farms. In the case of dairy farms, the proportional allocation has the lowest impact on income inequality.

Conclusions

Our findings highlight the importance of considering the heterogeneous effects across different farm types of changes in environmental payment schemes. It shows that neglecting these differing effects across farm production types and farm income levels could lead to conflicting impacts regarding competitiveness, environmental gains, and income inequality. Our simulation results suggest that there is a trade-off between improving competitiveness (measured by technical efficiency) and environmental gains

(measured by methane efficiency). These estimates point to the need of designing a scheme where instruments consider the structural differences in dairy and beef production, as well as income differences. Accounting for these inequalities would also benefit the design of future policy instruments for environmental protection aimed to improve social acceptability and unlock the potential of the sector to contribute toward a more sustainable economy.

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Regional technical efficiency rankings and their determinants in the Irish dairy industry: a stochastic metafrontier analysis

Lungelo Prince Cele,[1,2] Thia Hennessy[1] and Fiona Thorne[2]

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Abstract

The paper aims to evaluate regional farm efficiency rankings for Ireland which seeks to be a leader in the global dairy industry. It conducts a within-country analysis based on technical and scale efficiency of dairy farms to explore how regional constraints imposed during the milk quota era may have affected Ireland's regional efficiency levels. The stochastic meta-frontier approach is adopted because of its usefulness in comparing regional technical efficiencies. The findings suggest that policies aiming to promote labor and soil quality improvement in the East region, and that relate to discussion groups in the South region, in addition to management of herd size, would be useful for improving efficiency post-quota. Moreover, some farms expanded beyond their optimal scale leading to a reduction in efficiency levels and this points to the need to tailor farm advice and promote caution and prudence in farm expansion decisions, especially in a region like South West. Policies that can support the ability of farms to invest and procure new resources to expand their size and minimize their unit costs associated with their growth are essential. The results from the South West region suggest that the national policy approach to support dairy expansion was not a "good fit" for all farms and all regions which can be expected given the technology differences. The evidence presented here suggests that some farms expanded beyond their optimal scale leading to a reduction in efficiency levels and this points to the need to tailor farm advice and promote caution and prudence in farm expansion decisions, especially in a region like South West.

Keywords: Farm efficiency rankings; Technical efficiency; Scale efficiency; Stochastic metafrontier

Drivers of technical efficiency in the Irish crops sector

Thorne, F[1]., Creissan, H.,[2] Kildea, S.,[3] Jones, P.,[4] and Gaffney, M.[5]

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Abstract

The tillage sector plays an important role in the Irish agri-food sector, by means of the economic output produced, input spend in the wider rural economy, provision of inputs for the livestock sector, and contributing to rural employment. Furthermore, whilst partial productivity indicators for the Irish cereal sector have shown to be very high in the international context (Thorne, 2017), there is mounting evidence that the average Irish (and EU) cereal yield is expected to increase only very slowly in the medium term (Kelly, 2019. Whilst extensive analyses of the drives of efficiency have been conducted for livestock agriculture in Ireland, analogous studies of the Irish crops sector have been lacking.

There are various reasons cited for this apparent yield stagnation, including technological advancements which have evolved to an extent that outputs are close to the theoretical frontier achievable yields. The evolution of EU agricultural policies have also been cited as having a stagnating effect on attainable yields, due to the decoupling of direct payments which has a theoretical potential to lower demand for direct inputs. Furthermore, the EU stance on technologies such as GM, gene editing and the limitation of certain active ingredients used in plant protection are theoretically cited as having a potential negative impact on yield advancements (Kelly, 2019).

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In the national context, competitiveness concerns for the sector are also borne out by the trend in income across sectors, with the relative income on Irish dairy farms increasing considerably in the past two decades. Total cereal area has also been decreasing, in a time when there is an increased demand for concentrate feeds, which is been met by increased cereal imports. Improving technical efficiency at farm level thus has become a matter of concern for the tillage farming sector in Ireland. The concerns regarding competitiveness (and efficiencies) in the sector have been reflected in various national policy documents such as FoodWise 2025 and Ag Climatise, with the ambition to introduce targeted support measures to 'increase the area under tillage above the current area of 300,000 ha's.

In tandem with concerns regarding economic sustainability of the Irish tillage sector, on the contrary there is evidence that environmental sustainability of specialist tillage farms in Ireland, yield superior results compared to specialist livestock systems of production (Buckley et al., 2021). Given the targets identified within the EU Farm to Fork Strategy and Green Deal documents, further mechanisms whereby the environmental performance of the sector can be improved upon provides a topical area of policy relevant research.

In response to these economic and environmental sustainability concerns, this paper seeks to examine the factors affecting technical efficiency on Irish tillage farms with a key focus on the principles of Integrated Pest Management (IPM). The focus on technical efficiency and drivers of efficiency are considered appropriate given that technical efficiency is considered to be a principal driver of competitiveness (Latruffe, 2010).

The analysis was based on a cross section of Irish farms specialised in cereal production, based on data from the Teagasc, National Farm Survey, coupled with an additional survey on the adoption of IPM at farm level. Stochastic Frontier Analysis (SFA) was used to examine the drivers of technical efficiency. Specific farm and farmer economic, environmental and socio demographic data were included as drivers of efficiency, with the choice of influencing factors guided by literature and available data.

Preliminary analysis of the factors affecting efficiency showed that resources at the farm level were widely used in a sub optimal manner, with significant opportunity for higher outputs to

be gained from the same set of inputs. Evidence to date does not indicate that the adoption of IPM practises were statistically significant in the determination of technical efficiency.

Whilst results to date are preliminary, based on a limited dataset, the findings will help to guide policy aimed at improving the sustainability of cereal farms, since knowing the main drivers of efficiency will help decision makers to improve farmers' efficiency and ultimately sustainability.

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Acknowledgements:

13:45-15:15	Contributed Paper Session 3	
	History and Succession *(18 min presentations and 4 min discussions)*	
Chair: Anne Kinsella Room: LCI-G007 (Seminar Room 3)	A Century of Irish agriculture	Cathal O'Donoghue (NUI Galway)
	From the hoof to the hook; the genesis of Ireland's beef processing industry between 1950 and 1960	Declan O'Brien (Irish Farmers Journal)
	Gender inclusion and open science: a long term perspective on two 'hot topics' in agricultural economics	David Stead (UCD)
	Timely and Smooth Succession path to a Sustainable Transition of the Rural Economy -Generational Renewal	Anne Kinsella (Teagasc) and Michael Hayden (Maynooth University)
	Climate *(18 min presentations and 4 min discussions)*	
Chair: Trevor Donnellan Room: LCI-G006 (Seminar room 5)	Towards climate-friendly agriculture on peatlands – insights from Austria	Laura Eckart* (BOKU)
	Adapting macro-models to consider environment-environment trade-offs: projecting greenhouse gas emissions and nutrient balances using the FAPRI UK modelling system	Erin Sherry (AFBI)
	Socio-economic Characteristics of the Early Adopters of LESS technology	Nilanthi Chathuranga Daulagala* (Teagasc/UCD)
	An Assessment of farmers perceptions of alternative Greenhouse Gas emissions mitigation technologies.	James Breen (UCD)
13:45-15:15	Lightning Paper Session *(10 min presentations and 5 min discussions)*	
Chair: Lorraine Balaine Room: LCI-G008 (Seminar Room 2)	Integrated Analysis of Farm-Level Marginal Abatement Cost Curve for Gaseous Emissions	Oyinlola Ogunpaimo* (Teagasc)
	A narrative approach to Irish dairy farmer's engagement and awareness of soil carbon storage, and GHG mitigation techniques for a future reduction in emissions from the agricultural sector	Jennifer Floody (Teagasc)
	Irish Farmers' position on Greenhouse Gas Emissions: An insight into representation, perceived trust and worry	Una Sinnott* (UCD)
	Adoption of precision livestock farming technologies in Irish pasture-based dairy systems	Paula Palma* (Teagasc)
	What is driving livestock productivity growth in Northern Ireland? An Empirical Approach	Kehinde Oluseyi Olagunju (AFBI)
	Adoption of Fixed Milk Price Contracts and Farm Investments in Irish Dairy Sector	Shefali Pardeshi* (Teagasc)

A Century of Irish Agriculture: A Policy Driven Sector

Cathal O'Donoghue

* National University of Ireland, Galway

Abstract

In this paper we have assembled a time-series of agricultural statistics over the past century to describe many of the important trends of what has been an important sector in Ireland over the course of the past century. The paper explores trends in land use trade-offs between tillage and pasture and describes growth in animals numbers, the substitution between different types of animals. Over the century the Irish agricultural sector has moved from a sector with a high subsistence dimension with up to 40% of output consumed on farms to a modern international exporting sector, much less reliant on the traditional trading partner the UK. The paper tracks mechanisation of the sector and the huge reduction in labour and significant restructuring over the century. We emphasise the importance of public policy, not just in relation to price and income supports, but also importantly in relation to trade and production restrictions. The century perspective highlights some recurring trends where export restrictions have seen resilience and recovery after they are eased.

From the hoof to the hook; the genesis of Ireland's beef processing industry between 1950 and 1960.

Dr Declan O'Brien

Irish Farmers Journal

Abstract

Ireland is among the largest beef exporters in the Northern Hemisphere, with sales exceeding 500,000 tonnes in 2021 and the business generating more than €2 billion in revenues.

However, beef processing was not always central to Irish agriculture. The genesis of the modern beef industry can be traced to the early 1950s when increased global meat demand prompted an unprecedented expansion in the country's cattle slaughtering capacity.

Exports of carcass and chilled beef increased by an impressive 700 per cent between 1950 and 1954, with foreign sales rising from a base of 6,400 tons to reach 44,000 tons.

The slaughter of prime cattle in local factories during the first five years of the decade increased six-fold from 26,000 head to 150,000 head, while the total kill of cattle and cows for the canning and carcass beef trades rose from 116,000 to 263,000 head.

This exponential growth in the beef industry ran counter to the prevailing economic trends in 1950s Ireland and challenges somewhat the accepted historical portrayal of the decade as a stagnant period in terms of innovation and business performance.

Moreover, the significant expansion in carcass beef exports in the early 1950s marked a fundamental shift in the structure of the Irish livestock industry. The dominance of the cattle export trade – which generated one-third of Irish exports earnings during this period – was challenged for the first time in more than a century by the emergence of the meat factories.

While the requirements of the carcass and canned beef industry accounted for just twenty per cent of all export-related cattle disposals in 1950, this figure had doubled to forty per cent by 1960. Indeed, by the end of the 1950s Ireland was exporting more than 50,000 tons of carcass beef to markets in North America, the Middle East, continental Europe and Britain.

This paper is based on research undertaken for my Ph.D. and explores:

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1. The factors, both domestic and international, which contributed to the establishment and expansion of the Irish carcass beef industry between 1950 and 1960;

2. The different companies and private individuals involved in beef processing during this period, and the markets that these firms supplied;

3. The challenges faced by the fledgling beef industry during the 1950s;

4. The extent to which the beef processors challenged the pre-eminent position of the live cattle exporters within the Irish livestock industry;

5. How the business culture of the beef processing industry of the 1950s has resonances with the modern meat sector.

The presentation will also address that attitude of the farm organisations and the Department of Agriculture to the development of the dead-meat sector.

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Gender inclusion and open science: a long term perspective on two 'hot topics' in agricultural economics

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Abstract

Gender inclusion and open science are two 'hot topics' in the agricultural economics profession. For example, one or the other were the subject of conference sessions/webinars of the Agricultural Economics Society (AES), the European Association of Agricultural Economists and the International Association of Agricultural Economists (IAAE) in 2021; and two open access journals have recently been launched (*Q Open* and the *Journal of the Agricultural and Applied Economics Association*). This paper provides some long term perspective on both issues based on the experience of the AES, as part of ongoing research for the Society's centennial history.

The AES ceased to publish the *Journal of Agricultural Economics* and *EuroChoices* itself in 2005, with publication moved to (now) Wiley. In the traditional subscription-based business model of publishing scholarly journals, each individual article comprises a mini-monopoly of knowledge which gives for-profit publishers liberty to engage in price discrimination to subscribers and potentially enjoy super-normal profits (Armstrong 2015). Escalating library subscription costs, and the principle that taxpayer-funded research should be available to the wider public, has produced momentum towards 'gold' open access. The AES has supported the principle of open access, for instance in evidence to a 2013 Parliamentary Select Committee. However its chief concern remains that implementation could undermine its publishing royalties from Wiley – these have become increasingly important in the Society's income stream. Whether monopoly profits have been earned through its publications is a moot point, given the available evidence on institutional subscription prices in an era when most libraries purchase the *Journal* and *EuroChoices* as part of a 'big deal' bundle of Wiley titles.

Inspired by the work of Offutt and McCluskey (2021) for the Agricultural and Applied Economics Association (AAEA), the historical data show an unsurprising scarcity of female AES members and presidents. Only one woman attended the 1928 AES summer conference, for example. Yet the AES probably had a marginally higher percentage of female members than the AAEA at the start of the 1980s. Its first female president took office in 1961 (Ruth Cohen [1906-91], with a second in 1970), which was well before the AAEA (1989), the Royal Economic Society (1980) and the IAAE (2021). However, it was another forty years before the AES elected a third female president. Testimony from unpublished documents and oral histories, including from Edith Whetham (1911-2001), also provide a mixed picture in regard to gender inclusion in the UK agricultural economics profession. Discrimination did occur, as when the husband of Morag Simpson (1923-98) was promoted ahead of her in 1953. In later decades, Ruth Gasson 'found perhaps not a very forceful direction but always support from the AES' regarding her research in a non-traditional topic area.

Timely and Smooth Succession path to a Sustainable Transition of the Rural Economy -

Generational Renewal

Anne Kinsella (Teagasc), Michael Hayden (Maynooth University)

and Bridget McNally (Maynooth University)

Abstract

Business continuity and succession planning are challenges for the agricultural sector, impacting the sustainability of rural Ireland. The increasing average age of farmers and the economic vulnerability of many farm enterprises are indicators of this challenge.

Some of the strongest barriers to innovation in agriculture are identified at farm level, and relate to business structures, lack of land mobility and aging farmers. In this context, sustainable generational renewal programmes necessitate a dual focus. It is important for sustainable generational renewal programmes to have the dual focus of providing and supporting adequate retirement income for retiring farmers, within a clear exit strategy and a framework that also enables farm successors and new entrants a formal route to farm ownership. The majority of farms in Ireland are sole-traders and this can hinder family-farm transfers and act as a barrier for new entrants.

The potential of collaborative farming and alternative farm business structures in offering opportunities for families and non-family members to farm together and for new entrants to join the industry has been widely discussed. However despite the policies in place and the opportunities such collaborative arrangements infer, there has been low adoption in Irish agriculture. Accordingly, this research paper will review some collaborative farming and alternative farm business structures in Irish agriculture and their role in farm succession, to include their role in not only attracting but also facilitating new entrants. This research paper will be further informed by research forthcoming from the EU Horizon Ruralization project where a case study on promising practices has been undertaken on the Irish farm partnerships model.

A framework for the integration of alternate/ and or the refinement of current farm business structures will be developed and as to how to integrate into farm business start-

ups while also facilitating more timely and applicable succession and retirement planning routes. Such initiatives, as recommended by the research, would not only incentivise smooth succession but also the sustainable transitioning of farm assets, to include land, to younger farmers whilst securing financial stability for older farmers in retirement.

Methodology

The paper will review the role of collaborative farming and alternative farm business structures in agriculture, to begin with a cross country review of Ireland in comparison with some selected EU countries (with well developed collaborative structures in place). This will include an exploration of the level of awareness, knowledge and engagement by Irish farmers, with reference to EU Horizon Ruralization project case study themes and findings as outlined in deliverable report. Elements of best practice to assist in policy formulation and enhancement of generational renewal programmes will be put forth as recommendations to further strengthen policy already in place.

By gaining insights from farmers who have engaged in collaborative farming and/or alternative farm business structures will inform the discussion. Farmers contemplating entering such arrangements can learn from the experiences of other farmers on how to deal with or to overcome practical issues that may arise in the transition process. A final element will involve conducting in-depth appraisal of how these arranegments assist or can in the future assist in meeting the business continuity challenge.

With a dual aspect approach, the paper will start the process of developing some policy recommendations to further enable collaborative farming structures as an on-going and viable option for new entrants to farming, in addition to facilitating the older cohort of farmers contemplating retirement.

Collaborative Farming Arrangements – the practice of Farm Partnerships

Farm partnerships come under the umbrella term 'collaborative farming, providing one possible means by which farm succession and inheritance can be facilitated to take place in a

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more timely and collaborative manner. In the most general terms, a farm partnership is where two or more farmers come together and make an agreement to share their farm resources, to include land, labour and capital. By doing so, they can enjoy the many benefits deriving from this collaboration, to include not only economies of scale for the farm business perspective, but also improved work-life balance. Other arrangements considered collaborative farming include contract rearing, share farming, cow leasing and long term land leasing.

Farm partnership have been identified as an example of a promising practice that may provide the first step of engaging in the process of succession and inheritance. They perform a key role in improving, not only the structural demographics of Irish farms but also the social aspect, while also addressing many other current challenges facing Irish farmers, including land fragmentation, smaller farm size, financial viability, rural isolation, and farm safety.

The low level of young farmer entry into farming and the consequent rising average age of farmers is viewed as problematic in an Irish context for the future of Irish agriculture, so that forms of collaborative farming, particularly farm partnerships, have been identified as an important step towards farm succession and inheritance. Commins and Kelleher (1973) (and later Gasson and Errington, 1993) refer to the succession process as a 'ladder' of responsibility which steadily over time is ascended by a young farmer entering a business. The process of retirement and succession is generally a gradual one, that follows clear phases. In the first phase, the farmer shares the workload with the successor. Following on from this, management is slowly passed over to the successor, The final phase is when eventually the successor becomes the sole operator. This middle phase, of management passing over to successor over time, is likened, by Gasson and Errington (1993), to a farm partnership.

Irish farmers can avail of a number of financial supports and incentives aimed at encouraging and maintaining the development of farm partnerships. One strategy for change, developed in the Irish policy context, is the promotion of farm partnerships across all farming systems. The rationale behind farm partnerships is that they incentivise a new set of working arrangements between the older 'retiring' farmer and the (usually) younger 'successor' farmers, providing more options for younger farmers to enter farming in an active and

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productive way, with recognised status and responsibilities and agreed sharing of the farm profits (Macken Walsh and Roche, 2012). Farm partnerships create more opportunities to maximise efficiencies and profitability in a number of ways, through combining farmer expertise, experience and resources, while also convincing older farmers of the benefits of earlier farm transfers.

The benefits associated with encouraging farm transfer and having young farmers involved in the farm enterprise have been widely cited. Potter and Lobley (1996) have coined the terms 'succession, successor and retirement effects'. These describe the processes whereby an identified successor, or lack thereof, can significantly influence the original holder's level of interest and investment in the farm as they approach, what should be, their own retirement from farming. The successor effect refers to the positive impact which a successor can have on a farm once he or she becomes actively involved in the decision-making processes and in the day to day running of the farm. On the other side of the coin, the retirement effect as a rule, has a negative impact on farms. This stems from the process of semi-retirement, if there is no successor present, where a farmers tends to de-intensify and liquidate assets. The contention is that a farm partnership could promote the successor and succession effect together, creating an environment for shared decision making and control, and at the same time stifling the negative outcomes of the retirement effect (ibid).

Both the Department of Agriculture, Food and the Marine (DAFM) and the Department of Finance offer a number of financial benefits and support for farm partnerships, in assisting to not only encourage but also to maintain their continued development. Such benefits include the Collaborative Farming Grant Scheme (CFGS) and the preferential stock relief for registered farm partnerships. These supports have ensured that all registered partnerships members are catered for in the implementation of farming support schemes such as the Basic Payment Scheme (BPS) , Targeted Agriculture Modernisation Schemes (TAMS) and Green, Low-Carbon, Agri-Environment Scheme (GLAS) .

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In the most recent data available from the Department of Agriculture, Food and the Marine as at end of 2021 year there are 3,260 registered farm partnerships (RFPs) in Ireland [2]. RFPs comprise just over 2 per cent of the Irish farming population, are just one of a number of collaborative farm business arrangements. All of the main farming enterprises can enter a farm partnership: dairying, beef, tillage, sheep and other enterprises such as horticulture, pigs, poultry and goats, but it has been predominantly dairy farms that have availed of the scheme and its incentives to date. As well as addressing many other current challenges facing Irish farmers, they perform a key role in improving not only the structural demographics of farms but also the social aspect. RFPs are becoming increasingly popular in Ireland, identified as critically important to the future development of agriculture and are associated with wide-ranging economic and social benefits. RFPs are formally registered on the Department of Agriculture Food and the Marine (DAFM) Register of Farm Partnerships[3].

RFPs provide a framework where farmers can work together in a formal business arrangement, where the profits of the business are shared among the partners. Teagasc, the agriculture and food development authority, supported by the Department of Agriculture, Food and the Marine (DAFM), developed the farm partnership model. Template agreements have been produced with the farmers' needs and requirements foremost, so as to allow farmers to enter the arrangements with confidence. The formalised nature of RFPs play a key role in family farm succession planning, with the young farmer getting the opportunity to become involved and also, most importantly to be formally recognised in the farm business at an earlier stage, while the existing farmer is allowed to remain active in the farm business. In this way, the older farmer maintains his farming role while also taking on a new role as a mentor.

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[2] Data Source: Department of Agriculture, Food and the Marine, personal communication: Farm Partnership Unit database as of mid-December 2021

[3] A Registered Farm Partnership must operate to certain conditions as set out in SI 247 of 2015 and the associated requirements for registering farm partnerships.

Putting farm partnerships in policy perspective context with their economic constraints and incentives

The issue of financial viability of a farm partnership is a crucial aspect. If the partnership cannot sustain the farm and provide a reasonable income for those involved, it is unlikely to be viewed as a feasible and sustainable option, regardless of its capacity to encourage farm succession to take place.

EU Horizon Ruralization Case Study One of the deliverables for the EU Horizon Ruralization project was a case study on farm partnerships as a promising practice, in particular as it pertains to farmers in the West of Ireland.

The predominance of mainly drystock, that is cattle and sheep farms, in many regions means that even with tax incentivised reliefs and financial supports, cattle farms on the lower income end of the scale, would still struggle to reap any economic benefit from entering a farm partnership. For their dairy counterparts, these higher income farms receive more value from the farm partnership and its tax reliefs. The latest Teagasc National Farm Survey results 2020, shows that family farm income per hectare on the dairy system is over 4 times higher than the income on cattle rearing farms, that is €1,223 verses €295 FFI per hectare. Farm viability plays the largest role in whether or not to enter a formal farm partnership, and collaborative farming arrangements in general, are if they viewed as an option for farmers. Regardless of any other factor, farm income and the future viability of the farm is the key to contemplating entering such arrangements and the ultimate success of same. Another most important issue is the residual income of the transferring farmer, should they opt to transfer the farm prior to death.

The issue remains, that policy at both EU and national levels has not apparently been sufficiently innovative to alter the established dynamic of low rates of transfer and an ageing farming population. The issue is particularly evident in the Irish context, where the vast majority of farm transfers are made via inheritance, and generally take place within families. This has culminated in a particularly stifled land market and very limited pathways to entry for young farmers (Hennessy and Rehman, 2007; Matthews, 2014). From an economic

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competitiveness perspective, the notion of engaging younger farmers in agriculture as a policy priority also implies their intention to actively farm in a productive way. The ability of a farm to generate enough income to support both the farmer and the successor is paramount if the partnership is to be sufficient to maintain two households.

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Towards climate-friendly agriculture on peatlands – insights from Austria

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Introduction

While natural peatlands under wet conditions are CO_2-sinks, they turn into strong sources of CO_2 when drained and being used intensively for agriculture (Joosten 2012). With the rewetting of peatlands and the introduction of paludiculture as potential measures under the so-called Eco-Schemes (EC 2021), and especially with the introduction of a new conditionality, namely GAEC 2 (Good Agricultural and Environmental Conditions) (BMRLT 2021a), the emissions from agriculturally used peatlands and their reduction is now finding their way into the CAP. While in Ireland a peatland strategy was already published in 2015 (DAHG 2015) and peatlands are addressed for example in the project FarmPEAT (Irish Rural Link 2022), in Austria, a national peatland strategy was only recently published, also including agriculturally used peat soils (BMRLT 2021b). At the same time, it is still not known to what extent peatlands are drained and used agriculturally in Austria and thus, also the structure of use and the farms managing these areas are unknown. Our study aims to close this knowledge gap and, furthermore, to shed light on socio-economic effects of possible measures for a more sustainable management on peatlands for farmers.

Data and research methodology

In order to estimate the extent of drained peatlands and their structure of use, the digital soil map of Austria (BFW 2020), providing information on soil types including peat soils, is intersected with spatial IACS data (BMRLT 2021). For the area of agriculturally used peatlands thereby identified, farm level IACS data are processed to analyse the structure and types of agricultural use. Moreover, by means of a literature analysis, socio-economic factors influencing agriculture on peatlands are identified. Based on these factors and the IACS data,

a cluster analysis is carried out to provide information on the structure of farms managing peatlands.

Triangulating the results of these analyses, three different case study regions in Austria were selected. They reflect typical context situations of agricultural use on peatlands including the respective farming systems. In these regions, expert interviews and interviews with farmers are carried out as a part of the case study analyses, providing information on socio-economic context factors that cannot be derived from available secondary data. Based on these primary data and IACS data, economic models are developed to estimate socio-economic effects of possible measures for a more sustainable management on peatlands for farmers on farm and field level.

(Expected) results and discussion

First results show, that in Austria around 79.300 hectares (ha) of agricultural land (excluding alpine pastures), are completely or at least partially located on peat soils, which accounts for about 2,5% of the total UAA. 61,3% of the 79.300 ha are managed as grassland, mostly intensive with three or more uses per year, and 38,2% are managed as arable land. Correspondingly, the cluster analysis shows that about 75% of all farms managing peatlands and about 65% of all agriculturally used peatlands can be attributed to grassland farms, with specialised dairy farming being especially important (about 40% of all farms). 35% of the peatlands are cultivated by arable farms, with or without livestock. Regarding the three case study regions, three different context situations of agricultural peatland management can be described, and potentials for a transition towards more climate-friendly management can be derived:

Specialised dairy farms predominate on agriculturally used peatlands in the Salzburg region. Land is cultivated predominantly as intensively used grassland with three or more uses per year. It is likely that forage losses caused by potential rewetting or extensification measures can hardly be replaced and farmers are limited in their flexibility to adapt due to the capital-intensive farming system (Schaller 2014; Röder and Grützmacher 2012). Correspondingly, expert interviews revealed that regular drainage of the land and its cost-benefit is not questioned by the farmers as peatlands are fully integrated into their farming system. This is

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supported by that fact that, according to the experts, only few differences between peat soils and mineral soils can be found regarding management and productivity. Initial results from economic calculations also show, that the value added for farmers by the use of peatlands is high.

Also, in the 2nd case study region in Vorarlberg grassland farms are predominant. However, extensively used litter meadows and more extensive forms of livestock farming are also present as managed peatlands are partly located in Natura2000 areas. Arising from the valley situation and an ongoing urbanisation process, the pressure on agricultural land in the region is strong. Due to their status as Natura2000 sites, peatlands have thus become a "refuge" for agriculture and are correspondingly important for farmers. The direct neighbourhood of arable land to extensive litter meadows is also special in the region and could bear conflict potential when enhancing water levels on the extensive land leads to spill-over effects on the intensive fields (Schaller 2014).

In the 3rd case study region in Carinthia, arable farming predominates, with and without animal production. On arable area, corn takes the most important share of the crop rotation, being processed through animal production (e.g. pig fattening). Generally, feedstock from arable land is easier to replace than roughage from grassland, as it can normally be purchased from the market (Schaller 2014). However, according to experts, especially pig farms in the region are competitive mainly due to their potential to produce own feedstock and hereby particularly corn with its high yields. From the expert's perspective, farms would clearly be less profitable due to high market prices for pig concentrate feed, in case arable forage area was lost due to peatland extensification.

Conclusions and Outlook

Introducing climate-friendly management on peatlands is associated with consequences for farms, which depend on the socio-economic characteristics of affected farms. Agriculturally used peatlands in Austria are largely used for the production of fodder in different farming systems. About 80% of the farms keep more than one livestock unit per hectare and are therefore dependent on the land to feed their animals. Especially roughage can hardly be replaced. While studies from Germany suggest that arable farms could replace lost fodder

more easily (Schaller 2014, Angenendt et al. 2014), this applies to Austria only in a limited extent. The example of Carinthia shows that profitability of pig farms in Austria seems to be driven by the fact that they produce own feedstock.

However, with about 80.000 hectares of agricultural land on peat soils, resulting emissions in Austria are significant. First results of this study show that the implementation of emission-reducing measures is likely to be associated with significant disadvantages for farmers. Possible measures to reduce emissions on these areas must therefore be discussed considering the costs incurred by farmers and their attitude towards possible alternatives and compensatory measures.

Based on the findings, in early 2022 farm surveys of typical farms will be carried out in the three case study regions. The results of these surveys are expected in April, including economic key figures on the productivity of the peat soils and the effects of possible measures. This analysis can also draw on experience from other countries, e.g. Ireland, where measures and projects for a more sustainable management of peatlands have already been initiated.

Acknowledgements

Adapting macro-models to consider environment-environment trade-offs: projecting greenhouse gas emissions and nutrient balances using the FAPRI UK modelling system

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Abstract

Greenhouse gas emissions are transboundary in nature – meaning that the impact on the global climate system is independent of where emissions originate. This can improve the capacity for economic efficiency in abatement, because emissions can be reduced where ever this can happen at lowest cost, without sacrificing any of the associated mitigation of climate breakdown. However, maximising the economic efficiency of emission reductions is only part of the picture. Achieving environmental efficiency is also important. This means that environment-environment trade-offs need to be evaluated, as well as economic-environment trade-offs, when carrying out *ex ante* policy analysis.

In the case of agriculture, some impacts on the natural environment are much more localised, in the sense that there is a direct relationship between where the problematic co-product originates, and the negative repercussions are felt. For example, an excess of nutrients in agricultural soils results in poor water quality for bodies within the same catchment. Changes to the location or commodity profile of agricultural production in order to reduce greenhouse gas emissions globally, could potentially worsen, or improve, nutrient imbalances and therefore impact the risk to local water quality.

An advance understanding of how a particular approach to greenhouse gas mitigation in agriculture can manifest complementary or adversarial environment-environment interactions provides an additional layer of evidence to assist decision-makers. Built in to *ex ante* policy analysis, such information can facilitate the design of parallel or corrective elements as part of greenhouse gas mitigation efforts in order to help avoid perverse or unintended consequences.

This paper outlines an approach to build on a national model of UK agriculture (FAPRI UK) to allow for both emission and nutrient balance impacts of alternative policy and market shocks

to be analysed. Agricultural methane and nitrous oxide emissions, as well as nitrogen and phosphorus soil balances, are projected out ten years, within the same modelling framework. The usefulness of this approach is demonstrated by showing the emission-nutrient trade-offs under a range of shocks.

Socio-economic Characteristics of the Early Adopters of LESS technology

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Abstract

The agricultural sector has become a pre-dominant source of air and water pollution in many countries, and the loss of nutrients to the environment indicates farm input use inefficiency. Farmers can be slow to respond to environmental issues because of the high cost of abatement, the diffuse nature of agricultural emission and a higher dependency on natural resources. The Irish agricultural sector is no exception. Ireland is non-compliant with the EU National Emission Ceiling Directive for ammonia emissions. LESS is a promising strategy in abating ammonia emissions in cattle farms as identified in the Marginal Abatement Cost Curve (MACC). The current study employs Maximum Likelihood Estimates to identify the socio-economic characteristics of early adopters' of Low Emission Slurry Spreading (LESS) equipment. Teagasc National Farm Survey data for 2020 (N=810) is used for the analysis. In the sample, about 35.8% of the total respondents have adopted LESS technology. The variables used in the model include characteristics of the farmers, i.e. age, household size and characteristics of the farms, i.e. farmland area, type of enterprise, region, income per unit land area (EUR/ha) and stocking rate. A statistically significant ($p < 0.001$) logit model indicated a positive relationship between adoption of LESS equipment and enterprise type (being a dairy farmer), region, farm size and stocking rate. The log-likelihood of adopting LESS technology increases with farmers whose dominant enterprise type is dairy ($p<0.001$), have a higher commercial orientation ($p<0.001$), higher farmland area ($p<0.001$), and are located in the border region 1 ($p=0.001$).

Keywords: Slurry spreading, LESS equipment, Ammonia abatement, Farmers, Dairy, Logit model, Maximum Likelihood Estimates, Binary choice Model, Ireland

Introduction

Slurry spreading is an effective farm management practice in Ireland, currently increasing in importance as an alternative plant nutrient source because the increasing chemical fertiliser cost is forecasted to diminish the farms' net marginal return in 2022. However, the value of slurry diminishes with a high amount of nutrient loss, for example, N loss due to leaching, runoff and gaseous emissions. Method and timing of slurry spreading are crucial determinants of nutrient retention in soil. Therefore, the Department of Food, Agriculture and the Marine in Ireland launched the LESS equipment grant scheme to promote efficient slurry spreading systems in Ireland. Reducing ammonia emission is critical for the Irish livestock sector. Environmental Protection Agency (2020) reported that manure management, animal manure applied to soil, and nitrogen from grazing animals' urine and dung deposition collectively account for approximately 89% of the national ammonia emission. Meanwhile, Ireland is non-compliant with the Directive 2001/81/E.C. of the European Parliament relating to ammonia emission. Adopting LESS equipment such as slurry tanks with trailing shoe, dribble bar or band spreaders, shallow injection systems, and umbilical system is a crucial strategy identified to achieve emission ceiling compliance in 2030 (Buckley et al., 2020).

Methodology

The current study uses Teagasc National Farm Survey (NFS) data of the year 2020 to identify the socio-economic characteristics of the farmers who are adopting Low Emission Slurry Spreading (LESS) Techniques. Teagasc has conducted the National Farm Survey (NFS) on an annual basis since 1972. A random, nationally representative sample of approximately 900 farms is selected annually for this survey. The study uses descriptive statistics and Maximum Likelihood Estimation (MLE) to predict the binary dependent variable (adoption of LESS technology). The parameter estimates indicate the change in the log of the odds associated with a unit change in an independent variable when all the other conditions are held constant (Wooldridge, 2012).

The model uses the cumulative logistic function (logit model) depicted in equation one below for estimating the log-likelihood of adopting LESS technology.

$$L_i = ln\left(\frac{P_i}{1 - P_i}\right) = \beta_0 + \beta_1 x_1 + u_i \quad Equation \ 1$$

Where;

$$L_i = log \ value \ of \ the \ odds \ ratio$$

Results

Socio-economic Characteristics of the Participants

The total sample size is 810 farmers. About 35.8% of the total respondents have adopted LESS technology, 60 % received Teagasc advisory service, 32% were in the 61-70 age category, and 28% were in the 51-60 age category. The highest average farm income is observed in regions 6 and 7, the most extensive farmlands are observed in Regions 3, and 7 and the highest average stocking rates are observed in regions 3 and 6. Furthermore, the average age of the farmers who adopted LESS technology is 55 years, their average farm income (Mean=1004.64 EUR/HA), farmland size (Mean= 73.56 HA), and stocking rates (Mean=1.92) are higher than those who did not adopt LESS technology.

Maximum Likelihood Estimation (MLE) for Adopting LESS Technology

The results are summarised in Table 1. Accordingly, higher stocking rate, being a dairy farmer, being locating in region one and larger farm size positively influence the adoption of LESS technologies.

Table 1: Adoption of LESS Technology, Binary logit model estimates

		Adjusted p-value
(Intercept)	-2.819	0.000
[D_FARM_REGION_CODE=1]	1.129	**0.001**
[D_FARM_REGION_CODE=2]	0.442	0.716
[D_FARM_REGION_CODE=3]	0.484	0.245
[D_FARM_REGION_CODE=4]	-0.625	0.125
[D_FARM_REGION_CODE=5]	-0.621	0.153
[D_FARM_REGION_CODE=6]	-0.061	0.867
[D_FARM_REGION_CODE=7]	-0.009	0.981
[D_FARM_REGION_CODE=8]	0[a]	.
Advisory Participation	0.074	0.685
Income (EUR/HA)	0.000	0.166
Total Farmland (HA	0.008	**<0.001**
Household Size	0.059	0.394
Respondents' Age	-0.008	0.362
Stocking Rate	0.626	**<0.001**
Dairy Dummy	1.330	**<0.001**
(Scale)	1[b]	

a. Set to zero because this parameter is redundant.

b. Fixed at the displayed value.

Discussion and Conclusions

The LESS equipment grant scheme is provided by the Irish Department of Food, Agriculture and the Marine to promote use of slurry tanks with trailing shoe, dribble bar or band spreaders, shallow injection systems, and umbilical system for slurry spreading and discourage use of splash spreading. Furthermore, from January 2021, using LESS equipment is mandatory for farms under nitrates derogation in Ireland (DAFM, 2021). LESS equipment reduces the spread width compared to splash spreading, minimises exposure to the surface area, reduces emission and applies slurry near grassroots (Donnelly, 2021). The current study examines the farmers' socio-economic factors who are the early adopters of LESS technology

in Ireland. The Maximum Likelihood Estimates for the binary dependent variable (1= Adopting LESS; 0= Not adopting LESS) shows that the level of farm management or commercial orientation indicated by the stocking rate, type of agricultural production (binary variable 1= dairy, 0= other enterprises; other cattle, sheep, horse, tillage), geographic location (Region 1) and farmland area are statistically significant ($p<0.001$) determinants that increases the likelihood of the early adoption of LESS technology in Ireland. This analysis indicates farmers with bigger and more profitable farms are highly likely to adopt environmentally oriented technologies when a government support scheme is available.

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An Assessment of farmers perceptions of alternative Greenhouse Gas emissions mitigation technologies

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Introduction

The Climate Act approved by the Irish government in October 2021 has identified sectoral targets to achieve a 51% reduction in total Irish Greenhouse Gas (GHG) emissions, including a target to reduce agricultural GHG emissions by between 21 and 30%. If widely adopted abatement strategies have the potential to reduce agricultural emissions by up to 15% in 2030 compared with projected emissions under a business as usual scenario (Lanigan and Donnellan, 2019). However, the adoption of these technologies is a complex decision that will depend on a wide variety of factors including the direct cost of the measure, the impact of the measure on farm performance and profitability, the farmers managerial ability, their perceptions accurate or otherwise of these measure, as well as the contribution of agricultural extension agents in communicating the extent of the problem to farmers. Farm specific characteristics such as soil type and farmer specific characteristics such as their age and education level will also influence farmers relative preferences for implementing different technologies. This paper reports the findings of a farmer survey and focus groups that explore farmers awareness of and attitude towards agricultural GHG emissions as well as their preferences relating to GHG emissions abatement measures and the factors that shape these preferences.

Data and Methods

A mixed method approach was used in order to capture both quantitative and qualitative data pertaining to farmers attitudes towards alternative abatement technologies. A survey was administered at dairy and beef farmer discussion groups to establish their existing knowledge

level on GHG emissions from agriculture in Ireland and their opinions in relation to the adoption of practices to reduce emissions. As part of the survey participants were presented with 11 different abatement measures to rank using a best-worst scaling method. The best-worst scaling method is used to measure farmers preferences for GHG mitigating technologies and which options may need to have additional information and support provided. This method measures the location of each option along a scale according to degree of interest (Goodman, 2005). By using this method, it allows us to develop an ordinal ranking according to the respondent's preferences which simplifies the analysis process and allows for direct comparisons between options (Goodman, 2005). In each BWS task, respondents were asked to identify the best and worst option of GHG mitigating technologies for their own farms. For the purpose of this study, in the BWS a balanced incomplete block design was used with 11 treatments (mitigation technologies), 11 blocks and 5 treatments per block, with each treatment appearing 5 times. After the questionnaires had been completed and analysed two semi-structured focus groups were conducted to discuss the mitigation measures. These focus groups explored the barriers adoption of specific measures.

Results

Improving live-weight gain of beef animals was the most popular option amongst beef farmers with the highest best count at 99 and the lowest worst count at 7, while the use of treated urea was the most unpopular among farmers as they have the lowest best count at 8 and the highest worst count at 98. In contrast, other measures such as implementing a herd health programme and increasing clover content in the sward appeared to divide opinion amongst beef farmers as they showed worst counts nearly as high as their best counts. Beef farmers typically ranked the most cost-effective measures highest, which is unsurprising given the low returns to beef production. Amongst dairy farmers "extending grazing season length" had the highest net score followed by improving the EBI of the herd and timing of slurry application. As was the case in the beef best-worst, overall, the dairy farmers tended to prefer the more cost-effective mitigation measures as also stated by Vellinga et al. (2011) and Barnes and Toma (2012). This is with the exception of low-emission slurry spreading as it was ranked the least cost-effective but was the fourth most popular measure amongst the dairy farmers

surveyed. Planting of forestry was the least popular measure amongst dairy farmers and the third least popular amongst beef farmers.

Discussion and Conclusions

In terms of farmer preferences for technologies it was clear that there was less preference for newer or lesser known technologies such as use of dietary additives and use of treated urea. It is also possible that the cost-effectiveness of some measures (in particular the more newly developed ones) is not fully appreciated by farmers, as some farmers expressed surprise at the potential savings to be made as a result of the measures included in the Carbon Navigator. Planting of forestry proved to be a particularly unpopular option amongst the farmers surveyed and is in line with the recent downward trend in farm afforestation in Ireland. Previous studies have found that many farmers perceive afforestation as an activity only suitable to more marginal land and this combined with the perpetual nature of farm forestry has led to low rates of afforestation in recent years.

Integrated Analysis of Farm-Level Marginal Abatement Cost Curve for Gaseous Emissions

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Abstract

Mitigation of climate change remains a central focus of the global communities. In Ireland, gaseous emissions from the agricultural sector are disportionately high compared to other developed countries. The Irish agricultural sector contributes 37.1% of greenhouse gas emissions (GHG) and 99.4% of ammonia emissions (NH_3). Extensive efforts have been brought to bear on the development and evaluation of mitigation measures that reduce either greenhouse gases or ammonia emissions from the agricultural sector. However, the extent to which mitigation measures for either GHG or ammonia may be synergistic or antagonistic has received less attention. Using the Teagasc National Farm Survey (NFS) 2020 data, this study engages in a cost-benefit analysis of a suite of mitigation measures across GHG and ammonia dimensions accounting for synergistic or antagonistic effects across 5 different farms system types.

Keywords: climate change, air pollution, environment, farm-level, abatement.

A narrative approach to Irish dairy farmer's engagement and awareness of soil carbon storage, and GHG mitigation techniques for a future reduction in emissions from the agricultural sector.

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Abstract

Climate change continues to feature in national and global policies and there is a concern that these will not connect directly to those who need to adjust their practices (Amundson, 2020). According to Wilke and Morton (2014), climatologists argue that there is a disconnect between science and policy. Yet there is a need to sequester as much carbon in the global soil reserves as possible, as record-breaking temperatures and melting ice sheets dominate the news (Kane, 2015). Many believe this process may be slow, perhaps even needing a century or more (Yang *et al*, 2019). Therefore inclusion of those who will have to alter their practices, here farmers, is vital.

Purpose

Stakeholder engagement is essential, to understand farmer's views and motivations, in co-designing technology (Kenny and Regan, 2021). There is a concern that scientific information and polices must be tailored in order for this to be effectively communicated to farmers (Ingram *et al*, 2016). Carlisle (2016) explains that the main factors, which may be preventing farmer adopting soil health practices, are agronomic, financial, public policy, knowledge and information, and demographic. There is research to show that farmers have different perspectives regarding what hazards and vulnerabilities they might face due to long-term weather patterns (Arbuckle *et al,* 2014). Therefore, this project attempts to include farmers in the conversation regarding storing additional atmospheric carbon in their soils.

Design / Methodology / Approach

An extensive literature review around soil carbon storage through agriculture was undertaken. This included all methods, which may be utilised along with an accurate assessment of soil organic carbon (Nayak *et al*, 2019).The research here adopted a mixed-methods approach of qualitative and quantitative. In this paper, the qualitative project and

preliminary results are presented. This portion of the research adopted a narrative approach for the data collection and analysis. Ethnographic interviews with 20 dairy farmers following a framework synthesised from an extensive literature review were recorded. These interviews take around 1.5 − 2 hours, with simple prompts from the interviewer and few interruptions (McAloon *et al*, 2017).

Originality

From the preliminary literature, review there is a lack of engagement with those who are tasked with the adoption of new practices (Ingram *et al*, 2016). While research regarding the best practices within agriculture for additional soil storage are prevalent (Dignac *et al*, 2017), a lack of research around farmer's views and opinions provide a necessary area for development. This paper builds on the existing research into farmer opinions (Dumbrell *et al*, 2016), and the use of narrative methodologies in agricultural research (Whitfield *et al,* 2015; McAloon *et al*, 2017).

Paper Type

Exploratory, qualitative narrative methodology.

Keywords

Farmer Engagement, Natural Resources, Soil Carbon Storage.

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Irish Farmers' position on Greenhouse Gas Emissions: An insight into representation, perceived trust and worry

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Abstract

This research brings unique questions to the fore and analyses the influences behind an Irish farmer's level of climate action. With a particular focus on emotive factors, this work allows for a cross sector analysis in Ireland and highlights the role of differing farming motivations on the uptake of low-carbon practices. Therefore, this work is crucial to the future uptake and continuing progress which agriculture across Europe is making towards low emission food production.

Discussions which specifically relate to trust among society, level of personal worry and the feeling of being represented/understood draw the most valuable conclusions of all. This research showcases matters such as trust, representation, level of worry and climate awareness among Irish farmers. The research shares valuable insight into the differences observed between farmer demographic, farmer characteristics, farm size, farm type and regional location.The key findings from this work are of particular interest to policy makers, agricultural economists, agricultural advisors, extension services and fellow researchers.

Introduction

Agriculture is responsible for over one third of Ireland's Greenhouse Gas emissions However, the potential to mitigate some of these emissions through the adoption of more efficient farm management practices may be hampered by farmers' awareness and attitude towards climate change and agriculture's role in contributing to GHG emission (Tzemi and Breen, 2018). Certain focuses, however, such as trust among society, level of stress/worry and the future sustainability of the farm in question have received little

attention in the research of GHG mitigation. We can see the importance of these focuse (trust among society, level of stress/worry and the future sustainability of the farm when reading literature on the topic:

• When people know that certain circumstances pose a threat to them, feelings of concern and worry motivate them to take specific self-protective measures (Loewenstein, Weber, Hsee and Welch, 2001).

• Farmers rated personal beliefs (75.6%) and public acknowledgment (68.9%) as very motivating for reducing GHG emissions, as well as training opportunities (43.3%) and an organised farm succession (40.2%), (Jantke et al., 2020).

• Beliefs vary with trust, and beliefs in turn have a significant direct effect on perceived risks from climate change (Arbuckle, Morton and Hobbs, 2013)

Hence, the conclusions from this research are of utmost importance to those relevant bodies previously referred to.

Methodology

One question (consisting of 9 components) was included in the Irish **National Farm Survey** for 2021/22 on behalf of this research work. The questions were structured using a standard likert scale of one to five where 1 meant the farmer in question 'strongly disagreed' and 5 meant that they 'strongly agreed' with the statement in which they were asked. The NFS was in the field from October 2021 until December 2021. This research showcases the data from four statements focusing on matters such as trust, representation, level of worry and climate awareness among Irish farmers. Survey responses will be analysed on the basis of farmer demographic, characteristics as well as farm size, farm type and regional location.

Results

The NFS data collection was completed in December 2021 and analysis of data has just begun. Results of this data will **cross compare agricultural sectors** in Ireland and draw conclusions based on the following:

• Evaluating whether Irish farmers feel **trusted** among society to mitigate GHG emissions. Identifying how **worried** Irish farmers feel towards lowering their GHG emissions and their farm's respective environmental impact

• Understanding whether or not farmers feel well **represented** in the national climate change discussion

• Concluding whether or not certain food producers are more acutely **aware and active** of their GHG mitigating duties

• Analyse whether or not farmers feel that the **future** of their farm is dependent on their personal level climate action

Discussion and Conclusion

This research provides an in-debt insight into how much the farmers of Ireland feel informed about GHG emissions and how much they feel represented in the climate discussion. Making an assessment of GHG emissions and abatement technologies from the grassroots, this project highlights the varying levels of worry, trust and awareness across different farm types in Ireland. In considering how relevant the topic of climate change is to Irish agriculture, there is huge industry contribution to be taken from the findings of this project.

Discussions which specifically relate to trust among society, level of personal worry and the feeling of being represented/understood draw the most valuable conclusions of all. This work forms part of a wider ERA-NET funded EU-wide project called MilKey. The aim of the project is to carry out a whole system analysis of sustainable and GHG optimised milk production systems taking into consideration the 3 pillars of sustainability; economic, environmental and social.

Adoption of precision livestock farming technologies in Irish pasture-based dairy systems

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Abstract

Precision livestock farming (PLF) technologies, or the use of information and communication technologies (ICT) to monitor animals' behaviour, welfare and production, have been widely promoted as important tools to improve the sustainability of dairy systems due to perceived economic, social and environmental benefits. However, there is still limited information about the level of adoption of PLF technologies and the factors associated with PLF technology adoption in pasture based dairy systems such as those present in Ireland. The current research aimed to address this knowledge gap by using a nationally representative survey of Irish dairy farms. First, we established the adoption rates of nine PLF technologies and grouped them into 4 PLF technology clusters according to the level of association with each other and the area of dairy farm management in which they are used. The PLF technology clusters were reproductive management technologies, grass management technologies, milking management technologies, and automatic calf feeder technologies. Secondly, we determined the factors associated with the adoption of each PLF technology cluster. Four binomial logistic regressions were used to determine the factors associated with the adoption of the PLF technology clusters. The factors considered in the models were herd size, farm family income per hectare, proportion of hired labour, age of the farmer, number

of household members, agricultural education, geographic region and discussion group membership. The results showed that adoption rates varied widely depending on the type of PLF technology, with the most adopted PLF technologies being those related to the milking process (automatic parlour feeders, milk meters, automatic washers and automatic cluster removers). Overall, we found that herd size, proportion of hired labour, and age influenced the adoption of all PLF technology clusters; while factors such us number of household members, agricultural education and discussion group membership influenced the adoption of some PLF technology clusters. However, the magnitude and direction of the influence of the factors in technology adoption differed between PLF technology clusters, suggesting that future research on PLF technology adoption should consider separate analysis for PLF technologies that are used in different dairy farm management areas.

What is driving livestock productivity growth in Northern Ireland? An Empirical Approach

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(EXTENDED ABSTRACT)

Introduction

The Northern Ireland (NI) agricultural sector has witnessed some gains in productivity in the last ten years. Despite this increase, statistics reveals the rate has slowed; on average total factor productivity (TFP) increased by 1.2% a year between 2007 and 2017, significantly lower than TFP growth between 1998 and 2006 (2.6% a year) (DAERA 2017). Moreover, the sector is faced with a number of important challenges, including limitations to factors of production such as land and labour. Another pressure on the industry is that successive policy reforms [e.g. changing agricultural policies and World Trade Organisation (WTO) agreements] have increased the exposure of domestic producers to world markets. Considering increasingly globalised markets, the sector should at least, keep pace with the productivity growth of competitors in other countries, and potentially capture additional market share. Against this backdrop, it is important to gain a better understanding of the sector's performance considering its significant role in NI economy. A key indicator of competitiveness is productivity: a measure of how efficiently inputs are converted to outputs.

The aim of this study is to gain an improved understanding of productivity drivers in the NI livestock sector – dairy, beef and sheep farm sectors. The study has three main objectives:

1. Compute a measure of productivity at aggregate level (for dairy, beef and sheep farm sectors).
2. Decompose aggregate productivity into different components: productivity growth within farms and resource reallocation between farms. This decomposition will enhance the policy conclusions that can be drawn as these components imply

different pathways to improving productivity; i.e. on-farm innovation and resource reallocation between farms.

3. Examine the factors influencing farm-level productivity.

This study consists of two parts: (1) the first part conducts analysis for the dairy sector and the findings are reported in this extended abstract, (2) the second part, an ongoing research, conducts analysis for beef and sheep farms

Methodology

To achieve the first objective of the study, which is to compute a measure of productivity at aggregate level, a TFP index was developed using a non-parametric approach called the Fisher Index. The TFP was first computed at farm level using the adjusted Fisher index using the Eltetö Köves Szulc (EKS) formula (Eltetö and Köves 1964; Szulc 1964). TFP is expressed as an index relative to a specific 'base' farm and year. For any farm-year observation, this measure gives the relative difference in TFP between that and the base observation. The TFP obtained here is at farm-level, therefore, to aggregate the farm-level inputs and outputs in sector level TFP requires the application of specific sample weights. Sample weights are applied *ex-ante* to aggregate output and input at the sector level to measure the TFP.

To achieve the second objective, which is to decompose aggregate productivity growth into different components, we apply the Olley and Pakes (1996)'s decomposition method of sector-level productivity. This measurement can show the extent to which productivity growth within farms and resource allocation across farms contribute to the sector-level TFP growth.

The third objective is to examine the factors influencing farm-level productivity of, and this was achieved using a panel fixed effect regression model.

The data used for the estimation are mainly obtained from the Farm Business Survey, a part of EU Farm Accountancy Data Network, for the period 2005 -2016.

Results and discussion

Analyses on dairy, beef and sheep farm sectors are conducted. However, only results on the dairy sector are available and presented at the time of abstract submission.

The findings show the dairy sector TFP improved (growth averaging 0.5% a year) between 2005 and 2016 due to output, primarily milk, increasing relative to input. NI's average yearly productivity growth during the period was larger than England's (0.2%) and Australia's (-0.1%).

Our estimates from the Olley and Pakes decomposition approach reveal that productivity growth within farms is the main contributor to sector-level productivity growth (with net positive effects averaging 0.31% per year).This suggests that enhancing on-farm innovation through technology and efficient management are important for improving aggregate productivity. While more modest, there was a steady benefit to TFP from the shifting of available resources towards relatively productive farms, with net effects of resource reallocation component averaging 0.16% growth per year. Considering this, there is a good case to consider these components complementary.

Finally, the econometric analysis using the fixed panel approach shows differences in TFP on dairy farms are significantly affected by farm and farmer characteristics. Our findings reveal that factors that positively and significantly influence farm-level TFP include herd size, milk yield, stocking density, and share of hired labour have a positive and statistically significant impact on TFP, while labour input per cow, purchased feed input per cow, and share of direct payments in total farm output have a negative and statistically significant impact. The impact of age is negative, and the drag on productivity grows as age increases. Capital investment and education both have a positive impact on farm-level TFP, as well as on their interaction.

Our findings provide useful insights for policy makers seeking to further improve dairy productivity at sector - and farm-level. Ongoing analysis is looking at conducting similar analysis for beef and sheep farm sector in order to help develop a more informed and effective agricultural policies.

Adoption of Fixed Milk Price Contracts and Farm Investments in Irish Dairy Sector

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Extended abstract

With the expansion in the dairy sector, farmers are facing greater risk and uncertainty in terms of milk prices and farm income. Farm insurance products tend to cover personal risks and/or production risk. Fixed milk price contracts (FMCs) are the most used risk management tool in the Irish Dairy Sector although a minority of farmers avail of this tool (Loughrey et al, 2021) and deal with market risk while financial risk is related to investment decisions. In 2011, fixed milk price contracts were introduced by Glanbia in Ireland and were eventually offered by all of the other main milk processors. There is no one common fixed milk contract in Ireland as each contract varies in the terms and conditions, including price and duration. Farmers can opt for multiple contracts, and these can be overlapping in time.

Farm investment plays a vital role in enhancing productivity in the agricultural sector. Farmer's decision to invest depends on various internal and external factors. The major drivers of investment in Irish dairy sector are new entrants, increased specialisation, environmental regulations, intensified milk production. A high demand for labour across the economy motivates farmers to make labour-saving investments. Various economic, social and environmental aspects are part of a farmer's choice to invest and decision to expand (Samson et al, 2016).

The aim of the following study is to evaluate the recent factors contributing to the adoption of risk management strategies and farmer's investment decisions. This study will use the Teagasc National Farm Survey (NFS) Data for the empirical analysis. The data for this research is taken from Teagasc NFS Database post quota for the period 2016 to 2020. A sample of around 230 to 270 specialist dairy farms (number of farms are different for each year) is available for this analysis. The propensity score matching method is used to match the non-

adopters with the adopters based on the observed characteristics of the farms. This method produces counterfactual levels of farm investment for each farm. These methods can be used to indicate the differences in farm investments associated with risk management tool adoption.

The following study will answer the following research hypothesis,

- Farms with high milk production which adopt fixed milk price contract are likely to invest more.
- There is an association between agricultural training/education and the adoption of FMC's and farm investments.
- There is a relationship between financial debt and net new investment per cow on the farm.

The main conclusion which can be derived from this research study is that the adoption of risk management tool like fixed milk price contracts protects farms from the milk price volatility as farmers are assured with a fixed price for their produce and thus there is a scope for such farmers to invest more and take risks on the other aspects of their enterprise.

The future scope of the research will involve accounting for unobserved heterogeneity including risk aversion.

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