Crops
Environment
& Land Use
Programme

Teagasc

National Agri-Environment Conference 2014

Thursday, 13 November 2014
Tullamore Court Hotel

Agriculture
Food
Knowledge
Research
Innovation
Science
Advice

teagasc
Agriculture and Food Development Authority

National Agri-Environment Conference 2014

Thursday, 13th November, Tullamore Court Hotel

9.30-9.45am	**REGISTRATION**
9.45am	**Opening:** Paddy Browne Head of Crops, Environment & Land Use Programme, Teagasc

SESSION 1 | GHG's - Chairperson: Pat Murphy
Head of Environment, Knowledge Transfer, Teagasc

10.00-10.20	**Policy Challenges for Reducing Agricultural Greenhouse Gas:** Dr. Gary Lanigan, Research Officer, Teagasc
10.20-10.40	**CAP Reform - Achieving GHG Emissions Reductions:** John Muldowney, DAFM
10.40-11.00	**Discussion - Q & A**
11.00am	**TEA / COFFEE**

SESSION 2 | Biodiversity & Water Quality - Chairperson: Tom Dawson, President, ACA

11.20-11.40	**Policy Challenges for Biodiversity:** Dr. Helen Sheridan, Lecturer, UCD
11.40-12.00	**Policy Challenges for Improving Water Quality:** Ger Shortle, Programme Manager, Agricultural Catchments, Teagasc
12.00-12.20	**CAP Reform - Achieving Biodiversity & Water Quality Objectives:** Jerome Walsh DAFM
12.20-12.45	**Discussion - Q & A**
12.45-1.00	**Water Quality & Farming - Improving Relationships:** Professor Cathal O'Donoghue, Head of Rural Economy & Development Programme, Teagasc
1.00pm	**LUNCH**

- Lunch vouchers can be purchased from hotel staff for €15 (Incl. Tea/Coffee)
- Presentations will be made available on www.teagasc.ie

SESSION 3 | Short Presentations - Chairperson: Dr. Monica Gorman, UCD

2.00pm	**Agri-environmental Education in Level 5 & 6 Programmes:** Ger Griffin, Walsh Fellow, Teagasc
2.08pm	**Cross-Compliance - Improving Farmer Engagement:** Catherine Seale, Walsh Fellow, Teagasc
2.16pm	**Utilisation of the Uplands for Production & Environmental Outcomes:** Fergal Maguire, Walsh Fellow, Teagasc
2.24pm	**An Examination of Biodiversity Practices on Dairy Farms in Co. Waterford:** Catherine Keena, Countryside Management Specialist, Teagasc

SESSION 4 | Research Update - Chairperson: Dr. Karl Richards
Head of Environment, Soils & Land-Use Dept. Teagasc

2.35pm	**The Effect of N. Fertiliser Formulation and Inhibitors on Nitrogen Efficiency & GHG Emissions:** Dr. David Wall, Research Officer, Teagasc
2.50pm	**Nitrate Leaching on Curtin's Farm:** Dr. Brendan Horan, Research Officer, Teagasc
3.05pm	**Irish Soil Information System - Applications for Future Research:** Dr. Brian Reidy, Research Officer, Teagasc
3.20pm	**Nutrient Balances & Use Efficiency 2006-2012:** Dr. Cathal Buckley, Research Officer, Teagasc
3.35pm	**Potential Role for Barrier Technology in Improving Water Quality:** Dr. Owen Fenton, Research Officer, Teagasc
3.50pm	**Water Footprint on Irish Farms:** Eleanor Murphy, Walsh Fellow, Teagasc
	Discussion - Q & A (*after each Topic*)

SESSION 5| Greening & EFA's - Chairperson: Con Feighery, Regional Manager, Teagasc

4.00-4.30	**Implementing Greening & EFA's in Ireland:** Paud Evans, DAFM
4.30-4.45	**Discussion - Q & A**
4.45 p.m.	**Close of Conference:** Professor Gerry Boyle, Director, Teagasc
	Tea / Coffee available

Teagasc
Agriculture and Food Development Authority

Foreword

The Teagasc team are delighted to welcome you to this years agri-environmental conference. While we are returning to a familiar venue in the Tullamore Court Hotel, the focus of the event is very much about facing up to the new and ever increasing challenges of supporting Irish agriculture to deliver increased output and improved environmental outcomes.

There are two main areas of focus for the conference. Firstly, we have a number of speakers who will address the key challenges facing agriculture in relation to the three critical areas of environment action. Gary Lanigan, Teagasc researcher, will look at policy challenges in relation to greenhouse gas emissions, Helen Sheridan, UCD, will look at bio-diversity and Ger Shortle, programme manager of the Agricultural Catchments Programme, will deal with improving water quality. John Muldowney and Jerome Walsh from the Department of Agriculture Food and the Marine(DAFM) will discuss the potential contribution of new Common Agriculture Policy measures to meeting these challenges. Paud Evans, DAFM, will outline the introduction of the greening measures which will be part of the Basic Payment Scheme in 2015.

The second focus of the conference is to introduce new environmental research. The research updates will focus on applied research which are relevant to farmers and to the professionals supporting them, on looking at some of the measurable outcomes of environmental policy and practice change in the last twenty years and will highlight novel approaches to working with farmers to achieve improved outcomes. This research will have a very significant bearing on the messages to be delivered and methodologies used by agri-professional in the coming years.

Pat Murphy
Head of Environment, Knowledge Transfer, Teagasc

Gaseous Emissions in Agriculture

Gary Lanigan & Karl Richards, Teagasc, Soils, Environment & Land-Use, Johnstown Castle, Wexford

Irish agricultural greenhouse gas (GHG) emissions are dominated by methane (from ruminants and manures) and nitrous oxide (from fertiliser and animal deposition). While emissions have been falling steadily (-17.6%) since 1998, the sector remains a significant proportion (32%) of total national GHG emissions.

The EU Commission's recent 2030 climate change and renewable energy proposals have recognised the twin challenges of food security and greenhouse gas emissions reduction. Whilst limiting emissions of greenhouse gases (GHG's) pose serious challenges to the Irish agriculture sector, new opportunities for offsetting emissions and increasing GHG efficiency offer the prospect of achieving Food Harvest production targets, whilst limiting emissions.

The principle goal of Teagasc's GHG research programme is focussed on reducing gaseous emissions in the context of maintaining and optimising agricultural productivity.
This programme seeks to

a) Understand the key processes involved in the production of methane and nitrous oxide emissions
b) Develop of key mitigation strategies such as dietary strategies, manure management, fertiliser technologies as well as researching future technologies
c) Quantify the carbon sequestration potential of agricultural soils
d) Coordinating national GHG research across all research institutions via the Agricultural GHG Research Initiative for Ireland
e) Develop decision support for farmers (the Carbon Navigator)

Teagasc have ranked mitigation strategies based on efficacy and economic cost/benefit in a Marginal Abatement Cost Curve and these strategies have the potential to hold methane and nitrous emissions steady despite increases in future production. Indeed, when allied to sequestration from forestry and grassland soils, sectoral emissions can be reduced. Ultimately a mosaic of strategies that combine improved efficiencies, low-emission technologies and carbon sequestration will be required to further reduce agricultural GHG intensity.

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CAP Reform – Achieving GHG Emissions Reductions

John Muldowney, DAFM

Agriculture is a contributor to climate change through **emissions** of *methane* and *nitrous oxide*. Agriculture can also be impacted by climate change, which defines need for long term preparation for **adaptation** to climate change. It is considered that an important aspect of CAP Pillar 1 and 2 is to be able to verify the impact of the measures related to climate change.

Overall the CAP has made an increasingly significant contribution to the environmental sustainability of the European agri-food sector in recent years, in particular through the various requirements that farmers have had to comply with under cross compliance through the Statutory management requirements (SMRs) and Good Agricultural and Environmental Condition (GAEC) provisions, and the agri-environmental measures contained in Rural Development Programmes (RDP).

This contribution is further enhanced following the recent agreement on the reform of the CAP for the period 2014-2020, which ensures the policy's coherence with the Europe 2020 strategy and its support for the achievement of the twin goals of competitiveness and sustainability. The CAP's green credentials will be strengthened through the linkage of 30% of the annual national ceiling for direct payments to the delivery of agricultural practices beneficial for the climate and the environment. This is the first time that a minimum level of environmental protection has been enshrined in direct payments under Pillar 1. Farmers will have to comply with 3 compulsory green measures, namely, the retention of permanent grassland, crop diversification and the establishment of ecological focus areas.

In addition, one of the three key objectives to be achieved by Pillar 2 funding is the sustainable management of natural resources, and climate action therefore environmental themed measures continue to be a strong feature of RDP's under Pillar 2. While the 'greening' of Pillar 1 in the new CAP (2014-2020) can potentially contribute to achieving these environmental targets, Pillar 2 measures will be required to encourage and assist farmers to go beyond the Statutory and GAEC requirements of Pillar 1 and achieve more targeted objectives.

While a minimum spend of 30% of total funding on agri-environment measures is required, and Member States' RDP's must include an agri environment measure, 20% of the total RDP budget must be aimed at measures preserving and promoting the changes necessary in agricultural practices that make a positive contribution to climate action.

The new Irish RDP for the period 2014-2020 submitted to the EU Commission is being informed by the findings and recommendations in the environmental analysis of FH2020 and the MACC report[1] by Teagasc. The new RDP will be a key support in enhancing the competitiveness

1 http://www.teagasc.ie/publications/2012/1186/1186_Marginal_Abatement_Cost_Curve_for_Irish_Agriculture.pdf

of the agri-food sector, achieving more sustainable management of natural resources and ensuring a more balanced development of rural areas.

The measures have been designed to support the Smart Green Growth message of Food Harvest 2020 and thus will encompass the themes of technology, efficiency and sustainability.

The main elements of the RDP in terms of proposed measures are:

- A new beef data and genomic technology measure. This scheme will have a range of benefits in terms of sustainability, profitability, animal health and welfare, quality assurance, and herd quality. Genomic technology, in which we are a world leader, uses DNA finger printing to increase the efficiency of animal breeding programmes by identifying high performance at a very early stage. The application of this technology on a national scale through investment in this programme aims to secure this technology's adoption in the National Suckler herd similar to its widespread adoption in the National Dairy herd. It supports efficiency gains which deliver benefits directly to the farmer in terms of output and financial return as well as to the environment as efficiency of production systems improve.
- Knowledge transfer and innovation measures including support for the European Innovation Partnership. These knowledge transfer measures are aimed at underpinning farm viability, sustainability and growth through the adoption of best practice and innovative solutions.
- A substantial new agri-environment/ climate scheme which will build on the progress made under REPS and AEOS. The Scheme aims to deliver overarching benefits in terms of the rural environment and address issues of climate change mitigation, water quality and the preservation of habitats and species.
- Incentives for on-farm capital investment, which will incorporate support for investments with clear sustainability benefits eg investment in trailing shoe slurry spreading and Biomass expansion scheme.
- Other supports aimed at collaborative farming, artisan producers and organic farming.

In particular it should be noted that the first two measures target the promotion of the cost beneficial mitigation options identified by the Teagasc MACC, i.e. improved breeding index and knowledge transfer.

This type of smart investment will ensure that we remain as efficient as possible in our production systems. Irish agriculture has already achieved significant progress in production efficiency including the use of fertiliser and manure, grassland management, improved breeding and better fertility. Essential ongoing research into new technologies is being undertaken to maintain our economic and environmental competitive advantages. The level of emissions from agriculture has been steadily decreasing in recent years and the Department of Agriculture, Food and the Marine will continue to work with state and industry stakeholders to seek greater future efficiencies in a sustainable Irish agriculture sector.

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Policy Challenges for Biodiversity

Helen Sheridan, School of Agriculture and Food Science, UCD, Belfield, Dublin 4

At a national level, '*Smart, Green Growth*' is the proposed strategy for the Irish agricultural sector (DAFF, 2010), whereby future development will seek to capitalise on natural advantages and focus on increasing agricultural output in a sustainable manner. This presentation will focus on botanical and habitat diversity findings from some research projects that illustrate where some of these natural advantages may lie and also highlight some challenges for the future.

To date our research group has undertaken habitat surveys on approximately 170 grassland farms (approx. 6,000 ha) throughout the country. Results have revealed that on average approx. 14% of grassland farm area has been retained as semi natural habitat. The challenge for policy makers is to ensure that the future development of the agricultural sector, or any particular component of it, does not jeopardise the continued existence of this diversity. Such a development could seriously compromise the ability to deliver ecosystem services that are fundamental to agricultural production at the necessary scales (field, farm and landscape).

In addition these semi-natural habitat figures are high relative to many other countries and therefore provide evidence of our green credentials. This is an area where Ireland has competitive advantage and this should be exploited as a marketing tool to strengthen the link between biodiversity and Irish produce in the minds of consumers.

However, this work also revealed that the ecological condition of at least some of the farmland habitats in question is dubious. For example approx. 50% of the hedgerows and field margins surveyed were in poor ecological condition. Therefore, it is not alone retention, but also the development of appropriate management regimes that is necessary to secure the long-term future of these habitats.

This being the twentieth anniversary of their introduction it seems appropriate that agri-environment schemes be acknowledged as a potential mechanism to achieve this. However, caution is required in this respect. Results from a study to investigate the botanical diversity of different categories of grassland funded through AEOS has revealed that there is much room for improvement in terms of the grassland communities being supported. However, on the converse side, a number of the grasslands included within this study did illustrate much more ecological interesting species composition and therefore are worthy of continued conservation payments.

Agricultural development has largely resulted in the marginalisation of botanical diversity to areas that are peripheral to mainstream agricultural activities. This is because with the exception of a very small number of agronomically desirable species, it is viewed as a limiting factor to production. This is typified by the vast majority of grassland research undertaken over the last 50 years or so. However, despite

its desirable traits, perennial ryegrass is a highly nitrophilous species and singular reliance on high input grass monocultures is becoming less economically viable and socially and environmentally acceptable. Resource use efficiency resulting in high yields of good quality forage, at minimal cost to farmers and with minimal impact on natural resources, is fundamental to the sustainability of future growth in Irish grass-based farming systems. Preliminary results from the SmartGrass project indicate that multi-species grasslands in grass based production systems may have a very important role in this respect, which has been greatly underestimated to date.

Acknowledgements:

I would like to acknowledge my colleagues and funders on the EPA funded Ag-Biota and DAFF funded Agri-Baseline projects; my colleagues on the Walsh Fellowship 'Cost Effectiveness of Selected AE Measures for Habitat Conservation, and my colleagues on the DAFM funded SmartGrass project, that have assisted in the generation of these findings: Drs Gordon Purvis, Barry McMahon, Rochelle Fritch, Bridget Lynch, Tommy Boland, Ms Cornelia Grace and Ms Blathnaid Keogh (UCD), Drs John Finn and Daire Ó'hUallacháin (Teagasc, Johnstown Castle).

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Policy Challenges for Improving Water Quality

Ger Shortle, Manager, Teagasc Agricultural Catchments Programme

There are signs of stabilisation and improvement in water quality in Ireland in recent years following a general declining trend in the preceding decades. This coincides with the introduction of a broad range of initiatives to address declining water quality including improvements in urban and domestic waste water treatment and, in the agricultural sector, initiatives such as REPS and the Good Agricultural Practice (GAP) measures under the Nitrates Directive.

There is good evidence that, following the introduction of packages of measures, a delay or lag can be expected before there is any detectable improvement in water quality. These lags have been described in scientific papers. Examples include the lag in phosphorus (P) decline in Index 4 soils to Index three which can be up to thirty years and high nitrate levels in groundwater which can be expected to take up to 21 years to reach threshold levels following the introduction of measures. Expectations of measurable improvements must be tempered in light of these lags.

There are some signs of improvement in water quality or at least positive indicators of changes that point towards future improvements in water quality. For example more manure application in the early part of the growing season and a decline in P Index 4 soils. Also, in a recent study of a drumlin lake, analysis of sediment shows a long slow decline in water quality since the mid-20th century followed by signs of recovery in the last decade or so despite increasing stocking rates in the area. However there remains a significant gap to close between current water quality and the Water Framework Directive target of 100% of Irish waters at good status or better. Non-agricultural point sources make a significant contribution to impaired water quality and measures are in train to deal with them; similarly the challenge of effective urban waste water treatment has to be tackled. Careful implementation of the GAP measures will become increasingly effective over time but it's prudent to consider options for addressing the risks that may remain in some situations which may not be fully mitigated by GAP.

The Agricultural Catchments Programme is continually improving our understanding of the processes that drive nutrient loss at catchment scale and showing where changes in management can improve efficiencies and reduce risks to water. For example simple changes in the management of open drains could cut P losses and automated systems for identifying Critical Source Areas (CSA) on farms could focus attention on these small areas thus reducing nutrient loss risk while facilitating intensive production on the rest of the farm. Developing ways to provide good, timely information to farmers to support their nutrient application decisions and management of CSAs offers great potential as an effective and inexpensive measure to reduce risk to water.

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CAP reform - Achieving Biodiversity and Water Quality Objectives

Jerome Walsh DAFM

The Common Agricultural Policy now over fifty years old is ever-evolving. While its original objectives centred on increasing agricultural productivity and ensuring a better standard of living for farmers and supporting the wider agricultural community, since the McSharry reforms of 1992, increasing competitiveness and environmental sustainability have emerged and developed as significant objectives over a number of successive reforms. The CAP2020 reforms have shifted the emphasis on the environment and sustainability even further. The introduction of the new green payment under pillar I is a key example of this, as well as more targeted priorities for protecting and enhancing the environment under Pillar II. Biodiversity and Water Quality objectives are addressed in a number of ways under these latest reforms. Firstly, under Pillar I through the implementation of the aforementioned green payment, which are also complemented by the updated Cross compliance provisions under the Basic Payment Scheme (replacing the Single Payment Scheme). Secondly, the Pillar II Schemes, such as the new agri-environment Scheme and locally-led output-based schemes will build on the environmental baseline set under Pillar I, but in a more targeted manner, addressing specific issues on a more localised and regional basis.

Cross-compliance consists of two components, statutory management requirements (SMRs) and standards for Good Agricultural and Environmental Condition of land (GAECs). These requirements and standards relate to the environment, climate change, public, animal and plant health, animal welfare and the good agricultural condition of land. Some of the statutory management requirements relate to the implementation of a number of environmental Directives. Firstly, the Nitrates Directive 91/676/EEC, concerning the protection of waters against pollution caused by nitrates from agricultural sources, which are implemented through the Good Agricultural Practice for the Protection of Waters Regulations (commonly referred to as the Nitrates Regulations). These Regulations provide a basic set of measures to ensure the protection of waters, including drinking water sources, against pollution caused by nitrogen and phosphorus from agricultural sources, having a particular focus on nutrient management with a view to minimising environmental losses. Other SMRs relate to the implementation of Directive 2009/147/EC on the conservation of wild birds (Birds Directive), Directive 92/43/EEC on the conservation of natural habitats and wild flora and fauna (Habitats Directive), thus aiding the protection of sites designated under these Directives. There are seven GAEC standards, the first three of which are aimed at protecting water quality, by establishing buffer strips around water bodies and other actions to minimise the risks of pollution to ground water. A further three standards are targeted at protecting soil and carbon stocks by setting minimum measures to protect soil cover and minimise erosion. The final standard sets minimum standards for the protection of landscape features such as: hedges, ponds, ditches, trees in line, in group or isolated, field margins and terraces.

Greening is a new component of CAP from 2015. Farmers who participate in the Basic Payment Scheme must implement the three standard greening measures: (i) Crop diversification (ii) Permanent grassland and (iii) Ecological Focus Area (EFA). Crop diversification will benefit soil organic matter and structure; nutrients management and input reduction; has benefits for disease control and improving habitats and landscape diversity. Similarly, EFAs will benefit biodiversity, soil and water quality, climate change mitigation and enhance landscape diversity. The benefits of maintaining permanent grassland include climate change mitigation (particularly by protecting high organic matter soils), biodiversity, soil, water management, flood prevention and landscape amenity value. While these measures will have a lower impact in Ireland compared to other Member States, this is credited to the fact that many farmers in Ireland are inherently 'green by definition', due to the predominance of grass-based production systems and the extensive network of hedgerows in Ireland.

Whereas Pillar I sets the environmental baseline through greening and cross-compliance, Pillar II builds on it through a series of more targeted measures to meet specific priorities. Firstly, the GLAS (Green Low-carbon Agri-environment Scheme) is the key measure providing a multiple selection of actions with environmental benefits across a wide range of areas. The tiered design feature of this Scheme ensures a more balance uptake of actions delivering on a range of environmental priorities.
Tier I priorities include Natura habitats, mandatory actions for certain farmland birds, commonages, organic farmers, as well as priority access for farmers in high status water sites. Vulnerable water areas are also to be targeted under tier 2. Tier 3 consists of a range of general actions some with multiple environmental benefits. The key actions for water quality include riparian margins and protection of watercourses action. Some examples of beneficial actions for biodiversity include: traditional hay meadow, hedgerow actions, woodland establishment, arable margins, bird/bat boxes and solitary bee actions. The introduction of mandatory requirements in relation to record keeping, the involvement of an agricultural advisor and the use of a nutrient management plan will help farmers to tailor the actions to those that are of most benefit to their holding.

An Organic Farming Scheme is included in the RDP to support the sustainable development of the organic sector, which has obvious benefits for the environment. Organic farming practices contribute to improving soil and water quality and to the improvement of general biodiversity. For example, by encouraging crop rotation, better use of organic fertilisers, improving soil organic matter and through the non-use of synthetic plant protection products or synthetic fertilisers.

A targeted and locally-led output-based measure is also included in the RDP to complement the national approach of the GLAS and Organic Schemes. The main objective of the measure is to provide a complementary support to the overall agri-environment goals, one which encourages the development of locally-focused projects designed to respond to specific environmental challenges. Two specific projects have been identified as priorities: (i) continuation support for the Burren Farming for Conservation Project, which will aid the sustainable management of the Burren landscape and (ii) a new project aimed at the conservation of the freshwater pearl mussel in certain identified priority catchments. In addition, it is also intended to use the measure to promote independent locally-driven solutions to identified priorities, which may include biodiversity, climate or water quality objectives, by way of a competitive-call process.

In summary, the Common Agricultural Policy provides a number of provisions which are beneficial for biodiversity and water quality. The SMRs, GAECs and new greening elements provide a broad range of benefits under Pillar I, and these are built upon by a number of both complementary and targeted measures under Pillar II, that offer more tailored solutions to meeting biodiversity and water quality objectives.

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Water Quality & Farming – Improving relationships

Professor Cathal O'Donoghue, Head of Rural Economy & Development Programme, Teagasc

This research illustrates how river water quality is affected by the combination of natural and anthropogenic factors, the relative influences of which are changing over time. This study undertakes an econometric analysis exploring the effects of land use, geomorphological and climatic variables on river water quality in the Republic of Ireland. This is achieved by combining a number of spatial datasets from a range of sources relating to agricultural, residential, forestry, geomorphological and climatic data with the biological measures of water quality (Q values) using an ordered probit panel data model. This modeling framework allows a spatial and temporal examination of the different drivers of river water quality at a national level.

Findings from this research indicate that various agricultural activities such as livestock, cereal and pig production have a significant negative effect on river water quality. However, analysis indicates that this effect is significantly reducing over time. In Ireland, wastewater from a significant proportion of the population (generally in rural areas) is treated by small-scale on-site systems (septic tanks). Results indicate a statistically significant and negative association between septic tank density and river water quality. Findings from this analysis indicate that an active landfill site upstream of a monitoring station was associated with lower Q value outcomes. Conversely, greater forestry cover was found to be positively associated with better river water quality outcomes. The analysis also indicates that river water quality is affected by a combination of geomorphological (e.g. soil type, slope) and climatic (e.g. rainfall) variables.

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An Assessment of Environmental Education within Teagasc, Agricultural Education Courses

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3 Environmental Knowledge Transfer, Teagasc, Johnstown Castle, Co. Wexford

This study sets out to look at both the level of environmental education which is contained in Teagasc education courses and also the changes which have taken place in environmental education as a result of the migration to the FETAC common awards structure. It is envisaged that this study will be of benefit to Teagasc as an aid in reviewing agricultural education courses and planning the future development of both course structure and course content. The removal of milk quotas in 2015 and the roll out of a restructured Single Farm Payment scheme with new supports for young farmers has seen a dramatic increase in the number of young people looking at agriculture for their future career. This has led to a 140% increase in student numbers enrolling in Teagasc agricultural education courses over the past seven years.

The early part of this study highlighted a number of significant areas of concern in relation to agricultural environmental education. Changes which took place as a result of the restructuring of course layout and content during migration to the FETAC common awards saw the removal of previous environmental elements of the education courses delivered by Teagasc and the integration of environmental material into remaining modules. An area of concern was therefore raised about the level of environmental material remaining in the courses which students undertook and the fact that not all students were directly completing an environmental module. Literature which was examined highlighted that in order to teach students about emerging areas such as climate change and emissions from agriculture, other elements of environmental concern have to be clearly established as by and large climate change and emissions tie into an overall environmental and sustainability ethos. This study used student surveys and teacher interviews as its main methodologies.

Key Findings include:

- Level 6 students completing advanced certificates have a very positive attitude towards the environment.
- Level 5 students demonstrated a positive attitude towards environmental but attributed much of this to experiences outside of agricultural education. They felt their course was too heavily laden with content relating to legislation.
- Teachers felt Level 6 advanced course students have a distinct advantage due to completion of Environmental and Sustainable Farming module.
- Teachers see this advanced module as a comprehensive addition to course content.
- Teachers place a high level of importance on integrating environmental material in their subject areas.

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Cross-Compliance - Improving Farmer Engagement

Catherine Seale, Walsh Fellow Teagasc

1 Introduction

Ireland's agriculture sector is committed to ensuring the environmental sustainability of farming, however questions remain as to how this will be realised in practice (Teagasc, 2013). This PhD project investigates how farmer engagement with Cross Compliance information and training can be improved using participatory practices. Part of this project involves understanding how effectively Teagasc's *Cross Compliance Workbook* (McKenna et al., 2013) performs as a support tool for farmers to self-assess their holdings against the various environmental, public health, animal health, plant health and animal welfare regulations pursuant to Cross Compliance. The Workbook was developed by Teagasc further to recommendations arising from a MAgrSc in Agricultural Innovation Support project (McKenna, 2012).

2 Farmer perspectives

In order to investigate the effectiveness of the Workbook we have used a participatory framework (Kesby et al., 2007; Heron and Reason, 2006). A key requirement of a participatory framework is understanding the different 'worldviews' present (Checkland and Poulter, 2006). In this study, we took a preliminary step to achieve this by seeking the perspectives of 198 farmers in relation to Cross Compliance at various training events dedicated to Cross Compliance in counties Cork, Carlow, Donegal, Galway, Roscommon, Longford, Limerick and Laois and at the Ploughing Championships in 2013.

There was predominantly positive feedback from farmers in relation to the usefulness of the Workbook: *"the workbook…will help me to go through my farm in different sections and work on the problems that I see."* Additional insights included suggestions from farmers for future training and information programs. The most frequently cited suggestions were;

1. Regular Cross Compliance events to keep farmers up to date;
2. More on farm help in relation to Cross Compliance from advisers;
3. More information in relation to nitrates, phosphorous and soiled water;
4. Specific Cross Compliance record-keeping courses;
5. More information on farmer rights during and after Cross Compliance inspections;

Furthermore, farmers highlighted issues in relation to how Cross Compliance is enforced. Many indicated that they found the process stressful and excessively complex:
"(its) *impossible for individual farmers to be fully aware of all the rules*", "*It is causing stress to farmers worrying about inspections*".

The 'grey areas' of nitrates and soiled water, the terms associated with Good Agricultural and Environmental Condition (GAEC), and issues related to tagging, were highlighted as particularly problematic from farmers' perspectives.

3. **Understanding the relationship between engagement and action**
   The next stage of this research is in-depth interviewing of a sample of farmers who attended Cross Compliance training to determine if any behavioural changes occurred following engagement with training and the Workbook. From the preliminary research study undertaken, it is expected that the Workbook's self-assessment exercise assists individuals to recognise the need for and to undertake farm-level changes when non-compliance issues are detected. However, an in-depth approach is required to explore the wide range of factors surrounding farmers' engagement with Cross Compliance and the effectiveness of the Teagasc Workbook in that context.

   Project collaborators, Teagasc's Environmental Specialists, have been actively involved in deciding the empirical focus of this study and preliminary findings have been shared to enhance learning arising for extension practice. This inter-professional collaboration, involving also farmers, is part of the Participatory Action Research (PAR) process of the project.

1. **Acknowledgements**
   The Cross Compliance Information and Training Project is funded by Teagasc's Walsh Fellowship Scheme. Team members are Catherine Seale (Walsh Fellow); Dr Áine Macken-Walsh and Dr Kevin Heanue (Teagasc Rural Economy and Development Programme (REDP)); Dr Chris High, Prof. Andy Lane and Dr Martin Reynolds (Open University, UK); and Tim Hyde and Mark Gibson (Teagasc KT Directorate).

   We gratefully acknowledge the participation and assistance of individual farmers and Teagasc administrators and advisers.

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Farmers attributes, management practices and attitudes associated with Commonage use

Fergal Maguire, Walsh Fellow, Teagasc

Background:

- In Ireland there are 4500 separate commonages covering 422,500 hectares of land.
- 11,837 farms have access to commonage land.
- 90% of SACs, 60% of NHAs and 10% of SPAs are situated on commonage land.
- Traditional farming systems have contributed to creating these High Nature Value areas.

Aim

- Establish how commonage land in Wicklow is used today and what can be done to get shareholders back using it.

Objectives

- Identify the attributes and management practices of farmers who continue to utilise their commonage land.
- Assess the relationship between sheep production levels and commonage use.
- Identify the factors that may affect farmers establishing and joining commonage groups.

Methodology

This study has two parts. The first part was a survey of sixty farmers who have grazing rights to commonages in County Wicklow. This survey was undertaken through the completion of a questionnaire. The questionnaire was administered in the home of the farmer or an appropriate location. In the second part of my research, all shareholders on two commonages were invited to participate in a meeting to set up a commonage group. Attendance of shareholders, level of interest and proceedings were observed and recorded.

Preliminary Findings

- Pattern of usage has changed dramatically on commonages in the last twenty years
- 56% of farmers surveyed no longer use their commonage for grazing
- Main reasons for not using commonage include higher sheep mortality rates, reduced productivity, overgrown vegetation, and increased labour requirement
- 70% of farmers surveyed felt that setting up a commonage group would be beneficial for the management of their commonage
- 100% of active and inactive members attended the commonage group meeting
- All present at meeting agreed that it was essential for them to come together to discuss management issues for the commonage.

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An examination of biodiversity practices on dairy farms in County Waterford

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Background

Biodiversity is important to Irish agriculture. Ireland is a signatory to the Convention on Biological Diversity (CBD) and as such undertook to promote the conservation and sustainable use of biological diversity. A meeting in 2010, in Nagoya, Japan, adopted a revised and updated Strategic Plan for Biodiversity, for the 2011-2020 period.

Farmers' Basic Payment Scheme now includes a 'Payment for Agricultural Practices beneficial for the Climate and the Environment' or 'Greening' as it is more commonly known. A very significant percentage of the national ceiling (30%) is allocated to Greening each year and all farmers who participate in the Basic Payment Scheme must also implement the Greening provisions.

In 2013, Bord Bia launched the 'Sustainable Dairy Assurance Scheme' with plans to invest almost €3.5million next year in a new targeted marketing campaign, under the 'Origin Green' banner, to promote Ireland as a source of world-class sustainably produced food and drink. It is about driving the development of an industry worth almost €3 billion in exports and maximising the contribution of dramatically expanding dairy production to the Irish economy. This programme positions Irish producers and processors as "best in class" and is a perfect fit with the corporate responsibility strategies that inform procurement policies in multi-national purchasers of Irish dairy products and ingredients across the globe

Research Questions

1. What is influencing farmers' decisions on practices that impact on biodiversity?
2. What are effective Knowledge Transfer Methods for farmers?
3. What are the challenges for dairy farmers?
4. What are the challenges for Teagasc?

Methodology

Interviews were completed on-farm with 150 dairy farmers in Waterford, selected at random for interview, one-third from each category: Less than 250,000 litres; 251,000-400,000; and over 400,000 litres.

Implications for Extension

This research will contribute to developing the theoretical understanding of the factors influencing farmer's uptake of biodiversity practices; contribute to national debates on factors affecting farmers' adoption of environmental management practices; fill information gaps on environmentally-friendly measures in CAP payments and on targeted agri-environment measures for commercial farmers.

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The effect of N fertiliser formulation and inhibitors on N efficiency and GHG emissions

David Wall

1. The effect of N fertiliser formulation and inhibitors on N efficiency and GHG emissions

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2. Background and Objectives

Nitrogen (N) fertiliser is an important source of greenhouse gas emissions in Ireland accounting for almost 3% of the annual total (CO_2 equiv). Fertiliser is also the largest variable cost on Irish farms at over €400m annually. Increasing N use efficiency (NUE) is an important development needed to help achieve Food Harvest 2020 targets in a financially and environmentally sustainable way. Use of nitrate-N (NO_3–N) based fertilisers, under wet temperate conditions in Ireland, can result in fertiliser nitrous oxide (N_2O) emissions. Switching from NO_3–N to urea based fertilisers could potentially reduce N_2O loss. Whilst increased use of urea based N fertilisers could increase national ammonia (NH_3) emissions, the use of urease inhibitors can manage NH_3 loss risk. The objective of this study was to evaluate the effect of switching from calcium ammonium nitrate (CAN) to urea or urea with a urease inhibitor (Agrotain™) and/ or nitrification inhibitor (DCD) on grass production, NUE and N_2O emissions in temperate grassland.

3. Materials and Methods

The experiment took place at three permanent pasture sites: a silt loam, Johnstown Castle (JC), a sandy loam, Moorepark (MP) and a clay loam Hillsborough (HB). The experimental treatments were: 5 rates each of (a) CAN, (b) Urea and (c) Urea + Agrotain, at 100, 200, 300, 400 and 500 kg N ha^{-1}, one rate each of (d) Urea + DCD and (e) Urea + Agrotain + DCD (200 kg N ha^{-1}) and (f) a control. The experimental design was a randomized complete block with five replicates. The experiment simulated a grazing environment; the annual fertiliser N rate was applied in five equal splits through the growing season with grass harvested prior to each application. Grass yield and N uptake was determined at each harvest and N_2O emissions were measured throughout the year using the static chamber method and used to generate the N_2O emission factor.

4. Results & Discussion

There was a significant response to N fertiliser applications at each site. Over the 2013 growing season annual grass yields were comparable for the different N fertiliser formulations at a given N application rate. There was a consistent trend for higher cumulative N_2O emissions from the CAN treatments compared with the urea treatments at all three sites. The N_2O fluxes observed followed a trend clay loam > silt loam > sandy loam. Soil texture is closely related to both water holding and infiltration capacity thus these results are in line with other studies which linked soil drainage to N_2O emissions, with highest emissions produced on poorly and

moderately drained soils and the lowest on well drained soils.

5. Preliminary Conclusions

- Urea based N fertilisers produced grass yields comparable to CAN.
- Urea based N fertilisers show promise for managing N_2O emission risk relative to CAN.
- N_2O emissions form these sites were closely related to fertiliser N application and soil moisture.
- Further research is needed to evaluate these trends across multiple years and climatic conditions.

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Nitrates Leaching on Curtin's Farm

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Impact of local weather conditions and agronomic practices on groundwater quality in a karst aquifer on an intensive dairy farm in Southern Ireland.

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ABSTRACT
Exploring the relationship between agricultural nitrogen (N) loading on a dairy farm and groundwater reactive N concentration such as nitrate (NO_3^-) is particularly challenging in areas underlain by thin soils and karstified limestone aquifers. The present study on such a site aims to relate changes in detailed paddock specific agronomic N-loading, hydrogeological and geological site characteristics with N occurrences in groundwater over a 10 year period from 2001 to 2011. In addition the concept of vertical time lag from source to receptor is considered. Statistical analysis used regression with automatic variable selection. Four scenarios were proposed to describe the relationships between paddock and groundwater wells using topographic and hydrogeological assumptions. Monitored nitrate (NO_3^-) concentrations in the studied limestone aquifer showed a general decrease in the observed time period (2002 – 2011). Statistical results showed that a combination of improved agronomic practices and site specific characteristics such as thicknesses of the soil and unsaturated zone together with hydrogeological connections of wells and local weather conditions such as rainfall, sunshine and soil moisture deficit (SMD) were important explanatory variables for NO_3^- concentrations. Statistical results suggested the following agronomic changes improved groundwater quality over the 10 year period: reductions in inorganic fertiliser usage, improvements in timing of slurry application, the movement of a dairy soiled water (DSW) irrigator to less karstified areas of the farm and the usage of minimum cultivation reseeding on the farm. In many cases the explanatory variables of farm management practices tended to become more important after a 1 or 2 year time lag. The present approach can be used to elucidate how groundwater nutrient concentrations change due to specific management and/or legislative implementation.

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The Irish Soil Information Systems

Dr Brian Reidy, Research Officer Teagasc

The Irish Soil Information System (ISIS) project was established in 2008, following a comprehensive inventory of Irish soil data compiled by Daly and Fealy (2007) which highlighted that soil data coverage of Ireland was incomplete in both detail and extent. The ISIS project is funded under the Environmental Protection Agency STRIVE Research Programme 2007-2013 and co-funded by Teagasc. It was led by Teagasc with the participation of researchers from Cranfield University (UK) and University College Dublin. The overall objective of the ISIS project was to conduct a programme of structured research into the national distribution of soil types and construct a soil map, at 1:250,000 scale, which will identify and describe the soils according to a harmonised national legend. This map is now available in digital format and forms the basis of a new soil information system for Ireland (http://isis.teagasc.ie).

The ISIS project has utilised existing data and maps from the previous National Soil Survey (NSS) conducted by An Foras Talúntais (forerunner organisation to Teagasc). The NSS produced: mapping at 1:126,720 scale for 44% of the country; a General Soil Map of Ireland and a National Peatland map, both at 1:575,000 scale and other miscellaneous large scale mapping of experimental farms. In addition, more recent map products have been included such as the Indicative Soil and Subsoil mapping (Fealy and Green, 2009) with national coverage using GIS and remote sensing techniques.

The ISIS project adopted a combined methodology of utilising novel predicted mapping techniques in tandem with traditional soil survey applications. This unique combination at a national scale has resulted in the development of a new national soil map for Ireland. Building upon the detailed work carried out by the An Foras Talúntais (AFT) survey (known as *Terra Cognita*), the ISIS project generated soil-landscape models at a generalised scale of 1:250,000 for the known counties. These soil-landscape models (also referred to as soilscapes) were used as the baseline data for statistical models (random forests, Bayesian belief networks and neural networks) to predict soil map units in counties where there was no map available (referred to as *Terra Incognita*). To validate the methodology, this work was supported by a 2.5 year field survey, in which 11,000 locations were evaluated for soil type, using an auger bore survey approach. These data were used to check the predicted soil mapping units (associations) for counties, where a detailed soil survey map was not available. Where new soil information was generated, due to previously unknown combinations of soil-landscape units, profile pits were selected at representative locations across the country. These 225 pits were described and sampled in detail and were used to generate a new soil classification system for the country. The final product is a unique combination of new and traditional methodologies and soils data from both the AFT and the ISIS

project. The final, soil association map of Ireland consists of 58 associations that are made up from 213 soil series. Associated representative profile information is available in the online soil information system.

A key component of the ISIS project has been the development of a soil and land information system and associated public web site. This system has been designed to hold the complete set of information deriving both from the ISIS field programme and modelling activity, as well as the previously existing legacy soils information available for Ireland. Drawing on this information system, the web site is designed to hold and disseminate this information online both in cartographic and tabular form to stakeholders. Prior to this development, there has been no harmonised computerised system in place to hold and manipulate national Irish soils data. The information system therefore addresses the pressing need and requirement for a publicly-accessible, integrated IT framework based upon contemporary informatics standards to serve the many and varied stakeholders having an interest in soils information in Ireland.

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Nutrient Balances & Use Efficiency 2006-2012

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This research estimates farm gate nitrogen and phosphorus balances and use efficiencies across 150 specialist dairy farms (weighted to be representative of 8,668 dairy farms nationally) over a seven year period between 2006 and 2012 using data from the Teagasc National Farm Survey which is part of the EU Farm Accountancy Data Network. The study period coincides with the introduction of EU Nitrates Directive based regulations in the Republic of Ireland.

Results from this analysis indicates that in the 7 period post introduction of EU Nitrates based GAP regulations in the Republic of Ireland, N balances have declined by 24.9 kg ha^{-1} (from 169.0 to 144.1 kg ha^{-1}) and N use efficiencies have improved by 2.5% (from 21.2 to 23.6%) across these specialist dairy farms. This reduction in N balance is pre-dominantly due to declining chemical N fertiliser (23.1 kg ha^{-1}) use as other N imports and exports remained relatively static over the study period. This reduction is equivalent to 1,188 kgs of N across the average farm.

Phosphorus balances declined by 6.0 Kgs Ha^{-1}over the study period from 12.1 in 2006 to 6.1 Kgs Ha^{-1} in 2012. This decline was again driven by a reduction in chemical fertilisers imports of 6.5 Kgs Ha^{-1} over the study period. This decline is equivalent to a reduction of 291 Kgs of P across the average farm. Phosphorus use efficiency also improved over the period from 59.2 in 2006 to 78 per cent in 2012.

In addition to the introduction of EU Nitrates based regulations, results of a random effects panel data econometric model indicate that balances and use efficiency are influenced by factors such as fertiliser prices, stocking rates, land use potential, off-farm employment, contact with extension services and climatic variables.

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Dr Owen Fenton

A recent survey has revealed that 60% of Irish farmers identified wet soil as the most important factor limiting early turnout to grass and subsequent grassland management. Increasing the productivity on heavy and moderately heavy soils will increase Ireland's competitiveness in dairying, which is in keeping with the goal outlined in the Teagasc Statement of Strategy 2012-2015 to improve the competitiveness of agriculture, food and the wider bio-economy. Food Harvest 2020 has set clear targets in the form of a 50% increase in milk production by 2020. At present in Ireland agricultural land drainage on heavy and moderately heavy soils is undergoing a renaissance to meet such targets (e.g. Teagasc Drainage Manual, 2013).

This will include re-installation and maintenance of in-field, open drains and outlets all over the country, which will lead to greater volumes of water discharging from land to surface water bodies. International and national research shows that drainage water contains nutrients (N and P).What is less well documented is that nutrient losses and loads in the water phase differ due to soil type and input differences. The SEA on Food Harvest 2020 conducted by the EPA concluded that the objective of Food Harvest 2020 environmental assessment must be to provide for a high level of protection of the environment and to promote sustainable development by integrating environmental considerations into the implementation of the strategy. Given that the 'green and natural' image is fundamental to the Food Harvest 2020 strategy, it is essential that Ireland demonstrate its commitment to these goals by actively engaging and complying with EU and international commitments (including water quality and climate change obligations). Ireland must bring water bodies to 'good status' and also, perhaps the more difficult target, must prevent the deterioration of existing 'high' and 'good' status water bodies. Engineered remediation technologies such as denitrifying bioreactors target single contaminants along a nutrient transfer continuum.

However, mixed contaminant discharges to a water body are more common from agricultural systems. Indeed, evidence presented herein indicates that pollution swapping within denitrifying bioreactor systems adds to such deleterious discharges.

The present paper proposes a more holistic approach to contaminant remediation on farms, moving from the use of 'denitrifying bioreactors' to the concept of a 'permeable reactive interceptor' (PRI). Besides management changes, a PRI should contain additional remediation cells for specific contaminants in the form of solutes, particles or gases.

Balance equations and case studies representing different geographic areas are presented and used to create weighting factors. Results showed that national legislation with respect to water

and gaseous emissions will inform the eventual PRI design. As it will be expensive to monitor a system continuously in a holistic manner, it is suggested that developments in the field of molecular microbial ecology are essential to provide further insight in terms of element dynamics and the environmental controls on biotransformation and retention processes within PRIs. In turn, microbial and molecular fingerprinting could be used as an in-situ cost-effective tool to assess nutrient and gas balances during the operational phases of a PRI. In an Irish context the ideal position for a remediation structure is within the existing drainage infrastructure i.e. in open drains before the outlet. In this way there is no need to take land out of production.

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Understand water use on Irish dairy farms

Eleanor Murphy Walsh Fellow Teagasc

It is estimated that agricultural production contributes 92% to the global water footprint. Understanding the distribution and demands for freshwater in the agri-food sector is important due to increasing global populations, food security concerns, climate change and changing patterns of dietary demands. With the abolition of EU milk quotas in 2015 and Irish government strategies such as FoodHarvest 2020 there will invariably be increased pressure on freshwater resources. With increased production there will be a great need to develop and promote sustainable Irish dairy production; proving sustainable water use through a water footprint will be important metric making Ireland's dairy exports more attractive to consumers on the global market.

The water footprint is a consumption based indicator and is defined as the sum of water used in the production of goods and services consumed by a nation, organisation or individual (Hoekstra, 2011). The water footprint addresses blue, green and grey water. The blue water measures the volumes of groundwater and surface water consumed. The green water is the volume of water lost through evapotranspiration of rain water stored as soil moisture during periods of plant cultivation. The grey water refers to pollution potential of a production process.

Blue water includes on-farm or direct water use in the Irish dairy system. In the overall water footprint it takes up a small proportion but it is often the first place where water savings can be identified and implemented. On average 6.4 litres of direct water is used for every litre of milk produced. This water use is driven by consumption by livestock and miscellaneous use, plate cooler water use and cleaning procedures in the parlour. Fresh water demands for animal maintenance is determined by climate, dry matter intake and milk yield and varies from year to year. Teagasc recommend an optimum plate cooler ratio of water: milk of 2: 1 for optimum energy consumption. Milk cooling procedures using a ratio 2:1 or higher demand 56% less energy to cool milk than plate coolers which use <2:1 L water / L milk. Plate cooler water can be collected and reused for wash-down procedures and animal drinking water. Another aspect to consider in efficient water use is the maintenance of the water supply network on a farm. Leaks which go unchecked can add to the pumping cost of water on a farm. A leak of 10L/min could cost up to €526/annum in pumping costs. A hot water leak of 60mL/min (1 drip/sec) could cost up to €240/annum in associated pumping and heating costs.

A greater understanding of water use and the drivers of water use on farms gives an insight that enables the Irish Dairy sector to reduce its burden on freshwater resources

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A GUIDE TO GREENING

Paud Evans DAFM

1. Introduction

From 2015 the Single Payment Scheme will be replaced by the Basic Payment Scheme. In addition to the Basic Payment Scheme, Ireland must introduce the 'Payment for Agricultural Practices beneficial for the Climate and the Environment' or "Greening" as it is more commonly known and make an additional payment to eligible farmers under the greening measures. Farmers who participate in the Basic Payment Scheme must implement the three standard greening measures as follows:

- Crop diversification
- Ecological Focus Area (EFA)
- The protection of permanent grassland - in Ireland, the obligation to maintain permanent grassland is managed at national level and therefore there is no obligation imposed on individual farmers to meet this requirement.

While the Greening obligations do not have to be met until 2015, we are conscious of the fact that arable farmers will be taking decisions during the second half of 2014 that will have consequences for their 2015 payment in terms of the Crop Diversification requirement, in particular. This booklet is a guide to the obligations and requirements under Greening and is designed as an aid to farmers in making these decisions.

2. Exemptions

While all farmers are required to comply with Greening requirements, many farmers are "Green by Definition" and will be exempt from taking any further action under the Greening requirements where:

- more than 75% of the eligible land of the holding is grassland, provided the arable area not covered by these uses (land under arable crops) does not exceed **30 hectares**;

Land is subject to organic farming practices where the farmer is registered with this Department licensed by one of the Organic Control Bodies. However, such exemption only applies to that part of the holding which is farmed organically.

It is important to note that for many arable farmers, the current farming practices that they are engaged in mean that they will already meet the requirements of the greening practices without taking any additional measures i.e. they have sufficient number of crops and have sufficient EFA features on their holding.

3. Crop Diversification

Crop diversification is designed to encourage a diversity of crops on holdings which have arable land. There is no 'crop diversification' requirement where a farmer holds less than ten hectares of arable land. Arable lands include arable crops, temporary grassland (lands that were used in crop rotation during one or more of the previous five years) and arable fallow lands). For farmers that have an arable area of between ten and thirty hectares on the holding, at least two crops are required of which the primary crop shall not cover more than 75% of the arable area. Where a farmer holds more than thirty hectares of arable land, at least three crops are required, of which the main crop shall not cover more than 75% of the arable land and the two main crops together shall not cover more than 95% of the arable land. Winter and Spring Barley, for example, are considered two separate crops and temporary grassland is also classed as a separate crop group for the purpose of crop diversification.

The thresholds are summarised below in the following table:

Crop Diversification		
Arable Land	**Number of Cropsw**	**Percentages**
Less than10 hectares (ha)	No obligation	
Between 10 ha and 30 ha	At least two crops	Main crop not more than 75% of the arable land
Over 30 ha	At least three crops	Main crop not more than 75% of arable land. Two main crops together not more than 95% of arable land.

4. Ecological Focus Area (EFA)

Farmers whose holdings include equal to or less than 15 hectares of arable land are exempt from this measure. Where a holding includes more than 15 hectares of arable land, at least 5% of that arable land is allocated to Ecological Focus Area. This percentage will be reviewed in 2017 at which time it may subsequently increase to 7%.

Land that is considered as Ecological Focus Area may include:

- hedges
- drains
- buffer strips
- arable land laying fallow
- areas with catch crops or green cover
- nitrogen fixing crops
- areas with short rotation coppice
- group of Trees/Field copses
- afforested areas as referred to in Article 32(2)(b)(ii) [SPS Eligible Forestry]

EFAs must be located on the arable area with the exception of landscape features and buffer strips which may be adjacent to the arable land. Ireland will apply a conversion matrix which allocates a fixed area to specific features and a weighting matrix which takes account of the environmental value of such features. The table below outlines the conversion and weighting factors:

EFA Conversion and Weighting Factors			
Features	**Conversion Factor**	**Weighting Factor (if both factors are applied)**	**Ecological Focus Area**
Hedges	5	2	10 m^2
Drains	3	2	6 m^2
Buffer Strips	6	1.5	9 m^2
Land Lying Fallow	Not applicable	1	1m^2
Catch crop/Green cover	Not applicable	0.3	0.3 m^2
Nitrogen fixing crops	Not applicable	0.7	0.7 m^2
Short rotation coppice	Not applicable	0.3	0.3 m^2
Group of Trees/Field copses	Not applicable	1.5	1.5 m^2
SPS Eligible Forestry	Not applicable	1	1 m^2

For the majority of farmers the 5% EFA requirement will be met with existing arrangements and no further action will be required.

5. What to do next

To assist farmers in meeting the greening requirements, the Department of Agriculture, Food and the Marine is currently in the process of developing an on-line system. This will allow farmers, who may be subject to greening practices to examine details of their holdings and farming practices to assist in establishing **whether they will be compliant with Crop Diversification and EFA requirements based on current practices or whether additional measures will be required.**

In relation to EFAs, it is envisaged that the on-line system will enable farmers with EFA obligations to logon to the Department's website and agree/change/disagree with EFA features identified on their holdings. This facility will also provide calculations with regard to the 5% requirement which will allow farmers to have advance knowledge as to whether they are meeting the EFA requirement or whether additional action will be required.

In relation to Crop Diversification, the Department intends using SPS applications to determine whether farmers who are subject to this measure will meet the thresholds as outlined above, i.e. whether they have the requisite number of crops and whether the percentage of each crop group satisfies the requirements.
If you are not already registered for the Department's online facility, it is vital that you register on-line as soon as possible.

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