

Kildalton Open Source Sustainable Dairy Demonstration Farm

Information Booklet 5th July 2018



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Minister of State,
Department of Agriculture,
Food and the Marine

This is a Department approved
Knowledge Transfer Dairy Event



Ireland's European Structural and
Investment Funds Programme
2014-2020



Co-funded by the Irish Government
and the European Union



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Welcome note from Teagasc



On behalf of Teagasc and the management team of the Teagasc/ Glanbia Ireland Open Source Sustainable Dairy Demonstration Farm at Kildalton Agricultural College, I would like to welcome you to today's event.

Global demand for food is projected to double by 2050 and, at the same time as increasing production to meet this challenge, we have to ensure that we protect our environment by meeting the demanding targets set for water quality, emissions to the atmosphere and protecting biodiversity. Food companies around the world have recognised the importance of verifiable sustainability claims for their products and increasingly demand that suppliers guarantee the sustainability credentials of their products. So dairy farmers are getting signals from regulators and customers that sustainable milk production is essential for the future of the sector. It's inevitable that these signals will get stronger.

The Kildalton Open Source Sustainable Dairy Demonstration Farm was set up to show farmers how to farm more sustainably. It builds upon the large body of research and knowledge-transfer experience in Teagasc, and draws on international knowledge to showcase solutions to the economic and environmental sustainability challenges facing Irish farmers. Sustainable agriculture puts us in a better position to face, not just today's challenges, but tomorrow's and it gives us the tools to shape the future we want.

We hope that you will find today's Open Event to be both informative and practical, and that you take home messages to improve the sustainability of your farm, whether through making changes straight away, or through planning changes that may take several years. The Irish agricultural sector has been proactive in improving the sustainability of our food production and we must ensure that we continue on this pathway.

The support of Glanbia Ireland has been instrumental in the establishment and operation of the project and I want to acknowledge their ongoing support. I also want to thank Mr Paul Hennessy, Kildalton College Principal and his staff, joint Project Leaders, Dr Brendan Horan and Dr. Karl Richards, Dr David Devaney who is responsible for the day-to-day implementation of the project.

Professor Gerry Boyle
Director, Teagasc.



Foreword from Glanbia



The dairy unit here at Teagasc Kildalton is a showcase for sustainable dairying that was set up in a joint initiative between Teagasc and Glanbia Ireland (GI). The farm demonstrates the best sustainable management practices that will deliver economic and environmental benefits on Irish dairy farms.

In Ireland, we have great natural advantages in terms of sustainability – our climate, as well as our predominantly grass-based, family farm, milk production system. But we cannot allow our national advantages to blind us to the need to minimise our impact on the environment.

Since the abolition of milk quotas, the supply of milk from the Glanbia catchment has expanded by around 35%. As an expanding dairy industry, we have to be very conscious of the fact that a significant proportion of our milk suppliers are dependent on the retention of the Nitrates Derogation for the optimum operation of their farms.

At Glanbia Ireland, we are determined to ensure that milk production in our catchment area expands in an environmentally and economically sustainable manner. For example, effective nutrient management based on regular soil analysis is key.

Environmental sustainability is also high on our business agenda. At today's Open Day, members of our marketing team will show how our positive sustainability credentials are marketed internationally. This must be based on proven science, rather than aspiration.

We led the way with the development of our Open Source programme, which has since been replicated nationally in the Sustainable Dairy Assurance Scheme (SDAS).

For farmers, sustainability should not be seen as a huge threat or a huge cost - my belief is that sustainability is our "licence to grow". By reducing energy and water consumption on farm, we reduce our environmental footprint and also our production costs.

The key to sustainability is adoption of best practise – today's Open Day provides a great opportunity to learn more about this key topic for all of us.

Jim Bergin,
Glanbia Ireland



Foreword from Kildalton College




Education and innovation are critical to the Irish dairy industry and a major strategic priority as we transition towards more sustainable agricultural models. Food Wise 2025 dedicates a significant focus to sustainability and places significant emphasis on both environmental protection and economic competitiveness. The achievement of the targets set out in Food Wise 2025 demands stronger and more continuous connections between education and employment in agriculture. In future, farms will need to be designed around people and systems that attract and retain capable staff, increase the desirability of farming careers, enhance productivity and sustainability

and increase the safety and wellbeing of people and animals on-farm. To that end, Teagasc is committed to the promotion of world class education programs to enable the development of a highly skilled workforce and to build our industry capability.

Kildalton College is the largest land based college in the country with over 1400 students attending courses this current academic year. The majority of students are studying on 2-year Teagasc training programmes while the remainder are studying on higher level degree courses linked to Waterford Institute of Technology or UCD. The college dairy unit and the Open Source Project are central components of all agricultural education programmes in Kildalton.

Sustainable agriculture is an integrated system of practices that, over the long term, will increase food production, enhance environmental quality, make the most efficient use of non-renewable resources and sustain the economic viability and quality of life for farm families and society as a whole. Irish grass based milk production is highly regarded internationally in terms of the environmental sustainability of our production system. Only 10% of global dairy production originates from grassland, which naturally provides a very sustainable method of food production and recent international studies have indicated that Irish milk has the lowest carbon footprint within the EU. Looking ahead, the ongoing expansion of milk production in Ireland over the next decade will be based on further improvements in grazing practices on farms coupled with improved soil fertility and further genetic improvement of dairy herds to realise higher productivity without adverse impact on the natural environment. The objectives of the Kildalton Open Source Sustainable Dairy Demonstration Farm are to provide a showcase for sustainable farming to demonstrate win win practices and technologies to our students, farmers, policy makers, industry leaders and customers and in so doing, to evaluate the role of emerging technologies on dairy farms.





Although the Kildalton herd has always operated at a relatively high level of technical efficiency, the challenge for the Open Source Project is to further improve on productivity within the farm while reducing the requirements for both chemical fertilizer and supplemental feeds. The project has set ambitious targets to further increase productivity and profitability while also reducing the environmental footprint of production. The main improvement pathways for the Kildalton farm include continuing to increase the EBI of the herd, increasing soil fertility and sward productivity, establishing white clover within the dairy pastures to reduce fertiliser application and reseeding underperforming swards. On a final note, I wish to thank our colleagues across Teagasc's Research, Advisory and Education services for their support and input to this event.

On behalf of Kildalton Agricultural College, I want to welcome you to the campus today. I sincerely hope you enjoy the event.

Paul Hennessy
Kildalton College Principal



Achieving a more sustainable farming enterprise: Summary of key findings from the Kildalton Open Source Sustainable Demonstration Farm

¹David Devaney

¹Teagasc, Kildalton College, Piltown Co. Kilkenny

Introduction

Achieving a more sustainable farming enterprise and at the same time reducing costs and improving profits is the core aim of this project. The Kildalton Open Source Sustainable Demonstration Farm won't develop an exact blueprint that every farm should adopt to become more sustainable. Rather it has set about to explore the effectiveness of a range of practical measures and technologies and establish their effectiveness in a more real-life dairy farming system. The Open Day and this booklet contains a wealth of information on every aspect of sustainable farming and this paper aims to pick out those strategies that will underpin your transition to improving the sustainability on your farm. Getting these right not only improves farm finances but will also improve the effectiveness of future decisions and strategies to keep improving farm sustainability.

Improving farm sustainability

1. The animal

High EBI cows are more productive, robust and efficient and consequently more profitable than lower EBI counterparts. Improving herd EBI by €10 per year is an important first step to increase animal performance and health and fertility and reduce the requirement for replacement animals. As well as being more profitable, they have a lower carbon footprint and Moorepark research has shown that for every €10 increase in the Economic Breeding Index (EBI) reduces carbon emissions by 2% per kg milk solids (MS).

2. The importance of soil fertility

Growing more fodder and extending the grazing season are critically important to maximize pasture production and together with appropriate overall stocking rates, minimise the requirement for external forage and concentrates purchases. The ability to grow and utilise large quantities of pasture is heavily dependent on having optimal soil fertility. Correcting soil fertility is the first, vital step, towards increased forage production with lower costs from inputs. The message here is to have your soils tested and act on the liming and fertiliser recommendations.

3. Incorporating Clover within grazing pastures

Clover has the potential to reduce nitrogen use, increase milk production per cow, and reduce nitrous oxide emissions. At Kildalton, clover has been

incorporated into all pastures by over sowing. Previous research has shown that where grass clover swards receive 150kg N per hectare, similar over grass production can be achieved to grass only swards with 250 kg N per year. In an environment where we need to be considering how to reduce greenhouse gas emissions, clover has a very important role to play in dairy grassland management.

4. Recycling nutrients from the animal to maximize sward productivity

Recent research has highlighted the important nutrient value of slurries and current recommendations are to recycle slurry to target areas that need it most (e.g. silage ground, low fertility land etc). We also know that time and method of spreading plays a big role in getting the best value from slurry e.g. spreading slurry in Spring and using Low Emission Spreading Systems like a band spreader can return 10 units of Nitrogen per 1000 gallons as opposed to 3 units if spread in Summer with a splash plate.

Next Steps

A comprehensive set of metrics – which will show how well we are improving farm sustainability - have been identified in the first phase of this project and we already have good information pointing to where we can make improvements. In the year ahead we will continue our clover overseeding and establishment programme with the aim of reducing chemical fertiliser in the very near future when the clover becomes established. The success of clover establishment is heavily dependent on soil fertility which we will continue to address with liming and targeted application of slurry and P&K fertilisers. There are efficiencies to be made with our electricity consumption and improvements to lighting, optimising the plate cooler etc will come before retrofitting with photovoltaic solar panels. We will continue our push to increasing biodiversity habitats and improving their condition by planting more hedgerows and minimising practices that impact negatively on the flora and fauna that thrive there. The continuation and expansion of our water quality analysis will help us develop a management plan that will distribute nutrients to the most needful areas helping us maximise returns from our fertilisers and minimize any negative environmental impacts. We also begin to look at emerging technologies that will have a meaningful role to play in the near future – for example sensors that can predict the nutrient content of a sward etc. All of these improvements will be made against a backdrop of continually improving the EBI of the herd and maintaining the excellent technical efficiencies that the teaching and technical staff in Kildalton College has already established.

It is important that we communicate our experiences along the way and we look forward to talking to you and listening to you along the way. We thank those people who have come along to this Open Day and we look forward to hosting the next Open Day in the near future. See you then!

Additional information: <https://www.teagasc.ie/environment/sustainability/>

Sustainability in Glanbia and in the Global Marketplace

¹Audrey O'Shea

¹Sustainability Manager, Glanbia Ingredients Ireland, Ballyragget, Co. Kilkenny

Glanbia Ireland's ethos around Sustainability is all about the "ability to sustain" the business into the future through responsible business practices while delivering value to our stakeholders and demonstrate Glanbia Ireland's commitment to our suppliers and co-op members livelihoods.

Most know that Irelands Climate Change targets will be difficult to achieve and there has been a lot in the media recently about moving from diesel to electric vehicles not only to reduce carbon emissions but also to reduce nitrous oxide and particulate matter emissions in an effort to improve our breathing air quality. Within the agricultural sector there is no quick fix for the greenhouse gas emissions such as methane from livestock but we are working to continually improve and find best practices solutions e.g. taking the advice of Teagasc and using their tools such as the marginal abatement cost curve (MACC) and the Carbon Navigator both of which will not only have the ability to guide towards a lower carbon number but also better guide towards financial returns. Similarly Nutrient Management tools will not only lead to the most economical use of fertilisers, but also help to reduce indirect greenhouse gases and protect water courses. In terms of air pollution the removal of fossil fuels and the better management of slurry to reduce ammonia emissions will all contribute to better air quality.

To maintain Irelands green image and to protect our licence to grow we must collectively be aware and ambitious to achieve the environmental targets and work towards ensuring continual improvement in the areas of Climate Change, Water Quality and Air Quality (Ammonia), all in an effort to protecting our Natural Capital, Ireland natural resources and our farmlands for our children and our children's children.





Sustainability in the Global Market Place.

'Sustainability' is important to all Glanbia Irelands customers and the term takes many forms depending on the market and the individual customer. For some it means an "affordable" price or animal welfare, for others it has environmental connotations such as clean water, chemical free or reducing carbon in the atmosphere. While the interpretation of sustainability might be open-ended it is clear that sustainability now plays a central role in risk avoidance, raw material sourcing and/or investment strategies and underlies customer's individual Corporate Social Responsibility goals.

A number of our customers seek to meet consumer demand for products produced in a sustainable way by bringing their credentials directly to their consumers through, for example, on-pack claims and free-from brand messaging that are prevalent on products today e.g. Fair trade, Gluten free, Low GI, Salt-Free, Fat-Free, No added Sugar, 100% Natural ...and the list goes on.

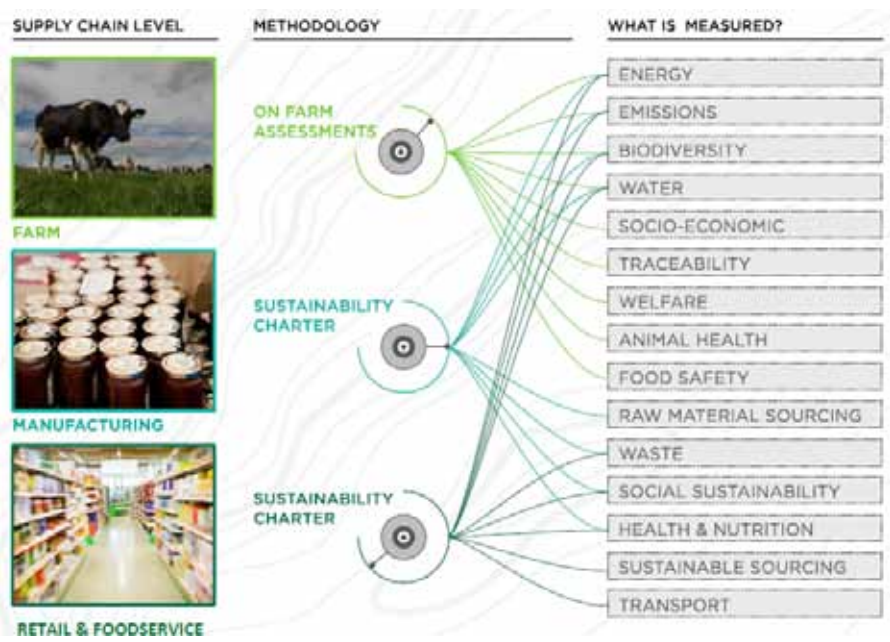
The desire for Natural Nutrition is driven by personal health concerns and the fear of chemicals in the diet. The not so distant memory of food scandals and complicated supply chains have contributed to an overwhelming appetite for transparency as well as the ability for full traceability and visibility of animal feed, food ingredients, their origin, their quality and simpler recipes.

The combination of the aforementioned trends has given Glanbia Ireland a platform to commercialise the work we've been doing on farm over many years around Open Source, Origin Green and the Sustainable Dairy Assurance Scheme (SDAS). As Glanbia Ireland we are stronger together to deliver a sustainable business. From Glanbia Agribusiness, through Glanbia Ingredients



and into the marketplace with Glanbia Consumer Foods, bringing all three together as one under the umbrella of Glanbia Ireland gives us a much stronger proposition and opportunity to bring our unique and differentiating propositions to market.

The Bord Bia research carried out in the spring of 2018 has further substantiated the opportunity to add value to our dairy products i.e. customers and consumers recognise, appreciate and trust Glanbia Irelands suppliers to deliver a wholesome, natural product; that can be validated through the evidence based independent certification through the SDAS.The diagram below maps what is measured by Open Source and Origin Green along the supply chain.



The continued support and participation of the Glanbia Ireland milk suppliers in the Open Source programme and the Bord Bia SDAS is crucial in ensuring our license to operate and to allow us to continue to add value to your milk supply in the international marketplace.

Sustainability’s Value Proposition

<ul style="list-style-type: none"> Consumers expect it 	<ul style="list-style-type: none"> Customers require it
<ul style="list-style-type: none"> Employees engage with it 	<ul style="list-style-type: none"> Drives Efficiency
<ul style="list-style-type: none"> Creates Differentiation 	<ul style="list-style-type: none"> Protects Natural Resources
<ul style="list-style-type: none"> Industry licence to operate 	<ul style="list-style-type: none"> Protect our future



Bord Bia's Origin Green Programme

¹Michael Houlihan

¹Bord Bia, Quality Assurance Department

Origin Green is Ireland's food and drink sustainability programme. It is a programme, led by Bord Bia, that brings together Ireland's entire food industry – from farmers to food manufacturers, retailers to foodservice operators – with the common goal of sustainable food production. This programme enables Ireland's food industry to set and achieve measurable sustainability targets that respect the environment and serve local communities more effectively. Crucially, Origin Green is about measuring and improving how we do this on an ongoing basis. Origin Green members include farmers who are the largest cohort of programme members and the foundation of the food supply chain.

How Does Origin Green Work?

Origin Green for farmers

The rollout of sustainability assessments at farm level has been made possible by Bord Bia's pre-existing Quality Assurance infrastructure, which has been in place for over twenty years. This infrastructure sees more than 100 farm auditors undertake almost 800 independent farm audits each week. Traditionally, these assessments have focused on traceability, animal health & welfare, and general environmental issues, with an overarching focus on food safety. All of these elements are still relevant from a sustainability perspective.

Building on Quality Assurance

In 2012, the well-established QA schemes were expanded into Sustainable Assurance Schemes, marking the beginning of the Origin Green programme. Origin Green expands the scope and depth of sustainability measures tracked, in order to ensure that the programme delivers an assessment system which measures what matters. The additional sustainability criteria being measured to date in the Sustainable Dairy Assurance Scheme (SDAS) as part of Origin Green include greenhouse gas; biodiversity; water measures; energy efficiency; soil management and socio-economic factors. The information gathered by each auditor is combined with data from two other national livestock databases; the Animal Identification & Movement System (AIMS) and the Irish Cattle Breeders Federation (ICBF). All this data supports the generation of a carbon footprint for every member of the SDAS and this is something that is unique to Ireland. The scale and depth of the Origin Green programme is unparalleled and recognised to a huge extent in the international marketplace.



Ireland's dairy industry delivers proof of sustainability from the ground up. It is rooted in grass based system with over 90% of Ireland's dairy produce coming from SDAS Origin Green farms. To date, there are over 16,000 dairy farms that are members of the Sustainable Dairy Assurance Scheme accounting for 95% of all dairy farmers in Ireland.

Origin Green for food businesses

Ireland's food business members commit to a mandatory mix of target areas specified by the Origin Green Charters. The mandatory areas, from which targets are set, form the basis of a business's 3-5 year sustainability plan. Each plan is reviewed annually and monitored for progress against the set targets. At present, Origin Green has over 330 companies with independently verified and annually monitored sustainability plans. These members represent 90% of total Irish food and drink exports.

Why is Ireland so Well Suited to Sustainable Food Production?

Ireland has many natural advantages when it comes to food production. Our climate makes a long, grass-growing season possible. It gives us plenty of rainwater. And our weather conditions are ideal for rearing livestock and growing many crops. Our grass-based system is more efficient and environmentally sustainable than intensive indoor animal feeding systems.

The production of good food comes naturally to us. 80% of the agricultural land is covered in grass – the basis for our largest indigenous industry, supporting 140,000 family farms and over 163,000 jobs. Ireland's world-class meat, dairy, beverages and seafood are enjoyed far beyond our shores. In a generation, our food industry has evolved into a world-class, global player. Last year, we exported €12.6 billion of food and drink to 175 countries.

Realising that no one country, sector or individual business can solely lead the move towards global sustainable food production, the Irish agrifood industry is committed to working with both domestic and international partners to improve performance through collaboration. The motivation behind Origin Green is to assist the Irish food industry in producing food in the most sustainable way possible so that Ireland can become a global leader and best practice example in sustainably produced food and drink.

Additional information: <https://www.origingreen.ie/>



Ireland's Origin Green Sustainability Strategy led by international insights

¹Padraig Brennan

¹Bord Bia, Origin Green Programme Manager

Introduction

Origin Green was launched in June 2012 but the genesis of the world's first national food sustainability programme goes back to 2009 when Bord Bia commissioned a major piece of trade and consumer work providing the market insights that led to the development of Origin Green. When Origin Green was subsequently launched in 2012, Bord Bia committed to getting everyone in the industry "on the journey", measuring what matters, setting and meeting international standards and committing to continuous improvement. Origin Green went on to become the third pillar of Bord Bia's current strategy, ***Making a World of Difference***, but it underpins all of Bord Bia's work.

Today Origin Green is a full supply chain programme from farmers and processors through to retailers and foodservice operators. It started on farms through the enhancement of the existing quality assurance schemes and the development of the Sustainable Dairy Assurance Scheme (SDAS), moved on to manufactures (now over 580 involved), and expanded into Retail and Foodservice in 2016. This unique scheme has given Ireland a licence to do business with a number of new customers in a range of new markets and has also helped defend and maintain existing business.

Six years on, the market has changed significantly and sustainability is now very much on every customer's agenda. While Ireland is recognised as a global leader in this field, and today is still the only country with an independently verified national sustainability scheme, this leadership position has created an expectation for continued improvement and development of the programme.

As we reflect on the success of the last six years it was time to go back out to our customers and consumers and take stock to assess where to go next to ensure we continue to add value and maintain a competitive advantage in this area.

As in 2009 it was PWC who undertook Bord Bia's second Global Sustainability Survey in the spring of 2018. 8,500 consumers and a wide spectrum of trade customers in 13 markets were interviewed to understand customer and consumer awareness, attitudes and purchasing behaviour around sustainability. The full results of this study have yet to be officially published, however we can share the five key take-aways with you and they can be summarised as follows:

1. Sustainability & Food Sustainability Mean Different Things

Consumers associate 'sustainability' with 'protecting the environment' but they associate 'food sustainability' with being 'better for the planet'. For some consumers, there is a nutritional dimension to sustainability and importantly, that definition of being 'better' for the planet relates to food being 'healthy', 'fresh', 'clean' and 'safe'. These results vary greatly by market and these insights will help us continue to evolve Origin Green and adjust our messaging and resonance by market. One market example of a customer putting this into action is the leading Swedish retailer, ICA. They are at the forefront of *behavioural nudging* and introducing a range of positive actions to help their consumers lead sustainable lives. This includes an app that measures consumers' steps and links this to an in store discount; the more steps an ICA consumer takes during the week, the higher the discount they are entitled to in- store.

2. Customers lead in the West, Consumers lead in the Rest

In Western markets, particularly European markets, the sustainability agenda and importance of sustainability for food is being driven by trade customers; leading customers are ever more demanding around the topic. In other markets (Asia, Middle East), it is the end consumer who is driving the topic of food sustainability. This has profound implications for the marketing of Irish food in different regions and markets. It is important to note that outside of Ireland, China is the first and only country where Bord Bia is communicating Origin Green at consumer level to create the pull effect at trade level.

3. Transparency of Information is A Strength For Ireland

The 2018 research has confirmed that trade customers the world over have a voracious appetite for information and transparency, and these demands are growing with increased customer requests for proof points across a number of areas including animal welfare, grass-fed etc. In April 2018 Bord Bia welcomed 532 international buyers to Marketplace International in the RDS to meet 179 Origin Green verified members for the first ever sustainable global sourcing event. The resounding consensus from the trade customers in attendance was the value they place on the level and extent of data that is being collected via the Origin Green programme and the confidence that this gives them to grow their business with Ireland and Origin Green verified members. For this data to continue to go in the right

direction we need to accelerate our commitment to continuous improvement across the supply chain.

4. Our Grass Fed Story Is Motivating To Customers

Some of the detail they are looking for under transparency is related to **Grass Fed**. This proof point didn't appear in the 2009 research and demonstrates that there has been more of a move towards pasture beef and dairy products in the intervening eight years.

5. Customers & Consumers Value Our Carbon Foot-Printing

Traditionally we associated carbon foot-printing with a B2B message, however Bord Bia's recent research shows that this is now very much moving into the consumer space. On the 14th June 2018, a Swedish burger chain, Max, launched the world's first climate positive burger, and we will no doubt see similar product launches in other markets in the near future as customers and consumers increasingly compare the merits of various protein alternatives, including their carbon footprint.

The 2018 PWC research segmented international food customers into three sustainability personas: laggards, followers and leaders. The sustainability leaders will continue to be Bord Bia's primary focus and the ambitions of Origin Green will evolve in line with the ambitious targets of these leaders. How Bord Bia communicates with these leaders will also evolve over time, a recent example being Bord Bia's alignment with the UN SDGs (sustainable development goals) to align our commitments with those of our customers, using a common language and framework.

From the outset, collaboration has played a vital role in assisting in and enhancing the development and roll out of Origin Green across the entire food and drink supply chain in Ireland. Bord Bia looks forward to continue to work closely with Glanbia Ireland as one of the pioneer members of Origin Green as we continue to place significant emphasis on developing and maintaining collaborative relationships with a wide range of stakeholders both in Ireland and abroad as we reflect on the next phase of Origin Green.



Sustainable Dairy Production Systems

¹James Ryan, ²Richard O'Brien & ³Brendan Horan

¹Teagasc, Kildalton College, Piltown Co. Kilkenny

²Teagasc, Waterford/Kilkenny Advisory Region

³Teagasc, Moorepark, Fermoy, Co. Cork

In addition to the economic and animal welfare benefits associated with grazing, Irish grass based milk production is highly regarded internationally in terms of the environmental sustainability of our production system. Only 10% of global dairy production originates from grassland and in comparison with cropping, grassland is an important biological filter which reduces nutrient and chemical run off and supports biodiversity and carbon storage. Recent international studies have indicated that by virtue of our high reliance on grazing and reduced need for mechanisation, Irish milk has the lowest carbon footprint within the EU. Looking ahead, the sustainable intensification of milk production in Ireland over the next decade will be based on further improvements in grazed grass utilisation coupled with further genetic improvement of dairy herds to realise higher productivity from within our grazing systems and without adverse impact on the natural environment. Foremost of concern for the industry, the implementation of best practice grazing systems at farm level is of paramount importance to deliver increased productivity within environmentally sustainable production systems.

Benchmarking the Sustainability of the Kildalton Agricultural College Dairy Herd

Although a wide array of innovative sustainability metrics will be developed as part of the Kildalton Open Source project and new research technologies will be tested, the overall success of the project will be anchored on Teagasc best practice grass-based farming systems allied to a high level of farm technical efficiency and accurate implementation. The college dairy herd characteristics are outlined in Table 1 as the benchmark for future improvements across an array of sustainability objectives for the project.

Table 1. Benchmarking Kildalton Dairy Farm System against National Farm Survey (NFS), Top 10% and target performance based on 2016/ 2017 statistics.

	Kildalton	NFS ¹	Top 10% ²	Target
Dairy herd EBI (€) ³	125	86	105	140
Maiden heifer EBI (€) ³	176	116	160	180
Herd mean calving date	24/01/17	6/03/17	10/02/17	10/02/17
Overall stocking rate (LU/ha)	3.1	2.1	2.3	2.9
Grass growth (t DM/ha) ⁴	13.5	9.0	14.0	16.0
Dairy farm area at soil P & K index >2 (%)	47	10	75	100
Fertilizer N (kg chemical N/ha)	280	160	250	250
Fertilizer P (kg chemical N/ha)	7	7	15	10
Purchased concentrate (kg DM./cow)	820	933	800	500
Purchased forage (kg DM/cow)	500	0	110	0
Milk solids (kg sold/milking platform ha)	1,081	825	1,021	1,350
Milk solids sold / kg feed input (kg/kg)	0.3	0.4	0.6	1.0
Calving rate (% calved in 42 days) ³	87	63	85	90
Calving interval (days) ³	364	391	370	365
Herd maturity (No. calvings/cow) ³	3.4	3.4	4.1	5.0
Carbon footprint (kg CO ₂ eq./kg milk)	0.99	1.05	0.85	0.80
N / P use efficiency (%)	23 / 75	25 / 71	27 / 70	33 / 85
Habitat cover (%)	5	7	5	10
Net profitability (€/ha incl. full labour) ⁵	860	473	1,032	2,500

¹National Farm Survey, ²Teagasc e-Profit monitor, ³ICBF, ⁴Pasturebase, ⁵at 29 c/l base milk price

The Kildalton College dairy herd is composed of 112 dairy cows plus followers on a total available land area of 48.6 hectares (ha). The college herd is a genetically elite crossbred herd (within the top 1% of herds nationally on Economic Breeding Index (EBI)) and delivering high levels of milk fat plus protein (milk solids) sales with satisfactory overall reproductive performance. The herd has an artificially early median calving date of January 24th for student training purposes. Approximately 40% of the total land area used by the dairy herd is leased and surplus young stock has been retained to meet the teaching requirements of students at the college. Consequently, the overall dairy farm operates at a high overall stocking rate (SR) of 3.1 livestock units (LU) per ha

which is comprised of 2.3 dairy cows and 0.8 replacement LU per ha. Overall pasture growth at 13.5 tonnes DM/ha during 2017 is low compared with Top 10% and target levels and is reflective of the lower overall level of soil fertility on the dairy farm. Consequently, high levels of Nitrogen (N) and Phosphorus (P) have been applied during 2016 and 2017 to build soil fertility and increase grass growth on the farm. Owing to the early median calving date, high overall SR and below optimum soil fertility, significant quantities of purchased concentrates and forage have been required to meet the annual feed requirements of the herd in recent years.

Based on the elite genetics of the herd and high levels of concentrate and forage supplementation, the overall level of milk solids production of 457 kg /cow is at target levels while milk solids production per hectare is 20% below target levels due to the presence of significant numbers of young stock on the dairy platform. Owing to the high overall level of supplementary feed, milk solids production efficiency per kg supplement is below target levels. The herd is of high fertility status, and although the calving rate of 87% in 42 days is below target, the average calving interval of 364 days is excellent. Despite a low overall empty rate of 11% during a 12 week breeding season, the overall maturity of the herd is average at 3.4 lactations per cow while the culling rate from the herd is also high at 19% in 2017. Owing to the high productivity of this elite herd and predominantly grass diet, the Carbon (C) footprint of the system is close to target levels at 0.87 kg CO₂ equivalent per kg milk produced. In addition, the herd is achieving average levels of N and P use efficiency while overall habitat cover is below average for specialist dairy farms. Finally, the overall financial performance of the dairy farm operation is good at €860 net profit per ha after full labour costs in 2017 and similar to the performance of the top 10% of dairy farms as measured within the Teagasc e-profit monitor system and corrected to 29 c/l base milk price.

Further Improvements to the Kildalton Farm System

Although the herd is currently operating at a relatively high level of technical efficiency, the challenge for the Open Source Project is to further improve on productivity within the farm system while closing the farm system and reducing the requirements for both chemical fertilizer and supplemental feeds. To that end, Table 2 outlines the 3 year targets for farm system improvement towards a more sustainable overall farm system.

Table 2. Kildalton Dairy Farm System Improvement Plan (2018-2020 Inclusive).

	2018	2019	2020
Dairy herd EBI (€)	158	169	180
Herd mean calving date (dd/mm/yy)	24/01/18	10/02/19	10/2/2020
Dairy herd size (No. cows)	112	120	120
Overall farm stocking rate (LU/ha)	2.8	2.8	2.8
Grass growth (t DM/ha)	14.0	14.5	15.0
Dairy farm area at soil P & K index >2 (%)	70	80	90
Fertilizer N (kg chemical N/ha)	250	250	250
Purchased concentrate (kg DM./cow)	800	800	750
Purchased forage (kg DM/cow)	500	250	150
Milk solids (kg sold/milking platform ha)	1,100	1,200	1,250
Calving rate (% calved in 42 days)	85	90	90
Herd maturity (No. calvings/cow)	3.4	3.7	4.0
Net profitability (€/ha incl. full labour)	1,200	1,500	1,600

The main improvements required are outlined hereunder

- The genetic potential of the herd is anticipated to increase by €10 per year by continuing to use the highest EBI sires available and introducing 20% of herd as high EBI replacements each year.
- To reduce the requirement for concentrate supplementation and further improve animal performance, the herd mean calving date should be delayed to February 10th in line with best practice recommendations for high SR grazing systems with breeding season commencing on April 25th and concluding 12 weeks thereafter.
- Based on a reduction in young stock rearing to 20%, the dairy herd should be expanded to 120 cows over the 3 year period with existing heifer rearing area used by the herd to further reduce forage and concentrate purchase requirements. It is also envisaged that the heifer rearing enterprise will be displaced from the dairy platform by the end of the period thereby reducing SR and associated feed requirements.
- An overall nutrient management plan for the dairy farm will ensure that sufficient dairy slurry is recycled on the dairy area in line with best practice methods and application strategies and soil fertility is rapidly corrected based on P, K and lime build up applications during the period.



- The incorporation and establishment of white clover within the dairy pastures during 2017 will facilitate increased N fixation and reduce chemical N requirements in 2018 and 2019. Coupled with improvements in soil fertility and the reseeding of the lowest performing 10% of dairy area annually, grass production on the dairy farm is anticipated to increase to 15 tonnes DM/ha by 2019. The overall increase in grass DM production coupled with the reduction in SR will also reduce the requirement for purchased concentrate and forage for the dairy herd.
- Based on increased milk output per ha and reduced costs associated with purchased feeds, chemical fertilizer and young stock rearing, overall farm net profit per ha is anticipated to increase to €1,500 during the 3 year period.

Additional information: <https://www.teagasc.ie/animals/dairy/>





Soil Fertility on the Kildalton Open Source Sustainable Dairy Demonstration Farm

¹David Devaney

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Introduction

Soil fertility is a key component to the efficient utilisation of soil nutrients in the production of food in an environmental and sustainable manner. To maximise the productivity of our soils it's important that we understand their chemical, physical and biological properties. Soil testing is the starting point and the foundation to delivering the correct balance of nutrients. Soil testing in Kildalton in 2014 provided a baseline for our fertility improvement programme and this information when combined with Teagasc's Nutrient Management Planning (NMP) Online tool has helped us identify what quantities of nutrients we need and where in the farm we need it most. In terms of soil fertility, we have set ambitious plans to have 80% of land in optimal condition by 2018. Optimal soil fertility underpins several of our sustainability pillars and it can be regarded as the foundation on which sustainable farming is built.

Achieving Optimum Soil Fertility

Soil Testing in 2014 showed us that we had only 6% in optimum fertility (i.e pH >6.2 and soil P & K index 3 or 4). This was in line with national average where only 10% of soils are in the optimum range. National soil test results indicate that soil P and K levels continue to decline, with 62 and 55% of grassland soils index 1 and 2 for P and K, respectively. In 2014, 54% and 49% of Kildalton's soils were index 1 and 2 for P and K, respectively. Overall soil fertility in Kildalton in 2014 closely matched the national average. To achieve targets of having 80% of land in optimum condition we commenced applying lime and addressing P&K in a systematic fashion. Liming reduces the pH of soil and increases the availability of major (N, P & K) soil nutrients, leading to increased grass production. Using soil tests to identify paddocks requiring lime, lime was spread at 5T/Ha in 2016 and 2.5T in 2017. Soil pH has responded well and from having only 2% on land with optimum pH, we have increased to 47% and 66% in 2018 – a relatively short period of time. Soil testing in 2018 has indicated what the paddocks that need to be targeted and will provide information on application rate (T/Ha). In 2017 we spread 66T of lime and 2018 soil testing indicates less than 30T needs to be spread. In addition to reducing acidity levels, liming also has benefits for releasing more P&K and it's common to see a flush of strong grass growth in the months after liming. In conjunction with liming, we have used soil testing to identify those paddocks requiring most attention for additional nutrients. NMP Online has enabled us to calculate the maximum amount of chemical P we

can spread and where best to target the fertiliser. A total of 315kg of chemical P was spread in 2017 using 0-7-30 to concurrently tackle P and low K levels, particularly in silage grounds. Soil sampling in 2018 has shown that we have decreased the % of Kildalton's soils in index 1 from 31% to 4% as the fertility rises from Index 1 to Index 2. A sustained maintenance and build-up fertility programme, coupled with regular soil testing will guide us to achieving optimum soil fertility. Whilst the move from Index 1 to Index 2 and from Index 2 to Index 3 is desirable, we have also seen an increase in the paddocks at Index 4. This is undesirable from an environmental and economic point and these will be managed to bring back to Index 3.

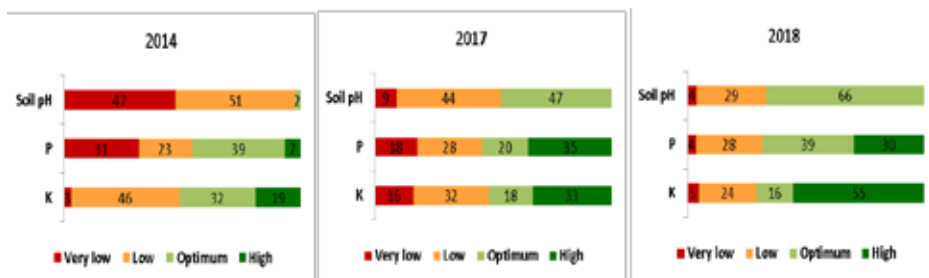


Figure 1 Summary of soil testing in 2014, 2017 and 2018 (%)

Take Home Messages

There is a marked reduction in return on investment when applying fertiliser to soils where the underlying problem is soil pH. Correcting and maintaining the soil pH should be first consideration in soil fertility management. Optimum soil pH for grassland is at or above 6.3 and it is recommended to apply lime to raise the soil pH to 6.5, so that the lime application will maintain soil pH for a number of years. Aim to have optimum soil P and K (Index3) fertility in all fields. Index 1 and 2 soils have a very low to low nutrient supply and will require additional nutrients on an annual basis to increase the fertility levels. Index 4 soils have a high nutrient supply; these soils represent an opportunity to save money of fertiliser inputs by harvesting the P and K soil reserves for a number of years depending on the soil test reading and the level of offtake from that soil.

Regular soil testing is vital to establish soil fertility and monitor the progress of improvement!

Additional Information: <https://www.teagasc.ie/environment/soil/>

Don't let Soil Fertility Curtail your Dairy Business

David Wall¹

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Summary

- Lime and fertiliser phosphorus (P) and potassium (K) use on Irish farms has been low over the past decades
- Currently ~40% of soils on dairy farms have below target soil pH and lime application plans are required to correct this
- Soil test results indicate that 85% of soils have suboptimal fertility which is limiting grass growth potential on dairy farms (target soil pH = 6.3, target soil P & K Index = 3)
- Low soil fertility (e.g. soil P Index 1) equates to a loss of in excess of 1.5 t grass DM/ha per year, which is worth €275 per ha, per year
- Higher yielding swards and highly stocked farms require higher nutrient application rates to replace nutrients removed during grazing and silage cutting
- Soil testing and fertiliser planning are key requirements for any successful farm
- Slurry is valuable resource and should be targeted towards soils with highest requirement for P & K to help offset expensive fertiliser costs

Introduction

Soil fertility levels have declined on dairy farms coinciding with a reduction in fertiliser usage over the last decade (Figure 1). Of the dairy farm soil samples analysed by Teagasc in 2017 only 15% had optimal soil fertility levels as indicated by soil pH, P and K. With only 32% of dairy farms applying lime on a regular basis it's not surprising the less than 45% of soils sampled on dairy farms in 2016 had soil pH at the optimal level > pH 6.2.

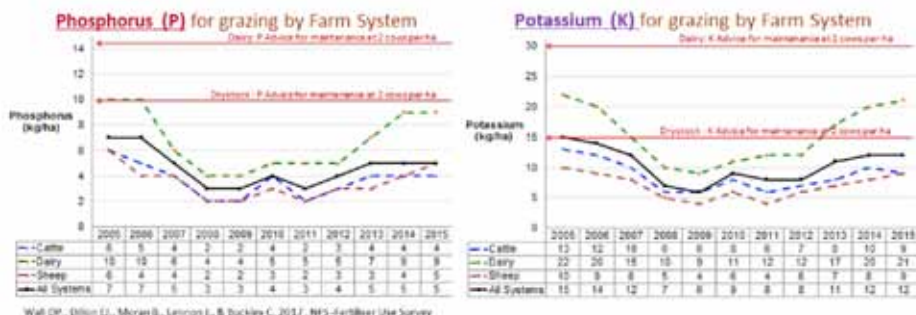


Figure 1. Phosphorus (P) and Potassium (K) use for grazed swards on dairy farms between 2005 and 2015, surveyed by Teagasc National Farm Survey. Typical P and K maintenance fertiliser rates for dairy and drystock are shown by the red lines.

With up to 85% of soils currently deficient in at least one of these critical elements, poor soil fertility poses a significant threat to achieving increased productivity, profitability and sustainability on dairy farms.

Lime & Fertiliser advice

The starting point when building soil fertility is to apply lime according to the soil test recommendations. The nutrient application advice for P and K for dairy grassland is shown in Tables 2 and 3. The advice for both P and K applications shown includes P and K from both chemical fertiliser and slurry sources. In addition, the P application rates should also be adjusted to account for the P coming onto the farm in concentrates.

Table 2 Simplified P fertiliser requirements (kg/ha) of grazed and cut swards for dairy farms (*These total P requirements should be adjusted for concentrate feeds or organic manures applied*)

Soil P Index	Grazed Swards				Silage Swards	
	Farm Stocking Rate (LU/ha)				Cut Once	Cut Twice
	<1.5	1.5-2.0	2.0-2.5	>2.5		
1	30	33	36	39	+20	+30
2	20	23	26	29	+20	+30
3	10	13	16	19	+20	+30
4	0	0	0	0	0	0

Table 3 Simplified K fertiliser requirements (kg/ha) of grazed and cut swards for dairy farms (*These total K requirements should be adjusted for organic manures applied*)

Soil K Index	Grazed Swards				Silage Swards	
	Farm Stocking Rate (LU/ha)				Cut Once*	Subsequent cuts*
	<1.5	1.5-2.0	2.0-2.5	>2.5		
1	85	90	95	100	+185	+75
2	55	60	65	70	+155	+75
3	25	30	35	40	+125	+75
4	0	0	0	0	0	0

* Typically no more than 90 kg/ha K should be applied at closing for silage



Conclusions

Fertiliser is an important investment on dairy farms and represents >25% of total variable production costs. Trying to plan fertiliser application strategies without field by field information on soil fertility levels is impossible and leads to poor return on investment and potential losses to the environment. Soil testing costs less than 1 kg of fertiliser P per ha per year (€2) and having up to date soil test results for the whole farm is essential when selecting the right fertiliser type, and deciding the right fertiliser application rate and right fertiliser application timing.

Although it costs money to increase fertility levels, the returns in terms of increased grass production from low fertility soils can be considerable (>1.5 tonnes grass dry matter per ha), and can increase the livestock carrying capacity (i.e. stocking rate) of the farm, provide additional winter feed stocks (silage), improve animal health (nutrition value of the grass), increase milk and meat outputs and ultimately whole farm profitability.

Additional Information: <https://www.teagasc.ie/environment/soil/>



The Glanbia Soil Nutrition Programme: For Farming in a Sustainable Way

¹John Carroll

¹Agri-Purchasing Manager, Glanbia Agribusiness

Introduction

At Glanbia, we carry out approximately 8000 soil samples annually on circa 600 Grassland farms as part of our integrated nutrition programmes for our customers. The results reflect largely what Teagasc are finding with almost 90% of grassland in a poor soil fertility category. That's 9 out of every 10 acres in our catchment area. Figure 1 shows the breakdown of soil analysis and it's worth noting the high percentage of soil in Index 1 & Index 2 condition.

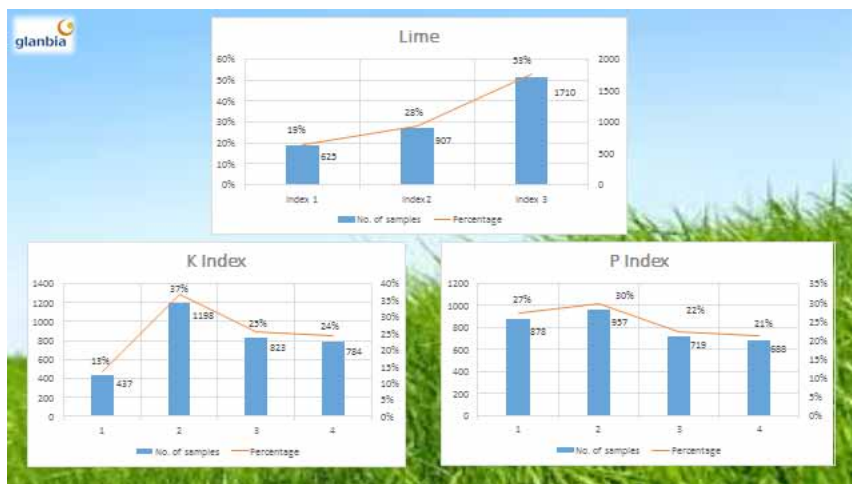


Figure 1. Results from the Glanbia Soil Nutrition Programme

The Glanbia Soil Nutrition Programme

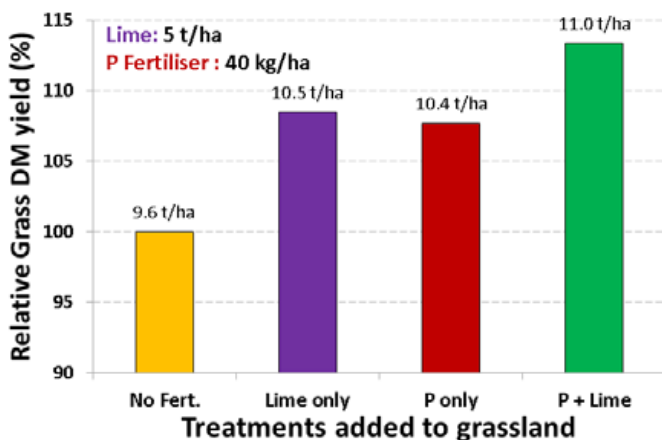
As part of our extensive nutrition services on offer Glanbia can now provide a Soil Fertility Programme to help integrate soil science and grassland production with animal nutrition. Using the very latest information and technology on hand Glanbia can provide accurate recommendations based on soil analysis results. This will enable farmers to use fertiliser more efficiently and while saving money, will produce and utilise more grass and farm in a more sustainable way

The programme is built up sound research that shows the benefits of optimising soil fertility

- The optimum soil index for P and K is Index 3. The optimum pH for grassland is 6.3. Research has shown that soil of P index 3 will grow up to 1.5tDM/ha more grass than soil with P index 1, worth an extra **€250/ha/yr**.
- Where soil pH is suboptimal it can restrict grass growth by up to **1.5t DM/ha**.
- On average, farmers are growing just over 9t DM/ha and utilising **7.5t DM/ha**. Farms focussing on grass growth and measuring with Pasturebase Ireland are growing 12 – 15t DM/ha. That's a difference of **€560 - €1200/ha** extra profit over the average farm
- For every extra tonne pasture DM utilised/ha, operating profit increases by **€268/h**. Increasing pasture DM utilised/ha by 3t can be worth up to **€800/ha/year**

Focus on your soil pH

A low pH can have a drastic effect of grass growth. Grassland soil maintained at the optimum pH can release up to 64 units/acre/year of Nitrogen from the soil. Low soil pH can negatively affect the efficiency and availability of freshly applied P, K and trace elements as either fertilisers or organic manures. Teagasc research (Figure 2) has shown the benefits to grass growth from applying lime and the additional benefits from applying lime and phosphorus. Liming makes best use of the nutrient resources already in your soil and those you spread.



Focus on your soil Sulphur

Sulphur deficiencies are now seen on farms across Ireland. The application of sulphur will increase the protein content of grass and silage. Sulphur can improve the DM Digestibility of grass by 4%.

It also optimises the nitrogen uptake of the sward increasing its use and efficiency. Spending just €6/ha on Sulphur can prevent yield reductions of up to €100/ha. Trials have shown that spreading sulphur can increase grass yield by 2t/ha/yr (€500/ha) and silage yields by over 3t/ha/yr (€750/ha).

Take home message

Low soil fertility can lead to lower farm incomes through not making best value of costly fertiliser. Improving soil fertility has environmental benefits and benefits to farm profit. Table 3 summarise the benefits you could realise if you address soil fertility

	Majority of Farmers	Top 10%	Difference	Benefit
pH	<6.2	>6.2	1t/ha	€160/ha
P Index	1	3	1.5t DM/ha	€250/ha
K Index	2	3	3-4t DM/ha *Silage	€500/ha
Sulphur	One application ~ 5-14u/ac	Gradual + Sustained app. ~ 10 – 16u/ac	2t DM/ha *Grazing 3.3t DM/ha *Silage	€320/ha - €530/ha

Table 3 Financial benefits from improving soil fertility



Establishing white clover on grassland farms

¹Michael Egan

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Introduction

The benefits of white clover in grassland, in terms of nitrogen fertiliser savings and increased animal performance have previously been shown at a number of experiments undertaken at Teagasc Moorepark and Teagasc Clonakilty. Currently there is increased interest in white clover as the cost of N fertiliser continues to increase, and application rates are limited under the Nitrates Directive. Clover fixes atmospheric N and makes it available for grass growth. Previous research has shown that clover can contribute up to 100 kg N/ha/yr through N fixation, resulting in significant savings for farmers. White clover can also increase animal production by 40 to 65 kg milks solids/cow when compared to grass only swards.

How to establish a clover sward on your farm

Clover can be established on your farm using two methods; 1) Direct reseeding, 2) Over-sowing.

1. Direct Reseeding

Key steps involved in a full reseed

- Analysis of a representative sample of soil for P, K and pH; if ploughing take sample subsequent to doing so
- Spray off the old pasture with a minimum of 5L per ha of Glyphosate; allow 7 - 10 days after spraying before cultivating
- Avoid ploughing too deep (15 cm) as it can reduce soil fertility
- Prepare a fine, firm seedbed and apply lime, phosphate and potash as per soil test results
- Sow perennial ryegrass (27-34 kg/ha) and white-clover (1 to 2 kg/ha) seed mix
- Avoid sowing clover seed too deep as have poor seed reserved – approx. 10 mm
- Ideally cover seeds and roll well to ensure good contact between the seed and the soil

2. Over-sowing

Over-sowing is a simple and low cost method of introducing white clover onto your farm. Success is very much dependent on weather conditions around sowing; therefore there is a certain amount of risk associated with this approach.

Key steps involved with over-sowing white clover;

- When over-sowing, the clover seed can be broadcast onto the sward or stitched in using a suitable machine (e.g. Einbock pneumatic seeder; Figure 1)
- Best practice to over-sow directly after grazing (≤ 4 cm post-grazing sward height; Figure 2) or as after cutting the paddock for surplus bales – it is not recommended to over-sow clover into dedicated silage paddocks
- A slightly higher seeding rate (3.5 to 5 kg/ha) is recommended for over-sowing compared to a full reseed, to overcome the issues with slugs and a lower germination rate
- Sow with a fertilizer that containing P fertiliser as this will favour establishment particularly if soil fertility is poor
 - 1 bag of 0-7-30 or 0-10-20/acre
 - If possible reduce N fertiliser post over-sowing
- Soil contact post sowing is one of the most crucial factors effecting germination
 - Roll paddocks post sowing to ensure soil contact
 - Apply watery slurry (if available) – ideally around 2000 gals/acre
- Ideally over-sow on well managed grassland – not suitable on old ‘butty’ swards with a low content of perennial ryegrass – if this is the case a full reseed is best practice

Figure 1: Einbock Grass seeder in action at Kildalton



Management of grass-clover swards after over-sowing

Poor establishment results have been obtained where the grass get too strong after over-sowing. This is the single biggest reason for failure that lies within the farmer's control. Swards need to be grazed tight after over-sowing white clover. The single most important recommendation, is tight grazing for the first 3 grazings post sowing, both for direct reseeding and over-sowing, keeping pre-grazing herbage mass <1200 kg DM and grazing swards to <4 cm. By doing this it allows light to penetrate to the base of the sward which is essential for clover establishment. Soil moisture conditions have a major influence on the success of over-sowing. In general, highest rates of rainfall are recorded during the winter and lowest rainfall during May, June and July. To improve the chances of success on drier soils it is recommended that over-sowing is carried out in late April or early May. Ideal circumstances would be paddocks where surplus grass is removed as baled silage.

Weed control is an essential element in both direct reseeding and over-sowing. Weeds in new reseeds are best controlled when grass is at the 2-3 leaf stage. Docks and chickweed are two of the most critical weeds to control in new reseeds; it is important to control these at the seedling stage, by applying the herbicide before the first grazing. When clover is included in the swards, it is important to use a clover safe herbicide. When over-sowing clover into existing grass swards, it may be better to control more established weeds before over-sowing the clover into the sward. If you are considering this it is important to consider the residue time from application of the spray to over-sowing the clover, as it can vary from 1 month to 4 months. It is important to contact your local advisor or merchant if doing this. All pesticides users should comply with the regulations as outlined in the Sustainable Use Directive (SUD).

By ensuring the above steps are carried out successfully, clover content in the sward can equate to >15% of the sward make up the following year. The grazing management in subsequent years is also of critical importance to ensure the persistence of clover in the sward.



Figure 2: Post-grazing sward height (≤ 4 cm)

Additional information: <https://www.teagasc.ie/crops/grassland/pasture-profit-index/>



Grassland Management on the Kildalton Open Source Sustainable Dairy Demonstration Farm

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Introduction

Ireland's natural resource of almost four million hectares of grassland, combined with our mild, moist climate, provides us with a significant comparative advantage over other international milk producing countries. These advantages allow Irish farmers to grow grass and produce milk at low cost. Teagasc estimates that if grass utilised were to be increased by one tonne DM/ha/year, the benefit to dairy farmers would be €181/ha

Soil Fertility

Soil fertility levels have declined on dairy farms coinciding with a reduction in fertiliser usage in the last decade. Of the dairy farm soil samples analysed by Teagasc in 2015, only 10% had optimal soil fertility levels as indicated by soil pH, P and K. Forty four per cent of soils sampled had soil pH at the optimal level > pH 6.2. With up to 90% of soils currently deficient in at least one of these critical elements, poor soil fertility poses a significant threat to productivity and profitability improvement on dairy farms. Kildalton dairy farm realizes the importance of soil testing and recent tests are being used to target the required nutrients to the right areas of the farm to build up overall farm soil fertility to optimal levels. We have set ambitious targets to have 80% of our soils at P & K index >2 by 2019.

Grazing management

Grass growth in Ireland is highly seasonal with little growth from November to February. Autumn closing date is one of the most important management factors influencing the supply of grass in early spring. To ensure adequate quantities of grass are available at the start of calving, farmers should use the autumn planner, which allocates an area of ground to be closed from October to November. It is recommended that the first paddocks should be closed between October 5th and 10th and 60% of the area should be grazed by November 7th, with 100% grazed by the end of November.

The spring rotation planner (SRP) should be used to manage grazing in the first rotation. The first rotation should start in early February and continue until early April. 30% per cent of the farm should be grazed by March 1st and 66% by March 17th. Average farm cover (AFC) should not be allowed to drop below 500 kg DM/ha in March or early April. It is important to monitor AFC alongside the autumn planner and SRP to ensure that AFC does not drop below target levels.



Figure 1 The Autumn Grazing Planner is used in Kildalton to allocate closing ground and optimise grass the following Spring

For mid-season management the use of grass measurement walks weekly will ensure swards with high leaf content and that is grazed at the target pre grazing herbage mass of 1,300-1,600 kg DM/ha. This allows cows to graze to 4 cm, which will ensure grass quality is maintained throughout the year.

Weekly grass walks are carried out on the Kildalton dairy platform during the grazing season with grass covers recorded in PastureBase. Weekly decisions are made based on the average farm cover whether to take out surplus paddocks or increase/decrease the amount of supplement being fed to cows.

Over sowing clover and reseed

Economically, paddocks with a low proportion of perennial ryegrass are costing farmers up to €300/ha per year due to reduced Dry Matter production and nitrogen use efficiency. If the cost of reseed is estimated at approximately €700/ha, the increased profitability of the reseeded pasture would cover the initial reseed cost in just over two years. This means reseed is one of the most cost effective on-farm investments. Reseed is carried out each year on the Kildalton dairy platform. Paddocks identified for reseed are identified from PastureBase as those that have produced the lowest tons of grass Dry Matter in previous years. The increased pasture production associated with incorporating clover in swards offers potential for dairy farmers to reduce N fertiliser use, and therefore costs, as well as positive environmental impacts when compared to the commonly used N fertilised grass only swards. Over-sowing is a low-cost method of introducing and maintaining clover in swards.

Additional Information: <https://www.teagasc.ie/crops/grassland/>





Water Quality and Sustainability: Findings from the Agricultural Catchments Programme

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Introduction

Teagasc has a substantial research programme focused on farming and water quality. The largest single part of this is the *Agricultural Catchments Programme* which is funded by the Department of Agriculture Food and the Marine. We are currently in Phase 3 of this programme (2016-2019), which is building on the data collected and the work done in the previous two phases, as well as developing a greater capability to model the future impact of farming on water quality.

By developing truly sustainable systems of production the Irish dairy sector has an opportunity to capitalise on our clean environment and increase the value of our products. Protecting and improving water quality is at the core of this challenge.

What is sustainable dairy farming?

There are many definitions of sustainability but sustainable dairy farming may be described as the efficient production of safe, high-quality milk and dairy products in a way that protects and improves the natural environment, safeguards the health and welfare of the dairy herd and provides for the social and economic needs of the farming community. To be truly sustainable a dairy farm must be capable of being handed on to the next generation in as good or better physical, financial and environmental shape as it is now.

Sustainability has a market value

Sustainability is one of the biggest worldwide trends in food marketing, and therefore, it has a substantial value in the marketplace. While dairy processors and retailers around the world all like to attach sustainability claims to their products, not all of them can do it in a transparent and verifiable way. Ireland has a major marketing advantage in this regard, which is recognised by Bord Bia and incorporated into their marketing strategy in the Origin Green initiative. This is the first sustainability programme in the world that operates on a national scale, bringing together government agencies, the private sector and farmers. Over 90% of Ireland's dairy produce comes from Origin Green farms. Importantly, Origin Green includes an inspection and verification requirement,

with sustainability targets for farmers and processors. By moving towards achieving these targets the dairy sector can reduce environmental impacts and protect Ireland's extraordinarily rich natural resources. Our grass-based milk production systems give Ireland a strong foundation in sustainable production.

Water quality in Ireland

The quality of Irish groundwater and surface waters are among the best in Europe. However, the Environmental Protection Agency (EPA) water status assessment for 2010-2015 shows that 43% of rivers, 54% of lakes, 69% of estuaries and 14% of coastal waters (by area) assessed were classified at less than good ecological status. Only 1% of groundwater bodies are at poor chemical status due to high phosphorus levels or due to historical contamination from mining activities and industrial development. Elevated nitrogen and phosphorus levels continue to be the most widespread surface water quality problem in Ireland. The EPA associates these elevated nitrogen and phosphorus levels primarily with human activities, such as agriculture and wastewater discharges to water from towns and villages and septic tanks in rural areas (Table 1).

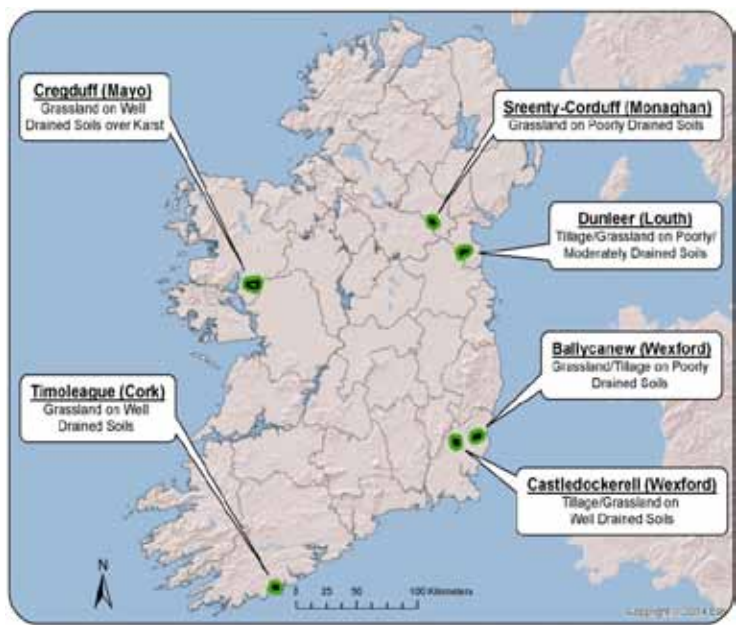


Figure 1 The catchments selected for in-depth analysis under the Agricultural Catchments Program

Trends in river water quality since the last reporting period (2007-2009) show little overall change in status. However, the number of river water bodies classified as “High” (the best category) has declined from 13.4% in the 1987-to-1990 monitoring period to 0.7% in the 2013-to-2015 monitoring period. Also of concern is the number and area of transitional waters (i.e. the tidal part of estuaries) that are not reaching High or Good status. Nitrate levels are a considered a significant factor influencing the ecology in this type of water.

Table 1. Summary of Water Framework Directive (WFD) water status for groundwater (chemical status) and surface waters (ecological status) during 2010-2015. (EPA, 2017)

Water body	Status of Irish waters (2010- 2015)				
	High	Good	Moderate	Poor	Bad
Groundwater (% area)	n/a	99	n/a	1	n/a
Rivers (% water bodies)	10.4	46.3	25.5	17.5	0.3
Lakes (% water bodies)	11	35	33	13	8
Transitional (% area)	8	16	63	12	1
Coastal (% area)	41	44	12	2.5	0.0

Rules and regulations

The Nitrates Directive is one of the key EU laws for the protection of waters against agricultural pressures. In 2006 Ireland’s National Action Programme under the Nitrates Directive was introduced. It brought into force the Good Agricultural Practice (GAP) measures which are generally known as the “Nitrates Regulations”. Since then farmers have been operating under these regulations and are subject to inspections and potential penalties if there are any breaches of the GAP measures.

The Nitrates Directive is one of a group of directives that have been brought together in the Water Framework Directive (WFD). This Directive is unique in that, for the first time, it establishes a framework for the protection of all waters including rivers, lakes, estuaries, coastal waters and groundwater, and their dependent wildlife/habitats under one piece of environmental legislation. While the Nitrates Directive focusses mainly on achieving good chemical status for water, the WFD is primarily concerned with bringing waters to at least good ecological status.



Specifically the WFD aims to:

- protect/enhance all waters (surface, ground and coastal waters);
- maintain existing “high status” waters;
- achieve “good status” for all waters;
- manage water bodies based on river basins or catchments; and,
- involve the public in this process.

Protecting water quality on dairy farms

Farmers have two strong incentives to encourage them to work towards better water quality; market demand for sustainably produced food and regulations. However, there is a third and probably more important incentive; improved production efficiency. Many actions that a farmer can take to reduce the risk to water quality will also have the effect of improving economic performance i.e. a win:win for the farmer. The most important of these are listed below:

1. *Improved nutrient management planning* — this is the single area with the greatest potential to improve outcomes for water quality on Irish farms. Better management of nutrients, including liming to correct soil pH, will optimise nutrient use efficiency and deliver better profits for farmers, while reducing the risk of nutrient loss to water. An enhanced approach to supporting farmer nutrient management decisions is one of the elements needed to achieve this improvement. The new Teagasc *NMP Online* nutrient management planning software aims to address this need by making it easier for advisers and planners to produce high quality NMP's with maps that make it easier for the farmer to understand and implement the plan. Of course specialist advisory support to interpret the plans is also important and more information on this can be got from your local Teagasc office.
2. *Better slurry-spreading decisions* — generally farmers are pretty good at deciding where, when and how much slurry or dung to spread. This is backed up by recent research from the Agricultural Catchments Programme (ACP), which found that there was little evidence of slurry in streams following the end of the ‘*closed period*’ for slurry spreading. This means that farmers either weren't spreading slurry or farmyard manure at this time, or were spreading it on the parts of their farms where it was less likely to be washed off. There were, however, some signals of slurry runoff at the start of the closed period. This happened when heavy rainfall associated with early-autumn storms occurred shortly after the ‘*open period*’. These signals were also found during the particularly wet summer of 2012 when soils were wet and storms coincided with normal summer slurry spreading. Farmers can reduce the risk of slurry run-off by targeting slurry spreading in the growing season, while keeping an eye on the weather forecast to avoid adverse climatic conditions. The use of low-emission slurry spreading methods allows slurry

to be spread on grass covers not suited to splash plate applications. This enables spreading well before the start of the closed period. In future it may be possible to have real-time updates on expected ground conditions for farmers based on weather forecasts to support their decision making.

3. *Eliminating point sources* — point sources is the term used to describe sources of nutrients other than those lost off the land through run-off. These are divided into agricultural sources (what escapes from farmyards, milking parlours, silage pits, effluent tanks etc.) and non-agricultural sources (mainly septic tanks). The impact of farm and non-farm point sources can be significant and where there is evidence of this impact, targeting and eliminating these sources will reduce pressure on the receiving waters and leave more 'head-room' for losses from farming. The ACP has found that point sources can have a disproportionately large negative impact on stream-water quality during the summer. In some catchments, summer phosphorus concentrations in streams increase as the water level reduces, indicating that it's mainly a point source influence since in summer losses by run-off from land don't generally happen. This may have a disproportionately large impact on year-round stream ecology as streams generally don't recover from the damage suffered during the summer and the cycle is repeated from year to year.
4. *Reducing sediment losses* — Irish sediment losses are low by international standards. Stream bank and bed erosion and road losses make up most (75% in a poorly-drained catchment) on the more common land uses, i.e. grassland in catchments with modified channels. This sediment can cause significant damage to the stream ecology either directly by clogging up gravel beds or indirectly by carrying phosphorus which binds to the particles of sediment into the stream. Farmers can reduce the risk of sediment loss by some simple measures like: taking care to avoid siting field gaps, troughs and feeders near streams; directing runoff from roads away from streams or drains; and, reducing cattle access, especially where stream banks are likely to collapse.
5. *Improving production efficiency* — most improvements in farm management, such as better animal breeding or better grassland management, will lead to better nutrient use efficiency as relatively more product is produced from less input. This means that the farmer gains, either through lower input costs and/or having more live weight to sell. Thus, better farm management practices, while not directly targeting environmental gains, will likely have positive environmental and economic effects — a classic win:win.



Summary

- Achieving sustainable production can deliver significant gains on Irish dairy farms
- Protecting and maintaining water quality is a key component of sustainability
- Good sustainability credentials enhance the value of food products
- Ireland's water quality is among the best in Europe
- Protecting water quality can deliver a win:win for farmers



Sustainability Pilot programme – Glanbia Ireland

¹Emma O' Grady

¹Programme Manager, Glanbia Ireland

Objectives

The purpose of this pilot is to establish and manage the execution of a detailed on-farm sustainability research programme with a particular focus on improving water quality, carbon footprint and nutrient management planning.

This pilot will specifically revolve around thirty of GII's milk suppliers with the output from this programme informing the future shape of GI on-farm sustainability and related farm development programmes along with feeding into/guiding the work of Dairy Sustainability Forum.

The outcome of this pilot study will establish a blueprint in dairy best practice as these relate to nutrient use efficiency, water quality and carbon emissions along with the associated impact on farm financial performance. This best practice blueprint will support the growth plans of GI's milk suppliers and underpin the business investment strategy.

Progress to date

The thirty suppliers selected are geographically spread throughout the Glanbia catchment area. These suppliers are selected across a number of key points of interest;

- Soil type
- Scale
- Milk system
- Water course presence
- In milk expansion mode
- Other environmental areas

Their soils were sampled in 2017 and comprehensive farm plans developed. Using these soil sample results Nutrient Management Plans (NMP) are completed for all pilot farms. In addressing NMP recommendations each farm will analyse performance in grass growth and utilisation for 2018. The financial performance impact will then be quantified.

2018 will also see works beginning on each farm in addressing; fencing of water courses, slurry and yard management issues, biodiversity plans & other associated works addressing the farm plans



Location of the 30 suppliers involved in the sustainability pilot



Key research findings from this exciting sustainability programme will be communicated later this year.



What is the new Agricultural Sustainability Support and Advisory Programme for farmers?

¹Pat Murphy

¹Teagasc, Head of Environment Knowledge Transfer, Johnstown Castle, Wexford

Introduction

This programme is a new approach to achieving improvement in water quality supporting the goals of the Food Wise 2025 strategy and the recently launched River Basin Management Plan which acknowledges that farmers, but also others, must play a role in improving water quality

Through a commitment from the Departments of Agriculture, Food and the Marine and Housing, Planning and Local Government and support from the industry, 30 advisors will work within a partnership which encompasses Teagasc, the co-ops and LAWCO - the Local Authorities Water and Communities Office. These new sustainability advisors will advise and work with farmers to protect and improve water quality. The programme will draw on the experience and resources of the two departments, the local authorities, the dairy co-ops, Teagasc, Bord Bia and the farm organisations.

Under the programme, the new team will promote on-farm sustainability best practice to all farmers. They will also deliver targeted advice to farmers operating in areas where water quality is at risk. The local authorities, with the technical support of the Environmental Protection Agency will identify risk areas at local level. Teagasc and the co-ops, working with the farm organisations at local level, will provide advice and support to farmers in managing on-farm risks. The co-ops will support sustainability best practice through their structures, promoting best farm practice and nutrient management processes across all their suppliers.

The programme has the potential to strengthen delivery of Ireland's obligations under the Water Framework Directive. It is part of a new approach to River Basin Management Planning for the 2018-2021 cycle. This new approach will initially focus on water quality, and over time, will also address on-farm climate change and biodiversity strategies. The programme will be jointly funded by both departments, Teagasc, local authorities and the dairy co-ops on a trial basis for four years to 2021. The 20 Teagasc advisors will work primarily in the areas for action supporting farmers one-to-one to identify issues that could impact on

water quality and to put in place a plan to improve practices on the farm.. It will be a free service to farmers in the areas for action covering three main topics: nutrient management, farmyard management and land management. The 10 dairy processor advisors will focus on suppliers that they have in the 'at risk' areas and will be putting in place a support structure for farmers, particularly where a significant amount of change is required.

Proritisisation Exercise

A prioritisation exercise was carried out which identified 726 at risk water bodies in 190 areas for action between 2018 and 2021. These are shown in the interactive map located at: <http://watersandcommunities.ie/areas-for-action>

In each of these areas:

1. A Catchment assessment will be carried out to identify the risks for that catchment
2. Public and farmer engagement processes will take place
3. Advisors will provide support for farmers in the catchment to deal with specific issues identified and to improve practices
4. LAWCO staff will provide support to non-agricultural 'risk owners' to deal with issues identified



Figure 1. The Minister for Agriculture, Food and the Marine, Mr. Michael Creed T.D., and the Minister for Housing, Planning and Local Government, Mr. Eoghan Murphy T.D., together with Jim Woulfe, Chairperson of Dairy Industry Ireland at the launch of the sustainability support and advisory programme in November 2017

Farm Machinery & Sustainable Farming

¹David Devaney ¹Ger Griffin ¹Stuart Goodwin, ¹Francis Quigley, ¹Declan Byrne

¹Teagasc, Kildalton College, Piltown, Co. Kilkenny

Introduction

Farm machinery plays an important role as we move to embrace more carbon-efficient production of food on Irish farms. Irrespective of the machine the demand for less fuel consumption, less crop damage, greater yield potential and more environmental protection is driving new innovation and adoption of new technologies on Irish farms. Uptake of new mechanisation is largely driven by cost and to that end there has been much effort into investigating the long term costs vs payoffs, particularly where large increases in resource use efficiency can be demonstrated. Recent incentives through TAMSII grants and GLAS payments are also making more expensive mechanisation options more attractive.

Machinery use on Dairy Farms

Dairy farms require large volumes of slurry to be spread, large volumes of chemical fertiliser to be spread and large amounts of bulk feed to be fed, and there has been considerable research in these areas over the last few years. Low emission slurry spreading systems refer to vacuum tankers fitted with one of the following: a dribble bar spreader, shallow injection spreader or trailing shoe spreader (see Figure 1). The method of slurry application, splashplate or low emissions spreader, will have a large effect on nitrogen losses. Whereas the splash plate broadcasts slurry across the full spread width, the low emission spreader will place narrow bands of slurry either on or just underneath the soil surface(if ground conditions are soft). Ammonia losses which are greatest on warm, dry, sunny days will be higher using splash plate application because more of the slurry is open to loss. This represents a loss of valuable nutrient and the difference between the two can be as much as 3 units per 1000 gallons applied.



Figure 1. Trailing shoe in action at Teagasc Kildalton

Fertiliser is the second largest variable cost on most dairy farms and from an environmental and economic point of view, it's important to spread it evenly and at the correct rate. Ensuring your fertiliser spreader is set up and calibrated correctly will ensure best use of this expensive input (see Figure 2). Maintaining, cleaning and lubricating spreaders to minimise corrosion from fertiliser will extend life of the machine and increase trade in value.



Figure 2. Determining the evenness of fertiliser spreading by Tray Testing

Take Home Messages

Slurry spreading message:

- Carry out cost:benefit analysis
- Grass management benefit - reduced closed period following application)
- Saving on N fertiliser with Trailing shoe
- Avail of TAMS incentives
- Reduced Crop damage and increased utilisation with low emissions applicators

Chemical Fertiliser spreading:

- Essential to calibrate spreaders seasonally and especially when switching between products with differing bulk densities
 - Prilled urea vs granular CAN
- Regular maintenance improves functionality and re sale value
- Use contractors for blanket spreading where rates are favourable

Production Losses on Irish Farms – Sources and Solutions

¹Dominika Krol

¹Teagasc, Johnstown Castle, Wexford

Introduction

Farm management and operations can give rise to losses to air (Fig. 1) and water and consequently reduce production efficiency. Losses to air (gaseous emissions) comprise of greenhouse gases (GHGs) and air pollutants. Main GHGs in Irish agriculture are methane (CH_4) and nitrous oxide (N_2O), both of them much more potent in their potential to warm atmosphere than carbon dioxide (CO_2). Main air pollutant is ammonia (NH_3). Nitrogen (N) based gaseous emissions nitrous oxide and ammonia are key components of these losses and are regulated by strict limits through European and national legislation. These nitrogen-based losses to the air also represent a large nutrient loss on farm. Irish agriculture produces over 30% of all GHGs and virtually all ammonia in the country. Ireland is required to reduce GHGs by 30% and ammonia by 5% by 2030. Complying with these reduction targets underpins sustainability and 'green credentials' of Irish agricultural production. Therefore there is an urgent need for on-farm adoption of GHG and ammonia mitigation measures.

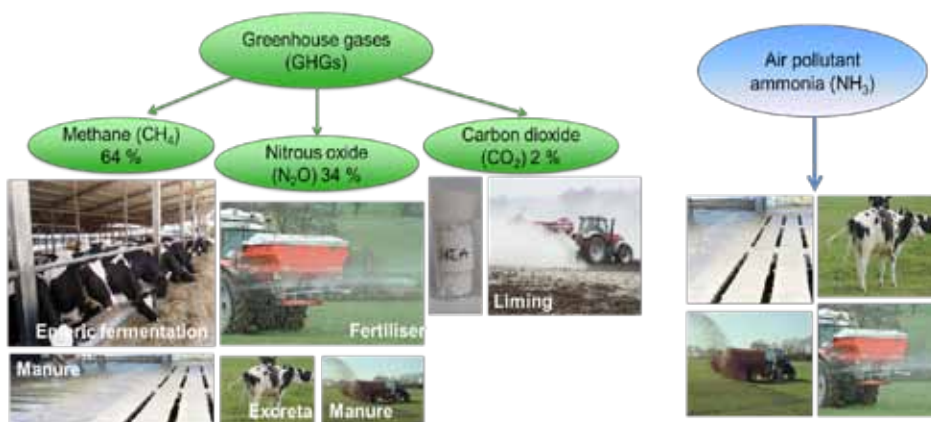


Figure 1. Sources of gaseous losses: greenhouse gases (GHG's) and ammonia (NH_3) on Irish farms

Objectives

Reducing these nitrogen-based losses can be achieved through increasing nitrogen-use efficiency and thus reducing N inputs or by replacing the form of N fertiliser from one that is easily lost from the soil with another form that is stored for a longer period. Data from the Teagasc National Farm Survey shows that these efficiency gains present a win-win solution in terms of environmental and economic sustainability, with the most profitable farms having the highest nitrogen-use efficiency.

Solutions at glance - suite of mitigation measures

There are many possible options for reducing GHG and ammonia emissions and at the same time improving on-farm efficiency and profitability. Table 1 presents a suite of such win-win solutions that can easily be implemented and deliver good results. While improvements in the areas of dairy economic breeding index (EBI) and animal health can provide benefits mainly through reducing animal methane (CH₄) emissions, other presented measures focus on N use efficiency and resultant N losses. Many measures that help reduce GHG emissions have added benefit of reducing ammonia emissions at the same time. Optimization of soil fertility and inclusion of clover in grass sward allow for reducing N fertilisation rate without a yield penalty. Similarly, choosing fertiliser source such as protected urea substantially reduce N losses to the air while sustaining quantity and quality of yields. Remaining measures focus on manure management, either through extending animal grazing season and thus reducing quantity of animal manure being stored and land spread, or through mitigating emission during storage and land spreading through the use of slurry additives or low emission spreading technologies. Through reducing N losses during storage and land spreading, more N is retained in the system and available as nutrient supporting plant growth.

Table 1. List of measures that deliver on-farm GHG and ammonia savings and current state of adoption of these measures at the Kildalton Open Source Farm.

Mitigation Measure	GHG	NH ₃	Implemented on Kildalton farm?
Dairy EBI	✓		Yes
Animal health	✓		Yes
Nitrogen use efficiency	✓	✓	Yes
Clover in sward	✓	✓	Yes
Protected urea	✓	✓	Yes
Soil fertility	✓	✓	Yes
Extended grazing	✓	✓	Yes
Low emission slurry spreading	✓	✓	Yes
Slurry additives	✓	✓	No



Solutions in focus - Protected Urea for Sustainable Fertiliser Use

One of the above mitigation measures is protected urea. Calcium ammonium nitrate (CAN) is the most popular form of straight N fertiliser on Irish farms consistently supporting high yields, however it is susceptible to large N_2O loss. Urea, on the other hand, is cheaper per unit N, but up to 20% of the nutrient value can be lost as ammonia. Protected urea reduces losses of both ammonia and N_2O compared to conventional N fertilisers while consistently yielding as well as CAN and at similar cost (Fig. 2).

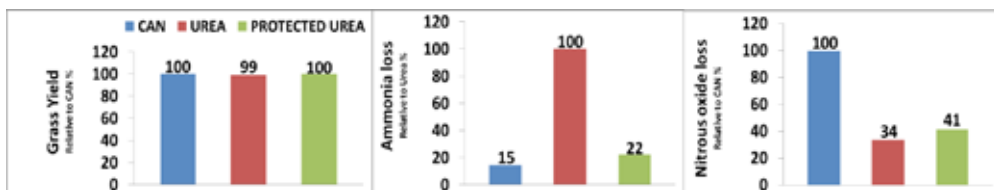


Figure 2. Grass yield, ammonia loss and nitrous oxide loss of protected urea compared to CAN and urea.

Take Home Messages

Adoption of measures to mitigate GHGs and ammonia on Irish farms is urgently needed in order to comply with our emission reduction targets and to underpin environmental sustainability of Irish agricultural production. A suite of win-win solutions is available for the farmer to choose from. Most notably, choosing fertiliser source such as protected urea can provide large benefits. Protected urea preserves yield quantity and quality, reduces ammonia loss by nearly 80% compared to urea and nitrous oxide by nearly 60% compared to CAN. There are also programs that help farmers to improve farm productivity and environmental sustainability. NMP Online can help improve soil nutrient fertility thereby improving nutrient use efficiency and reducing losses to the environment. Carbon Navigator tool can target other areas where management can be improved with further savings of nutrient losses.

Additional Information: <https://www.teagasc.ie/environment/climate-change/>



Getting the best out of slurry on your farm

¹William Burchill

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Slurry is a valuable source of N, P & K and effective use on farm can help control fertilizer costs. The typical value of 1,000 gallons of cattle or pig slurry applied by splashplate in springtime has an available N-P-K content equivalent to a 50 kg bag of 6-5-32 and 11-7-20, respectively. To maximise the nutrient value of either cattle or pig slurry a number of decisions need to be made regarding Where, When, Application method and How much slurry is spread on the farm.

Where?

The P and K within slurry accounts for up to 90% of the nutrient value within cattle slurry. Targeting application of slurry to paddocks with a high requirement for P and K such as paddocks with low soil indexes (index 1 and 2) for P and K and silage paddocks is the first step to maximising the nutrients within slurry on your farm. Targeting these areas will help reduce fertilizer bills and replenish soil P and K reserves. Research shows that fields around the farmyard tend to have higher levels of both P and K (Index 3 & 4) due to more regular applications of manures. Silage fields tend to be the furthest fields away from the yard and tend to have low soil fertility levels plus the largest demand for both P and K. Slurry is a valuable fertilizer and the extra transport costs in moving slurry to fields further from the farm may offset the extra spreading charges associated with extra transport.

When?

The timing of slurry application is important when it comes to maximising the N within slurry. About half of the N in slurry is immediately available to the plant i.e. ammonium-N. Losses of ammonium-N occur when there are drying conditions such as warm, sunny and windy days. To maximise N use by the plant, apply slurry on cool, overcast or misty days. It is recommended to apply as much slurry as possible in the springtime to maximise the fertilizer N value of slurry. Spring applied slurry is worth approximately 3 units of N per 1,000 gallons extra compared with summer application, due to better N recovery at that time of the year. However, irrespective of timing, applying slurry in the right weather conditions (cool, overcast, misty conditions) is advised rather than hot dry weather. Application of slurry early in the year also allow for more time for P and K from the slurry to be taken up during the grass growing season besides late applications in the autumn.

What Application method?

The method of slurry application has a large effect on the nitrogen efficiency of slurry. The majority of slurry in the county is spread using a splash-plate. Low emissions techniques such as the trailing shoe, dribble bar and to a lesser extent the shallow injection system are becoming more popular. The splash-plate technique broadcasts slurry across the whole surface of the field and, depending on timing / weather conditions, a lot of the nitrogen in the slurry maybe lost. The trailing shoe places the slurry in lines below the grass, the dribble bar places the slurry in narrow bands on top of the grass and the injection system places the slurry in lines within the soil (Figure 1). Putting the slurry into these lines reduces the slurries exposure to drying conditions and reduces the chance of nitrogen loss from the slurry.

On average, the trailing shoe and dribble bar will increase the N value of slurry by 2-3 units/1000gals compared to the splash-plate. Low emissions application techniques also offer other potential benefits over the splash-plate.

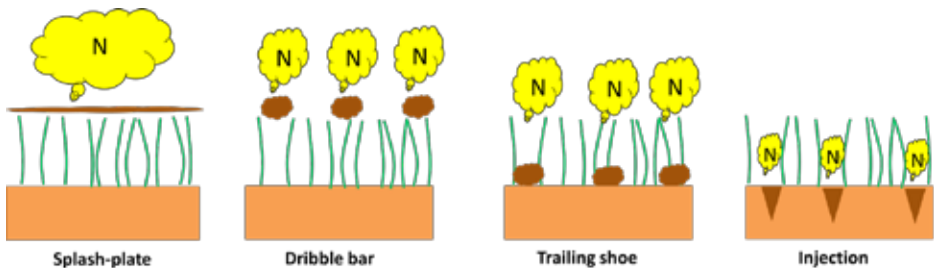


Figure 1: Illustration of slurry applied on grassland and level of nitrogen loss when applied by the different slurry application techniques.

Recent demos conducted by Teagasc Kanturk and Teagasc Moorepark advisory illustrated the ability of the low emissions application techniques to reduce slurry grass contamination visually (Figure 2) which resulted in cows preferring to graze grass (Figure 3) which had received slurry using the low emission techniques compared to the splash-plate even 20 days after slurry spreading.



Figure 2: Contamination of grass (1,700 kg grass DM/ha) when slurry was spread at 3,000 gallons/acre using the splash-plate, swivel spout, dribble bar or trailing shoe.

Lower post grazing grass covers were measured on the grassland plots receiving slurry using the trailing shoe, dribble bar and swivel spout than the splash-plate indicating lower contamination and that cows prefer to graze these plots even after a 20 days interval between slurry spreading and grazing.

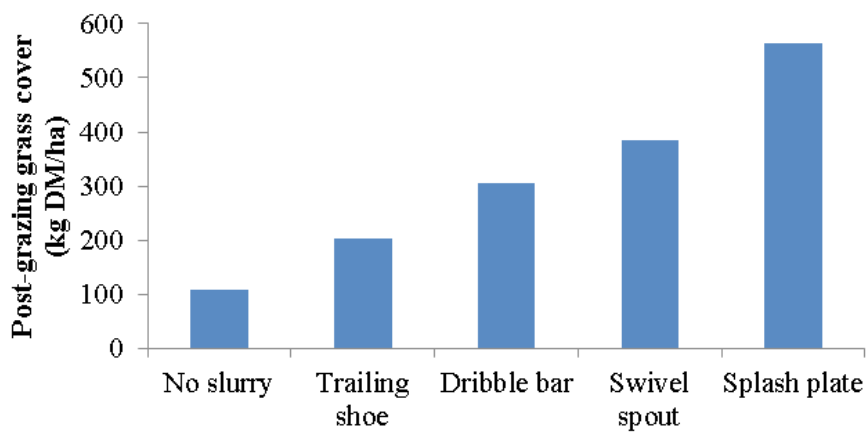


Figure 3: Post-grazing grass cover on grazed plots which received slurry using different slurry application techniques.

Investment by an individual farmer in a trailing shoe or dribble bar may be cost prohibitive as the savings in N fertilizer may not cover the extra costs associated with farmer-owned equipment. This will depend on the volume of slurry produced on farm, and the value placed on potential other benefits such as flexibility of timing into taller grass covers, reduce grass contamination, reduced odours and more even nutrient application. However, where a farmer is already using a contractor for applying slurry by splashplate, using a contractor with a dribble bar or trailing shoe may be cost effective. The contractor price is usually higher per hour, but the value of slurry is increased by approximately €3 to €4 per 1,000 gallons (cattle / pig slurry) by these methods, so depending on the volume spread per hour, a higher cost per hour of the contractor can be justified for using the modern techniques. Some of the key figures required to compare the different application techniques are summarized in Table 1. The dribble bar, trailing shoe and injection system are best in terms of nitrogen N efficiency and grass commination but cost more, add weight to the slurry tanker and have narrower working spread widths.

Table 1: Comparison of different slurry application techniques regarding cost, weight, spread width, grass contamination and nitrogen efficiency.

	Cost*	Weight*	Spread width	Grass contamination	N unit/1000gal Spring	N units/1000 gal Summer
Splash-plate	€20k	13t	10-12m	High	6	3
Dribble bar	€33k	13.5t	6.5-7.5m	Low	9	5
Trailing shoe	€34k	13.7-14.5t	6.5-7.5m	Low	9	5
Injection	€38k	14.5t	5m	Low	11	8

*Costs are based on a 2,000 gal tanker and are indicative. Weights based on a 2,000 gal tanker full of slurry.

How Much?

The nutrient content of slurry will vary with animal type and diet, and especially with slurry dilution with water. Knowing the nutrient content will help ensure that crops receive the planned levels of N, P & K to maximise grass growth for either silage or grazing. Laboratory analysis of slurry even at a once off will allow farmers to know what the typical units of N, P and K per 1,000 gal/slurry are on the farm. A more practical approach may be to estimate the slurry dry matter on-farm using a slurry hydrometer or even visually assess the slurry. The thicker the slurry (more dry matter) the more N, P and K will be in the slurry. For example, slurry from a covered slatted unit slurry tank will have a higher dry matter (6-9%) and contain much more nutrients than a typical open tank receiving rainwater (3-5%). The amount of N:P:K applied in slurry per acre depends on the slurry thickness and application rate and can be seen in Table 2. Slurry dilution with water will increase the N efficiency but will reduce the P and K content of the slurry and this must be accounted for in balancing crops P and K requirements. For example, 2,000 gal/acre of thick slurry will deliver similar N:P:K as 3,500 gal/acre of watery slurry (Table 2) and are sufficient to meet second cut silage P and K requirements of 8 units P/acre and 60 units K/acre.

Table 2: N, P and K applied per acre depending on slurry application rate and slurry thickness

	Watery slurry 4% DM			Thick slurry 8% DM		
	units/acre			units/acre		
Application rate	N	P	K	N	P	K
2000 gal/acre	9	6	41	17	11	72
2500 gal/acre	11	8	52	21	14	90
3000 gal/acre	13	9	62	25	17	108
3500 gal/acre	15	11	72	29	20	126

New Derogation Rules

The new rules of Ireland's fourth Nitrates Action Plan (2018-2021) came into effect from the 1st January 2018. Under the new rules derogation farmers (>170 kg organic N/ha) must now spread 50% of all slurry produced on the farm by the 15th June each year. After 15th June slurry must be spread using either a dribble bar, shallow injection spreader or trailing shoe. This deadline has been extended to the 15th July in 2018 due to the bad weather associated with the winter/spring of 2018. Farmers must also have sufficient winter storage for all livestock manure and soiled water produced on the farm in order to be eligible to qualify for a derogation.

Take home messages

- Target slurry application to fields with low soil test P and K results (i.e. Index 1 and 2) and silage fields
- To maximise N recovery apply slurry on cool, overcast days in springtime
- Switching slurry application with splashplate from summer to springtime will increase N value by approximately 3 units per 1,000 gallons for cattle slurry
- Using dribble or trailing shoe application methods will also increase N value by approximately 3 units per 1,000 gallons for cattle slurry and reduces grass contamination
- Adjust the application rate of your slurry depending on how watery/thick the slurry is and the crop demand e.g. first cut silage (N:P:K = 100:16:100) or second cut (N:P:K = 80:8:60)

Additional information: <https://www.teagasc.ie/crops/soil--soil-fertility/organic-manures/>



Increasing biodiversity on intensively-managed farms

¹Daire Ó hUallacháin

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Agriculture has shaped the Irish landscape and the wildlife (biodiversity) it contains. Many of our best known farmland plants and animals are dependent on agricultural practices, and changes in these practices in turn affect farmland ecology. Intensification of agriculture over recent decades has resulted in a decline of biodiversity within agricultural systems. Whilst there is a need to increase production to cope with increasing food demands, the environment and ecosystem services it provides need not be compromised. Emerging research and policy agendas are now based on sustainable management of agricultural land.

Grass-based farming systems in Ireland are well positioned in terms of the wildlife they support within the landscape. It is estimated that natural habitats make up 12-14% area of grassland farms. These are highest on more extensively managed farmland, resulting in most focus to date being centred on sustaining and enhancing biodiversity within these more-extensive systems. However, intensively-managed systems can also play an important role in halting the decline of farmland biodiversity. Objectives of the Food Harvest 2020 and FoodWise 2025 reports include the need for the development of effective methods for biodiversity conservation, as part of the development of sustainable production systems in both intensive and extensive systems. Incorporation of such measures could provide a very important and much overlooked branding and marketing opportunity to Irish farmers and retailers in terms of capitalising on Ireland's 'clean, green' image.

Appropriately-designed wildlife measures (such as those mentioned below), targeted for intensive systems, could play an important role in halting the decline of biodiversity and achieving the goals of sustainable expansion. Such measures can also play an important role in delivering on other environmental goals such as improving water quality and reducing greenhouse gas emissions.

- **Maintain and manage existing habitats**
- **Hedgerow management**
- **Watercourses and buffer strips**
- **Field margins**
- **Establish new habitats**



Planting a new hedgerow will provide food and shelter for many generations of plants, mammals, birds and insects. They also provide useful shelterbelts and benefit carbon sequestration

Conclusions

Biodiversity is a primary environmental indicator of sustainable agricultural systems. There is a need for effective methods to promote wildlife conservation, as part of the development of sustainable agri-production systems. This provides important branding and marketing opportunities for farmers and retailers.

Additional information <https://www.teagasc.ie/environment/biodiversity--countryside/>





Biodiversity in the Kildalton Open Source Sustainable Dairy Demonstration Farm

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Introduction

Irish farms are characterised by having a good diversity of habitats such as hedgerows, field margins, ponds and streams, native woodland, bogs and species-rich meadows and pastures. Irish biodiversity therefore depends on farmland habitats and farmer's actions are critical in maintaining and managing existing natural habits aswell as availing of opportunities to create new habitats. In Kildalton we have mapped our habitats and we know how much habitat we have and where it is located. We have undertaken surveys to establish the condition of these habitats and developed action plans to establish new habitats in locations which will deliver multiple benefits.

Biodiversity in Kildalton

One of the jewels in Kildalton's crown is the network of hedgerows in Kildalton where we have 53 distinct hedgerows covering over 10.25km with the majority of hedgerows being in favourable condition. Hedgerow surveys conducted by Johnstown Castle have shown us where we can improve the condition of some our hedgerows (Figure 1). These may be in unfavourable conditions because fertiliser spreading or weed spraying too close to the hedgerow base. Teagasc have a number of leaflets available online which give information on best management practices for different situations and these inform and guide us to best managing our hedgerows. Earlier this year we planted 150m of hedgerow which is the first stange of an annual planting regime to increase and improve our hedgerow network. In doing so we will avail of their many benefits including improving water quality, adding to the landscape, providing windbreaks and shelter, disease control etc.



Figure 1 Hedgerow evaluation at Kildalton College

Kildalton has two ponds on the grounds which are fed by two springs and discharge into the River Pil. Maintaining good water quality is important and this is being monitored by both chemical and biological sampling of these surface waters. Although the River Pil is not monitored routinely by the EPA, our own analysis shows us that the Kildalton stream river has a lower nutrient content than that of the River Pil. Our surface water quality is therefore not impacting on water quality in the River Pil and it is proving a rich habitat for a wider variety of invertebrates (Figure 2), plants, small fish etc



Figure 2 Damselfly at the Clover Pond in Kildalton


Bird surveys in Kildalton has shown us that we have 44 species regularly visiting the farm. Seven species of bats have been recorded in Kildalton in good numbers. These numbers are a reflection of the different mature habitats across Kildalton, many of which are well connected with each other.

Tackling invasive alien species is another important part of managing habitats for biodiversity. Certain invasive alien species such as Japanese Knotweed has come to prominence in recent years and there is growing awareness as to their impact on biodiversity but also their potential impact on farm structures. Kildalton has a rich history and was originally part of the Bessborough Estate owned by the Ponsonby family and the main house stretches back to 1755. At different stages, various ornamental plants were grown in the grounds and we are now working as part of the newly established national working group on tackling Invasive Alien species to create awareness and promote relevant information to the agriculture industry.

Take Home Messages

Managing and maintaining what you have is the first step in considering biodiversity on Irish farms. It is easy to underestimate what you have but in general Irish dairy farms have a variety of valuable habitats. Correctly managing habitats at the correct time of year is important. Simple actions such as not spraying or fertilising field margins or corners provides will valuable space for plants, insects and mammals.





Forestry – A Sustainable and Complementary Farm Resource

¹Tom Houlihan

¹Teagasc Forestry Development Department, Killarney, Co. Kerry

Introduction

Over the past twenty five years 22,000 landowners, 83% of which are farmers, have converted some of their land to forestry, creating a sustainable and complementary farm resource. There is increasing recognition of the economic, social and environmental contributions from forestry including its crucial role in greenhouse gas mitigation, particularly for future scenarios post-2030. As well as providing a range of ecosystem services, forestry has a significant role to play in enhancing farm viability, optimising use of marginal land, optimising work time opportunities, facilitating tax efficiency, facilitating retirement planning and as an excellent pension fund.

Complementing Dairying in Cork

Donal McCarthy from Ballydehob, Co. Cork (Plate 1) is a progressive dairy farmer who identified opportunities to diversify his farming activity and create a complementary on-farm enterprise. Donal planted 11 hectares of marginal land located on an out-farm in 2010. This is a commercial venture but with an inclusion of broadleaf species and with additional retained areas for biodiversity and landscape enhancement. Donal went on to plant a further 27 hectares of marginal land in 2015 (Plate 2). He is one of the 30% of all forest owners nationally who, over the last 10 years, have gone on to plant at least a second time following their initial planting decision. According to Donal 'I have no regrets whatsoever. Forestry can help optimise my returns on out-farms and marginal land. I now have a growing, sustainable and secure pension plan which I will be in control of myself.' Analysis by Teagasc has shown that the annual equivalised value of a productive 10% diverse forest, expressed in today's money, can be in excess of €550 per hectare. Thus forestry can deliver on multiple objectives as a sustainable and economic enterprise.



Figure 1: Forestry Complementing Dairying



Figure 2: Productivity and Sustainability

Forestry : Multiple Benefits

Forests have been traditionally perceived solely as a resource that produces wood. The current vision and objectives of forests have been transformed with a strong emphasis on the multiple benefits that they can provide. The strategic goal stated in Ireland's forest policy review (2014) is *'To develop an internationally competitive and sustainable forest sector that provides a full range of economic, environmental and social benefits to society and which accords with the Forest Europe definition of sustainable forest management'*. In this regard, well-planned

forestry can also deliver a wide range of non-wood products and ecosystem services that can be highly significant on-farm enhancements in future years. These services include carbon sequestration, protection of water quality and biodiversity enhancement.

Carbon Sequestration: Forests mitigate climate change through sequestration of carbon by tree growth and carbon storage in soils, tree stems, roots and ground litter. The extent of mitigation depends on planting levels, the type of forests, site types and forest management systems. Through sequestering of carbon, forestry can act as a future enabler for dairy and other farm enterprises and significantly contributing to our future national abatement effort.

Ireland's contribution to the Paris Agreement on climate change will be via the Nationally Determined Contributions proposed by the EU on behalf of its Member States. The Commission Effort Sharing Proposal included the allocation of 26.8 million tonnes (CO₂ equivalents) of land-use, land-use change from forestry (LULUCF) credits to Ireland over the 10 year period 2021-2030 (5.6% of 2005 base year emissions). Member States with a larger share of emissions from agriculture were allocated a higher share of LULUCF credits within this proposal. This equates to 2.68Mt CO₂ equivalents per year. It is projected that the full allocation could be met and exceeded by at least 0.29 Mt CO₂ equivalents per year with the bulk of the sequestration due to forestry (Teagasc Greenhouse Gas Working Group, 2018)

Protecting Water Quality: Farmers and landowners have an essential role as custodians of our landscape and natural resources. They can now avail of the appropriate afforestation measures such as broadleaf and native woodlands and create a resource that can protect water quality. The recent Department of Agriculture, Food and the Marine (DAFM) 'Woodlands for Water' publication explores how the establishment of new native woodland combined with undisturbed water setbacks can deliver services that protect and enhance water quality and aquatic ecosystems. Even a limited area of woodland near watercourses (termed 'riparian woodland') can become a protective, enhancing and visually attractive resource on the farm, without reducing enterprise productivity.

Enhancing Biodiversity: Forests are among the world's most complex and diverse ecosystems. Conifer, broadleaf, mixed woodlands and forests can contribute significantly to biodiversity, both within their boundaries as corridors for wildlife and as refuges in the wider landscape. Areas for Biodiversity Enhancement (ABEs) are incorporated into all new forests. They conserve existing habitats and biodiversity features and promote further diversity. The selection of tree species has a major influence on the habitat value and

biodiversity. A minimum of 15% broadleaf component is now required on all new planting sites. The establishment of a forest is an opportunity to positively influence wildlife communities and make positive contributions to biodiversity in the landscape when properly planned. Forest management planning also affords the opportunity to enhance future biodiversity in our forests.

Take Home Messages

- Forestry is a sustainable option for marginal and fragmented land.
- DAFM establishment grants cover the cost of planting in most cases with 15 year annual premiums (€510 to €680 per hectare) offering secure long term income.
- There is a wide range of DAFM Grant and Premium Categories to suit all circumstances
- Eligible land planted with forestry retains Basic Payment.
- Forest design, scale and good management are critical to maximising crop quality, timber value and environmental contribution.
- Forestry is a permanent land use change subject to a replanting requirement.
- Teagasc provides a comprehensive independent advisory service.

Farmers and landowners can avail of excellent supports available when considering land use options. Contact your local Teagasc forestry staff and log onto www.teagasc.ie/forestry for further information.





Campaign for Responsible Rodenticide Use (CRRU)

¹Sharon O'Mahoney

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Introduction

Demands of consumers for high quality and safe food mean that there is a requirement for high standards in all stages of food production, including strict quality assurance requirements from buyers, such as supermarkets and food processing companies. Among these requirements is the need for the effective control of rodents, which pose significant economic and health related risks, as they can consume and contaminate food stuffs, damage property and transmit disease. Control of rodent populations is therefore essential in many agricultural and urban environments and is principally achieved through the use of anticoagulant rodenticides. Contamination can occur when a non-target species consumes bait directly (primary exposure), or when a predator or scavenger consumes an animal which has been previously exposed (secondary exposure). There is a requirement to ensure better stewardship and best practice use of rodenticides to reduce and prevent exposure to wildlife. The Campaign for Responsible Rodenticide Use in Ireland (CRRU Ireland) was established to meet this requirement.

Objectives

Under the banner “Think Wildlife”, CRRU Ireland promotes best practice and responsible rodent control, to reduce wildlife from rodenticide exposure. As rodenticide products are authorized following the EU approval of their active substances, compliance with the Best Practice Requirements will be required for the mitigation of the risks for human health and the environment associated with their use. Risk mitigation measures and practices required for the authorization of rodenticide products, will be specified on product labels. Accordingly, compliance with the Best Practice Requirements will be an essential requirement for the use of authorised rodenticide products.

To facilitate correct usage of rodenticides thereby minimising the exposure of wildlife, CRRU Ireland has prepared Best Practice Requirements for Rodent Control and Safe Use of Rodenticides, delivers ‘Wildlife Aware’ training and accreditation for professional pest controllers and works with government agencies, rodenticide industries and relevant stakeholders to improve standards of rodent control in Ireland.



Figure 1. Barn Owl feeding on rodent

The CRRU Code

The CRRU Code is a 7 step code of good practice which ensures that rodenticides are used correctly and in a manner that will minimize exposure to non-target wildlife.

- Step 1:** Always have a planned approach
- Step 2:** Always record quantity of bait used & where it is placed
- Step 3:** Always use enough baiting points
- Step 4:** Always collect and dispose of rodent bodies
- Step 5:** Never leave bait exposed to non-target animals and birds
- Step 6:** Never fail to inspect bait regularly
- Step 7:** Never leave bait down at the end of the treatment



Take Home Messages

Control of rodent populations is essential in agriculture. The use of rodenticides can result in unintended exposure of non-target wildlife. CRRU Ireland was established to ensure best practice use of rodenticides and prevent exposure to wildlife. Farmers in GLAS should comply with CRRU. Compliance with CRRU is a suggested meeting topic under the KT Programme.

Energy and Water Use Efficiency on Dairy Farms

¹John Upton & ¹Eleanor Murphy

¹Teagasc, Moorepark, Fermoy, Co. Cork

Summary

- Benchmark your farms energy costs against other farms. The average cost of electricity usage on Irish dairy farms is €5 per 1,000 litres milk produced
- Check the electricity unit cost against the best unit rates using a cost comparison website
- Use night rate electricity for water heating and the morning milking. **Night rate hours are from 11pm to 8am during winter time and 12 midnight to 9am for summer time**
- Efficient recycling strategies for plate cooler water (e.g. for wash-down or stock drinking) is important to reduce water use while maintaining energy efficiency

Introduction

The average cost of electricity usage on Irish dairy farms is €5 per 1,000 litres milk produced. There is a large variation in that figure – from €2.60 to €8.70 per 1,000 litres produced, or from €15 to €45 per cow per year. These figures suggest that there is potential for many farmers to reduce their electricity usage by making some changes to how they produce milk. Teagasc estimates that the average farm could save €1,800 per year through altered management strategies and the use of energy efficient technologies. These costs exclude VAT and network charges. The main drivers of energy consumption on dairy farms are milk cooling (31%), the milking machine (20%) and water heating (23%). A more detailed breakdown of energy consumption is illustrated in Figure 1.

Calculate your energy costs

A simple calculation can be made to approximate on-farm electricity costs. Firstly, add up the total electricity charges over a year excluding standing charges, VAT and PSO levy; these figures can be found on the electricity bill. Multiply by 100 to convert from euro to cents. Next add up the total number of litres of milk sold to the processor over the same period. Dividing the electricity cost in cents by the number litres will give the cost in cent per litre. The average three bedroom house in Ireland uses approximately 5,000 units of electricity per year. This can be deducted to account for domestic usage if the dwelling house is on the same meter as the farm.

Night Rate electricity Vs Day Rate electricity

Night rate is charged at ~€0.08 per KWh, and day rate is charged at ~€0.16 per KWh; exact costs vary by the electricity supplier. Checking your pricing and tariff structure against the best available rates can also yield significant savings. The cheapest supplier could be 20% less than the most expensive supplier.

A price check can be carried out using a pricing comparison website. All you need is information about your present tariff, annual usage and night rate usage in order to make comparisons and calculate possible savings. If you decide to switch suppliers, it is important to read the small print. Check the standing charges and termination charges.

Key points about night rate electricity

- **Night rate hours are from 11pm to 8am during winter time and 12 midnight to 9am for summer time.**
- Where appliances are required to operate during night rate hours (e.g., electrical water heaters), digital time clocks with battery backup should be used.
- Analogue timers without battery back-up will become out of sync in power failures
- Note: There is no charge from ESB networks to install a night rate meter. The meter standing charges increase from approx. €0.46 per day to €0.60 per day after moving to night rate electricity. This means that a minimum of 1.5 units of electricity would need to be used each night to offset the extra charges.
- A typical dairy water heater uses approx. 1.5 units of electricity per hour and takes about 6 hours to reach full temperature.

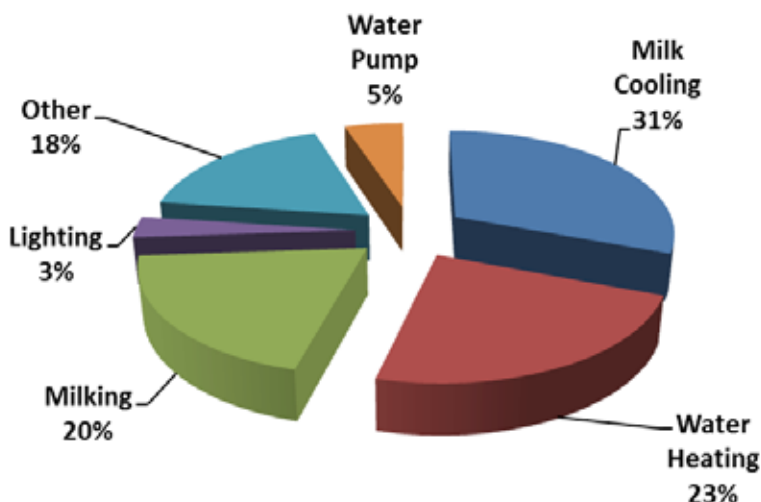


Figure 1: Average component consumption on 60 commercial dairy farms

Water use on dairy farms

In a study of 25 Irish commercial farms that were monitored for a 12 month period, the average volume of water consumed per litre of milk produced was 6.4 litres. Consumption by livestock and other miscellaneous use accounted for two thirds of water use on farms. The second largest use of water was the plate cooler (1.69 L/L). An efficient recycling strategy for this plate cooler water is important to reduce water use while maintaining energy efficiency. Plate cooler water can be collected and reused for wash-down procedures and animal drinking water (provided the bacterial load of the source is low). Maintenance of water systems was identified as a key aspect of efficient water use. Leaks can add to the pumping cost of water, with leaks of 10L/min costing up to €526/ annum in pumping costs.

Conclusions

Calculating the energy costs of your farm in cents per litre of milk produced is a useful exercise to benchmark efficiencies against national averages. Farms with energy costs of greater than €8 per 1,000 litres milk produced will benefit from investing in energy efficient technologies (such as plate cooling), whereas farms below the average electricity spend of less than €5 per 1,000 litres would benefit from cost reducing measures such as moving consumption to night rate electricity (e.g. for water heating and morning milking) and moving to the least cost supplier.

Want to halve the cost of electricity for milking?

¹Helen Williams, ¹Ivan Sproule, ¹Majella Kelleher & ²Audrey O'Shea

¹Sustainable Energy Authority of Ireland

²Sustainability Manager, Glanbia Ingredients Ireland, Ballyragget, Co. Kilkenny

Electricity can represent a significant cost for dairy farmers, and fluctuations in price add uncertainty to the mix. A prudent question to ask is what is the best way to protect yourself? Taking steps to reduce the amount of electricity your parlour uses, so that regardless of what the future holds helps ensure that you can be sure you're in the best possible position.

Here's how...

More efficient milking technology can have a significant impact on your electricity bills. Dairy farmers who have invested in vacuum pumps with **variable speed drives** report that the new equipment is not only quieter and more environmentally friendly, but that **it can save them up to 50% on the electricity cost of milking**. Variable speed drives can also be retrofitted onto existing pumps, as long as the existing pump is capable of operating efficiently at slow speeds – check with your supplier first.

Case study

Farmer's name	D Fitzgerald
Herd size	178 Cows
Location	Co Cork
New technology	Variable speed vacuum pump
Estimated annual savings	€2,500

The Technology

David Fitzgerald installed two new vacuum pumps with variable speed drive (VSD) to control the level of vacuum generated. VSD technology determines exactly how much vacuum the system requires and regulates the speed of the pump to provide a constant, stable vacuum that uses substantially less electricity.

The parlour's technician, local Boumatic Gascoigne Melotte agent Allen Treacy, introduced David to the technology last year when the Sustainable Energy Authority of Ireland (SEAI) and Teagasc were running a pilot grant scheme for VSDs. They opted for the *Boumatic Air Star 200*, a lobe pump described by those in the know as the "Rolls Royce of vacuum pumping systems". Lobe pumps offer a greater range of operating speeds than the more common vane pumps. Capable of milking up to 24 cows, the *Air Star* takes in current frequencies of 16Hz to 60hz, as opposed to traditional pumps which only fluctuate between 35Hz and 50Hz.

Installation of the new vacuum pumps cost €15,210, excluding VAT. Under last year's support scheme, D Fitzgerald received €7,605 of the cost as a grant from SEAI and paid the balance himself.

Long term benefits

According to an SEAI estimate, the more efficient technology will save D Fitzgerald a minimum €2,500 annually, paying back the cost of his upgrade in three to four years. Without the grant, it would have taken him a little over six years to get his investment back.

Power savings are not the only reason that farmers like D Fitzgerald have chosen to invest in VSDs. A pump that is able to run at a lower speed most of the time will have a **longer life**



New vacuum pump with Variable Speed Drive

span and require less maintenance that a conventional pump. It is also **considerably quieter** when in operation – a major benefit cited by participants in last year's grant scheme. In addition, the lobe pump does not use oil.

Allen Treacy said he first installed an *Air Star* VSD more than seven years ago and has seen increased demand for VSDs with the recent pilot grant scheme. He added that retro-fitting the device on an existing traditional vacuum pump also delivered significant savings, and he is glad that more funding is being made available for these technologies.

Get involved

If you're a dairy farmer and you're interested in participating in 2018's grant scheme, please get in touch with your local Glanbia or Teagasc advisor, or contact SEAI by emailing info@seai.ie or visiting Glanbia Connect or SEAI's website and looking under grants for businesses.

New Technology Installations	Level of support (%)	Max support Excluding VAT	
		Single Phase	Three Phase
Complete new vacuum pump including pump, motor and inverter VSD with controls	40%	€5,000	€3,000
Retrofit of existing vacuum pump with inverter VSD and controls	40%	€1,750	€1,250
Retrofit of milk pump with inverter VSD and controls , (pump and/or motor as required)	40%	€1,000	



Farm Safety for Dairy Farmers

¹John McNamara

¹Teagasc, Kildalton College, Piltown, Co. Kilkenny

Introduction

Your safety and health is your most important resource. To the end of September 2017, 18 persons have lost their lives in farm accidents; this follows on from 2014 when 30 persons died in farm accidents. This made up 55% of all workplace deaths while just 6% of the workforce is employed in the agriculture sector. This information should motivate everyone in farming to manage health and safety effectively. Management of farm safety involves completing and implementing a Risk Assessment and ensuring that farm. Considerable DAFM TAMSII Funding is available to improve farm safety. Kildalton College as part of Teagasc policy constantly strives to maintain or improve its farm safety standards and practices.

Farm Safety Management

An Accident happens when a person is impacted by some source of energy, e.g. fall, blow, PTO, animal, or what a vital bodily function is impeded. Farms are very dynamic places where persons, machinery, loads and livestock are constantly moving. A farmer must be alert at all times to foresee possible injury situation. As working long hours and being tired are major risk factors for farm accidents having infrastructure, facilities and equipment to match workload is a key to preventing accidents. Completing and implementing a Risk Assessment on a regular basis is a legal requirement. A new Risk Assessment document was introduced on 1st July 2017 and all farms, where the Risk Assessment approach applies, must have the new Green Document completed by 31st December 2018.

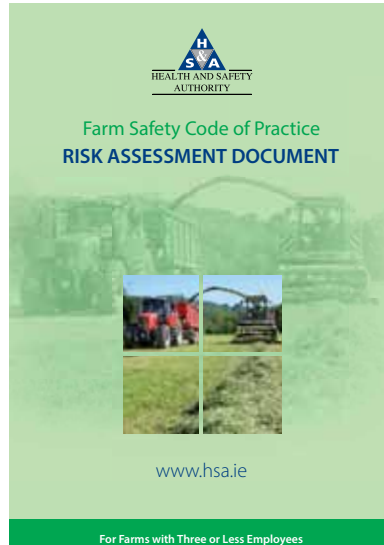


Figure 1. New Farm Safety Risk Assessment Document

Farm Safety Adoption

Research by Teagasc on use of the Risk Assessment document found the following:

- Users filled the document meaningfully but to a limited extent with an average of 3 controls identified
- Attending Half day training led to a 40 % increase in controls identified for action.
- Farmers who implemented the controls they identified had overall safer farms

Take Home Messages

- Complete and Implement the new Risk Assessment Document
- Attending Half day training if you have not already done so.
- Keep a constant watch for Hazards and implement controls immediately
- Examine how you can cut workload, especially in advance of the busy spring season

Additional information: <https://www.teagasc.ie/rural-economy/farm-management/farm-health--safety/>



Maintaining your Health as a Farmer

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Introduction

Health is a vital attribute both to farm and for lifestyle. However a major study by Dr B. Smyth MD (2012) has indicated that farmers have a 5.1 higher 'all cause' death rate than the occupational group with the lowest rate within the working age range (16-64 years). The major causes where death rates are excessive include cardiovascular disease (CVD), cancers and injuries. Musculoskeletal disorders particularly low back pain (LBP) is the most prevalent physical occupational complaint among farmers (28%). LBP-associated disability leads to on-going pain and reduced capacity to work. Farmer stress due to farm stressors such as workload and poor health is being reported increasingly. As health is 'biopsychosocially' or personally influenced, farmers are advised to give maintaining of improving health their attention.

Approaches for Maintaining Health

A Health Booklet for farmers – Staying Fit for Farmers is has been prepared (Figure 1). It is vitally important to become informed about health issues and take follow-up action. Small changes can lead to significant health benefits over time. Also examine the way you farm as long working hours can lead to tiredness and stress issue. Reduce heavy lifting to prevent musculoskeletal disorders. Reduce the risk of respiratory hazards by controlling dust and spores. Wear suitable Personal Protective Equipment such as gloves and respiratory face masks when required.

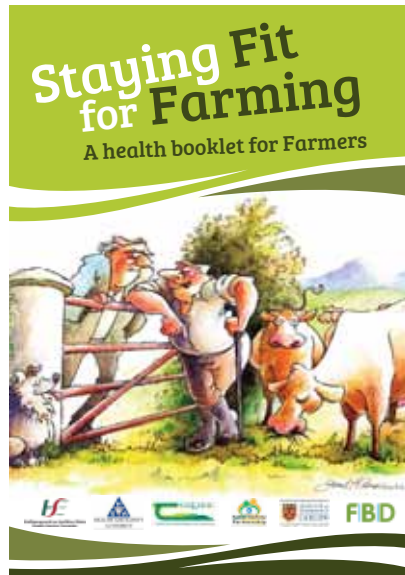


Figure 1. Farmers Health booklet.

Implementing health promoting approaches

The following approaches are vital to maintain health

- Be informed about farmer health issues
- Undergo a regular health check with a health care professional
- Exercise, diet, weight control and crucial for health.
- Quit smoking and limit alcohol consumption.

Take Home Messages

‘Your health is your Wealth’, it takes knowledge and personal commitment to maintain health. Farmers are often surprised to hear that farmers as an occupational group have a poor health profile but when the data is considered the factors leading to this situation become apparent. Teagasc is committed to working with health promotion professionals to assist farmers to maintain health. Health is a vital ingredient of sustainable farming.

Additional information: <https://www.teagasc.ie/rural-economy/farm-management/farm-health--safety/>



Farmers Have Hearts

¹Marese Damery

¹Health Check Manager, Irish Heart Foundation

Introduction

The Irish Heart Foundation is the national charity fighting heart disease and stroke, we have led the way in reducing deaths from heart disease and stroke through our research, education and community service to help Irish people live longer, healthier lives. Cardiovascular disease (CVD) is the leading cause of death in Ireland with 80% of premature CVD caused by unhealthy lifestyle (WHO, 2017). Changes in lifestyle and medical interventions can improve cardiovascular health. Irish farmers are a particularly high-risk group for CVD, the leading cause of death in Ireland.

The Irish Heart Foundation supported by the Health Service Executive have been conducting free heart health checks in marts for over 5 years reaching nearly 5,000 farmers nationally. The Heart Health Check provides a cholesterol, blood pressure and weight measurement check and includes tailored individual lifestyle advice by a cardiovascular experienced nurse. The nurses also discuss with farmers their risks for heart disease and stroke in relation to alcohol intake, smoking, stress and physical inactivity, they are not making a diagnosis but are identifying risk, farmers with abnormal results are advised to see their GP for follow up. Over the past 5 years 63% of Farmers have been advised to see their GP with one or more risk factor for heart disease and stroke.

Evaluation Report

The Irish Heart Foundation through the Institute of Technology Carlow conducted an evaluation to get an insight into the cardiovascular health status of Irish farmers based on the results of heart health checks carried out by the IHF at farmers' marts, to look at the impact of the health intervention in relation to the farmers', experience of the heart health checks, their adherence to following up with their GP when advised, to their lifestyle/health behaviour change and use of health information. The evaluation would help to strengthen the evidence base around workplace health promotion in Ireland that establishes how to reach and engage farmers in their health.

Findings from the report:

- 80% of famers were found to have four or more CVD risk factors
- 79.2% were referred to their GP based on the heart health check results
- Only 31.4% of them had followed through and visited their GP by Week 12

- At Week 1, 74.1% reported that they were thinking of making changes to health behaviour with 48.3% (n=83) at Week 12 reporting having made changes.
- 41.9% reported that they 'would not have attended a health check otherwise'
- Most farmers reported a positive experience of the heart health check

Recommendations from the study were to:

- Expand health promotion in relation to Irish farmers
- Look at ways to increase use of local support networks and peer support
- Look at ways to increase follow-up use of (preventive) health services
- Do more research specifically in relation to obesity and stress among farmers

Conclusion:


The Irish Heart Foundation are delighted to be supporting a further Farmers Have Hearts study which will run over 4 years and is being conducted by Teagasc PhD Walsh Fellow Ms Diana Van Doorn at the Centre for Men's Health at IT Carlow and further supported by Glanbia Ireland, the Health Services Executive and the UCD School of Physiotherapy and Performance Science.

This study will build on the research already conducted and adds significant value to the regular health checks that are undertaken each year through our Farmers Have Hearts programme, supported by the HSE. This research is important in identifying ways that we can support farmers make positive changes to their lifestyles. The Health Checks will be taking place in marts and Glanbia sites.

For information on the locations for the health checks in the Marts: <https://irishheart.ie/>



Health checks being carried out by the Irish Heart Foundation



Using the Carbon Navigator to reduce Greenhouse Gas Emissions on your dairy farm

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Introduction

Agriculture accounts for almost 33% of Irish greenhouse gas emissions, with most of the remainder being contributed by the transport and domestic sectors. Even though agricultural emissions have declined by 9% since 1990, Ireland is committed to reduce GHG emissions by 20% by 2020 and by 40% by 2030.. An EU study rated Irish Dairy Production as the most carbon efficient in the EU. With the expected increase in dairy cow numbers and dairy output by 2020 and beyond, the dairy industry faces a challenge to increase output in the face of reduced GHG emissions targets. While it is accepted that agricultural GHG emissions are difficult to reduce, farmers who adopt a number of key practices and technologies can significantly improve efficiency, improve profitability and lower GHG emissions.

Agricultural greenhouse gasses

Methane (CH₄)

From rumen fermentation and slurry storage. Methane is 25 times more potent than carbon dioxide. It accounts for almost two thirds of agricultural GHGs.

Nitrous Oxide (N₂O)

From organic and chemical nitrogen fertiliser and animal excreted N. It is 300 times more potent than carbon dioxide. It accounts for almost one third of agricultural emissions

Carbon Dioxide (CO₂)

Associated with the use of fossil fuels for energy and the manufacture of fertiliser. It accounts for a relatively small proportion of agricultural emissions

While agricultural GHGs are difficult to reduce, the good news is that a number of studies have shown that achieving improved technical efficiency, reducing emissions and increasing profitability can all be achieved together.

The Carbon Navigator

The Carbon Navigator is a decision support tool to help farmers to reduce their carbon footprint. The Dairy Carbon Navigator collects a small amount of information from the dairy enterprise and uses this to assess the performance of

the farm against peers. It rates performance from poor to excellent. The Carbon Navigator estimates the percentage reduction in enterprise GHG emissions that can result from increasing technical efficiency in certain areas on the farm. It also estimates the improved profitability that will result from achieving the targets.

Five key areas: How they work

Grazing season length

Increasing the grazing season length lowers GHG emissions in two ways. Grazed grass in the early and late season is a higher quality, more digestible feed than grass silage, leading to improvements in animal productivity and a reduction in the proportion of dietary energy lost as methane. The shorter housing season leads to reduced slurry methane (CH_4) and nitrous oxide (N_2O) emissions from slurry storage and spreading. Energy used spreading slurry is also reduced.

Improving EBI

Increasing genetic merit through the EBI has the capacity to reduce the carbon footprint in four ways.- First, increasing milk solids yield per cow decreases emissions per unit of product. Second, improving fertility reduces calving interval and replacement rate, thus reducing enteric CH_4 emissions per unit of product. Third, more compact calving can increase the proportion of grazed grass in the diet and reduces culling and replacement rates. Fourth, improved health reduces the incidence of disease and deaths, leading to higher production levels and lower replacement rate.

Nitrogen efficiency

Improving nitrogen efficiency leads to improved utilisation of N by plants and lowers losses to the air and water. Improving grassland management and matching crop uptake with fertiliser application are key factors. Urea requires less energy (and CO_2) to produce than CAN, and leads to lower N_2O emissions

Slurry spreading timing and methodology

Spring application of slurry reduces emissions, which are lower in cool conditions with low sunlight. The shorter storage also reduces losses of methane. The resulting reduction in ammonia losses increases the fertiliser replacement value, thereby reducing GHG losses associated with chemical N fertiliser. Low emissions application technologies, such as trailing shoe, also lead to reduced ammonia losses and increases the fertiliser replacement value of slurry.

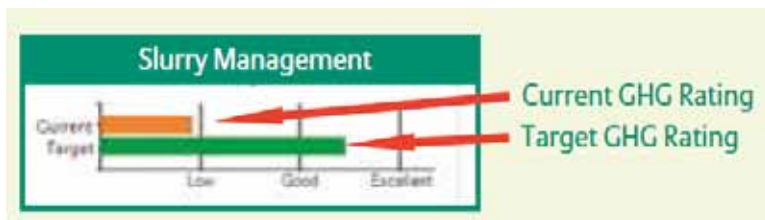


Figure 1 The Carbon Navigator shows progress against targets for different efficiency measures

Energy efficiency

Effective pre-cooling of milk through a plate heat exchanger, the use of variable speed drive (VSD) vacuum pumps and the use energy efficient water heating systems have the capacity to reduce energy related GHGs on Dairy farms

Take home message

In many cases there are management changes that can be made that have big gains for the environment and substantial cost savings for the farmer which increases profitability. Completing a Carbon Navigator is a relatively simple task that will signpost those areas on a farm where gains can be made

EBI – Breeding a Sustainable Future

¹Kevin Downing

¹ICBF, Highfield House, Bandon, Co. Cork

Introduction

The three pillars of sustainable agriculture are Economic, Social and Environmental and in that context, breeding plays a major role in all three pillars. In Ireland we use the Economic Breeding Index (EBI), which is a single figure profit index, which dairy farmers use to breed more profitable cows. Not only that, but the gains in extra profit are directly contributing to the reduction in Greenhouse Gas (GHG) emissions. Therefore, the EBI is delivering a more sustainable cow.

Latest work by Teagasc has indicated that for each €10 gain in herd EBI there has been a gain of €20 in terms of additional net profit per cow per year while leading a 2% reduction in the carbon footprint.

Mitigation strategies like the EBI, that increase profit and reduce emissions are a win-win for the farmer and the wider communities.

Reducing the Carbon Footprint

The EBI is currently made up of seven sub-indexes, namely (1) Production, (2) Fertility, (3) Calving, (4) Beef, (5) Maintenance, (6) Management and (7) Health. The financial gains from increased herd EBI have been well documented and many of these gains have directly contributing to reducing green-house gas emissions.

There are currently a number of ways in which the EBI index is contributing to the reduction of Ireland's carbon footprint. They are as follows:

1. Milk Production

Co-Op Milk Data based on 2,801 Creamery Suppliers		
Year	Milk Yield/Cow	Milk Solids/Cow
2010	4,858	363
2011	4,872	368
2012	4713	360
2013	4795	366
2014	4845	374
2015	5240	410
2016	5170	407
Table 1: Milk Production Trend 2010 - 2016		

Increasing Milk yield and composition per cow will automatically decrease the emissions on a per unit of product basis. Table 1 shows an analysis of co-op milk supplies from over 2,800 creamery milk herds. The data clearly shows the increase per cow that has been achieved in both milk yield and milk solids between 2010 and 2016. While improvements in herd management have played an important part in these increases, breeding has also played its part. Cows today, are producing over 300 litres more milk and over 40 kilos of milk solids, than they were six years ago.

2. Cow Fertility

Fertility Improvements in the National Dairy Herd				
Year	Calves per cow per year	6 Week Calving Rate	Calving Interval (days)	Heifers calved 24-26 mths
2010	0.85	52%	402	54%
2017	0.91	63%	391	63%

Table 2: Dairy Herd Fertility Trend 2010 - 2016

Improving the cow's fertility sub-index will result in reduced calving intervals i.e. more calves produced per cow, and increase the longevity of the cow in the herd, thus reducing methane emissions per unit of product. Table 2 shows the fertility gains that have been achieved in the national dairy herd between 2010 and 2017. All the key fertility metrics have seen improvement with Calves per Cow per Year going from 0.85 to 0.91 in a seven-year period which across 1.4m cows represents an additional 84,000 calves being born. Similarly, in that period, the calving interval has been reduced from 402 days to 391 days.

3. Compact Calving

The more compact the calving season, the more grazed grass can be included in the cow's diet. Breeding more fertile cows will help achieve this intensive grazing strategy. It will also contribute to the age at first calving. Having more replacements born early in the year will allow them more time to achieve the correct target weight at breeding and therefore more heifers will hit the optimum age of between 22-26 months of calving thus reducing the 'idle time' in a cow's lifetime. Finally, compact calving should also help reduce culling and replacement rates.

4. Animal Health

Improved cow health e.g. Mastitis & Lameness, reduces the incidence of disease and deaths leading to higher production levels and lower replacement rates. The EBI sub-index for health can be used to identify bulls that will breed

healthier cows while the calving sub-index will help identify easy calving bulls with lower mortality rates.

5. Low Maintenance Cows

Levels of feed intake are an important factor influencing methane production. Smaller cows consume less feed than larger cows i.e. they have a lower maintenance requirement. For the same level of production, a smaller cow is obviously a more efficient converter of feed into milk. The maintenance sub-index in the EBI captures this cow size using the cull cow factory weights. This can then be used to breed lower maintenance cows that produces the same output.

Steps to Increase your herd EBI

Genetic gain is cumulative and permanent so the gains achieved in EBI continue to add up and last permanently. Breeding for higher EBI, is achieving a more sustainable cow that is more kind to its environment. Herd owners should be targeting to increase their Herd EBI by at least €10 each year. This can be achieved through a combination of the following:

- Identify the key traits you need to improve, focusing especially on milk production and fertility.
- Choose a team of high EBI bulls that compliment your herd. For most herds, fertility is the main weakness that needs to be improved.
- Select your team from the '**ICBF Active Bull List**'.
- Use sufficient straws, e.g. 55 straws per 10 heifers required.
- Focus on your heifers - breeding heifers to carefully selected high EBI bulls is the fastest way to improve herd EBI and profitability.
- Join **HerdPlus** and use our reports to guide breeding policy and to monitor progress.

Additional information: <https://www.icbf.com/>

Collaborative Farming: Sustainable Solutions to Improve Labour Availability on Irish Farms

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Introduction

Irish farm structures have for some time been deficient in terms of age profile, farm size & skill set. In 2007 the age profile of Irish farmers was 55 years & only 6.9% of all farmers were under 35 years. These deficiencies pose a threat to farm viability and limit the options for taking advantage of growth opportunities. Greater use of collaborative farming arrangements can help redress the current deficits. The main collaborative arrangements are outlined below:

- **Partnership:**

- Partnership provides a sustainable business model for farmers to amalgamate farming businesses, share labour input and remove duplication of routine tasks.

- A business model where young trained farmers can establish a career in dairy farming.**Contract Rearing:**

- Use contract rearing to reduce labour input and reduce stock groups on the farm.

- **Share Farming:**

- An alternative business model to allow young trained farmers to establish a career in dairy farming. Allows older farmers to step back from day to day work where necessary.

- **Cow leasing**

- An opportunity to get a financial return on surplus cows in the short-term
- Can help a young farmer to reduce initial set up costs when entering dairy farming.

- **Specimen template agreements**

- Available from Teagasc for all the collaborative arrangements featured in this article at: (<https://www.teagasc.ie/rural-economy/farm-management/collaborative-farming/>)

Registered Farm Partnerships

A partnership with another farmer can offer a superior work-life balance to operating alone through more labour availability. It can alleviate the need to rely on hired in labour. While the farm will be still busy, the fact that there is at least two labour units making an income off the farm and available to carry out the work on the farm on a daily basis is what provides this superior work life balance. A partnership can and must provide to the opportunity for increased scale as the farm will have to sustain two family incomes. Collaborating can provide scale in a sustainable way as the additional labour is built in as part of the partnership.

Working in partnership means there is often a better and broader range of knowledge and skills available to the partnership business. This facilitates better and more informed decision making on a wide range of subject areas. Discussions among partners mean that business decisions are teased out further and explored in greater depth. A well thought out work structure leads to labour greater efficiency through having more labour available and also a reduction in the duplication of routine farm operations between two farmers.

The key challenge for any farmer considering partnership or any collaborative arrangement is to develop and nurture a strong working relationship with other people in the agreement. The relationship must be built on strong core values such as trust, respect, understanding, and above all excellent communication.

Share farming

The key feature distinguishing share farming from a partnership is that two completely separate farming businesses operate on one farm. All receipts and payments are split between both people as set out in their written agreement. They both calculate their own separate profits from the arrangement. The concept remains the same across all enterprises including dairy farming.

Share farming as a structure could suit a situation where the landowner no longer wants to be involved in the day to day running of the farm but will retain an interest in the financial performance of the farm. The share farmer generally provides all of the labour and in some cases, the livestock and/or machinery. The landowner provides the land and the facilities required for the dairy enterprise to be successful.

Contract Rearing

Contract rearing is business structure where a dairy farmer pays an agreed monthly fee to another farmer to rear the dairy replacement heifers. In setting up the agreement, it is vital to discuss and agree all the practical issues around the management of the heifers. These include: a start and end date; the number of animals to be reared; a schedule of weighing; veterinary inputs and breeding

management amongst others. The enterprise can be carried out in tandem to the existing beef enterprise on the farm. Perhaps an out farm or specific area of the farm could be devoted to contract rearing. It is critical that the rearer gets paid adequately to cover direct costs and that a labour charge is included. Essentially the rearing period can be broken down into five stages: calf rearing; first grazing season; first winter; second grazing season and second winter. The rearing periods need to be borne in mind when planning a rate of payment. The benefits to the dairy farmer in contract rearing are: it simplifies the farming system with only cows to manage. It may also allow for some expansion on the grazing platform or remove the need to rent additional land to carry the enterprise.

Conclusion

Collaborative farming has wide ranging benefits for the farmers who get involved. The key to long-term success is mutual benefits to all members of the arrangement. Some of the benefits include: new opportunities for existing and new entrant farmers; better work-life balance through greater labour availability; better decision making through greater skills mix and opportunities for young trained farmers with experience to begin their career in dairy farming. The challenge for many dairy farmers in Ireland is a change of mind-set and the establishment of a strong working relationship with their fellow collaborating farmers.

Additional information: <https://www.teagasc.ie/rural-economy/farm-management/collaborative-farming/>



Sustaining the Dairy Farm Finances

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Introduction

Since milk quotas have been removed there has been a huge opportunity for both dairy farmers to increase the volume of milk produce and for those outside the sector to “get into” dairy farming. Dairy farming has always been one of the most profitable enterprises in Ireland, but it is not for everyone. Dairy farming is a highly skilled occupation and requires excellent management skills to ensure that the operation delivers cash-flow. For the vast majority of dairy farmers it is also a full time occupation and with many farms expanding, it also requires the additional skill to manage staff.

Current Farm Data

Unless you measure how your farm business is doing, you cannot improve it. Many farmers prefer to go out onto the farm and complete a task instead of spending time in the farm office looking at figures. It is easy to make an assumption that if the farm is growing more grass and the cows have higher protein that the farm is making more profit. This should be the case, but it might not be. It is a fallacy to rely on “proxies”. The actual financial figures need to be checked. The Teagasc Profit Monitor is one such tool that you can use to perform detailed analysis of your performance as a farm manager. You can benchmark yourself against last year and other farmers. The National Farm Survey also produces data that you can compare yourself to.

A Farm Plan

“I have no plan, so nothing can go wrong”...Spike Milligan.

Farm planning is deciding in advance what should be done, how it is to be done, when it is to be done and by whom. For example, when you go to the mart, and you see a bullock that is good value, should you buy it even if it does not fit your system? Many farmers have ideas in their heads as to where they would like to go with the business. These need to be written down, as the process helps to clarify them. Building a sustainable dairy farming business starts with a well thought out idea. This needs to be developed with your adviser. Once this is done a financial plan can be prepared to see if the plan is actually achievable.

Implementing the plan

Terms like “Skill before Scale” and “Better before Bigger” are used to stress the importance of analysing your farm efficiency prior to making any change to the business. A well-constructed plan will have key tasks to be completed by certain dates. These will focus on making an existing business better and more efficient

prior to expansion. It will have a plan to deal with the unexpected (poor milk price / poor weather / interest rate rise etc.). If a large expansion is planned, the risk to the plan will be greater, so it is important to have a mitigation plan in place. It is also important to recognise your own skills and where they are limited. Many farmers may need to complete short specific made courses to improve their skillsets. A review should be completed regularly to check progress on the plan.

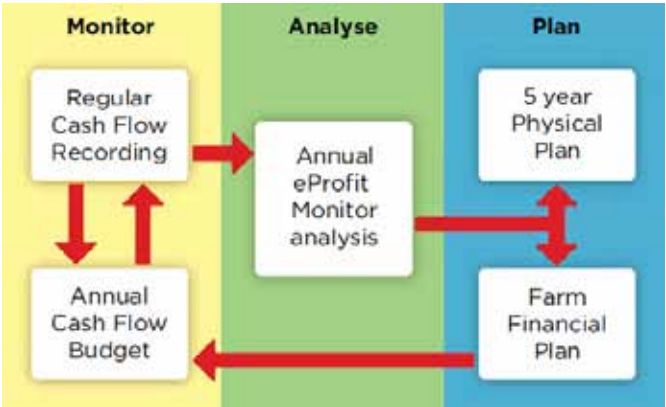


Figure 1 Steps in Farm Business Monitoring

Take Home Messages

In order to ensure that the farm business you operate is sustainable for your family into the future, it is important that the current business is analysed regularly to see how it is performing against the industry. You should also have a plan as to where you would like your business to be at a specific time in the future. This then should be used as a target to develop a farm plan to achieve your ambitions.

Additional information: <https://www.teagasc.ie/rural-economy/farm-management/>

Extra cows – dealing with the work

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Introduction

There are over 300,000 additional dairy cows on Irish farms compared to pre quota era. As most of these additional cows are on existing dairy farms, they have created an additional workload on farms, especially in spring.

Dealing with increased workloads

There are three approaches to dealing with this increased workload.

Approach 1

The first is putting the facilities and practices in place to make the farm more labour efficient. These include having adequate sized facilities for the herd size, e.g. milking parlour, calving area, calf shed etc. It also includes adopting the research proven practices that minimise workload, especially during the peak work season. These include once a day (OAD) feeding of calves, OAD milking in early lactations and getting cows to grass early.

Approach 2

The second way to approach the increasing workload is through better organisation. Farmers must be very clear on what their working year looks like, and have definite start and finish dates for breeding, calving etc. Equally the working week must be organised where there are definite milking times, feeding times, etc. All people working on the farm needs to know their role for that week. There should be a clear system of how work is completed on the farm and Standard Operating Procedures should be available for certain tasks, e.g. operation of milking machine, bulk tank cleaning etc.


Approach 3

The final step to managing increased workload is to get extra help. Initially this may be increased use of contractors, followed by part time workers. Depending on scale, it may require a full time employee. But it is important to get efficiency and organisation correct initially, before considering getting additional help on farm.



Figure 1. Better managing increased spring workloads by achieving a 6 week calving rate

Additional information: <https://www.teagasc.ie/animals/dairy/labour/>



NMP Online: A tool for better managing nutrient resources

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What is Nutrient Management Planning?

A Nutrient Management Plan (NMP) is simply a strategy for maximising the return from applied chemical and organic fertiliser resources. Having a NMP can give a 'win-win' by optimising fertiliser costs and concurrently protecting the environment. In the past, developing an NMP has been a time consuming process involving collation of data from a number of different sources, and often resulting in complicated and lengthy spreadsheets. The development of NMP Online simplifies the process and has some innovative ways in communicating the results

NMP Online

NMP online is a web-based system for developing NMPs and it enables agri-professionals to produce high quality nutrient management plans for farmers by combining their expert knowledge of soil fertility with a range of information sources. In a nutshell it works by assessing the current nutrient balance of the farm and devising a fertiliser management programme that will optimise soil fertility and ensure compliance with the limits set under the Nitrates Regulations.

The programme uses the latest in online mapping technology to produce a farmer friendly nutrient management plan along with colour coded maps. These maps are a very effective tool in communicating detailed specific guidance on a field-by-field basis.



Key benefits of NMP Online

- Efficiently complete complex nutrient calculations
- Access latest aerial imagery and mapping
- Create user friendly reports and maps
- Training & ongoing updates for all users

Sign up for NMP Online today

The Teagasc NMP Online tool is available to agri-professionals who work with farmers to optimise soil fertility and is delivered direct by Teagasc to their clients or via other consultants/planners as part of the Teagasc ConnectEd Online service.

Additional information: <https://nmp.teagasc.ie>



Targeted Agricultural Modernisation Schemes (TAMS)

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Introduction

TAMS II is an EU co-funded programme that aims to provide farmers with grant aid to improve and/or build a specific range of farm buildings or purchase equipment that may benefit their farm businesses. TAMS II stands for the Targeted Agricultural Modernisation Scheme. It comprises of the below schemes

- Young Farmer Capital Investment Scheme (YFCIS)
- Dairy Equipment Scheme (DES)
- Low Emission Spreading Equipment (LESS)
- Organic Capital Investment Scheme (OCIS)
- Animal Welfare, Safety and Nutrient Storage (AWNSS)
- Pig and Poultry Specialised Equipment (PPIS)
- Tillage Capital Investment Scheme

General Principals of the Scheme

- Online applications
- Investment super ceiling of €80,000 per holding (€40,000 for LESS is independent of this €80,000)
- Farm partnerships (increase ceiling)
 - Non Less- €160k
 - Less - €60k
- Budget divided into Tranche, every three months.
- 60% grant aid for Young Farmer
- 40% grant aid for all other schemes
- Nitrates compliant
- One Year to complete the investment

Young Farmer Capital Investment Scheme

- Between 18 and 40 on date of application
- Set-up for first time within five years of application
- Complete education within 3 years of approval - (otherwise grant rate of 40%)

Education: FETEC level 6
Complete education within 3 years of approval
40% grant aid - if education not completed at time of payment claim
20% top up - if education acquired within 3 years of approval

Investment Ceiling 80,000 per applicant
Partnership - investment * 2 (€160,000) however % grant rate depends on partners eligibility

Dairy Equipment Scheme

- Milking Equipment
- Cooling and storage equipment
- In parlour meal feeding



(**Figure 1** improvements eligible under the Dairy Equipment Scheme)

Low Emission Slurry Spreading Equipment

- Slurry tankers & Umbilical System
- Using one of following attachments
 - Trailing Shoe (see Figure 2)
 - Shallow injection
 - Dribble bar



Figure 2 Example of a trailing shoe in operation at Kildalton College

Animal Welfare, Safety and Nutrient Storage Scheme

- Animal housing & Welfare
- Farm nutrient Storage
- Farm Safety
- Animal Handling
- Silage base & resurfacing

Take home message

TAMS II aims to provide farmers with grant aid to improve and/or build a specific range of farm buildings or purchase equipment that may benefit their farm businesses. Options like upgrading milk cooling systems, low-emission slurry spreading systems can have multiple benefits for farm finances and environment



Water Quality at The Kildalton Open Source Sustainable Dairy Demonstration Farm

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Introduction

The Open Source Sustainable Farm collects and analyses water samples from different locations and depths across the farm. These water samples represent the amount of nutrients (nitrogen (N) and phosphorus (P)) found in surface water and the underlying groundwater. This data will establish the connectivity between the farm and the surrounding water bodies and allow a clearer understanding of how farm management and water quality in the area are linked over time.

Objectives

The primary objective of monitoring ground and surface waters on the Kildalton Open Source Sustainable Farm is to identify the impact of the farm on nutrient concentrations and loads in the surrounding water bodies (surface and groundwater). It is also important to track changes in management with changes in water quality both spatially and temporally, acknowledging time lag concepts, thereby informing future management will enable water quality improvements. To meet these objectives, a network of piezometers (Figure 1) and surface water sampling points were established in December 2016. In conjunction with monthly water sampling, an ecological survey (Figure 2) was conducted in May and repeated in September 2016.



Figure 1 A Piezometer is installed to 4.5m depth to enable groundwater samples to be tested. Also such pipes allow us to examine the speed and direction of groundwater flow.

Findings so far

In terms of N in groundwater, areas can be segregated into high (high nitrate, > 11.3 mg NO₃-N L⁻¹) and low (low nitrate, < 11.3 mg NO₃-N L⁻¹) natural attenuated areas where the soils differ in terms of drainage class. This can be seen from Figure 1 where one piezometer exceeds the 11.3mg/L during the sampling period. Our target is to decrease NO₃-N in groundwater to below the 11.3 mg NO₃-N maximum admissible concentration (MAC) for drinking water on all areas of the farm.

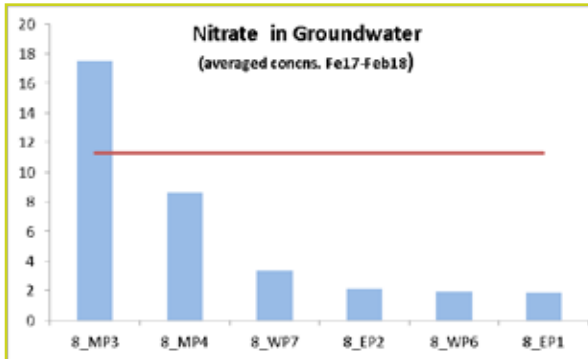


Figure 2 showing the high and low nitrate areas on the farm. The network of piezometers shows us the locations of 'hotspots' in the farm where we can apply location specific management to improve water quality

Typically, poorly drained areas offer more protection than free drained areas. Also in some poorly drained areas ammonium can be elevated, when nitrate is converted to ammonium. However, there is no evidence that the surface water stream running through Kildalton is having an adverse effect on the River Pil. In fact the nutrient loading of stream water has to date been consistently lower than that of the river (Figure 3) The two ponds show differences in nutrient and ecological status which can be attributed to different management regimes and the River Pil.

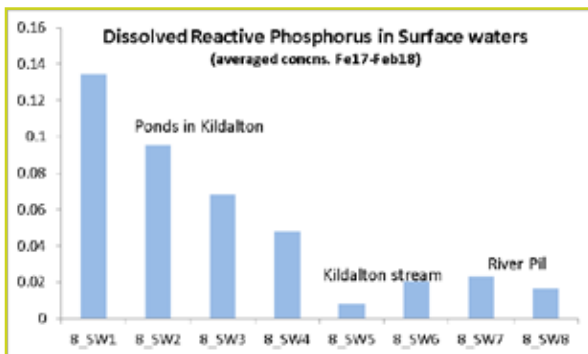


Figure 3 showing the positive impact that Kildalton has with respect to Dissolved Reactive Phosphate (DRP) entering the River Pil. Although the first artificial pond has relatively high levels of DRP, this becomes reduced as the waters make their way through the farm and the stream water entering the River Pil has lower levels of DRP (< than 0.03 mg L⁻¹)

The River Pil is not monitored by the EPA and this work is important in setting a baseline and establishing a record of water quality. Ecological assessment utilising the EPA's Quality Rating System (Q-value) determined the River had good/moderate status in May and good/high status in September (Figure 3).




Figure 3. Ecological sampling of River Pil in May 2017

A comprehensive sampling regime has been set up in Kildalton with monthly sampling across a wide range of chemical parameters including nitrate, dissolved reactive phosphorus (DRP), potassium carbon and metals like copper, iron, magnesium and manganese. Annual biological sampling provides us with a picture of how the water quality has been over a longer timeframe. Going forward, we are introducing further analysis to investigate whether pesticides can be detected. The recent purchase of a multi parameter sensor will enable biogeochemical parameters to be also added to the database.

Take Home Messages

Teagasc aims to continuously improve the sustainability of the farm seeking new opportunities to improve performance in practical and financially sound ways. The Kildalton Open Source Sustainable Dairy Demonstration Farm will play an important role in supporting the Irish dairy sector in reaching its sustainability goals. An integral part of this is tracking farm management and water quality simultaneously and implementing changes in management to improve water quality.

Additional information: <https://www.teagasc.ie/environment/water-quality/>



WATERPROTECT: Research towards sustainable herbicide use

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Introduction

In modern agricultural production, unwanted pest species are often controlled using pesticides. However, some of these chemical compounds can be leached or washed off soil surfaces, and can eventually be detected in drinking water sources. MCPA, used to control rush and broadleaf weed growth, can be particularly mobile once applied. At the end of 2016, 63 supplies serving over 900,000 people had open investigations due to failures to meet the pesticide standard (EPA, 2017). These failures were largely attributable to MCPA detections which coincided with periods of MCPA application to grassland (EPA, 2017).

The Horizon 2020 project, WATERPROTECT, aims to assess specific practices, mitigation tools and strategies for protecting water resources from pesticide contamination. WATERPROTECT is centred on an inclusive multi-participatory framework which is enabled through collaboration between organisations in Belgium, Denmark, Spain, Poland, Romania, Italy, Romania and Ireland. Within each country a structure of stakeholders are striving to deliver a series of work packages set out to achieve the specific research aims.

The WaterProtect Irish case study is led by Teagasc, with the University of Ulster, Wexford County Council and Glanbia Ireland Ltd working as active partners. The Irish research will focus on assessing the efficacy of specific measures for mitigating the losses of pesticides to aquatic systems (groundwater and surface water).

Research

The research will be conducted in two catchments in Wexford that have been monitored extensively as part of the Agricultural Catchments Programme. Both catchments are distinct in terms of their hydrogeological settings, with one characteristic of mostly free draining soils overlaying fissured slate bedrock and is dominated by arable land, while the other has mostly poorly drained soils overlaying volcanic rhyolite and is dominated by grassland for beef and dairy production.

The research will investigate the occurrence of herbicides in groundwater through the sampling of private water wells in both study areas. Approximately 162,000 households in Ireland rely on private wells for their water provision (CSO, 2012) hence, it is imperative that this water is of appropriate quality. This investigation will assess well water quality and also the importance of groundwater as a receptor and pathway for pesticide contamination.

On a field scale, the study will then with focus on MCPA and its fate and behaviour post application for rush control treatment in a poorly draining impermeable grassland field. Once applied, monitoring will evaluate its movement via subsurface drains, shallow groundwater, overland flow and surface water streams. This will be achieved through the use of high resolution active monitoring as well as passive samplers which are capable of providing overall average concentrations of MCPA lost via surface water streams.



Figure 1 Overview of the grassland catchment monitored as part of the Agricultural Catchments Programme (left) and evidence of overland flow after a rainfall event on a poorly drained field where MCPA would typically be used for rush control (right).

Acknowledgments

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement No. 727450. Disclaimer: this publication only reflects the authors' views and the Commission is not responsible for any use that may be made of the information it contains.





Rush Control and protecting water quality

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Introduction

Rush control normally takes place in June and July and involves the use of MCPA products, however in recent years drinking water monitoring results for Ireland show that a number of herbicides commonly used on grassland, such as MCPA have been detected in drinking water.

- MCPA is water soluble and takes several weeks to break down.
- Rushes thrive in poorly drained areas (with a water table near the surface) which are prone to runoff to nearby water bodies.

Herbicides can enter water bodies from:

- **Point sources** (mainly in the farm or farmyard) – leaks from storage areas; spills or drips from handling operations such as mixing, filling and washing; or
- **Diffuse sources** (mainly in the field) – inputs arising during or after application from processes such as spray drift, runoff and drainage.

What to do

- Use non-chemical control methods e.g. cutting, drainage, sward improvement.
- If spraying, target only the rush affected areas and, cut rushes one month before or one month after spraying to improve the effect of the spray.
- Consider weed wiping with an appropriate herbicide (not MCPA) as a rush control option.
- It is essential to take great care and follow best practice procedures when using any pesticide and particularly so in the case of herbicides used on grassland.

Weeds in Grassland

- Don't underestimate basic grassland husbandry such as applying lime, fertilizer, topping or reseeding as weed control measures.

- Low levels of weeds do not affect grass production and are beneficial to the environment.
- A vigorously growing grass sward can out-compete weeds and prevent new weeds growing.
- Spraying at the right time doubles the effect of the spray.

DO's when using herbicides:

- **DO** read the product label instructions carefully and plan the treatment in advance.
- **DO** inform yourself of the location of all nearby water bodies (ditches, streams, ponds, rivers, lakes and springs).
- **DO** find out if any groundwater body or surface water body in your locality is used as a drinking water source and, if so, the location of the nearest abstraction point.
- **DO** ensure that herbicide and pesticide products are stored in a secure, dry area which cannot result in accidental leaks or spills. Empty, triple-rinsed containers should be disposed of in accordance with the Good Practice Guide for Empty Pesticide Containers.
- **DO** ensure that application equipment is properly calibrated and in good working order.
- **DO** take every precaution during mixing and preparation to avoid spills and drips. Minimise water volumes (rain and washings) on the handling area.
- **DO** consider using drift-reducing nozzles if spraying. Keep the spray boom as low as possible to the ground and use the coarsest appropriate spray quality.
- **DO** clean and wash down the sprayer at the end of the day, preferably in the field and well away from water bodies or open drains. Tank washings should be sprayed onto the previously sprayed area, on a section far away from any water body, observing the maximum dose for that area.

DON'Ts when using herbicides:

- **DON'T** perform handling operations (filling, mixing or washing the sprayer) near water bodies, open drains or well heads. Maintain a distance of at least 10 metres and preferably 50 metres, where possible.
- **DON'T** fill the sprayer directly from a water body.
- **DON'T** spray if the grass is wet or if heavy rain is forecast within 48 hours after application. **DON'T** spray during windy conditions.

- **DON'T** spray near open drains, wells or springs.
- **DON'T** spray on waterlogged or poorly draining soils that slope steeply towards a water body, drain, well or on any other vulnerable area that leads directly to water.
- **DON'T** discard sprayer washings down a drain or onto an area from which they can readily enter a water body.

Safeguard Zones

- Statutory 'no-use' zones (called safeguard zones) apply around drinking water abstraction points, ranging from 5 metres to 200 metres depending on the size of the supply. Your Local Authority or The National Federation of Group Water Schemes can advise on this.

Remember

1. Careless storage, handling or use of pesticides can easily cause breaches of the legal limit for pesticides/herbicides in drinking water.
2. A single drop of pesticide/ herbicides lost to a water body such as a typical stream (1 metres wide, 0.30, metres deep), for example can be enough to breach the legal limit for pesticides/herbicides in drinking water of 0.1 part per billion along 30km of its length.
3. Check how near water bodies (ditches, streams, ponds, rivers, lakes, etc), drains or wells are to where you are working.
4. Find out if the treatment area is in the vicinity of a drinking water abstraction point or well.
5. GLAS and LIPP (Low Input Permanent pasture) "Where present, rushes must be controlled either mechanically, by weed wiping and/or by spot spraying. While weed wiping and/or spot spraying can take place between 15th March and 15th July, topping to control rushes cannot take place between these dates"
6. For GLAS Traditional Hay Meadow - Where present, rushes must be controlled either mechanically by weed wiping and/or by spot spraying. While weed wiping and/or spot spraying can take place between 15th March and when the meadow is mown annually, topping to control rushes cannot take place between these dates.

Additional information: <https://www.teagasc.ie/environment/water-quality/>

www.pcs.agriculture.gov.ie, www.epa.ie



Teagasc Glanbia Joint Farm Development Programme 2015 – 2018

Supporting Sustainable Growth

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The overall purpose of this Teagasc Glanbia Joint Programme is to ensure that suppliers are equipped with the necessary skills and knowledge to sustainably and profitably develop their dairy farm businesses. This Joint Programme has six objectives:

- Improved cost control and farm profit through better financial and business management
- Increased grass growth with maximum forage usage
- Improved herd fertility leading to optimised calving pattern
- Increased milk solids production per cow and per hectare
- Improved milk quality to meet more challenging market requirements
- Compliance with the Open Source Sustainability standard

Eleven monitor farms play a central role in promoting the adoption of the latest technologies and the location of these farms is outlined in Figure 1 below.

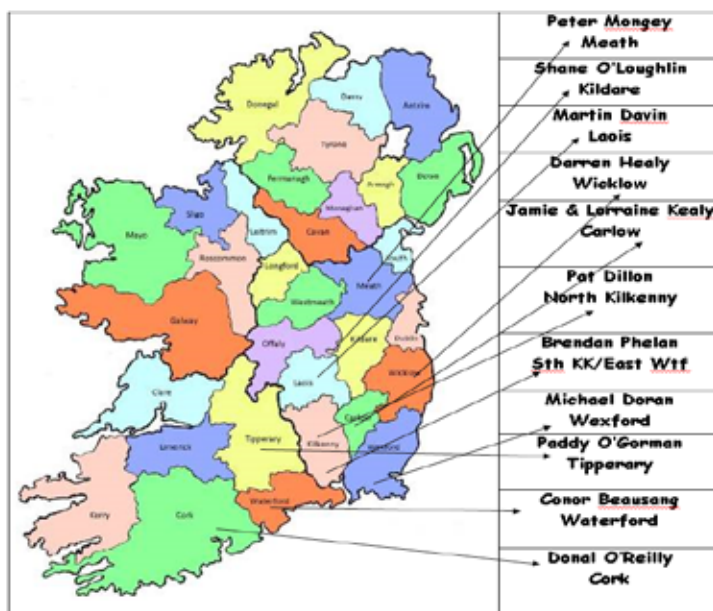


Figure 1. Location of Teagasc Glanbia Monitor Farms

All monitor farms were soil tested in 2015 at the start of the programme and considerable progress has been made in soil fertility during the intervening period (Figure 2). Lime was very low on all the farms and most farms spread 5 tonnes per hectare in the first year and spread more if required in 2017. The lime status of the farms improved dramatically and 90% of the samples taken at the end of 2017 are now adequate for lime. In addition, fertilizer containing higher levels of P and K were used over to 3 years of the programme and at the end of 2017, 70% of the soils are now at index 3 and 4 for P. In contrast, K has remained stubbornly static over the 3 years and this is probably reflective of the removal of surplus bales from these paddocks each year.

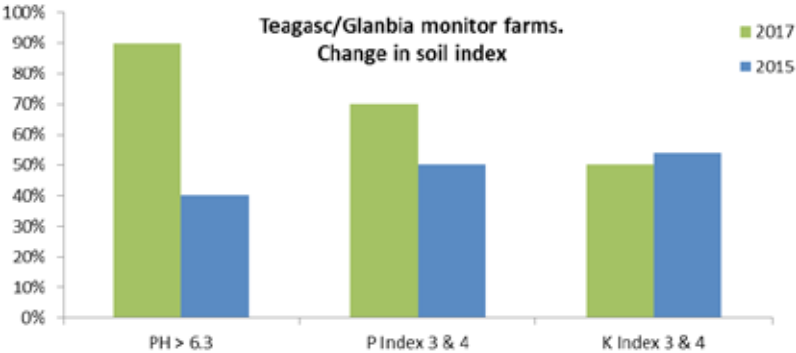


Figure 2. Change in Soil Fertility on Monitor Farms 2015 to 2017

Over the course of the programme the improvement in soil fertility and grazing management has resulted in increased grass growth on monitor farms (Figure 3). Grass growth improved from 13.5 to 16 tonnes DM/ha over the 3 years. All the farms are grass measuring over 35 times per year. The outside blocks of land were identified as particularly low in P and K and in need of reseeding. The grass growth potential of these blocks were low and a lot of upgrading of soil fertility and reseeding has taken place on these blocks.

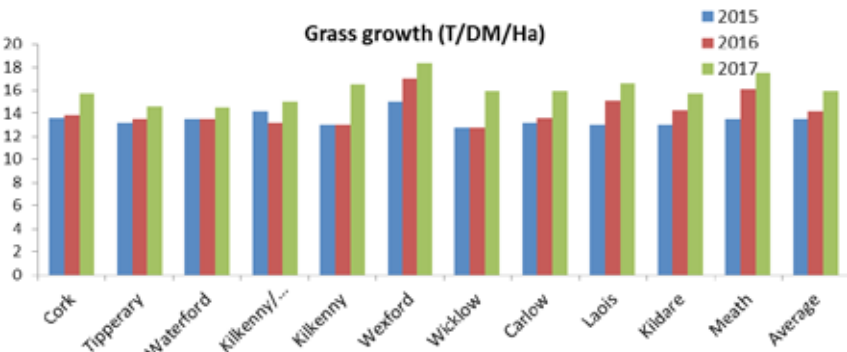


Figure 3. Grass growth on Monitor Farms 2015-2017

Since 2015, milk production has risen dramatically on monitor farms with over 90 kg of extra milk solids per cow now being produced (Table 1) and with improved milk fat and protein composition which was worth 1.5 cent per litre during the period. At the same time, the EBI of the herds has also increased and all farms are using Sire Advice through ICBF to pick their bull teams. Equally, weighing heifers and achieving target weights was an integral part of the overall programme. The combined benefits of improved herd genetics coupled better management in terms of higher quality grass, better use of heat detection aids and record keeping and the achievement of target weights in young stock has resulted in six week calving rate increases from 73 to 86% during the programme. The amount of concentrate fed remained fairly static over the 4 years at 700 kg/ head while overall farm stocking rates increased from 2.1 to 2.5 LU per hectare as a consequence of increased grass production and utilisation. Most of these farms are now at peak stocking rate and further expansion will come from other blocks or an increase in area of existing blocks.

Table 1. Physical performance of the Teagasc Glanbia monitor farms (2014 – 2017)

Year	2017	2016	2015	2014
Milk yield (litres/cow)	5,816	5,766	5,581	5,006
Fat (%)	4.37	4.34	4.19	4.15
Protein (%)	3.63	3.63	3.64	3.50
Milk solids (kg/cow)	478	472	449	393
Milk solids (kg/ dairy ha)	1,200	1,132	974	813
Farm stocking rate (LU/ha)	2.5	2.4	2.2	2.1
Herd size (No. Dairy Cows)	161	144	125	100
Grass growth (Tonnes DM/ha)	16.0	14.2	13.5	
Six week calving rate (%)	86	83	78	73

Conclusion

These farms are now producing more milk per cow and per hectare. This has led to an increase in farm profits. The Teagasc € profit monitor was used to analyse these farms over the 4 years of the programme. The profit monitor costs do not include drawings, tax or capital repayments. The costs dropped from 25.27c/l in 2014 to 20.68c/l in 2017. The net profit per cow increased from 14.24 c/l in 2014 to 17.89 c/l in 2017. Milk price in 2017 was 1 cent lower in 2017 at 38.36 c/l. Large investments were made across the farms with on average €207,000 spent on infrastructure for the extra cows from 2015 to 2017. Cash flows were done at the start of every year and a six year plan was upgraded yearly. This year all the farms will be holding their final farm walk to review progress over the last 4 years. I would like to thank all the farmers who participated in the programme.



Teagasc/Glanbia Farm Walks 2018

The Teagasc/Glanbia Joint Programme was set up to position dairy farmers in the Glanbia area to take advantage of growth opportunities that arose post 2015.

Join us this summer as we visit the monitor farms involved to learn what skills and knowledge they have gained from the programme to sustainably and profitably future proof their dairy farm businesses.

Date	Location
Thurs, 14 th June	Eamonn & Darren Healy, Ballydonnell, Redcross, Co. Wicklow
Fri, 24 th August	Pat Dillon, Grangecuffe, Co. Kilkenny
Fri, 31 st August	Donal O'Reilly, Bishops Island, Watergrasshill, Co. Cork
Wed, 12 th September	Michael Doran, Johnstown, Duncormick, Co. Wexford
Fri, 14 th September	Peter Mongey, Stackallen, Slane, Meath
Thur, 27 th September	Paddy O'Gorman, Rathkeevan, Clonmel, Co. Tipperary
Fri, 28 th September	Martin Davin, Eglish, Rathdowney, Co. Laois
Fri, 5 th October	Shane O'Loughlin, Oghill, Monasterevin, Co. Kildare
Tues, 9 th October	Brendan Phelan, Ballykillaboy, Kilmacow via Waterford, Co. Kilkenny
Fri, 12 th October	Conor Beausang, Churchquarter, Grange, via Youghal, Co. Waterford
Friday, 19 th October	Jamie & Lorraine Kealy, Slaneyquarter, Tullow, Co. Carlow



Additional information: <https://www.teagasc.ie/animals/dairy/joint-programmes/glanbia/>

Sustainable herds use Antibiotics Responsibly

¹Shane McElroy

¹Glanbia, Ballyragget, Co. Kilkenny

Glanbia Milk Culturing & Sensitivity Testing Service

Don't waste money by using ineffective treatments this autumn. Use the milk culturing service to help with:

- **Mastitis/SCC** – identify the cause of mastitis/high SCC in your herd – every herd is different
- **Dry cow & Milking cow treatment selection** – which treatments will work best to cure the infected cows in your herd?



Antimicrobial Resistance (AMR)

This is when bacteria or parasites become resistant to medicines. Increased antibiotic usage leads to more resistance!

Before you treat:

- Does really need an antibiotic treatment?
- Does the animal have a bacterial infection?

Especially at dry-off, calf pneumonia & scours!

Selective Dry Cow Therapy

An antibiotic treatment is not necessary to dry a cow off:

- The only active ingredient in dry cow tubes are antibiotics
- Cows with low SCC & no mastitis this lactation are not infected and don't need an antibiotic
- Teat sealers will prevent new mastitis infections during the dry period

Benefits:

- Reduced antibiotic residue risk (& worry) in early lactation
- Reduced workload at dry-off
- Cost savings

Many Glanbia farmers have been using Selective DCT in recent years with excellent results.

To build your confidence that Selective DCT will work in your herd:

- Skip antibiotic tubes in just 5-10 of your lowest SCC cows (from Milk Recording records)
- Good hygiene is very important when inserting the teat sealer

Take home messages:

- Sustainable agriculture needs medicines that work
- Reduced antibiotic usage is part of our sustainable agriculture future
- Speak to your local Glanbia Milk Quality Manager for more information on any of the above



A healthy herd is a sustainable herd

¹Shane McElroy

¹Glanbia, Ballyragget, Co. Kilkenny



The Glanbia Herd Disease Screening Service puts you in control of infectious diseases

Infectious diseases are blockers to:

- milk production
- cow fertility
- growth rates & cow condition

Every disease can be controlled, but every herd has different diseases.

Two steps towards disease control:

1. Identify the disease risks for your herd – HDS Service
2. Put a simple control plan in place using your results

The Glanbia Herd Disease Screening service screens the herd for seven commonly occurring diseases that may be affecting your herd's milk production or fertility. Recent Teagasc research has shown that **the total milk loss from these diseases can be more than 700 litres per cow per year.**

Also included in the service is a **results information leaflet** which accompanies each set of disease results and explains more about the diseases and what your results mean, and the next steps that you can take to control the disease, if necessary.

Additional information: <https://www.glanbiaconnect.com/farm-management>

Feeding in summer drought conditions

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Introduction:

Soil moisture and high daily temperatures have begun to strongly impact on daily grass growth nationally, with growth rates on many farms falling below 45kg DM per day (PastureBase June 2018). As a result, average farm covers are beginning to drop below the target 160-170kg DM per cow. Given the prospect of sustained dry weather, it is important that prompt actions are taken to manage the situation.

Grazing management decision rules

- The main priority now is to reduce daily grass demand to below daily growth rate. This will help to hold grass cover on the farm, protecting current growth and speeding up recovery when rain arrives.
- Rotation length must be maintained at 25-27 days approximately. Effectively this means grazing no more than 4% of the grazing platform daily. Assess the grass available on this area and supplement with forage/concentrate to balance herd demand
- For example, a 140 cow herd is grazing 45ha (3.1 stocking rate). Max daily area allowed should be 1.8ha (4% of 45). If there is 1100kg DM per ha available then the paddock has $1.8 \times 1100 = 1980$ kg available. Herd demand is 2520kg per day, therefore 540kg of total supplement is required per day.
- In this example, holding total grass allowance to 1980kg equates to 44kg daily demand per ha day (1980/45). This will hold grass cover per ha reasonably well if growth rates are within 5-7kg daily. Larger deficits will rapidly reduce average farm cover.
- If there is larger deficit between growth and demand it will be necessary to temporarily reduce demand further by reducing grazing stocking rate and feeding extra silage.
- Increasing rotation length beyond 30 days may lead to much reduced grass quality in current conditions.
- Post grazing residuals of 4 to 4.5cm must be maintained , otherwise feed is being wasted

- Maintain fertilizer N at 25kg per ha after grazing. Risk of losses are low with CAN products, however if drought conditions persist to >60mm soil moisture deficit it is advised delay N until rain is forecast

Hints and tips on feeding out forage supplements in dry weather

- Dry field conditions should make the task of feeding out much easier compared to spring. Each farm will have its own preference (based on facilities/machinery/labour) but the main objective remains to reduce total daily grass intake to the level of daily growth or below. Feeding forage will be necessary for many farms. Once the available daily grass is known, some options for feeding are:
- Separate a proportion of the herd and place on 100% silage plus meal in a convenient paddock. This may be a paddock marked for reseeding later in the year. A small area of fresh grass can be allocated to this group daily. Some farms have used a double temporary wire feeding rail to good effect. This approach simplifies grazing management of the main group.
- Offer silage to all cows in the grazing paddock, placing silage along perimeter fencing. This works best where feed can be allocated with a diet feeder. Total silage allocation should be calculated to balance available grass on the paddock daily. Forage should be spread along a long linear distance (1m per cow) to reduce competition and bullying.
- Hold a proportion of the herd in the yard for silage feeding after milking. These can be turned out with the main group after 3-4 hours feeding. This simplifies feeding out silage but in dry conditions there is a risk of injury due to slippery concrete floors
- High fibre straights can be offered PKE/hulls/pulp at a rate of 3-4 kg per cow. Some farms choose to feed these in mobile feed troughs in the field. Note that citrus pulp does not work well in this situation due to its lower NDF fibre content. Ensure full access to clean water.
- Whichever actions is chosen, it is vital act now to ensure that grass supply is stretched out as early as possible. If covers are allowed to drop too quickly, it will result in the entire herd having to managed on silage for a period. Grass recovery will also be delayed.
- Plan supplement until 4-5 days after growth exceeds demand. Assess feed plans with this in mind

Concentrate feeding guidelines: Parlour-fed concentrate will form a major part of daily feed allowance in drought conditions. Some decisions rules are:

- Feed up to 5-6kg of parlour concentrate per day as part of an overall feed plan. This is a relatively safe level provided adequate forage and water are provided. A further 2-3kg of high fibre straights can be fed out-of-parlour.
- Purchase concentrate based on UFL value, targeting a value of >0.94 UFL on a fresh weight basis
- Ration crude protein should be decided based on overall composition of the diet. In normal circumstances a 14% high energy ration would be adequate at grass. However, in the current situation it is likely that lower protein ingredients will form a significant part of the diet. Also, where grass is drought stressed and lacking N uptake, it is possible that sward protein content could be lower than normal.
- Therefore, it is recommended that a 16% ration be used if grass intake is around 7 to 10kg per day. If the herd is placed on silage full-time than a high energy ration of 18+% will be needed in the short term. These targets are for parlour rations fed at 4-6kg.
- Be careful not to overfeed magnesium. A rule of thumb is that cows will tolerate up to twice the recommended allowance over a short period (100-120g per day). Above this level there may be issues with scouring as Mg has a laxative effect. Therefore if concentrate is formulated for a 2kg feeding rate then max feeding rate should be limited to 4kg

Decision rules on grazing silage crops

- Areas closed for silage and accessible for grazing with <2200kg DM covers may be grazed as a 'standing supplement'. Pre-mowing does not confer any advantage in this situation.
- Recent work on zero grazing in NI showed a significant drop in milk yield where heavy swards (2500 kg DM) were cut and fed, relative to cutting or directly grazing lower mass swards (<1600kg DM). The decision to zero graze should be based on pre-grazing yield.
- Overall, if silage swards have surpassed ideal pre-grazing herbage masses and are nearing cutting stage then it is preferable to leave for silage cutting at this stage.

Other options to reduce milking herd demand

- Autumn calving herds can dry off stale cows 2-3 weeks early and feed off the grazing block
- Consider offloading problem cows (e.g. high SCC) that are already in line for culling
- Once daily milking (OAD) is known to help cows retain body condition at a cost of reduced milk solids output (15-20%). However this assumes that cows' intake is maintained relative to 2x daily milking. Where OAD milking is imposed in tandem with reduced feed intake, milk output may be reduced by >30%. OAD is an option to manage cows in severe situations but at this point the preferred option would be to supplement the required feed instead.
- Do not neglect youngstock. Total dry matter intake requirements are small relative to the milking herd but nonetheless adequate feed dry matter (2.0 to 2.2% of liveweight) must be offered daily



Temporary double wire feed rail for silage feeding



Feeding straights in mobile troughs



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Test Your Soil to get the Balance Right!

Now is the time to check soil fertility!

Plan your fertiliser requirements for
the coming season.

To maximise the productivity of your soils it is essential to maintain optimum soil fertility levels and apply the correct levels of lime, P and K, based on soil test results.

Soil Fertility Benefits

- Improve soil N release by up to 80 kgN/ha/yr
- Better response to applied N, P, K & slurry

Soil Fertility Targets

- Grassland soils pH 6.3
- Tillage soils pH 6.5
- Soil P & K at Index 3