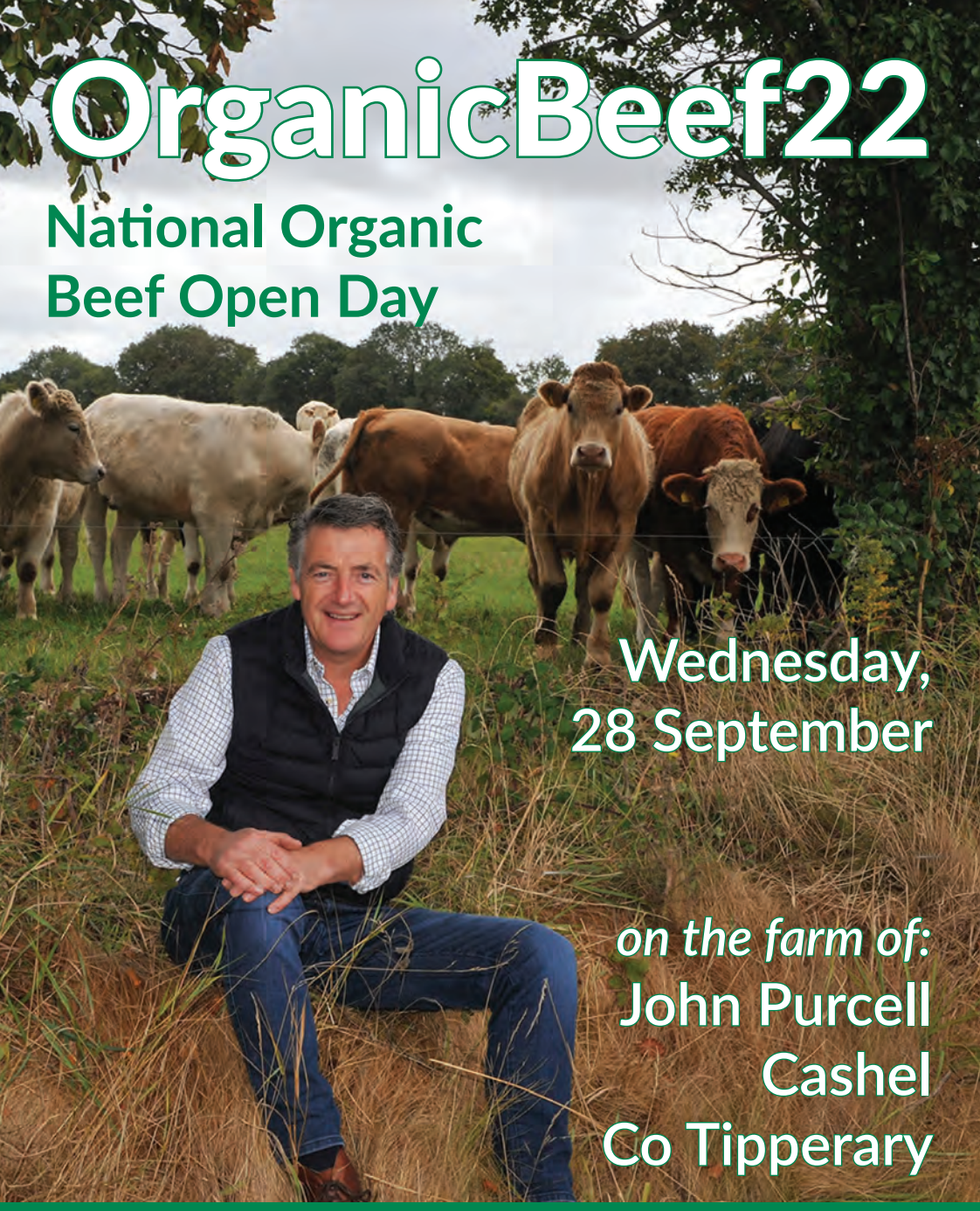
OrganicBeef22

National Organic Beef Open Day



Wednesday,
28 September

on the farm of:
John Purcell
Cashel
Co Tipperary

teagasc
Agriculture and Food Development Authority

An Roinn Talmhaíochta,
Bia agus Mara
Department of Agriculture,
Food and the Marine

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Foreword – Minister Hackett

Pippa Hackett
Minister of State at the Department of Agriculture, Food and the Marine

I would like to extend a very warm welcome to all attendees, farmers and exhibitors at today's important national event in the Golden Vale. Many of the key stakeholders of the organic farming community are represented here today, making it an ideal opportunity to network and share knowledge and expertise as we continue our work to establish a thriving organic food sector in Ireland.

I have no doubt that today's event will build on our existing momentum towards reaching our target of 7.5% of agricultural land in Ireland farmed organically by 2027.

The Irish beef industry has a strong reputation, and I believe that this can only be further enhanced by increasing our Irish organic beef offering, which will help stimulate new market opportunities for producers, both at home and abroad.

The growing demand from consumers for food produced under high animal welfare conditions and to a higher environmental standard is a call to action for farmers to consider organic farming as a long-term, sustainable enterprise.

As Minister of State in the Department of Agriculture, Food, and the Marine with responsibility for Organic Farming, I have secured a budget of €256m over the next CAP period to achieve these targets.

The new scheme including our higher payment rates will be open for application for new Organic Farming Scheme participants from this October, I would encourage all farmers to start examining now the opportunities that this scheme offers and discuss with their Advisor.

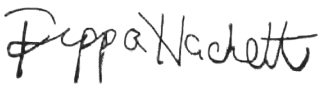
Organic farmers are known for their pioneering and solutions-led

attitude to the land, and the value proposition of organic produce continues to resonate with consumers.

While it is imperative that we continue the work of sourcing and growing markets for Irish organic beef to ensure that conversion is an attractive long-term economic option for farm families, I also know from my own experience as an organic farmer that the benefits of converting to organic farming will appeal hugely to those farmers who recognise that the fundamental principles of improving environmental benefits on their farms do much for our society at large.

I would like to conclude by thanking John Purcell for hosting today's event and for his many years of commitment to the organic beef sector. I also wish to thank the organics teams in Teagasc and in my own Department, as well as the organic certification bodies and organic advisers across the country, for their continued support.

I wish all attendees a productive day, and I hope that you leave energised by the potential of the organic sector and informed about the wealth of supports that are available to assist farmers considering conversion as well existing organic farmers.



Foreword- Teagasc

Prof Frank O'Mara
Director, Teagasc

On behalf of my Teagasc colleagues and myself, I am delighted to welcome you to this National Organic Beef Open day, which is being jointly organised by Teagasc, Bord Bia and the Department of Agriculture, Food and the Marine (DAFM). We are indebted to John Purcell for opening his organic farm for the event, and allowing us to share the knowledge and expertise he has built up over many years as an organic beef farmer.

The open day is aimed at providing up to date best practice for existing organic farmers and also will aim at providing an insight into organic farming methods for those farmers contemplating converting their farms. The Minister and the government have set an ambitious target to reach 7.5% of agricultural land area devoted to organics production by the end of 2027. This will mean converting an additional 7,000 farmers to organics, to add to the current 2,000 organic farmers in Ireland. Teagasc is committed to supporting both existing farmers and new entrants to organics and are adding an additional two specialists and 6 advisers to our organics team. We have also included 5 organic farms in our Signpost programme, and are planning new initiatives in organics research. A key part of our programme in recent years has been the series of farm walks on organic farms which we organise in collaboration with the DAFM. The 12 walks which took place in 2022 were very well attended, which indicates a strong level of interest among farmers in joining the new organic farming scheme. This is part of the new CAP and will open for applications later this year. We are committed to continuing these walks.

The new organic farming scheme has significant funding of €256m over the next CAP period and the increased payments are attractive to farmers. One manifestation of this is that demand for our Organic Farming Principles 25 hour course is very strong. To cater for this, we will run two courses per months through the autumn to next spring.
Today's event is an important one which will be very informative for both existing organic farmers and farmers considering conversion. There is a lot of information and advice available from Teagasc, Bord Bia, the DAFM, and other bodies, and we look forward to answering your questions and helping you in whatever way we can. I hope you enjoy the day and fine it very useful.

Foreword - Bord Bia

Seamus McMenamin

I want to welcome all attendees to today's National Organic Beef Open Day which has been jointly organised by Bord Bia, Teagasc and the Department of Agriculture Food and Marine (DAFM) to provide an overview of all aspects of organic beef production in Ireland.

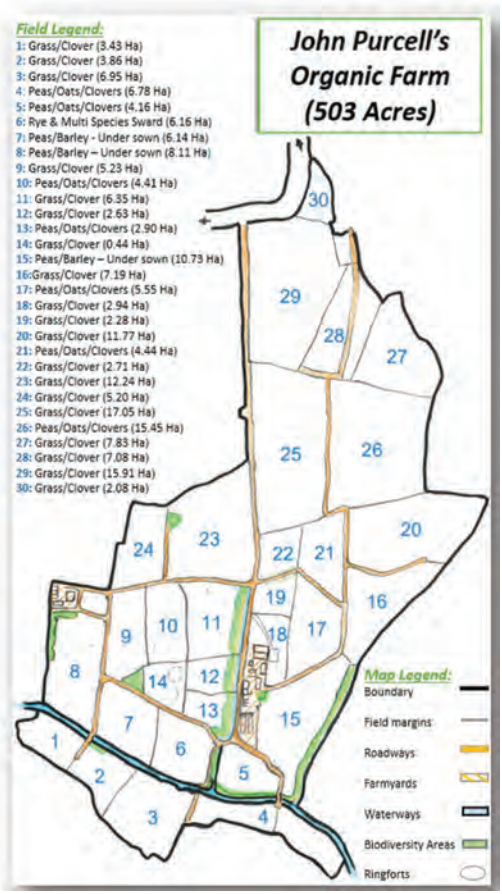
There has been a growing focus on organic food production in Ireland which is reflective of the growing government support available for the sector and the ambition to increase the land area being farmed organically in Ireland to 7.5% by 2027. Today's event aims to provide information on all aspects of organic production, from best practice advice at farm level for organic production through to the provision of insights and updates on existing and future market development for Irish organic produce.

With the prospects of increased organic food production in Ireland, at Bord Bia we are currently reviewing how we can best support the sector through targeted marketing development and promotional activity whilst also recognising the unique constraints being faced in terms of scale of supply and the seasonality of production in some categories. Many key stakeholders are exhibiting here today which provides the ideal opportunity for the sharing of information and enhanced collaboration within the growing organic food sector in Ireland.

I wish all attendees and exhibitors here today a productive day and would also like to take this opportunity to thank John Purcell for opening his organic beef farm here in the Golden Vale to facilitate this very important event.

Introduction to John Purcell's Farm

Welcome to the organic beef farm of John Purcell. John took over the running of the farm from his late father Michael Purcell in 1997. The farm had always been associated with a livestock enterprise and in 1998, John converted the farm to organic and continued with the beef model.
The overall farm operation of 950 acres consists of owned and leased land and all together produces over 1000 finished beef cattle per annum for the market. Today, the farm walk is on a block of 500 acres. This farm produces most of the winter feed for the operation and houses 600 cattle during the winter months. Combination crops and clover grass swards are grown here as part of the winter-feeding system.
John's farm is not exclusively focusing on beef production, he also has incorporated biodiversity corridors/ habitats and planted over 10,000 trees in the last three years to sequester carbon and is planning to claim carbon natural status by 2025.



Farm Details:

The farm is made up of one block of land, which is located in the Golden Vale. 141 Ha of owned land and 62 Ha of leased land makes up the block. The total area of this farm is 203.56 Ha as can be seen opposite on the map.

Land Use

The farm is primarily a grass-based system where cattle are out grazing the land for much of the year.

Combination crops are grown to provide high quality forage for the cattle during the winter period. A combination crop is a mixture of a cereal and a combinable pea.

A number of biodiversity corridors have been created to enhance wildlife throughout the farm and add to the overall farm ecosystem.

Table 1 – Land Use 2022

Land Use	Area (ha)
Grass/Clover	123.7
Rye/Multi species	5.2
Combination Crop Y1	43.7
Combination Crop Y2	25
Biodiversity Corridor	3.2
Farmyard	2.7
Total	**203.5**

Combination Crops on the Farm

On the farm, the aim is to have a closed system in terms of producing all the feed requirements for the cattle.

John has found that red/white clover is sufficient to finish Angus/Hereford cattle, however, to finish the continental breeds (60% of cattle); a higher energy feed is required. Therefore, the grass/clover silages are supplemented with a combination crop of peas and barley/oats.

A 5-6 year crop rotation plan is being implemented on the farm. Approximately 40% is ploughed every year and the remaining 60% is in a grass/clover ley.

All combination crops grown on the farm are harvested as a whole crop silage. Before harvest, it is vital to ensure that the Dry Matter (DM) % is 30 or over and to ensure that the grains do not go over ripe. The crop is harvested when the grain is at the "mature cheesy stage" just before they ripen and get hard. This is where the energy levels of the grains are at the optimum when ensiling the crop. The crop is cut using a silage harvester with a whole crop header attached. The corn cracker on the harvester cracks the grain as it is harvested to increase digestibility of the grains.

Table 2 – Combination Crop Details sown in 2022

Crop	Combination Crop Yr. 1 (Peas/Oats/Clover)	Combination Crop Yr. 2 (Peas/ Barley)
Area (Ha)	**41**	**27**
Seed Mixture	60% Peas 23% Oats 6.8% Ryegrass 6.8% Persian Clover 3.4% Egyptian clover	20% Eso 60% Pea 40% Bruno 40% Barley 20% Avalon 20% Wlima
Sowing Rate kg/ha	148	129
Sowing Date	1st April	30th March
Harvest Date	22nd July	21st July
Harvest Yield (t/ha)	34.5	34.5

Table 3: Combination Crop Margins 2022

Combination Crop Year 1 and Year 2 Margins 2022 (€/acre)		
	Year 1 Peas/Oats/Clover	**Year 2 Peas/Barley & Undersown Grass/Clover**
Materials (€/Acre)	**216**	**316.8**
Seed	110	210.8
Manure	64	64
Lime	42	42
Machinery (€/Acre)	286.95	286.95
Plough, Till and Sow	75	75
Manure Spreading	41.95	41.95
Harvesting	170	170
Total Variable Costs (€/Acre)	502.95	603.75
Land Use (€/acre)	200	200
Total Fixed Costa (€/acre)	200	200
Total Costs (€/acre)	702.95	803.75
Yield /acre (tonne)	13	13
Cost/tonne (€)	56.07	61.83

Source: Johns own figures

Organic Rye:

Organic rye was sown for the first time in 2021 as a trial.

Table 4 – Rye Crop Details

Rye	
Area:	6ha
Variety:	Dukato
Sowing Rate:	220kg per hectare
Sowing Date:	22nd Sept 2021
Harvest Date:	6th July 2022
Harvest Yield:	(t/ha): 44.5

Crop Rotation

Crop rotations are a very important aspect to all organic farms. A crop rotation is a planned sequence of different crop types. Crop rotations have many benefits including:

- Replenish Soil Nitrogen
- Suppress Weeds
- Reduce Pest & Disease Levels
- Maintain Organic Matter (OM) levels and Soil Structure

With combination crops being such an important part of the diet for the cattle during the winter months, a crop rotation was required to meet these requirements.

Table 5: Crop Rotation on Farm

Year	Block 1	Block 2	Block 3	Block 4	Block 5
1	Combination Crop	Grass/ Clover Ley	Grass/ Clover Ley	Grass/ Clover Ley	Grass/ Clover Ley
2	Arable Silage	Combination Crop	Grass/ Clover Ley	Grass/ Clover Ley	Grass/ Clover Ley
3	Grass/ Clover Ley	Arable Silage	Combination Crop	Grass/ Clover Ley	Grass/ Clover Ley
4	Grass/ Clover Ley	Grass/ Clover Ley	Arable Silage	Combination Crop	Grass/ Clover Ley
5	Grass Clover Ley	Grass/ Clover Ley	Grass/ Clover Ley	Arable Silage	Combination Crop
6	Grass/ Clover Ley	Grass/ Clover Ley	Grass/ Clover Ley	Grass/ Clover Ley	Arable Silage

Year 1: Combination Crop Peas/Oats/Clovers harvested as a whole crop silage.

Year 2: Combination Crop of Peas and Barley. This is under- sown with a grass clover mix. The crop is harvested by means of a whole crop silage leaving the grass/clover ley.

Year 3-6: The grass /clover ley is then left for 3 to 4 years. This is used for grazing and a certain amount of silage during this period.

Soil Nutrients and Manure Management:

For a viable organic enterprise, regular input of nutrients by means of manure should be applied for the farm to be at its optimum in terms of crop and cattle production. As no artificial fertilisers are permitted in an organic enterprise, it is key to maximise the manures available on the farm to provide these nutrients. Keeping optimum nutrient levels ensures microbial and earthworm activity are retained which provides a platform for efficient nutrient cycling.

Keeping soil pH at the optimum levels of 6 to 7 facilitates Organic Matter breakdown and nutrient recycling which is vital in an organic system.

Organic manure nutrient contents can vary widely depending on the source of nutrients and it is advisable to have the nutrient content of manures tested to provide the information you need to make decisions on the farm going forward.

Sources of nutrients used on the farm:

- Nitrogen from atmospheric fixation by means of clover and peas
- Farmyard Manure (FYM) and slurry from cattle when housed during the winter period

Where and when are nutrients spread

Cereal Area

Before ploughing, approximately 8 tonnes of FYM are spread/acre. This is then ploughed in.

Grassland Area

Once conditions allow in spring, cattle slurry is applied to the grazing ground at a rate of approx. 1,500 gallons/acre. Trailing shoe is the method use to spread the slurry. Where silage is cut, a further 1,500 gallons/acre

is spread post-cutting to replace any nutrient losses by means of offtakes.
Lime is spread (based on soil results) on areas where it is required when preparing ground for cropping.
The farmyard manure (FYM) produced on the farm is handled in two ways
Sheds are cleaned out in January. The FYM is stored in clamps out in the fields where it will be spread on fields entering the crop rotation with the Year 1 combination crop.
Sheds are clean out again in May/June and is stored in the sheds until August. This is then spread on the fields that are most deficient in nutrients.

Composting:

Composting is a process that involves mixing and aerating organic materials to produce a stable product, which has a great value as a soil conditioner. It is encouraged because

- It has improved handling qualities and reduces the mass of manure
- Nutrients are in a more stable forms and thus reduces nutrient losses
- Weed seeds, pests and diseases are killed by high temperatures
- It helps improve soil structure

The plan for the coming year is to compost all the farms FYM and spread it out on the land during the autumn before the combination crops are sown next spring.

Livestock Enterprise:

The farm is a store to beef enterprise where cattle are sourced both from organic livestock mart sales (30%) and direct from farmers (70%). Good relationships have been developed between John and organic store producers over the years.
Cattle are bought all year round between 16 – 18 months of age at an average weight of 450kg. Both heifers and steers are bought the breeds vary.

Cattle either are finished off grass or are housed for the winter to be finished. When cattle arrive at the farm, they are isolated to minimise health or disease issues. When possible, the cattle are kept in the groups they came in to reduce stress.

Figure 1: Average Age profile of cattle on the farm in 2021

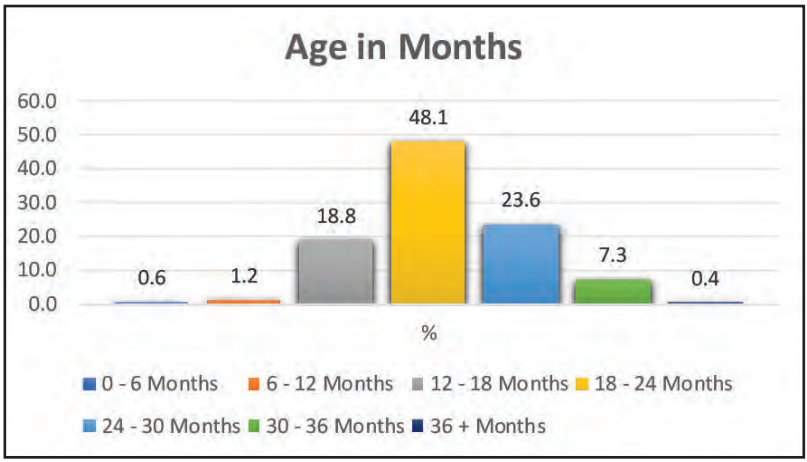


Figure 2: Breakdown of cattle breeds on farm in 2021

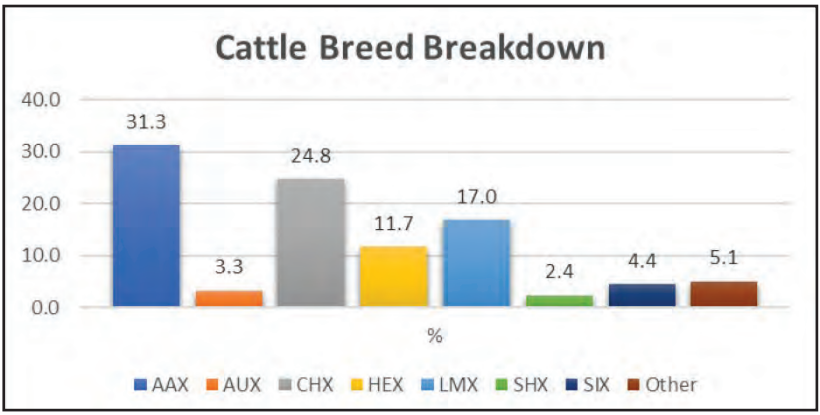
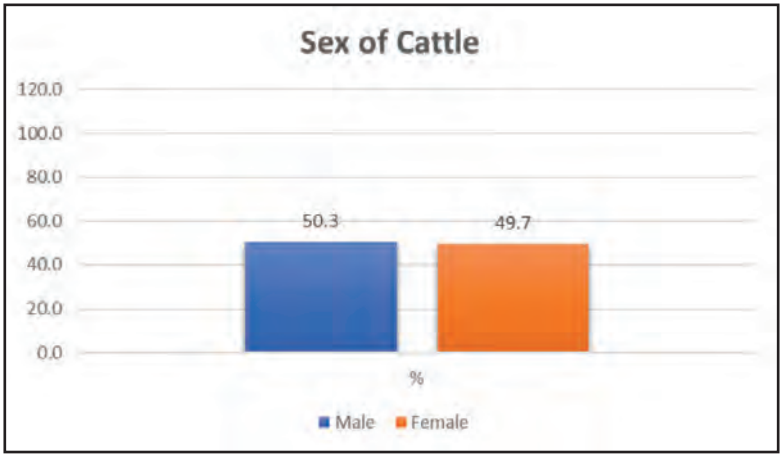


Figure 3: Breakdown of heifers and steers in Herd in 2021



Cattle Performance

John aims to supply a steady quantity of cattle all year round, particularly in the winter to spring period. The aim is to have the heifers ready for slaughter at 24 months at a weight of ~330kg and the steers finished at 30 months at a weight of ~360kg.

In 2021, the cattle arrived on the farm at an average of 452kg. The heifers put on an average daily gain of 1.1kg and the bullocks put on an average daily gain of 0.9kg. The cattle were on the farm for an average of 245 days before they were slaughtered. The following data shows the cattle performance on the farm in 2021.

Figure 4: Average Age in Months cattle slaughtered on the farm in 2021

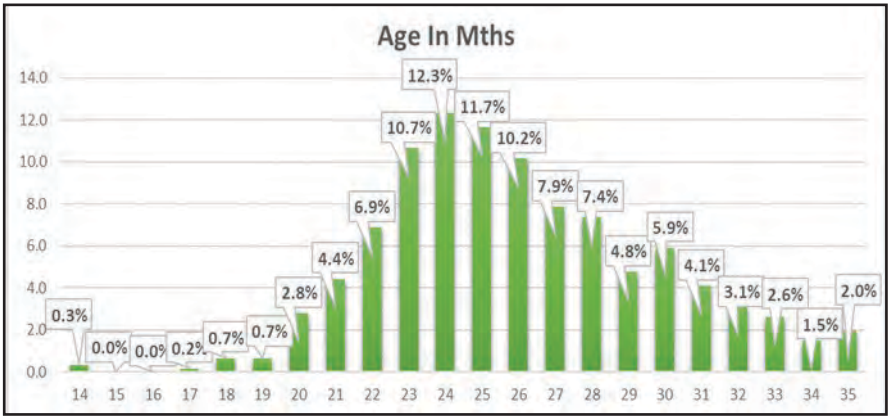


Figure 5: Average Carcase Weight (Kg) cattle slaughtered in 2021

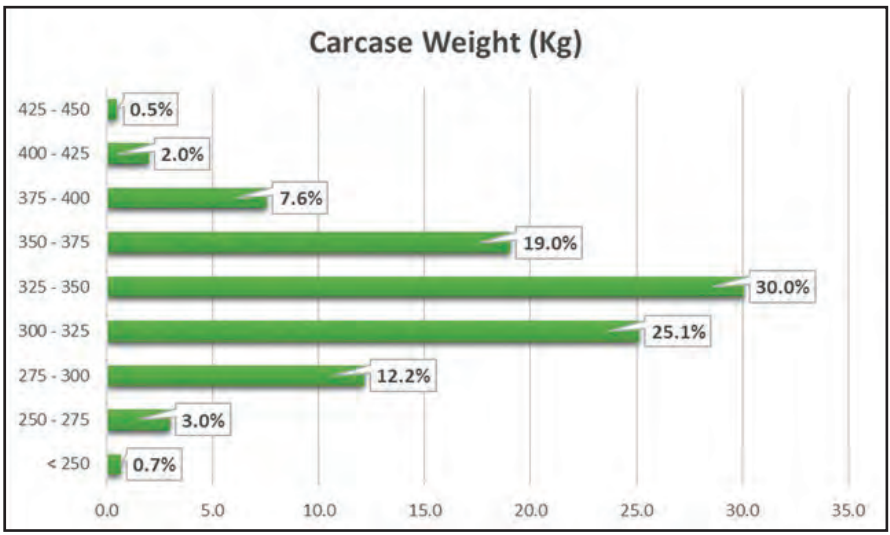


Figure 6; Breakdown of Steers and Heifers slaughtered in 2021

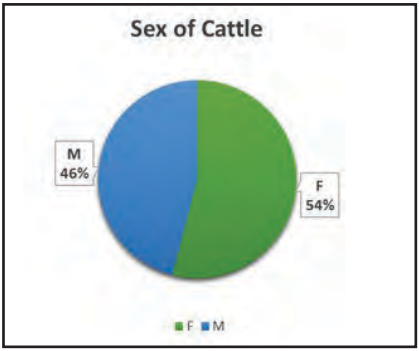


Figure 7: Breakdown of breeds slaughtered in 2021

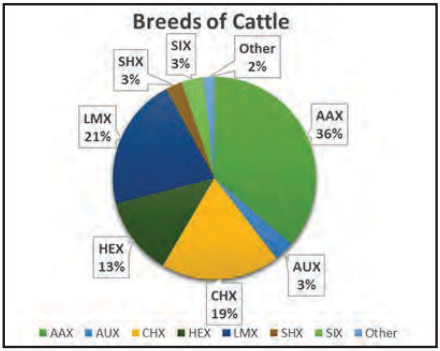


Figure 8: 2021 Conformation scores

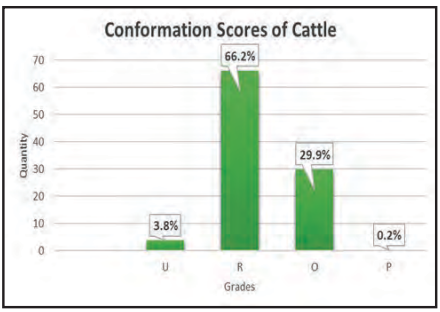
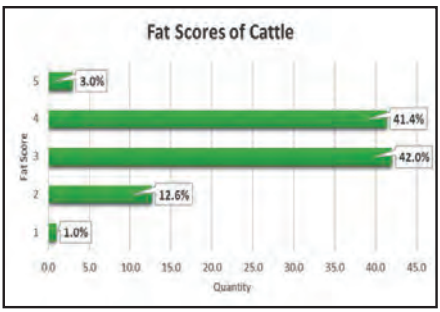


Figure 9: Fat scores for cattle slaughtered in 2021



Grassland Management:

Clover drives organic farming, by fixing nitrogen from the atmosphere and is a key way for an organic farmer to get nitrogen into the soil. There are two main types of clover, white clover and red clover.
On the farm, the aim is to maximise the amount of quality grass /clover sward, which finishes cattle without the use of any, concentrates. Outlined below is details of the grass/clover mixture sown on the farm.

Table 6: Grass clover seed mixture on the farm

Grass Ley Mixture (Undersown D2 Grass)

- 15% Clover
  - 10% White Clover
  - 3% Red Clover
  - 2% Yellow Clover
- 42% Low Grasses
  - 29% PRG
  - 5% Red Fescue
  - 8% Smooth Meadow Grass
- 43% Tall Grasses
  - 25% Festoloium
  - 5% Cocksfoot
  - 13% Timothy

Sowing Rate: 14.5kg/acre

Grazing Management on the Farm

Cattle are batched into different groups on the farm depending on weight, sex and breed. The aim is try and reduce stress on the animals, as minimising stress will increase animal performance.
Cattle enter a field with a grass cover of approximately 1,200 kg Dry Mater (DM)/Ha, which is the equivalent of 8 – 10cm in height. Paddocks are then grazed down to a residual of 4 – 5cm. This is done to protect the clover root structure while also reducing poaching and reducing ectoparasite problems.

Cattle are usually stripped grazed, so they always have access to fresh pasture. They are moved to a new pasture every 10 days to break the worm cycle.
Cattle are out on grass from March onwards and housed for the winter from November. In wet conditions, cattle are moved more frequently than normal to avoid poaching and to protect the clover in the sward. Once paddocks are grazed, they are topped regularly to increase tillering in the pasture while managing weeds and increasing organic matter levels in the soil.

Animal Health in Organic Farming:
A healthy herd in organic farming is achieved by a combination of good management, sound nutrition and good animal husbandry skills.
When a farm undergoes conversion to organic status an Animal Health Plan is required to be drawn up with the veterinary practitioner, who specifies the current animal health issues on the farm and how the farmer will tackle these problems into the future, while conforming to the requirements of organic certification standards.

Detection of problems needs to be early, and timely veterinary advice is invaluable – when an animal is ill the organic farmer reacts in the same manner as their conventional neighbour and veterinary assistance is required immediately.

Livestock Health on the Farm:

As animals are bought at approximately 450kg at an age of 16 – 18 months, health problems are greatly reduced as cattle have built up a certain immunity to parasite issue at this time. Animals are monitored daily for any sign of illness. If there is an issue with an animal such as cough or loose faeces, faecal samples are taken and sent for analysis. If these samples identify an issue, animals are treated appropriately.

Also, when animals are slaughtered, a fluke report is issued showing if there are any signs of parasite damage within the animal, from these appropriate actions can be taken.

If a treatment is administered, all withdrawals are trebled to ensure no residues are left within the animal. When an animal is identified as being ill, it is isolated and observed for one week post treatment to minimise risk of spread to the rest of the herd

Conventional Veterinary Treatments Permitted on Organic Farms

- Animals for meat consumption: one course of antibiotics within 12 months
- Animals for breeding: two courses of antibiotics within 12 months.
- Dairy Mastitis: two courses of antibiotics within 12 months; otherwise, the cow is removed from the milking herd.
- If limits exceed, organic status is taken away from animal.

Withdrawal Periods for use of Veterinary Products on Organic Farms

The withdrawal periods for allopathic medicines are longer for organic animals than for conventional animals. All withdrawals periods must be doubled. Unless the medicinal product used indicates a withdrawal period, the specified withdrawal period shall not be less than:

- 14 Days for eggs
- 14 Days for milk
- 56 Days for meat from poultry and mammals

Before sending an animal for slaughter, it is advisable to check with the processor as some processers have certain medication restrictions and enhanced withdrawal periods due to the destination of the final products.

Biodiversity on the Farm:

On the farm, biodiversity is a vital part in the day to running of the farm. No decisions are made without considering its effects of the flora and fauna on the farm. John is a strong believer that all flora and fauna on the farm depend on each other, so they need to be enhanced. He believes that "the farm is one large ecosystem so everything that you see on the farm depends on each other to survive, if one element is neglected, this will have a negative impact on a different aspect of the farm."

Numerous steps have been taken to enhance biodiversity on the farm which include:

- Biodiversity corridors (Approx. 5km in length)
- Integrated Wetland System (IWS) to purify water before entering watercourse
- Planted 10,000 native trees
- Several beehives around the farm
- Spawning ponds at the end of the riverbank
- 1 in 3 hedge rotational trimming regime implemented
- Mixed grass/clover species to provide flower most of the year for bees
- Bee and bug hotels around the farm to provide shelter
- Maintaining and enhancing hedgerows
- Adequate fencing and roadways to protect flora and fauna

In the future, John would like to do a whole study of exactly what flora and fauna are present on the farm. From this, he can then make decisions in how to sustain and even enhance the wildlife present on the farm.

Economics of Organic Beef Production

Joe Kelleher[1]; Elaine Leavy[2]; Martin Bourke[3]
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[2] Teagasc, Mullingar
[3] Teagasc, Gorey

Summary

- Organic beef production can be profitable
- Developing systems that have a low reliance on imported concentrates are crucial
- Making good quality silage is important on finishing farms

Introduction

Organic beef production is the largest organic sector in Ireland with approximately 1,400 organic farmers with beef cattle on their farms (2020). Due to the extensive nature of conventional beef production, coupled with high fertiliser prices and increased premia, it is expected that this number could increase significantly over the coming years.

Market

The market for organic beef looks positive. There are 2 main companies (Good Herdsmen and ABP Slaney Meats) handling most of the organic beef. Some individual farmers also sell their beef direct, typically with the assistance of a local butcher/abattoir. Similar to conventional beef, much of our organic beef is exported, with the UK, Germany and The Netherlands amongst the main importers. Due to strong retail sales of organic beef in these countries, it is expected that these will remain the key export markets. The German market alone is worth 15 billion euro (2021).

Quality forage diet

As organic meal prices are close to double conventional meal prices, any beef finishing system must be built around a diet of grazed grass and good quality silage to remain profitable. Many organic finishing farms conserve either red clover silage, whole-crop silage or top quality grass silage as an

economically viable method of finishing cattle with minimal purchased concentrate inputs. Where cattle are fed on this high quality silage, along with grazed grass, then cattle can be finished at 24 – 28 months, depending on the sex and breed of the animal. One winter on poor quality silage can have the impact of adding 3 months to the finishing age of the animal.

Profitability

Organic beef farming compares favourably to conventional systems. Typically, organic beef farmers are stocked in the region of 1.0 LU/ha, but this can vary depending on soil type. This stocking rate is slightly lower than conventional beef farms, but due to higher organic beef prices (typically in the region of a 15% premium), the total value of farm sales can be maintained despite the reduced stocking rate. When converting to organic farming, some costs will increase and some will decrease. Fertiliser cost will typically be eliminated. While organic meal is quite expensive, usage rates tend to be lower on organic farms leading to a reduced overall feed bill. Other costs such as seeds, bedding costs and licence fees may increase. Overall, it would be expected that total costs on organic farms would be lower than their conventional peers. The newly increased rates announced under the Organic Farming Scheme will also contribute positively to the overall farm profitability.

Due to the requirement for cattle to have access to a bedded area, bedding costs are one cost that is likely to increase after conversion to organic farming. Farmers located in parts of the country where there is a high concentration of tillage farmers should be able to access straw bedding at much lower rates than those who have to pay to transport the straw longer distances. Conversely, farmers on heavier soils may have access to rush bedding to counteract this. The key consideration when appraising the profitability of organic conversion is to realise that there are many variables and that it is vital for all farmers to calculate their own figures for their own farm.

Host farm profitability

While todays host farmer, John Purcell, has a holding well in excess of the national average farm, his figures give a good overview of the type of margins that can be expected from an organic beef finishing farm (See table 1). The absence of a fertiliser bill or any purchased concentrate means that

two of the largest bills on most farms are eliminated on this farm. John Purcell's figures are for the year 2021, when cattle purchase prices were approximately 15% lower than 2022 but equally cattle sales prices were also lower by a similar percentage.

Due to this farm, having a strong reliance on employed labour, we have eliminated this costs from the example on table 1, to make costs more representative. However, a full land lease charge of €208 per finished animal has been included. When you consider that the average conventional farmer incurs a net loss per finished animal (excluding direct payments), a margin of €110 per finished animal is good performance and if a farmer with all owned land were to include the land lease charge, then profitability is very positive.

The newly announced Organic Farming Scheme offers drystock farmers €300/Ha for the first 2 years of conversion and €250/Ha thereafter. When this is added to the figure above, it demonstrates that organic beef finishing systems can be a profitable farming enterprise.

Table 1. Host Farm Financial Performance

Host Farm Financial Performance

BORD BIA IRISH FOOD BOARD

2021 Purchases Details	
Purchase Weight (Kg)	400
Purchase Price (€/Kg)	2.30
Purchase Price (€)	920
2021 Sales Details	
Carcase Weight (Kg)	331
Sale Price (€/kg)	4.81
Sale Price (€)	1592

Costs / Head (€)	
Contractor	141
Veterinary	9
Lime	7
Seed	33
Transport	30
Straw	21
Fixed Costs (excl land lease)	110
Land lease	208
Total Costs (excl Depr & Labour)	560

Profitability /Head	
Sales Price	1592
- Purchase Price	920
- Costs	560
Margin/Head	112

Take home messages

- Positive margin per head excluding direct payments
- Reduce/eliminate purchased feed costs
- Quality silage is key
- This farmer knows his figures – do you know yours?

Conclusion

Organic beef finishing systems can be profitable. Growing high quality silage and reducing purchased concentrates are key to achieving this. It is important for all farmers to analyse their own figures before making the decision to convert.

An Roinn Talmhaíochta,
Bia agus Mara
Department of Agriculture,
Food and the Marine

Regulation of the Organic Sector:

- Department of Agriculture, Food and the Marine regulates the organic sector in Ireland.
- Organic production and labelling of organic products is controlled by European regulations, Regulation (EU) No. 848/2018 as amended refers.
- The EU legislation allows Member States to use private inspection bodies to carry out the inspection and licensing system of organic operator which is the system in place in Ireland.

Converting to Organic Farming:

Organic farming involves undergoing a period of conversion in which the land and producer adjust to organic farming methods. The conversion period for the change from conventional to organic farming will be for a duration of two years. Organic Farmers will receive priority access to Agri-Climate Rural Environment Scheme (ACRES).

Steps to Join the Organic Farming Scheme:

- Register as Organic - contact an Organic Control Body (details overleaf)
- Complete an approved Organic Farming Principles course - Teagasc or National Organic Traning Skillnet(NOTS) (details overleaf)
- To find an Organic Agent contact Teagasc or Agricultural Consultans Association(ACA) (details overleaf)

Having registered as an organic operator with an Organic Control Body (OCB), you may then apply to the Department of Agriculture, Food and Marine to join the Organic Farming Scheme (OFS). This requires two separate online applications:

a. Submit separate Organic Farming Scheme (OFS) application ONLINE. 2023 Organic Farming Scheme(OFS) open for applications in October 2022.

b. Declare land parcels as “in-conversion” or “organic” on Basic Income Support Scheme (BISS) application ONLINE.

An Roinn Talmhaíochta,
Bia agus Mara
Department of Agriculture,
Food and the Marine

Organic Farming Scheme (OFS):

Payment Rates	Year 1-2 (in-conversion) 1 - 70 ha €/ha	Year 1-2 (in-conversion) > 70 ha €/ha	Year 3-5 (fully converted) 1 - 70 ha €/ha	Year 3-5 (fully converted) > 70 ha €/ha
Drystock	€300/ha	€60/ha	€250/ha	€30/ha
Tillage	€320/ha	€60/ha	€270/ha	€30/ha
Dairy	€350/ha	€60/ha	€300/ha	€30/ha
Horticulture	€800/ha	€60/ha	€600/ha	€30/ha

A new participation payment will be paid to farmers in the Organic Farming Scheme of €2,000 in their first year of conversion to organic farming and €1,400 per annum thereafter

Organic Capital Investment Scheme (OCIS):

- Grant assistance available for on farm investments.
- On Line applications via agfood.ie.
- 50% grant assistance on pre VAT price or 60% grant assistance on pre VAT price for qualifying young farmers.

Scheme of Grant Aid for the Development of the Organic Processing Industry (OPIG):

- Grant assistance available for OFF farm investments.
- 50% grant assistance on pre VAT price.

Terms & Conditions available for above scheme and grants @ https://www.gov.ie/en/publication/fc7c8-organic-farming/

Organic Unit:

Organic Unit, Department of Agriculture, Food and The Marine, Johnstown Castle Estate, Co. Wexford.
Tel: 053 9163425. | **Email:** organic@agriculture.gov.ie.

Developing organics – challenges and opportunities

Seamus McMenamin,
Sector Manager, sheepmeat, livestock and organic

Summary

- Growing demand for Organic produce on domestic and export markets
- Positive market outlook with demand ahead of supply in key markets
- Bord Bia recognises the unique constraints of supply availability, competiveness and capability

Introduction

There has been a growing focus on organic food production in Ireland which is reflective of the growing government support available for the sector and the ambition to increase the land area being farmed organically in Ireland to 7.5% by 2027. This ambition is a notable increase from the estimated two % of utilizable agricultural land in Ireland under organic production in 2021.

With the prospects of increased organic food production in Ireland, Bord Bia is currently reviewing how we can best support the sector through targeted marketing development and promotional activity whilst also recognising the unique constraints being faced in terms of scale of supply, seasonality of production in some categories, prevalence of imports and capability to export.

Market opportunities

Market research commissioned by Bord Bia in 2021 provided an overview of the key opportunities and barriers for Irish organic produce across a range of European and international markets. In Europe, the study examined opportunities in France, Germany, Italy, Austria, the UK, Sweden, Denmark, and the Netherlands. The cumulative organic market in these eight countries was valued at €27.7 billion in 2020, growing from €19.5 billion in 2015. While the scale of opportunities for Irish organic produce varies across these markets it is worth noting that imported organic

produce accounted for 18% of total organic sales in these regions in 2020. This indicates that there are important opportunities for Irish organic products to be explored in these markets despite the impact on consumer choices of current inflationary pressures being experienced across Europe.
While Bord Bia is committed to supporting the growth in all categories of organic food production, the red meat (beef and lamb) and dairy categories are most likely to see growth in production in the short to medium term.
Beef and sheep production currently represent the largest category of organic production in Ireland and also account for the largest land area. There are an estimated 19,500 organic suckler cows and 66,000 organic ewes on Irish farms in 2021. Leakage of animals to the conventional sector is a key issue for both sectors, although there are some indications this has reduced in recent years. Organic beef production in Ireland is estimated to have been 3,800 tonnes in 2021 while organic lamb production was in the region of 302 tonnes.
The home market takes 45% of organic beef and 50% of organic lamb but any further growth in organic red meat production will be destined for export markets. Germany is currently an important market outlet for both categories, representing 25% of organic output for both species in volume terms. Engagement in this key market has indicated there are further opportunities to grow red meat exports with opportunities also emerging in other EU countries (and the UK). Maximising on these opportunities moving forward will be subject to Ireland's ability to overcome the current challenges and constraints of scale of supply and the seasonality of production, which is a particular issue for lamb.
Organic dairy production is another key development opportunity, however, production in Ireland remains small. There were 75 organic dairy farms in Ireland in 2021 and these are largely located in the Southwest of the country. There has been firm growth in organic dairy production (from a small base) between 2017 and 2022, with 90% of organic dairy products produced destined for the domestic market. The remaining 10% are currently exported to several markets including Germany, UK, France, Middle East and the US.

Bord Bia supports

Bord Bia is on track to deliver several projects to best support future growth in Irish organic production over the next few months. These include a project

aiming to quantify the volume of Irish organic produce available for the domestic retail sector, and for export, within each category. This insight will enable Bord Bia to plan targeted lead generation and promotional activities in 2023 and beyond. In early autumn Bord Bia will also present the results of an in-depth study into opportunities for Irish organic produce in Sweden and Denmark, building on an investment in a similar study focusing on the German market in 2021. The National Organic awards will be hosted by Bord Bia in October 2022 in conjunction with DAFM. The awards are hosted every two years to highlight and celebrate the achievements of Irish organic food and drink producers.

Retail partnership for Organic

Raising awareness of the range and availability of organic produce from Ireland amongst domestic consumers is a central aim of Bord Bia. This summer we collaborated with major Irish retailers to support this ambition. Bord Bia developed digital and in-store promotional assets for the *Organics from Ireland* campaign, to be used by retailers to highlight their organic Irish beef, lamb, dairy, seafood, eggs, fresh produce and prepared consumer foods. Previous research conducted by Bord Bia indicated a strong preference amongst Irish consumers for locally produced foods and this pilot project aims to raise awareness among consumers of the availability of organic food from Ireland so that they can choose both organic and local.

Red clover silage

Nicky Byrne and Donall Fahy
[1] *Teagasc, Animal and Grassland Research and Innovation Centre, Grange, Dunsany, Co. Meath*

Summary

- Red clover silage swards can produce high yields without the need for chemical N inputs due to its ability to fix in excess of 200 kg N/ha
- Red clover silages high intake potential increases live weight gains
- Cutting at 6-8 week intervals will help swards persist for 3-4 years

Introduction

Red clover (RC) can contribute substantially to organic, low-input and conventional animal production systems due to its ability to fix atmospheric N and support of higher animal performance. These benefits contribute to beef systems of improved farm gate nitrogen (N) balance, through a lessened need for fertiliser and feed, while maintaining high animal performance. Swards with a high content of red clover (75% on a dry matter basis) are capable of fixing 24-36 kg N/t dry matter (DM) produced, meaning swards of high clover proportion and DM production are potentially fixing in excess of 200 kg N/ha annually. The inclusion of red clover in conserved grass silage swards can increase average daily live weight gain (ADG) compared to grass silage diets. Despite the many benefits of RC inclusion, it has had limited uptake across Irish production systems, likely due to its more complex management requirements, unsuitability to frequent grazing, reduced DM yield stability and persistence giving a short term lifespan of approximately 3-4 years.

Agronomy

Unlike for perennial ryegrass (PRG) and white clover varieties, no Recommended List currently exists for RC varieties in Ireland, with Irish producers relying on information from the UK Recommended/National List to identify suitable varieties. Red clover should be grown in rotation, allowing for a four year break to control diseases such as stem eelworm and Sclerotinia fungus (clover rot). Typically 7.5 to 10 kg/ha of RC in addition to

20 to 22 kg/ha of PRG should be sown on well drained soils with a soil pH of 6.5 to 7. Depending on soil moisture and temperature, seedbed preparation and sowing, establishment may be slow but not necessarily a failure. Spring reseeds offer the greatest window of opportunity to optimise pre and post-sowing management.

Red clover has a deep taproot, an erect growth habit, with a low density of large shoots. Stems are formed from the growing points located on the crown on top of the taproot. Reserves of carbohydrates and N are stored in the crown and taproot, where they are remobilised to fuel regrowth after defoliation. The crown/growing point of RC is solitary and exposed, making it vulnerable to physical damage by machinery and animals. This means that RC is best suited to infrequent silage cuts rather than regular grazing.

Cutting intervals of 6 to 8 weeks allow sufficient time for the canopy to intercept sunlight to replenish energy reserves. Increasing the defoliation frequency beyond three cuts can reduce yield due to insufficient replenishment of plant reserves and thus persistence. 'Late' silage harvests (beyond mid-September) can be difficult to ensile (insufficient wilting) and are of relatively low yield making it difficult to justify economically. To protect the crown of RC cutting height should be 7–8 cm. Red clover has a low water soluble carbohydrate concertation and high buffering capacity, reducing its ensilability. The inclusion of perennial ryegrass as a companion species will improve the overall ensilability of RC silages as well as wilting (24 to 48 hours) to increase DM concentration, while ensuring that the leaf is not damaged (shattered) as a result of over wilting and excessive machinery passes.

Red clover swards have the ability to fix high levels of atmospheric N, making it available to plants in the soil, supplying in excess of 200 kg N/ha annually. Mixed RC and PRG swards receiving no chemical N were found to have similar annual DM production to PRG swards receiving up to 412 kg N/ha per year (15.8 and 15.7 t DM/ha, respectively).

Feeding value

Cattle consuming silages containing RC have increase dry matter intake (DMI) compared to grass silage. From this additional DMI and increased levels of rumen undegraded protein cattle consuming RC silage can achieve increased levels of live weight gain (ADG). Beef cattle offered a mixture of RC and grass silage were found to have an ADG of 1.04 kg, compared to grass

silage which supported an ADG of 0.59 kg. The feeding vale of RC silage appears lower than that of grass, with lower levels of digestibility because of high fibre levels. The elevated fibre levels are likely due to the higher levels of stem required to support the plants erect growth habit. Despite overall lower digestibility increased DMI and animal performance can be achieved due to the faster rate of digestion of plant fibres and increased particle break down contributing to increased passage rate and rumen fill.

Conclusion

The inclusion of RC into silage swards has great potential across Irish pasture-based production systems of all intensities. These swards have an enhanced ability over grass only swards to maintain high levels of herbage production and animal performance in the absence of chemical N fertiliser.

Benefits and establishment of Red and White Clover on organic farms

William Burchill
Teagasc Moorepark Advisory, Moorepark, Fermoy, Co. Cork

Summary

- Clover is a very important source of N on organic farms
- Clover increases herbage yield and quality
- Spring reseeding is the most reliable method of establishing clover
- Appropriate grazing, cutting and nutrient management are vital to maximise clover content and thus is benefits

Uses of red and white clover

White Clover is a nitrogen-fixing legume suited for grazing swards. Its growth habit and long persistence complements that of grass. As a result, grass-clover swards can be managed relatively similar to our typical grass only swards, while providing significant advantages for organic farms.
Red clover is a highly productive legume with a large capacity to fix N, while having generally lower persistence (4-6 years) than white clover. It has an upright growth habit growing up to 1 meter tall and is more susceptible to damage from grazing. For these reasons, it is more suitable for silage production.

Nitrogen fixation

Both red and white clover are N fixing plants with the ability to fix anywhere from 100-150 kg N/ha/year (white clover) and 100-200 kg N/ha/year (red clover). Clover uses this 'free N' for growth and over-time this fixed N also becomes available for grass in the sward. The clover percentage in a sward drives the amount of N fixed. Annual Clover contents of 25%+ would be required to achieve the higher rates of N fixed mentioned here in.

Herbage production

Grass-Clover swards driven by fixed N have the ability to support higher yielding swards compared to grass only swards on organic farms. Red

clover in particular is a very productive crop. Red clover-grass silage swards receiving zero chemical N fertiliser have been found to produce from 10-15 tonnes DM/ha/year (Clavin et al., 2016; Moloney et al., 2020).

Feed quality

Red and white clover are both high crude protein feeds, which reduces the need for expensive concentrates. Red clover-grass silage receiving no chemical N have been found to have crude protein contents of up to 15-16% crude protein while grass-only swards receiving no chemical N are typically in the range of 8-12% crude protein. Red and white clover are also more palatable than grass, which can increase animal feed intake and performance. White clover also has a high digestibility and maintains this throughout the grazing season. Both Red and White clover also have high mineral contents especially magnesium which reduces the risk of animal diseases and disorders linked to mineral deficiency.

Management

White Clover grazing

When managing white clover the key main is to maximise is percentage in the sward to drive N fixation. Grazing practices that encourage clover include; frequent tight grazing in the spring, pre-grazing yields of 1,400 kg DM/ha in the summer, long rotations in the Autumn (5-6 weeks) and tight grazing late in the year so the clover isn't shaded by grass over the winter. Apply slurry in the spring-time and soil test regularly to maintain/build soil fertility in particular target a soil pH of 6.5.

Red clover silage

A three to four cut system suits red clover-grass silage. Early cutting (Last week of May) is better for red clover silage than delaying into early June. After 1st cut the crop should be cut at 6-7 week intervals. A heavy cover of grass shouldn't be carried over the winter as it will shade out the red clover. A light grazing can be carried out in the autumn instead of a fourth cut but care must be taken to avoid poaching and grazing too tight. The DMD of the silage starts to drop significantly when the red flower starts to emerge similar to the seed head with grass. The red clover silage can be cut at the normal cutting height for mowers, which is in the region of 5cm. Avoid cutting much lower than this as it could damage the growing point of the

red clover (crown). Apply FYM or slurry at the start of the year. Follow each cut with slurry if available. Red clover silage is particularly hungry for Potassium (K) (25 kg K/ha per tonne DM harvested). Consult your organic advisor regarding K fertiliser allowances on your farm.

Clover establishment

Reseeding is the most reliable method to establish clover. Ploughing or disking will work equally well as long as a fine firm seedbed is established. Clover seed is tiny and has small energy reserves so loose 'fluffy' seedbeds and burying the clover seed deeper than 1cm will reduce its establishment. Spring reseeding is the best as it provides more suitable soil moisture and soil temperature for clover to establish. After sowing it's important to graze this swards at covers of 1,100 kg DM/ha for the first three grazings (white clover grazing swards). These swards should be grazed last in the Autumn to allow light down to the clover over the winter. Red clover swards can be cut for silage immediately after reseeding.

Some of the grass seed mixtures suitable for grazing and silage are;

Grazing options:

- 2kg white clover and 13 kgs grass per acre
- 2 kg white & 2 kg red clover & 11 kgs grass/acre

Silage options:

- 4 kg red clover & 11 kg grass/acre (25% clover mix)
- 4 kg red clover & 1 kg white clover & 10 kg grass per acre
- 5.5 kg red clover, 5.5 kg grass and 2 kg white clover/acre (55% clover mix)

At least 4 kg of red clover per acre should be included in a silage mixture and 2 kg white clover per acre in a grazing mix.

Varieties:

White clover varieties are classified by their leaf size, which determines there suitable for different swards and types of livestock. Every effort must be made to source organic seed, where possible, use varieties from the Irish recommended list (Table 1).

Table 1: White Clover varieties from the Department of Agriculture Irish recommended list

Leaf size	Suitability	Recommended Varieties
Small	Grazing-Sheep	Coolfin, Galway, Aberace
Medium	Grazing-Cattle	Chieftain, Buddy, Iona, Crusader, Aberherald
Large	Grazing cattle/Silage	Barblanca, Violin, Dublin, Alice

There is currently no red clover recommend list in the Republic of Ireland. The most recent Northern Ireland Recommended list included the following red clover varieties; Merviot, Milvus, Lemmon, AberClaret, Aberchianti, Fearga and Amos. The 'Recommended Grass and Clover List for England and Wales' is available on line and has varieties of red clover tested under climatic conditions similar to Ireland.

Over-sowing

Over-sowing is best suited to swards that already have an existing level of clover and good soil fertility. The sward must be open as soil to seed contact is vital for success. Oversowing should be carried out in spring after a tight grazing or a cut of silage. Having sufficient moisture in the soil at the time of over-sowing and immediately after is vital for successful over sowing. Clover seed can be broadcast with a fertiliser spreader by mixing it with gran-lime in the field or by stitching it in with an over-sowing drill. A rate of 2-2.5 kg unpelleted white clover per acre should be applied for over-sowing. After over-sowing the sward should be grazed at a cover of 800-1,000 kg DM/ha for three rotations to reduce competition from the grass in the sward.

Conclusion

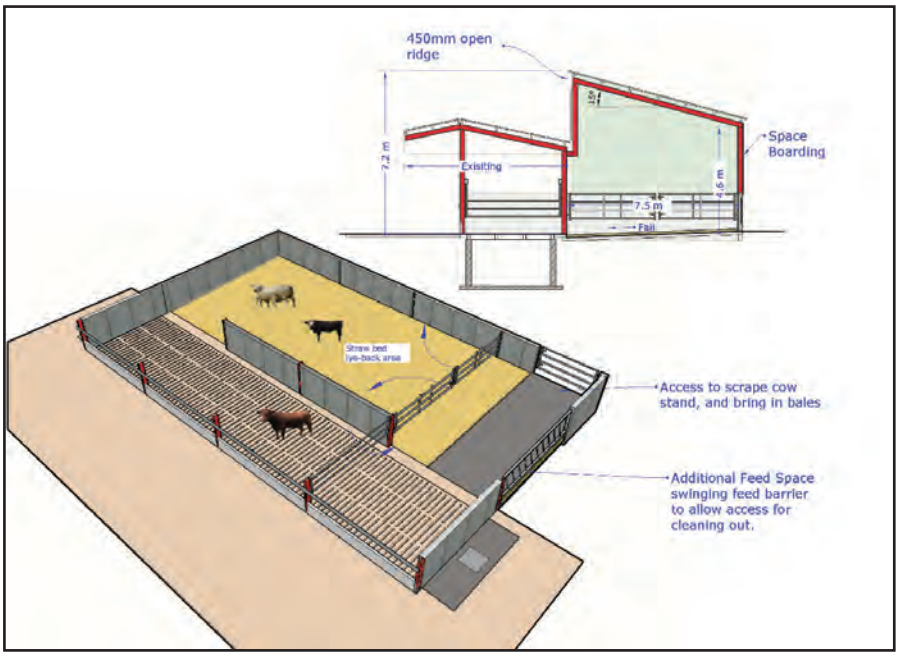
Red and white clover is a very important source of N on organic farmers and can significantly increase forage yield and quality. Spring reseeding is the most reliable method to establish clover. Appropriate seed mixtures and clover varieties should be selected when establishing clover based silage and grazing swards. Management practices mentioned herein such as cutting schedule (red clover) and late autumn grazing (white clover) is important to maximise the clover of the sward and thus attain the benefits of clover.

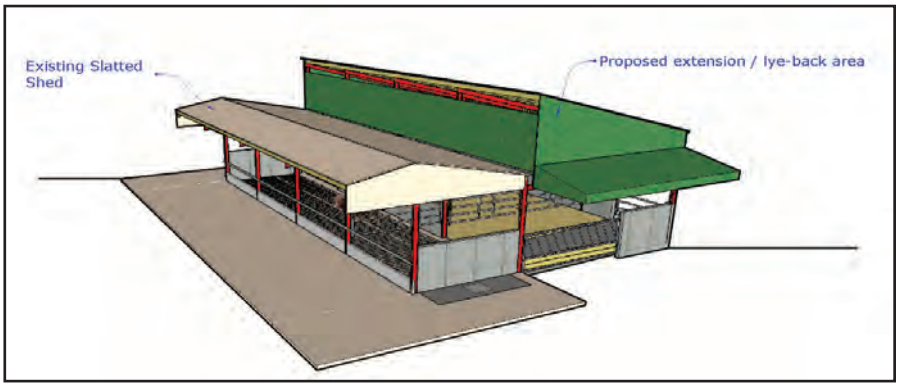
Housing Requirements of Organic Livestock

Tom Fallon,
Farm Buildings & Infrastructure Specialist, Teagasc Kildalton, Piltown, Co. Kilkenny.

	M2/head	Shed Capacity
Weanlings up to 350 kg	4	55
Finishing heifers (500kg)	5	44
Suckler Cows (600kg)	6	37
53% of the overall shed area is straw bedded		

The example below shows how a lie back could be added to an existing 4 bay slatted shed. The pen width in the slatted area is 4.35m with 3.8m (12.5 feet) slats. The additional shed is relatively high reflecting the need to cope





with about 1.5m of bedding if allowed to accumulate under the stock. Some farmers will chose a sunken floor but the capacity of the adjacent tank must facilitate this. It is assumed that the size of the existing stanchion is adequate to support the additional structure. The additional feed space facilitates all animals eating together as per natural herd behaviour, this may not be needed with a diet feeder etc.

Cost	**€40,910**
(TAMS cost €21,680)	
TAMS grant (40%)	€8,672
Net cost	**€32,238**

Quoted Cost	**€**
Shed	26,000
Walls	5,120
Floors	5,190
Feed barrier & gates	2,600
Electricity & miscellaneous	2,000
Total	**€40,910**

It is a good practise to get a number of quotations and to always stipulate that all work complies with Department of Agriculture, Food & the Marine Specifications S101, S117 and S128.

Assessing soil Compaction and Soil Quality

Giulia Bondi[1]; Cathal Somers[2]; Owen Fenton[1], David Wall[1]
[1] Teagasc, Johnstown Castle;
[2] Teagasc, Advisory Office, Mullinavat

Summary

- Soil quality is the soil's ability to provide a range of different services through its capacity to perform soil functions under changing management and climatic conditions.
- Soil structure is a measure of soil quality that can be easily assessed by using cheap, quick and user-friendly methodologies.
- Visual soil assessment techniques allocate an objective score based on manually breaking down a sample of soil by hand to assess specific soil features.
- GrassVESS: key features of soil structural quality are colour, aggregate size, shape and strength, pore structure, the presence of roots at different levels etc.
- This tool can be used by farmers and practitioners to check the quality status of their land.

Prevention is better than cure:

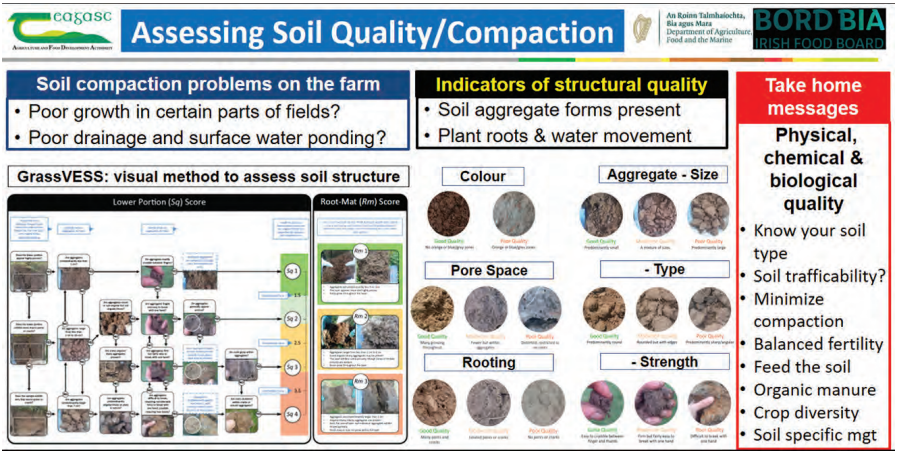
- Get to know your soil is key. Determine whether your management is having a negative impact and know where the problems are located within fields/paddocks.
- Avoid machinery and livestock traffic on wet soils. Soil structure is weaker when wet and prone to damage.
- Maintain nutrient balance is key to soil stability and resilience. SOM helps form soil aggregates by gluing soil particles together helping it to resist compaction.
- Soil biology, including plant rooting system is key to structural resilience. When soil structure is damaged, it is the action of soil organisms and roots which helps repair the damage by breaking up compacted layers.

Other resources & online information:

Some related outputs are available in the SQUARE webpage
https://www.teagasc.ie/environment/soil/research/square/support-material

The Soil Structure ABC:
https://www.teagasc.ie/media/website/environment/soil/The-soil-structure-ABC.-A-practical-guide-to-managing-soil-structure.pdf

Email:
Giulia.Bondi@teagasc.ie; David.Wall@teagasc.ie; Cathal.Somers@teagasc.ie; Owen.Fenton@tegasc.ie



Soil Biodiversity - benefits and strategies to improve biodiversity in your soil

Fiona Brennan[1]; Aoife M. Duff[1]; Natalie J. Oram[1]; Israel Ikoyi[2]; Kerry Ryan[1]; Yahaya Jebril Amanor[1]; Aaron Fox[1]; Arne Schwelm[1]; Katie Martin[2]; Aisling Moffat[3]; Sorcha Kelly[1]; Meritxell Grau Butinyac[1]; Rose Edwin[4]

[1] *Teagasc, Johnstown Castlel;*
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[3] *Teagasc Oakpark;*
[4] *Teagasc Moorepark*

Summary

- Soil physical health is essential for soil biological health. Visual assessment techniques including assessment of soil colour, structure and plant rooting patterns provide useful information about the health of the soil habitat. Soil physical health assessments can be carried out using GrassVess (grassland) or double spade method (tillage) techniques, and this can be done in tandem with observation or counting larger organisms such as earthworms.
- Physical damage to soil can be minimised by keeping soil vegetated, and avoiding machinery or animal traffic when soil conditions are unsuitable. Reduced tillage practices can also be beneficial for soil organisms that are particularly sensitive to them for e.g. earthworms.
- Diversifying crops, and thus creating a variety of habitats belowground, through implementation of practices such as crop rotation, cover crops, intercropping and mixed species swards (MSS) can mitigate soil erosion and biodiversity loss. Cropping systems such as MSS further help with drought resilience and enable reduction/elimination of N fertilisation, which is beneficial for soil biodiversity.
- Organic matter is hugely important to the physical, chemical and biological health of soil. Tillage soils or soils that are subject to continuous silage production can see a decline in organic matter quantity or quality over prolonged periods, if organic matter is not returned. Application of

organic manures and slurries, incorporating crop residues, diversifying your crop, crop rotations, grassland swards and always having a living root in the ground can all play a role in ensuring that the organic matter in your soil will support diverse soil biological communities.

- Optimising your soil fertility with the use of soil tests and liming to the correct pH for your system.

Other resources & online information:

Twitter:

@Soilmicrobio; @SOILGUARD_H2020, @MASTER_IA_H2020

Teagasc Website:

https://www.teagasc.ie/contact/staff-directory/b/fiona-brennan/

SOILGUARD

Kerry Ryan[1], John Finn[1], Fiona Brennan[1].
[1] Teagasc Environment, Soils and Land-use Department in Johnstown Castle, Co. Wexford.

About SOILGUARD

SOILGUARD is a European project that aims to improve and standardise methods for measuring soil biodiversity, and increase understanding of soil species distributions across different European regions.

What is soil biodiversity, and why is it important?

Soil biodiversity includes all life in the soil, from genes to communities, and the habitats they live in. The vast majority of life in the soil is microscopic. One teaspoon of soil contains more living organisms than there are people in the world! The microorganisms control a wide range of ecosystem services, such as nitrogen and carbon cycling. These ecosystem services are essential to agricultural systems and are strongly influenced by land management. Therefore, it is important to understand how soil biodiversity differs between land management practices so we can better maintain and improve it.

What are we measuring in Ireland?

We are compared soil biodiversity between perennial ryegrass grasslands with high levels of N fertilisation and multispecies grasslands with lower levels of N fertiliser inputs. We sampled a number of farms across the country to assess their soil biodiversity under the different sward types. We measured the background physical-chemical properties of the soil, such as pH and total carbon levels. We are also measuring and identifying species and communities of nematodes (microscopic worms) and micro-arthropods in the soil. We also collected samples that we will use to investigate soil microbes, including bacteria, fungi and viruses.

This study will increase our understanding of the effects of farm management on soil biodiversity and ecosystem services in intensively managed agricultural grasslands. This will also help us better understand and develop standard ways to measure soil biodiversity.

Perennial ryegrass

Multispecies sward

Measurements of soil biodiversity

- Physical-chemical properties (e.g. pH, total N, total C, %OM)
- Soil bulk density
- Phospholipid fatty acid (PLFAs) and soil biodiversity through eDNA surveys (Soil microbiome)
- Soil nematodes
- Soil micro-arthropods
- Litter decomposition & plant species of conservation interest

Take home messages:

Through this work, SOILGUARD aims to clearly describe the relationships between soil biodiversity and agricultural soil management at a global scale, to provide a better understanding of soil biodiversity and its importance in agriculture.

For further information or to become a SOILGUARDIAN:

SOILGUARD is a project funded by the European Union Horizon2020 Research & Innovation programme.

Website: www.soilguard-h2020.eu
Twitter: @SOILGUARD_H2020
Facebook: @SOILGUARD
Instagram: soilguard_h2020
TikTok: @soilguard
LinkedIn: SOILGUARD
eMail: Kerry.ryan@teagasc.ie

Soil Fertility and getting the basics right

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Maintaining good soil will be a key foundation to successful organic farm production. Soil testing will provide an insight into field by field soil fertility status at a small cost of €1.25/ha/yr. This will provide the basis for correcting and maintaining soil pH through planned lime applications. Maintaining optimum soils pH will increase the availability of major plants nutrients as N, P, K, Mg, Ca and S and release up to 70 kg N/ha/yr.

Soil testing

Test soils once every 2 to 4 years and sample every 2 to 4 ha depending on field / paddock size. Ensure soil samples are taken to the correct soil sampling depth of 10cm and take 20 soil cores per sample. This will establish soil fertility levels and provide the basis to preparing a farm fertiliser plan.

Soil pH & Lime

Only apply lime based on the most recent soil test report and aim to maintain grassland soils in the range of pH 6.3 to 6.5. For grass / clover swards aim for a high pH range of pH 6.5 to 6.8 to promote clover and maximise sward N fixation during the growing season. For cereals, maintain a soil pH + 6.5. Ground limestone is the most cost effective long-term option for correcting soil acidity and maintaining soil pH.

Balancing Farm Gate Phosphorus (P) and Potassium (K) Removals

Farm gate P and K removals can be calculated to estimate the amounts of P and K leaving the farm in farm produce (meat, milk, grain etc..). Table 1 overleaf shows the amount (kg) of P and K removed in different farm produce. The levels of P and k removed will depend on farm productivity.

Nitrogen

Nitrogen may often be the limiting factor therefore priming soils by maintain good soil structure and optimum soil pH will increase soil N

Table 1: Nutrient content of various farm produce

Product	P (kg)/ton	K (kg)/ton
Milk (1,000kg)	1	1-2
Meat (1,000kg)	1	2
Grain (1t)	3.4	4.7
Potatoes (1t)	0.6	4.9

Sources of nutrients

supply. Legume crops such as white (grazing) and red clover (silage) under good conditions it can supply 100 - 250kgs of N per ha per year, provided soil fertility is right and grassland management is good.

Phosphorus and Potassium

A key component of building and maintaining P and K in organic farming is a readily available supply of organic manures. Manure recycling will help replenish soil reserves and ensure that annual crop nutrient requirements are satisfied. Test organic manures to determine their actual nutrient values and apply on a rotational basis depending on crop / soil nutrient requirements. Importing organic manure from other farms is the option chosen on many farms as a method of sustaining the production on farm. Organically approved fertilisers such as sulphate of potash (K & S) are commonly not only applied in vegetable production but grass and crop production too.

In conclusion

Take soil samples on a regular basis to establish / monitor soil fertility. Prepare a farm nutrient management plan to guide the application of lime and organic manures during the growing season. Aim to maintain good soil fertility to improve the supply and efficiency of such nutrients as N, P & K and sustain good farm productivity annually.

Increasing biodiversity on organic farms

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Summary

- Wildlife measures designed and targeted for specific farming systems can play an important role in halting the decline of biodiversity and achieving the goals of sustainable agriculture.
- Retain, Enhance, Create: The quantity of existing farmland habitats should be ***retained***, and the quality ***enhanced*** before new biodiversity habitats are ***created***.
- New biodiversity measures could be targeted to less-productive areas of the farm, but should not replace existing wildlife habitats.

Introduction

Wildlife habitats such as hedgerows, field margins, ponds, wetlands, and woodlands, commonly occur on Irish farms. These habitats are vital to biodiversity, whilst also providing important benefits (ecosystem services) to agricultural systems, including nutrient cycling in soil, flood prevention, regulation of pests and diseases, pollination and carbon storage.
Policy agendas are focusing more on sustainable management of agricultural land, recognising the need to increase production (to cope with increasing food demands), without compromising the environment and ecosystem services. The *Farm to Fork Strategy* recommended that 10% of agricultural areas should be under high-diversity landscape features. More recently, the draft *Common Agricultural Policy (CAP) Strategic Plan* requires that 4% of agricultural area should be landscape features, with incentives (under Ecoschemes) for those who exceed this 4% threshold. It is estimated that natural and semi-natural habitats constitute over 6-7% of farm area on intensive farming systems and are substantially higher on more extensive farming systems.

Retain existing habitats

The retention of existing habitats is vitally important, as these habitats typically deliver greater ecological benefits compared to newly created

habitats. Existing habitats, including woodland plots, scrub, ponds and wetlands should be protected from more intensive agricultural management. These areas should be appropriately managed and avoided when sites are being selected for 'new' biodiversity or carbon initiatives.

Enhance the quality of habitats

Retention of habitats does not guarantee the quality of habitats. Hedgerows for example are a dominant habitat feature on Irish farms, however the quality of many hedgerows is frequently low. To enhance the ecological quality of habitats, they should be protected from intensive agricultural management.

Hedgerows

High quality hedgerows provide multiple benefits, including shelter for stock, biosecurity; improving water quality; sequestering carbon; and biodiversity benefits. Optimal management include:

- The sides of hedges could be trimmed less frequently, with the top allowed to grow taller. This provides greater shelter and stock-proofing for animals, and improves diversity and quality for wildlife.
- Replant escaped or 'gappy' hedgerows with native species (e.g. hawthorn). Native species support a greater abundance and diversity than non-native species.
- Leave trees or bushes to mature. Mature trees and bushes provide greater feeding and nesting habitats for birds, pollinators and a variety of other species.

Ensure that appropriate management is undertaken outside the closed period from March 1st to August 31st

Watercourses and buffer zones

Riparian buffer zones are areas of permanent vegetation adjacent to rivers and streams that are typically excluded from intensive farming practices. Appropriately managed buffer zones play an important role in maintaining water quality, ensuring bank stability and providing a habitat for biodiversity. To optimally manage these areas:

- Avoid nutrient application in the buffer zone.

- Allow vegetation in the strip to develop, but avoid the strips becoming dominated by scrub.
- Exclude livestock fully from watercourses (if feasible).
- If cleaning the channel-bed, the spoil should be deposited away from the buffer strip. Consult with Inland Fisheries Ireland prior to undertaking any in-stream management.

Create new habitats

New biodiversity measures play an important role where there is a lack of existing habitats. New measures could be targeted to less productive areas of the farm. However, replacing existing habitats with newly created habitats is poor practice and typically results in a reduction in farmland wildlife.

- Wider field margins provide a habitat for plants and animals, can prevent undesirable plant species from encroaching into the field, and more easily facilitate management of hedgerows.
- Awkward field corners could be left uncut following silage removal. This temporary measure provides food and cover for a variety of species such as farmland birds and small mammals. Corners could be grazed-off when animals are re-introduced to the field.

All farmers can help protect the wildlife on their farms. Retaining, Enhancing and Creating habitats can play an important role in the reversal of biodiversity decline and ensure the continued delivery of crucial ecosystem services. Such approaches can offer significant marketing opportunities to Irish farmers and retailers in terms of capitalising on Ireland's reputation for sustainable production systems.

Agricultural sustainability support and advisory programme (ASSAP)

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Summary

- Ireland has been set a target by the E.U. Water Framework Directive of achieving 'Good Status' for all waters.
- The River Basin Management Plan for Ireland sets out Irelands plan to achieve good status
- The ASSAP service is available to farmers in 190 Priority Areas for Action (PAA's) and is a key part of helping achieve good status
- The ASSAP is a free and confidential advisory service available to all farmers in a PAA

Introduction

In Ireland all water policy and management is led by the Water Framework Directive. Under this directive Ireland has been set a target of achieving at least 'good status' for all waters in Ireland. However, despite a lot of good work over the last 20-30 years we are falling short in achieving this target and water quality has declined in recent years.

Irelands response to challenges around water quality is set out under the national river basin management plan. As part of this plan, 190 priority areas for action (PAA) have been identified across the country where water quality improvements need to be made. There are multiple pressures across each of these PAA's including industry, waste water treatment plants and septic tanks, forestry, agriculture and urban pressures.

Implementation of the ASSAP

The Local Authority Waters Programme (LAWPRO) have deployed a catchment assessment team of 60 scientists across the country to assess streams in PAA's in detail and identify the significant pressures impacting water in each PAA. This group communicates the detailed information about

the PAA to all of the stakeholders across the local community including agricultural and non-agricultural land owners and businesses.
Where an agricultural pressure is identified the farmers in the area will receive the offer of a free farm visit from an advisor under the ASSAP programme.

Figure 1: Heavy rainfall leads to overland flow of water, Phosphorus and soil particles

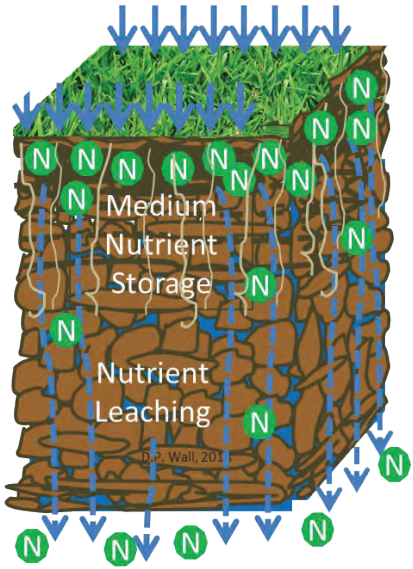

Figure 2: Nitrogen that is not used up by grass/ plant is available to leached to groundwater/ streams during heavy rainfall

The ASSAP programme is made up of a group of 35 advisors (20 working under Teagasc jointly funded by DHLGH and DAFM and 15 advisors from the dairy processing co-ops). These advisors are available to provide farmers with a free and confidential advisory service that farmers in a PAA can avail of on a voluntary basis.
The advisors will meet the farmer to assess the farm for any potential issues that are having an effect on the water quality in the local stream. In general an advisor will assess the farmyard, nutrient management practices and general farm land management practices including the use of pesticides and other toxic substances like sheep dip, etc.
At the end of a visit the advisor and farmer will agree on where the farmer should focus improvements or actions, if any are required, on his farm.

The practical advice will be designed to 'break the pathway' and prevent nutrients and other contaminants from entering water. A written summary of the advice and actions will be provided and a timeframe for completion agreed between them.

Conclusion

The ASSAP programme is collaborative and the funding and support received from DAFM, DHLGH and the dairy industry has been critical to allow a new approach to enabling local landowners to engage positively in seeking solutions to local problems with the support of a confidential advisory service. Support from the farming organisations for the programme has been very strong and this is vital in communicating and informing farmers about the ASSAP programme and its key messages.

The Signpost Programme; leading climate action by irish farmers

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Summary

- The Signpost Programme is a Teagasc-led, whole of industry partnership to support and enable farmers in climate action.
- A network of almost 120 Signpost demonstration farmers has been established, including five organic farmers.
- Organic farming offers a complete approach for reducing greenhouse gas emissions (GHG) and increasing soil carbon sequestration while sustaining healthy soils and protecting biodiversity.

Introduction

The Signpost Programme is a Teagasc-led, whole of industry partnership to support and enable farmers in climate action. While the focus of the programme is to support farmers in reducing greenhouse gas (GHG) emissions, it will also help with advice regarding improving water quality and enhancing biodiversity on Irish farms. Programme partners include farmers, agri-food industry organisations, state organisations, farm organisations and media. You can find out more about the Signpost Programme at www.teagasc.ie/signpost.

There are three main pillars to the Signpost Programme, namely (1) Signpost Farms, (2) Signpost Advisory Campaign, and (3) National Agricultural Soil Carbon Observatory (NASCO).

Signpost Farms

A network of almost 120 demonstration farmers has been established and this network will play two critical roles: (1) be amongst the first to adopt climate mitigation technologies; (2) share their experiences with other farmers through farm walks, events, articles, videos, media etc. Five organic Signpost Farmers are included in this network.

Signpost Advisory Campaign

Teagasc proposes to establish a new, targeted advisory service focussed on climate action and sustainability. This new service will provide training opportunities (to enhance farmer knowledge and skills and facilitate farmer-to-farmer learning) and targeted follow-up one-to-one support to farmers, leading to the creation of farm specific action plans. This will augment current advisory activities and will be provided free-of-charge to all participating farmers. Teagasc expects to launch this new service before the end of 2022.

National Agricultural Soil Carbon Observatory (NASCO)

This new on-farm research project aims to deepen the understanding of soil carbon sequestration. The Signpost Farms form an integral part of this Observatory. Agronomic soil samples (to 10cm) have already been taken on the Signpost Farms to establish baseline soil carbon levels, and plans are in place for more detailed soil sampling (to 1m depth). In addition, flux data from long-term eddy covariance towers will provide detailed information on carbon exchange at an ecosystem level; these towers will be located on a subset of the Signpost Farms.

Reducing GHG emissions

Recently the Irish Government agreed a sectoral target to reduce agricultural emissions by 25% by 2030 (as part of an overall ambition to reduce overall emissions by 51% in the same period). Previous Teagasc research has identified a range of measures which farmers can use to reduce emissions (see table below), and the rapid and widespread adoption of these measures by Irish farmers can be expected to make a significant contribution to reducing emissions. Each farmer will have to identify and implement the best solution for their farm business, and the Teagasc Advisory Service is ready to help farmers develop tailored solutions for their farm.

While the first two mitigation actions listed in Table 1 (overleaf) are not relevant to organic farmers as they relate to the (reduced) usage of fertiliser nitrogen, many of the other actions listed are central to successful organic farming.

Table 1. List of climate mitigation actions

- Reduced fertiliser N usage and losses
- Use of protected urea
- Application of lime
- Maintenance of correct soil P and K levels
- Use of LESS equipment/ timing of slurry application
- Better grassland management – more home grown feed
- Incorporation of clover and/ or multi-species swards
- Management of the farmyard to avoid nutrient losses to water
- Provision of adequate slurry & soiled water storage
- Improved herd health
- Continuously aim to breed better/ more efficient animals
- Optimisation of herd/ flock replacement rate
- Management of field margins/ buffer strips
- Side trimming only of escaped hedges
- Retention of thorn saplings/ flowering trees
- Incorporation of cover crops, straw chopping and planned rotations
- Forestry/ native woodlands/ shelterbelts

Organic farming benefits for the climate[1]

Organic farming offers a systemic approach for reducing greenhouse gas emissions (GHG) and increasing soil carbon sequestration while sustaining healthy soils and protecting biodiversity. The ways in which organic farming can contribute to reduced GHG emissions include:

- No chemical N fertiliser;
- Reduced nitrous oxide emissions from soils;
- No pesticides;
- Reliance on closed nutrient cycles;
- Limited stocking rates (matching to farms ability to grow forage);
- Reliance on home grown forage;
- Improved manure/ slurry management and usage;
- Improved soil carbon sequestration; and
- Improved species and habitat diversity.

So, while farmers converting to organic farming can potentially reduce their farm's GHG emissions in this way, both converting and existing organic farmers need to focus on the technologies in Table 1 to reduce their farm's GHG emissions over time.

Conclusion

In summary, Ireland has a strong international reputation as a supplier of sustainably produced food and drink. However, the Irish agri-food industry, including farmers, is challenged to become even more sustainable over the coming decade. This will require an even greater focus by farmers on caring for the environment and making space for nature, while continuing to produce high quality food and drink. Organic farming has a part to play in ensuring that Irish farming becomes even more sustainable.

[1] Organic agriculture and its benefits for climate and biodiversity, IFOAM Organics Europe, April 2022, available online at *www.organicseurope.bio*

Teagasc Biodiversity Management Practices Self-Assessment Tool: Linear Habitats

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Summary

The Teagasc Biodiversity Management Practices Self-Assessment Tool: Linear Habitats shows how well the linear habitats on a farm are managed to deliver biodiversity side by side with productive agriculture. The four element are:

- Hedges.
- Farming platform structure
- Field margins
- Watercourses

Introduction

Biodiversity management practices undertaken by farmers are a key element of farm sustainability. There is a need to include biodiversity management in the assessment of farm sustainability. This paper draws on existing evidence and literature to inform the development of an innovative, affordable, repeatable and rapid assessment tool that measures biodiversity management practice on farms and gives clear messages on Best Practice Biodiversity Management. The tool combines four elements of intensively managed livestock farms, which are of high relevance to biodiversity management, namely: hedges, farm landscape structure, field margins and watercourses (Figure 1).

In order to effect biodiversity practice change on farms, engagement with farmers is key. A study on biodiversity knowledge exchange with Irish farmers using face-to-face questionnaire-based interviews on-farm concluded that while farmers were positive towards biodiversity, it was

not a priority. There was a lack of understanding of biodiversity, requiring effective training. Farm advisors were identified as the key source of environmental information, and along with other farmers and family members, were key influencers of farming decisions.

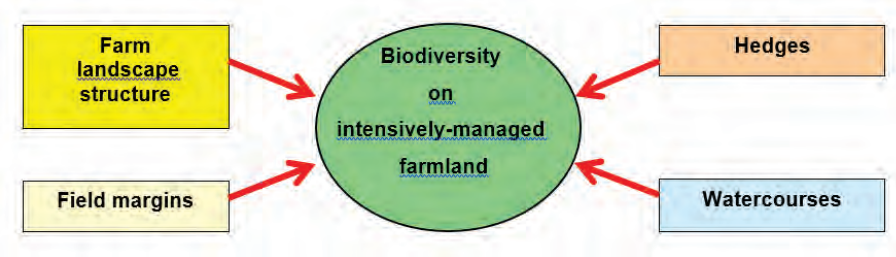

Figure 1. Diagrammatic representation of the characteristics of farms that combine to reflect biodiversity on intensively managed Irish farmlands

Hedges

Hedgerow structure is important for biodiversity. There are two distinct hedge types in Ireland. Both types are good, but each requires very different management. A lack of understanding of each hedge type leads to inappropriate management and damage to hedges. Ideally, each farm should have both types of hedges present to maximise biodiversity benefits.
Escaped (never-topped) hedge or treeline: Do NOT top. Side trim only
Topped hedges: Top to maintain as a hedge – a little above the previous years cut. Aim to grow up to at least 1.5 m and retain a new thorn tree in every hedge

Figure 2. Do not top an 'Escaped hedge' and do not let a 'Topped hedge' escape.

The bigger and bulkier a hedge is the better. A hedge height over 1.5 m provides suitable nest sites for birds with adequate cover above and below their nests. Birds do not nest at the base of hedges where foxes can reach them. Neither do they nest at the top of a hedge, exposed to birds such as magpies or birds of prey.
Flowering hedges provide flowers for bees and fruit and seeds for birds and small mammals. Escaped hedges flower freely with the biodiversity value in their canopy. Topped hedges with a dense base provide great cover at ground level for mammals as well as nest sites. With the recommended regular hedge cutting necessary for maintenance (little and often is recommended), there are few flowers or food on the body of Topped hedges. Retaining occasional thorn trees provide flowers and food. Existing Topped hedges with no mature thorn trees can be greatly improved by selecting individual or clumps of thorns from within the hedge and allow to develop into mature trees. The practice of retaining an occasional new thorn tree every year provides a diversity of tree heights. Songbirds use smaller developing trees which are a metre or so above the body of a hedge as 'songposts'.

Farmed landscape structure

Agricultural landscapes can be viewed as a mosaic of habitats, many linear in nature, within agricultural land. Average field size has the strongest overall effect on biodiversity on intensively managed farmland. The positive effect of decreasing average field size is not due to an increase in cover of natural and semi-natural areas in landscapes with smaller fields. Rather for a given amount of natural or semi-natural cover, farmlands with smaller fields have higher biodiversity. Linear habitats are networks or corridors for nature through the countryside. Their greater edge: area increases habitat diversity.
Under the Environment Impact Assessment (Agriculture) Regulations, permission must be sought from the Department of Agriculture Food and the Marine where hedge removal will result in a field over 5 ha. Farmed landscape with average field size less than 5 ha provides networks for nature and corridors of movement for birds, bats, bees and butterflies to move through the countryside.

Field margins

Field margins are a rough grass habitat, which is absent from a lot of intensively managed farmland in Ireland. Uncultivated and unsprayed field margins allows the rough grass margin to continue undisturbed, protecting the soil biodiversity. Their presence allows grasses and wildflowers to flower and seed, providing habitat for associated invertebrates, birds and small mammals. Birds such as linnet feed on grass seed. There is a high biodiversity value in native plants growing wild naturally. Wildflowers growing wild in unimproved field margins undisturbed and unfertilised for millennia are not to be confused or equated with sowing unregulated packets of flower seed following cultivation and the pre-existing plants (or 'weeds') sprayed-off to make the area look 'pretty' for a short time until the process is repeated. In this latter case, the word wildflowers has been hijacked!

We need to maintain our native species of flora and fauna, which have been here for thousands of years and are in tune with each other with regards timing of flowering and other growth stages. Some are inconspicuous – in other words, they may not be 'showy' or attractive to humans. Actions to protect our declining biodiversity must be evidence-based and directed by science, rather than individual preferences. It cannot be about actions that make the landscape attractive to humans, those that are easiest, or about focusing on one species at the expense of others.

Watercourses

All watercourses are important for biodiversity, including small watercourses and drains which are important in their own right, and also important for their influence on larger watercourses. Fenced watercourse banks prevent siltation from eroded banks allow natural bankside vegetation to flourish. Watercourse margins provide further protection for watercourses and allows space for native wildflowers and grasses to grow, providing habitat for associated fauna. Prevention of livestock drinking access to watercourses prevents siltation of watercourses, and protects the habitat for instream biodiversity

Conclusion

Linear habitats comprising hedges, field margins and watercourses are valuable habitats for biodiversity within the farming platform, alongside

land managed for agricultural production. Best practice biodiversity management practices on these linear habitats are important. Complete the Teagasc Biodiversity Management Practices Self-Assessment Tool: Linear Habitats for your farm to see how you score (see below).

Teagasc
Biodiversity Management Practices
Self- Assessment Tool: Linear Habitats

	Tick if Yes
Hedge Management	
1. Is the height of all your internal hedges at least 1.5m above ground level (or above hedge bank if present)?	
2. Is there a flowering thorn tree* in every hedge?	
Layout of Farming Platform	
3. Is your average field size** less than 5 ha?	
Field Margin Management	
4. Do you always retain at least 1.5m uncultivated margins when cultivating?	
5. Do you avoid spraying within your field margins (except for spot spraying noxious weeds)?	
Watercourse Management	
6. Are all watercourse banks on your farm fenced?	
7. Is there a fenced margin over 1.5m on all watercourses?	
8. Do you prevent livestock drinking access to all watercourses?	
What is your score? (*TOTAL number of Ticks*)	
Target Score = 8	

***Flowering thorn tree**
- Escaped hedges (untopped / treelines) naturally contain flowering thorn trees
- Topped hedges may contain individual flowering thorn saplings or trees **IF** retained

****Average field size:**
- Owned land ..... ha/No of fields (surrounded by permanent biodiverse boundaries) ..... = ... ha
- Biodiverse boundaries include hedges, watercourses, vegetated margins, etc – Not wire fences

***** **Noxious weeds:** Ragwort, dock, thistle, wild oat, male wild hop and common barberry

Combination Crops on Organic Farms

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Summary

- Combination crops typically contain 14 – 18% protein content making them a very efficient way of getting home-grown protein onto the farm
- They are a relatively easy crop to grow
- Legume (Peas or Beans) fixes and supplies N for the crop
- Meet P+K requirement by using FYM, slurry or other suitable organic manure
- Combination crops can be harvested as wholecrop, crimped or taken to fully ripe

Introduction

Combination crops are becoming a very popular crop to grow on organic farms. Essentially, the crop is a mixture of a legume (peas or beans) and a cereal crop (barley, oats, wheat or triticale). Occasionally, the mix can contain two or more cereal species. Every effort must be made to source organic seed.

Sowing Date & Seeding Rate/Mixes:

The preferred sowing date for combination crops is late March/early April. It's important to be patient and allow soil temperatures to warm up sufficiently in Spring and for land to be adequately dry enough so as to ensure the crop emerges quickly and evenly. Aim to produce a fine, firm, level seedbed. Roll after sowing to keep moisture in the seedbed, especially in a dry season. Sowing too early in Spring can also lead to more bird attack. Crows in particular, like the legume component of the mix. Some farmers sow the legume separately to get the peas or beans down deeper to 2 inches, with the cereal sown with a second pass of the drill at about ¾ to 1 inch depth. If using a pre-mix of both legume and cereal, aim for a

sowing depth of about 1 inch. Keep a watchful eye for bird damage in the early stages of establishment, and use appropriate deterrents (scarecrows/ bangers) if required.
If peas in the mix, ensure ratio of cereals to peas at least 50%, but preferably 60% cereal and 40% peas. Peas on their own are prone to lodging, so the cereal acts as a support to prevent lodging.

N, P & K Requirement of Combination Crops

As with any tillage crop, a recent soil test is the best starting point to address the nutrient requirement of a combination crop. The target pH for many tillage crops is slightly higher than for grass. Having the soil pH between 6.5 to 6.8 provides the best conditions to allow better availability of P and K for crop growth. The N requirement will be mainly met by the legume component of the mix being able to fix N for plant growth. However, extra N and the P and K needs of the crop can be supplied with a suitable source of organic manure, such as FYM, cattle slurry or other organic approved manure source. Adjust rates of organic manure based on the P and K analysis from the soil test and the projected target yield of the crop. It's very important to note the final yield of the combination crop, as a high yielding crop will remove considerably more P and K from the soil than a low yielding crop. Ideally, the off-take of P and K should at least match the rate of P and K applied in the organic manure to grow the crop.

Harvesting Combination Crops:

There are a number of ways to harvest combination crops, depending on which way the crop is going to be utilised.

Wholecrop

Cutting as a wholecrop and putting in the pit as fermented wholecrop involves cutting with a silage harvester fitted with a wholecrop or disc header. Alternatively, the wholecrop can be mown and then picked up with a grass header. Regardless of which silage harvester machine type used, the timing of cutting is important. The aim is to cut at a growth stage when the cereal in the mix is at the soft cheddar cheese stage. If harvesting too early, the crop will have a poor dry matter which increases the risk of poor fermentation and preservation. If left too late to harvest, the cereal grains

may prove difficult for livestock to digest. The cereal straw and legume stems are a valuable source of effective fibre which is an essential component of a healthy rumen.

Crimp

Another way of harvesting combination crops is to harvest with a conventional combine when the cereal grain and legume grain are between 30-35% moisture (about 2 to 3 weeks before fully ripe) and then crimp the grain. This involves passing the grain through a crimping machine which cracks the seed coat to expose the starch. The moist crimped grain is then ensiled in an airtight clamp.

Harvest Fully Ripe

The third option is to let the crop ripen fully and harvest with a combine. It's important to try and cut at low grain moisture, below 20% moisture, and preferably closer to 15% moisture if planning to store the grain for longer-term use. High moisture grain, if left in a pile, will heat quickly. Some growers store the grain in a loose shed and turn regularly with a loader to get moisture content down to 15%. If the grain is a little higher in moisture (17 to 25%), another option is to treat the grain with organic acid treatment (propionic acid). More recently, it has become popular to roll grain at the time of organic acid treatment using a crimping machine. The grain is then stored aerobically in a vermin proof shed, and kept cool to prevent insect damage.

Production from multi-species swards

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Summary

- Multi-species swards ((MSS), composed of grasses/legumes/ herbs/ forbs)), can markedly out-yield perennial ryegrass monocultures when receiving zero inputs of inorganic nitrogen fertilizer, and can produce similar yields to perennial ryegrass with higher inputs of nitrogen fertilizer.
- The inclusion of MSS, with their competitive yield advantage under zero chemical fertiliser N applications, makes them worthy of investigation for organic livestock systems.
- Early results suggests that herbage yield is primarily 'driven' by the legume (clover) component in the MSS.
- Relatively little is known about their persistency under grazing.
- Research is ongoing at Teagasc Grange (and Johnstown Castle and at UCD) to quantify the potential benefits of MSS for beef production systems.

Introduction

Under EU and national legislation, the agriculture sector has to reduce greenhouse gas (GHG) emissions and losses of nutrients to the environment. The ever-increasing cost of farm inputs, accelerated by international unrest, poses extra challenges to current livestock faming systems and places a renewed focus on low-cost efficient grass-based beef production. Until relatively recently, perennial ryegrass has been the dominant component of grassland seed mixtures, but the inclusion of clover (mainly white clover) is now widespread and offers conventional livestock grazers opportunities to reduced inorganic nitrogen fertiliser inputs and potentially improves animal performance. The potential benefit of grass-clover, apart from their capacity to fix atmospheric N, is they have higher herbage nutritive value, palatability, voluntary intake and in many cases better animal performance. Studies have demonstrated the capacity of white clover to fix atmospheric

N resulting in annual savings of chemical fertilizer equivalent to 100-150 kg N/ha for beef cattle grazing systems. Adding other pasture component to the sward has shown herbage production benefits and these advantages are greatest at zero fertilise N inputs. These swards, with a range of added pasture species, are generally referred to as multi-species swards.

Multi-species swards (MSS)

The inclusion of a greater number of herbage species in a sown grassland sward offers potential to further exploit complementarity and synergies between different pasture species. There is now increasing interest in using multi-species swards, which include grasses, legumes (white and red clover) and herbs/forbs (e.g. chicory and plantain). Table 1 summarises earlier work at Teagasc Grange showing the yield achieved from a range of swards with increasing species diversity.

Table 1. Annual herbage dry matter production averaged across three harvests (all with zero fertiliser Nitrogen)

Species included in the sward	Annual yield (kg DM/ha)
Perennial ryegrass only	5,885
Red Clover only	11,840
Timothy, Red Clover	11,791
Italian Ryegrass, Red Clover	10,025
Perennial Ryegrass, red clover	10,771
Timothy, perennial ryegrass, red clover, white clover	10,738
Timothy, perennial ryegrass, red clover, ribwort plantain, chicory	11,679

Earlier research at Teagasc, Johnstown Castle, concluded that when optimally formulated (an equal proportion of each sward component), MSS can markedly out-yield perennial ryegrass monocultures when receiving no or low inputs of inorganic N, and can produce similar yields with reduced inputs of inorganic N fertiliser. Thus, the potential for MSS in organic cattle systems seems worthy of investigation. A two-year study at Grange looked at annual herbage production for silage compared a range of swards types by applying 0, 120 and 240 kg N/ha and showed that when grown with zero N, the largest increase in herbage yield was derived from the inclusion of

clovers, with a relatively small additional benefit accruing from including complementary herbs. The yield advantage of MSS over a perennial ryegrass declined as the rate of inorganic N increased, which also reduced the persistence of the legumes and herbs within these swards. Under favourable ensiling conditions, unwilted MSS swards can preserve satisfactorily as silage. However, under more challenging crop ensiling conditions,MSS had a greater requirement for effective preservation. In terms of crop DM content, chicory, plantain and clover have a lower DM content than grass, typically 20-30 g/kg lower, thus suggesting the desirability of wilting MSS when used for silage. Examining individual components composition throughout the year in a MSS showed the digestibility of the individual species was as at least a good, if not better, than that of perennial ryegrass grown in the MSS mixture.

There is relatively little published on the animal intake, growth and carcass traits of beef cattle produced on MSS where a complete grazing seasons and indoor winter periods are incorporated. Early findings from ongoing work at Teagasc Johnstown Castle (dairy production) and UCD Lyons estate (dairy-beef production) suggest that animal output from MSS and grass/clover swards are similar (at a reduced rate of fertiliser N application), and both sward types are potentially ahead of the higher N fertiliser input perennial ryegrass system. To help answer the gap in information for suckler beef progeny, a beef production systems research project has commenced at Teagasc Grange. The study aims to assess the impact of a) pasture-type (grass-legume versus MSS) under grazing and for silage, b) genetic divergence for fatness in late-maturing breeds, and c) slaughter age (~19, 23 and 27 months), on the biological, financial and environmental performance of suckler weanling-to-beef production systems.

Beef from an all-grass forage diet

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Summary

- Most beef cattle receive concentrates at some stage of their lifetime.
- There is increasing interest in grass-forage-only beef production systems.
- Achieving live weight, and especially carcass fat score targets without strategic supplementary concentrate is challenging, requiring forage – grazed pasture and grass silage - of consistently-high 'quality'.
- When slaughtered at a younger age, early-maturing steers may be more suited to grass-forage-only systems due to their inherently fatter carcasses; but their carcass weight and conformation score is lower when compared to late-maturing breeds.
- With organic concentrate prices being much higher than conventional feeds, all-grass finishing systems may be suitable for organic farmers.

Introduction

In Irish suckler calf-to-beef systems where animals spend up to eight months or more annually at pasture, grazed pasture and pasture silage accounts for around 90% of feed consumed. Omitting concentrates from the diet of the animal poses challenges, and demands increased animal performance from grazed and conserved forage if animals are to produce a commercially saleable product at a relatively young age. The success of the systems depends on excellent grassland management, where individual animal growth rates are maximised, and on the ability to produce high-quality silage for the winter where optimum indoor performance for both growing and finishing animals is achieved.

Failing to achieve growth targets and minimum carcass fat scores leads to under-finished carcasses or older animals at slaughter, which can be a source of inefficiency, as well as potentially increasing the environmental footprint of such a production system.

Grass-based suckler steer weanling-to-beef production systems

A study was carried out at Teagasc Grange to compare the performance of purchased early- and late-maturing sired suckler weanling steers, slaughtered at either 20, 24, 28 months of age. Animals were offered either a) grass-forage-only diet (GO) (i.e. no concentrate) and slaughtered at 20- (GO20), 24- (GO24) or 28-month (GO28) or age, or b) grazed grass-only during the grazing season but received grass silage + concentrate during the winter and slaughtered at 24 months of age (GC24). Late-maturing steers had a heavier carcass, with superior conformation, and a lower fat score (Table 1). When slaughtered directly off pasture at a mean slaughter age of 20-months, only the early-maturing breed steers achieved the minimum carcass fat score, whereas mean carcass fat score was acceptable for all breed types when slaughtered at older ages. A further study confirmed these general findings.

Table 1. Effect of sire breed maturity (B) and production system (PS) on average slaughter weight and carcass traits of suckler steers

Breed (B)	Early-maturing				Late-maturing				Sig[1].	
Production System (PS)	G0-20	G0-24	GC-24	G0-28	G0-20	G0-24	GC-24	G0-28	B	PS
Slaughter wt. (kg)	528^{a}	596^{b}	663^{c}	708^{d}	527^{a}	558^{b}	649^{c}	690^{d}	NS	***
Kill-out (g/kg)	531^{a}	527^{a}	543^{b}	538^{b}	560^{a}	569^{a}	576^{b}	576^{b}	***	**
Carcass wt. (kg)	280^{a}	314^{b}	361^{c}	381^{d}	295^{a}	319^{b}	375^{c}	397^{d}	*	***
Conformation (1-15)	5.8^{a}	5.7^{a}	6.9^{b}	7.8^{b}	7.5^{a}	8.1^{a}	8.9^{b}	9.1^{b}	***	***
Fat (1-15)	6.1^{a}	8.5^{b}	9.9^{c}	10.1^{c}	4.1^{a}	6.1^{b}	8.0^{c}	7.9^{c}	***	***

[1]NS= not significant, * = P < 0.05; ** = P < 0.01; *** = P < 0.001

Omitting concentrates during winter finishing

In a three year weanling-to-beef production system study the indoor finishing phase of suckler-bred steers reared on a grass-forage-only versus a 'conventional' grass plus grass-silage plus concentrates was compared. Grass silage dry matter digestibility was invariably in excess of 740 g/kg. Live weight gain during finishing (133-day duration) was 0.4 kg/day greater for animals offered silage plus concentrates (Table 2). This resulted in a 43 kg heavier carcass for the supplemented animals, and increased their kill-out proportion (+19 g/kg), carcass conformation (+1.30 units) and carcass

fat score (+1.92 units). A proportion (~30%) of the forage-only animals were still 'under-finished' (fat score of six or less, scale 1-15) at the mean slaughter age of 24 months.

Table 2. Effect of grass silage-only vs. concentrate supplementation during the indoor winter 'finishing' phase on suckler steer performance and carcass traits (3-year average)

	Grass silage only	Grass silage + concentrates (4 kg fresh weight /head/day)
Live weight gain (kg/day)	0.57	0.97
Winter live weight gain (kg)	77	130
Slaughter weight (kg)	620	661
Carcass weight (kg)	347	390
Kill-out proportion (g/kg)	558	577
Carcass conformation score (1-15)	7.5	8.8
Carcass fat score (1-15)	6.5	8.4

'Third' season at pasture: animal performance

Early- and late-maturing sired suckler steers, reared similarly from weaning until ~24 months of age on a grass-forage-only system, were turned out to pasture and rotationally grazed for a 110-day 'third' grazing season, before slaughter at a mean age of 28-months. A live weight gain in excess of 1.5 kg/day was achieved during the grazing season for both breed types and, as observed in other studies, the early-maturing animals were heavier (+18 kg) at slaughter. However, the higher kill-out proportion (+38 g/kg) of the late-maturing animals resulted in a heavier carcass weight (+16 kg) compared to the early-maturing animals. The late-maturing animals had a higher carcass conformation score (+1.28 units; 1-15 point scale), but a lower carcass fat score (-2.23 units; 1-15 point scale) compared to the early-maturing animals. Both breed types exceeded the minimum carcass fat score of six (on 15-point scale), suggesting that they could, potentially, have been slaughtered earlier. The early-maturing breed type that were the fattest (average fat score of >10 (4-).

Composting Cattle Manure

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Summary

- Composting of manure produces a stable material free of disease and pests
- Certain parameters have to be correct for successful composting
- Properly composted manure can be an excellent fertilizer and can also be used as an animal bedding

Introduction

Composting is an aerobic process used to decompose and stabilise organic material into a microbiologically stable material. The end product of the composting process has benefits when applied to soil in terms of nutrients and soil structure and is free from pathogen, parasites and free from obnoxious odours.

Important Compost Parameters

There are several factors which can impact the composting process and can also impact on the quality of the compost produced. Mixing raw materials or feedstock's for composting to achieve the desired compost characteristics requires the testing of the starting feedstock's, particularly for carbon and nitrogen content. It is important to have the correct Carbon: Nitrogen ratio in your compost feedstock's and perhaps when starting composting one needs to get a preliminary laboratory analysis. Cattle manure is nitrogen rich and has a C:N ratio of 20 but can vary depending on the animal diet. Indeed most manures normally contain too much nitrogen and not enough carbon for successful composting. Getting a carbon and nitrogen content from your 'typical feedstock mix' may help in estimating volumes to add in the future.

Cattle manure usually has a high moisture content and therefore will probably require an amendment, to get the right C:N ratio. Therefore a carbon source needs to be added, such as straw or woody materials like

leaves, sawdust, wood shavings and crop residues can be used but grass alone may not be suitable. Larger woody materials, such as branches etc. may require shredding and sieving. Ultimately you are trying to achieve a carbon to nitrogen ratio of approximately 30:1. It is best to get a chemical analysis to confirm this, however a general guide may be that you need to add usually 2 or 3 times the volume of amendment for volume of manure.
Correct particle size (size of the fragments within the compost pile) is required; too coarse and there will be loss of heat; too fine and anaerobic conditions may occur in the windrow. Generally material size of 12 to 30 mm is ideal. Moisture content of 40% to 60% is generally fine for composting. Particle size, bulk density and perhaps moisture content needs to be done in the lab, but once done, and if the farmer is using similar material such as manure and straw, it can be dispensed with or done very occasionally During composting a 'fist test' can be done to get a rough estimate of moisture content. As mentioned, composting is an aerobic process and therefore it is important to have sufficient oxygen in the windrow (>5%) and this can be maintained by frequent turning. However if you turn the windrow too frequently, this can lead to nitrogen loss through ammonia volatilisation. The temperature within the windrow should be in the range of 40 to 60°C and not higher than 70°C. When the temperature within the compost pile does not rise significantly it indicates the compost is ready.

Why Compost?

Composting manures helps to reduce the overall volume of the material, and minimises issues with odours and fly pests. The composting process stabilises the material, and converts a lot of the quick release nitrogen in the manure into slower release forms of nitrogen. Between 10-30% of the total nitrogen content of the manure compost is available in the first year, with the phosphorus and potassium content immediately available. It has been shown that composts with slow availability of nitrogen, in contrast to material that releases nitrogen quickly, is beneficial to the growth of clover. The composting process speeds up the formation of humic substances, which are stable forms of carbon, which can take anywhere from 20 to 1000 years to degrade, rather than the carbon in crop residues which degrades more rapidly. These stable humic substances provide stable organic matter to improve soil health, soil structure and carbon sequestration. Compost

itself is easier to handle and spread than un-composted organic wastes and as the material is stabilised there is less risk of run off into water bodies etc. Composting however does require an investment in time and some equipment if it is to be done correctly, and usually requires some trial and error to optimise the process. If done correctly one ends up with a viable product that can be used in the farm as an organic fertilizer/soil amendment or animal bedding and any surplus could be sold

Conclusion

Composting is a very suitable and effective way of managing manure. It is a simple (e.g. windrow) process and following a few key rules and combining these with regular turning of the windrow should lead to high quality, stable compost. It can help to replace inorganic fertilizer use and bring other quantifiable benefits to the soil, such as the stable carbon substances, micro elements and a diverse microbiology while reducing the chances of pollution from the material. Certain tools and processes can be helpful in optimising the composting process and final analysis is required for optimum use of the compost.

What determines organic food purchasing behaviour in Ireland?

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Summary

- Fruit and vegetables are the most frequency purchased organic foods.
- Increasing availability of organic foods in the marketplace will increase behavioural control and increase organic purchase.
- Promoting positive benefits of organic foods will help form positive attitudes to organic foods and thereby increase likelihood of purchase.

Introduction

The production of food, regardless of type, comes at a cost to the environment, therefore farmers and food producers might need to consider food production methods that are more benign and environmentally friendly methods without necessarily sacrificing profits or cutting production volumes. Organic farming has long been promoted as an alternative to conventional agricultural production. Organic farming offers an alternative system by prohibiting the use of chemical fertilizers and markedly restricting the application of other chemicals, such as plant protection in plants and antibiotics in animals. These benefits come at the cost though as productivity may decrease. Recently, organic farming has received positive public attention across the EU as a new plan promoting the proliferation and uptake of organically produced food was announced as part of the Green Deal and Farm-to-Fork strategy. This plan envisages a considerable increase for land under organic cultivation (which should rise to 25% of the total agricultural area in just 10 years from today's average of 8.5%) as well as measures stimulating consumer demand for such food. For Ireland, this plan represents even a bigger challenge as currently less than 2% of agricultural land is being organically cultivated in this country, and furthermore little is known about the preferences of Irish consumers for organic food to determine the market for these foods.

Consumer Survey & Findings

Are consumers in Ireland ready to buy and consume organic food and what factors underpin their decisions to purchase organic foods. This question formed part of a survey conducted on 400 Irish adults in spring 2021 to examine factors influenced sustainable food behaviours and organic food purchasing.

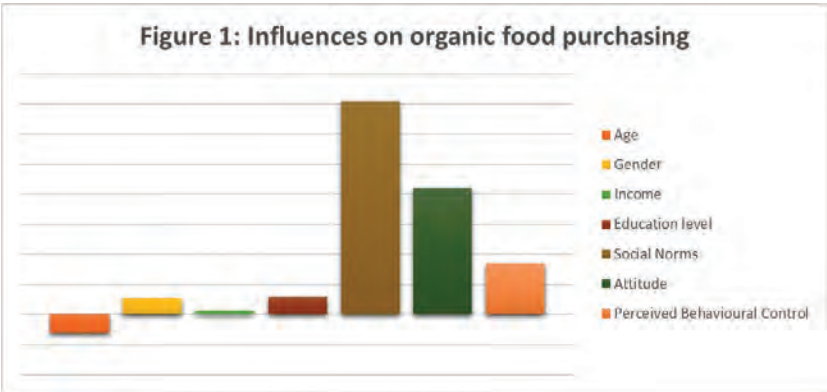
Approximately third (36%) of consumers report that they never or rarely purchase organic foods while just over 20% reported that they often or always purchase organic foods. When this was examined by food product, fruit and vegetables (38%) were the foods consumers were most likely to purchase followed by yogurt (25%). Approximately 18% of consumers reported to purchase organic meat on a frequent basis as shown in Table 1 below.

Table 1: Frequency of organic food purchase

	Never %	Sometimes %	Very often %
Organic food purchases	36	43	21
Meat	35	48	18
Fruit & Veg	14	49	38
Milk	48	33	19
Cheese	48	47	6
Yogurt	35	40	25

Traditional demographic measures such as age, gender, education and income that are usually associated with organic purchasing had little or no impact in this survey. What was found to be most impactful in determining organic food purchasing was positive attitudes to organic food, whereby consumers who considered organic food to be tastier, supported animal welfare and desire food grown without chemicals were more likely to purchase organic foods. In addition social norms which describes the impact of friends and significant others on respondents' consumption decisions positively influenced the decision to purchase organic foods. Therefore if others in the peer group of the consumers surveyed were purchasing organic foods, this in turn positively encouraged these consumers to behave similarly. The impact of behavioural control, which is consumers'

perceived ability to recognise, find and buy organic foods, was important for purchasing organic foods as seen in Figure 1 below.



Marketing organic products

Marketing campaigns to increase consumer demand and uptake of organic food purchasing should consider attitudes, social norms and behavioral control rather than focus on the traditional demographic segmentation categories of age, gender etc. Focusing on the impact of social norms on organic food purchasing will serve to increase the uptake of organic food purchasing in others. This in turn will help to form positive attitudes to organic foods that will also increase purchase. For both of these measures to work, consumers need to have a sense of control over their purchasing behaviour. Hence, the availability of organic products in-store or at food markets should be highlighted and promoted so that the products are readily available and recognizable to consumers.

Conclusion

These findings can be used to inform policies regarding organic food purchasing in consumers which in turn may encourage the transition to organic farming to meet targets set out in the EU green deal.

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