**Animal & Grassland Research and Innovation Programme**

Teagasc

# National Sheep Conferences 2023

**Tuesday | 24th January 2023**
**Hillgrove Hotel, Monaghan, Co. Monaghan**

**Thursday | 26th January 2023**
**Brandon House Hotel, New Ross, Co. Wexford**

Teagasc
Agriculture and Food Development Authority

Printed by Naas Printing Ltd.

# Teagasc National Sheep Conference 2023

**Hillgrove Hotel, Monaghan, Co. Monaghan**
**Tuesday 24th January 2023**

&

**Brandon House Hotel, New Ross, Co. Wexford**
**Thursday 26th January 2023**

*Compiled and edited by Orla M. Keane*
*Teagasc Animal & Grassland Research and Innovation Centre,*
*Athenry, Co. Galway*

ISBN 978-1-84170-685-6

# Teagasc National Sheep Conference 2023

Venue: **Hillgrove Hotel, Monaghan, Co. Monaghan**

Date: **Tuesday 24th January 2023**

## Conference Outline

Chairperson: *Nóirín McHugh, Researcher, Teagasc*

19.00 **Conference Opening**
*Frank O'Mara,*
*Director, Teagasc*

19.10 **Parasites of sheep and resistance to drenches – a New Zealand perspective**
*Dave Leathwick*
*AgResearch Grasslands, Tennent Drive, Palmerston North, New Zealand*

19.40 **Organic sheep farming – factors to consider and producing lamb on an organic farm**
*Elaine Leavy and Amy Jackson*
*Teagasc Local Advisory Office, Mullingar, Co. Westmeath and Organic Sheep Farmer, Co. Tipperary*

20.10 **Greenhouse gas intensity of average sheep systems in Ireland**
*Jonathan Herron*
*Teagasc Animal & Grassland Research and Innovation Centre, Moorepark, Co. Cork*

20.40 **The addition of clover or herbs to a perennial ryegrass sward on animal and sward performance**
*Lisa McGrane, Nóirín McHugh, Tommy M. Boland & Philip Creighton*
*Teagasc Animal & Grassland Research & Innovation Centre, Athenry & Moorepark and School of Agriculture and Food Science, University College Dublin, Belfield, Dublin 4*

21.10 **Close conference**
*Philip Creighton*
*Teagasc Sheep Enterprise Leader, Athenry, Co. Galway*

21.20 **Light refreshments served**

# Teagasc National Sheep Conference 2023

Venue: **Brandon House Hotel, New Ross, Co. Wexford**

Date: **Thursday 26th January 2023**

## Conference Outline

Chairperson: *Ger Shortle, Regional Manager, Wicklow/Carlow/Wexford Advisory Region*

| | | |
|---|---|---|
| 19.00 | **Conference Opening**<br>*Philip Creighton*<br>*Teagasc Sheep Enterprise Leader, Athenry, Co. Galway* |
| 19.10 | **Parasites of sheep and resistance to drenches – a New Zealand perspective**<br>*Dave Leathwick*<br>*AgResearch Grasslands, Tennent Drive, Palmerston North, New Zealand* |
| 19.40 | **Organic sheep farming – factors to consider and producing lamb on an organic farm**<br>*Elaine Leavy and Amy Jackson*<br>*Teagasc Animal & Grassland Research and Innovation Centre, Grange, Dunsany, Co. Meath and Organic Sheep Farmer, Co. Tipperary.* |
| 20.10 | **Greenhouse gas intensity of average sheep systems in Ireland**<br>*Jonathan Herron*<br>*Teagasc Animal & Grassland Research and Innovation Centre, Moorepark, Co. Cork* |
| 20.40 | **The addition of clover or herbs to a perennial ryegrass sward on animal and sward performance**<br>*Lisa McGrane, Nóirín McHugh, Tommy M. Boland & Philip Creighton*<br>*Teagasc Animal & Grassland Research & Innovation Centre, Athenry & Moorepark and School of Agriculture and Food Science, University College Dublin, Belfield, Dublin 4.* |
| 21.10 | **Close conference**<br>*Michael Gottstein*<br>*Teagasc Sheep Specialist, Macroom, Co. Cork* |
| 21.20 | **Light refreshments served** |

# Foreword

The latest published sheep census statistics (Dec 2021) show that there were 36,163 flocks in Ireland, an increase of 1.6% from 2020. Sheep farming is a significant part of our agricultural industry with more than 1 in every 4 farms in Ireland involved in sheep production. The number of breeding ewes increased by 2.1% on 2020 figures to 2.7 million ewes.

Bearing this in mind, the objectives of the Teagasc sheep Research and Knowledge Transfer programme are to increase the productivity, sustainability and competitiveness of Irish sheep production systems. Continuous generation of new knowledge is critically important and the incorporation and application of this information into on-farm production systems must be the on-going aim of all sheep farmers.

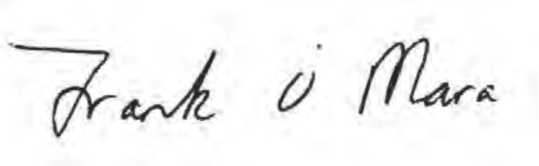
Flock health is the key to productivity on our sheep farms and a growing challenge being experienced within the industry is the area of anthelmintic resistance. Our first speaker tonight is Dr Dave Leathwick a principal scientist in parasitology at the pastoral agricultural research centre (AgResearch) in New Zealand. Dr Leathwick has been researching nematode parasites of grazing livestock, with a focus on their biology and control, and the development and management of anthelmintic resistance for nearly 35 years. He will outline work he has conducted with farmers and veterinarians, dealing with real-world drench resistance management issues.

The Food Vision 2030 strategy has set a target of increasing our land area farmed organically to 7.5% by the year 2030 and the 2023 Climate Action Plan has an even higher target of over 9% by 2030. For some of you a change to organic sheep production may be an option. Elaine Leavy, Teagasc Organic specialist and Amy Jackson an organic sheep farmer from Tipperary, will discuss factors to consider when producing lamb on an organic farm.

As we are all aware the focus on agriculture's impact on the environment is stronger than ever before. Addressing the area of greenhouse gas emissions, government legislation in Ireland now states a targeted reduction in greenhouse gases of 51% by 2030 with a 25% reduction in emissions from Agriculture. Tonight Dr Jonathan Herron, Teagasc, will outline some of the management practices that can be implemented on sheep farms to reduce our environmental impact and also have wider positive effects such as economic and production benefits.

Finally as always, Teagasc research has shown the value of pasture based sheep systems from a nutritional quality, cost effectiveness and sustainability perspective. Lisa McGrane, a PhD Walsh scholar based in Teagasc Athenry, will present her research on the addition of clovers (white clover or red clover), or herbs (plantain or chicory) to perennial ryegrass swards, on animal and sward performance under an intensive sheep production system.

Lastly, I would like to thank you for joining us for the National Sheep Conference, and to all of the speakers, and staff who assisted with the organisation of this year's conference.



Prof Frank O'Mara
Director, Teagasc

# Table of Contents

# Parasites of sheep and resistance to drenches – a New Zealand perspective

*Dave Leathwick*
*AgResearch Grasslands, Tennent Drive, Palmerston North, New Zealand*

### Take home messages

- Regularly test the effectiveness of the drenches you are using – by the time you 'see' a problem, it will have cost you plenty
- Don't rely solely on drench – a drenching programme is not a parasite control plan
- 'Think' about how to retain some unselected worms on your farm – Refugia is the key, and it may be easier than you thought
- Don't import someone else's bad worms onto your farm – always apply an effective quarantine procedure.

## Introduction

Anthelmintic (drench) resistance in nematode parasites is an issue facing farmers of grazing livestock (sheep, goats, cattle, deer, and horses) all over the world. It is unlikely that any country is immune to its advances. Resistance was first detected in the 1970s and 1980s not long after new modern drenches became available. Initially regarded as a curiosity and of little importance, resistance has continued to grow in prevalence and severity ever since. Today, in many countries, drench resistance on farms has become the norm and it is now rare to find farms where all drenches work against all the common parasite species. This is certainly the case in New Zealand where recent data shows that simultaneous resistance to all 3 of the older classes of broad-spectrum drenches, the benzimidazoles (e.g., oxfendazole), the imidazothiazole (levamisole), and macrocyclic lactones (e.g., ivermectin) is now present on about a third of sheep farms. Also, resistance in cattle is not far behind with resistance to all three of these drench classes now confirmed on a small number of properties.

So how did this situation become so bad without anyone doing anything about it? In reality, much has been done. Decades of research around the world has led to a reasonably good understanding of the factors which result in resistance developing (i.e., we know how to prevent it). There are also some good examples of where changes have been made to farming operations to minimise the development of resistance, and these have worked. Commercial farms exist today, on which all drenches still work as well as the day they first came to market. Clearly then, it is possible to farm without selecting for drench resistance, at least in some situations.

So how did we get into this mess? In New Zealand, at least, there are likely a small number of factors which have contributed to this widespread prevalence of severe drench resistance.

1. Farmers think they will 'see' resistance coming.
2. A reluctance to spend money because of a lack of understanding of the ultimate cost of drench failure.
3. Conflicting messages from different interest groups – in the presence of confusion just keep doing what worked in the past.

4. Aversion to risk.
5. Doing what you know how to do is always easier than learning to do something new.

Interestingly, none of these factors relate to not knowing what to do, they relate to making the decision to do something. They are about motivation and behaviour change.

## Minimising resistance development

The sad part about the high levels of resistance we are seeing today is that science, in many countries over many years, has developed an understanding of how resistance is selected (we know most of the risky practices) and therefore how to delay or prevent resistance from becoming an issue. In New Zealand at least, these 'resistance-delaying' practices have been tested on real farms and shown to work; we still have some large, profitable, commercial farms with little or no resistance to any drenches.

*1. Test that what you are using works*

The first and most obvious practice that farmers should adopt to minimising resistance issues is to test the effectiveness of the drenches they are using and to do so on a regular basis (at least once every year). If you detect an issue early (as it is developing) you can do something about it reasonably easily. If you wait until the problem is advanced and resistant worms dominate on your farm, then fixing it becomes more difficult and costly.

Most farmers that I have talked to over many years think that everything is OK if their animals look to be in good condition. In reality, the subtle production losses will be considerable before the animals begin to look 'wormy' despite drenching. New Zealand trials showed that the immediate cost of using a drench that is not fully effective can be 10-15% of carcass value at slaughter. Another study showed that the amount of grass necessary to get lambs to target sale weight increased by 30% over a three-year period as drench efficacy declined due to resistance. In all these studies, the losses occurred before the farmers were able to 'see' that the lambs weren't 'doing' as well as expected. For most farmers the cost of testing drench efficacy is miniscule compared to the potential losses of compromised growth rate. Unfortunately, many New Zealand farmers discover they have drench resistance by the presence of dead animals in the paddock.

*2. Too much drench*

There are a number of well recognized practices which have been shown clearly to select for resistant worms. These include excessive use of drenches (simply too many treatments), use of long-acting products (especially those with declining profiles of activity), and treatment coinciding with a shift to low contamination (clean) pastures such as hay or silage aftermath or new crops. Added to this is a failure to prevent importation of resistant worms with stock brought onto the farm. This latter has, I believe, become more important in New Zealand as multiple resistant worms have become more prevalent across the industry.

All these highly selective practices, except the last, have a common theme. They all give a large advantage to resistant worms while minimising the retention of susceptible worms on the farm. In scientific terms this pool of susceptible and unselected worms is known as 'refugia' – simply a refuge of susceptible worms. Very simply, if you have no drench-susceptible worms on your farm, then all you have is drench resistant ones (which obviously is not what you want). So, we have to think about (devise and implement) ways of retaining worms that we can kill with drenches – this we call 'maintaining refugia'.

*3. Retaining susceptible worms*

Many people say that retaining susceptible worms ('maintaining refugia') is complicated and difficult. From my experience on commercial farms in New Zealand this is far from true. There is nearly always a way of maintaining some untreated animals in a mix or rotation with drenched animals (lambs) that will fit with the farmer's operation. Some examples of such practices include,

- Running untreated 'tail-end' 2-tooth ewes (12-24 months of age) amongst drenched lambs on better pastures. The ewes benefit from the better pastures while cycling some susceptible worms to dilute any resistant worms passed by the drenched lambs.
- A farmer wanting to drench lambs onto pastures previously grazed for months by bulls (and therefore 'clean' of sheep worms) lambed some of his hoggets (12-month-old ewes) amongst the bulls prior to the lambs going on. Again, the hoggets benefit from the high-quality pastures and when the lambs are drenched onto these pastures after weaning there is a pool of unselected worm larvae to dilute any resistant eggs passed by the lambs.
- Rotational grazing of untreated adult ewes behind drenched lambs. Trial work we did showed that not only did the ewes cycle most of the same worm species as the lambs (but without exposure to drench) but that they reduced the number of worm larvae to which the lambs were exposed. Further, pasture quality was improved, and lamb growth rates were significantly higher when they were rotated with ewes compared to when they were grazed alone.

All these examples have demonstrated that 'refugia' can be included in a farming operation without compromising productivity (in fact often with increased profitability).

There are two approaches to leaving some animals undrenched to maintain refugia i.e., to focus on the ewes or on the lambs. By far the easiest is to minimise drenching of adult ewes and to make sure they are integrated / rotated in some way with the drenched lambs. Most New Zealand farmers who are managing resistance focus on stopping (or greatly reducing) any drenching of their ewes. Ensuring quantity and quality of feed, and hence good body condition, seems to be the key to making progress. Integrating cattle into rotations reduces the number of parasite larvae that ewes (and lambs) are exposed to. Adult ewes carry most of the same parasite species as lambs (the obvious exception is *Nematodirus*) and mostly they function as net removers of infective larvae i.e., they remove more larvae from the pasture than they put down. The immune system of the ewe reduces the percentage of parasite eggs which develop into infective larvae. So, rotating undrenched ewes with lambs has many benefits (including improved pasture quality).

Some farmers choose to leave some lambs undrenched but this is much less popular and is more difficult to manage without compromising growth rates. But this approach does fit some farming systems and it will work.

## Close the borders

As resistance has become more common on farms, and therefore in livestock, so too has the risk of importing resistant worms increased. Today, any animal moved onto your farm comes with the very real possibility of carrying resistant worms (possibly of a type you don't already have). In New Zealand today, importing resistant worms is possibly the most common way in which farmers acquire a significant resistance issue. The message about effective quarantine procedures has never been more relevant or important. All animals coming onto any farm (unless the source farm is **known** to be resistance free) should be treated with a new-active drench and if possible, held off pasture for at least 24 hours. To be sure, check that the quarantine treatment worked by egg counts 7-14 days after treatment. If the quarantine treatment wasn't effective, the sooner you know, the better.

# Organic sheep farming – factors to consider and producing lamb on an organic farm

*Elaine Leavy[a], Amy Jackson[b]*

*[a]Teagasc Organic Specialist, Mullingar Advisory Office, Mullingar, Co. Westmeath.*

*[b]Lacka Organic Lamb, North Tipperary.*

## Take home messages

- Choice of breeds is a very important consideration
- Draw up a flock health plan in consultation with your veterinary surgeon
- Use of temporary fences aids in maximising grass utilisation and makes it easier to maintain a clean supply of grass ahead of the lambs
- Length of time and rate of feeding pre-lambing is determined by the number of lambs being carried per ewe.

## Introduction

At farm level in Ireland, the organic sector has experienced a large influx of new farmers in recent years, with now over 4,000 farmers farming organically including just over 2,000 who entered conversion in January 2023. The number of organic sheep flocks in 2021 was approaching 700 with an estimated 66,000 breeding ewes, which will increase with the recent new entrants. The area being farmed organically is estimated to be approximately 190,000 hectares occupying over 3% of the total utilisable agricultural area (UAA) in the country, more than double the area compared to the previous decade. This compares with an average of 9.1% of UAA farmed organically across the European Union. The current Programme for Government aims to align the UAA under organic production in Ireland with the EU average.

The Department of Agriculture, Food and the Marine (DAFM) is the competent authority for regulating the organic sector. They have designated Organic Control Bodies (OCBs) to provide an inspection and certification service for all organic farmers in Ireland. For full interpretation of the rules and regulations governing organic sheep farming it is essential to study the 'Organic Food and Farming Standards in Ireland' document.

## Factors to consider

There are a number of factors that should be taken into account when considering the transition to an organic sheep farming system.

### *Breeds and Breeding*

A crossbred ewe is ideal and a cross of any two existing breeds can produce good quality ewes. Research has shown that the Texel breed has substantially better resistance to parasites than the Suffolk. This gives the Texel a distinct advantage in an organic system and the breed also produces a lean carcass. The Belclare breed carries a proportion of Texel genes and therefore has advantages over the Suffolk in parasite resistance. If aiming to lamb ewes early it is an advantage to have Suffolk cross ewes. Organic sheep farmers tend to choose breeds with a high tolerance to worms. A crossbred ewe can be mated with either Texel, Suffolk or Charollais rams to increase lamb growth rate. Breeding your own replacements in an organic system is of great benefit as it reduces the chances of introducing disease into the flock and helps build up resistance to pathogens on the farm.

Rams may be purchased from a non-organic farm for breeding purposes. If suitable organic female breeding stock is unavailable, with prior permission from the OCB it is permitted to buy in non-organic female breeding stock, up to 20% of the adult flock.

*Flock Health*

Disease prevention is key to good flock health. At the application stage of converting to an organic system a flock health plan is drawn up in consultation with a veterinary surgeon. The flock health plan addresses issues such as:

- What diseases are currently on the farm
- How can these be controlled or prevented
- What modifications can be made at farm level to reduce the risk of disease.

Operating a closed flock is a big help in keeping sheep healthy and measures such as double fencing boundaries and good general hygiene will reduce the risk of infection from various sources.

A clean grazing policy minimises the risk of internal parasites, as routine dosing is not permitted in the organic system. A clean grazing plan provides clean or lightly infected pastures for grazing by the ewes and lambs during the first part of the grazing season. These are then changed to another pasture at weaning time. After weaning, lambs should continue to graze good quality pastures such as silage aftermaths which provide clean grazing and will greatly reduce parasite burden.

*Diet*

Grass is the main component of the diet in an organic sheep system. As 100% of the feed must be from organic or in-conversion sources, you need to produce your entire forage requirement on your farm. However, organic grain and compound ration can be sourced when required. A rotational grazing system is preferred to set stocking as it is easier to control grass quality; a rotation with three to four paddocks or fields.

*Housing*

Sheep can be outwintered. If housed, they must be provided with a bedded solid floor area. Up to 50% of the total area can be slatted. The total space required per ewe is 1.5 $m^2$/head (minimum) with an additional 0.35 $m^2$/lamb. Plenty of straw should be used to keep the lying area for the ewes dry at all times. Conventional straw may be used for bedding.

*Organic Lamb Sales*

The Bord Bia 'Organic Lamb Survey 2021' indicates that of the organic lambs born in 2021, 53% were sold as finished lambs with 31% sold as store lambs and 16% used for other purposes (e.g. kept for breeding). The survey results indicated 49% of flock owners sold their finished lamb directly to the processor, with 13% sold through a producer group and 37% sold at marts or private sales.

## Producing lamb on an organic farm - Amy Jackson, Lacka Organic Lamb

*Introduction to farm*

Amy, in partnership with her husband Ross, are farming organically in Lacka in North Tipperary. The farm comprises both an organic cereal and sheep enterprise. Prior to conversion to an organic system it was a tillage farm with a number of crops being grown. The opportunity to incorporate a sheep enterprise arose when the decision was made to enter organics, as there would be grass on the farm as part of the rotation for the tillage crops. Amy found her way on to sheep farms since her childhood – initially helping out at lambing and subsequently helping all year round for a number of years. When Ross asked Amy in 2015, when the farm entered organic conversion, if she wanted to get a 'handful of sheep' she jumped at the chance.

*Sheep Breeds*

The sheep enterprise was established from scratch in May 2015. 'A mixed bag' of 120 crossbred commercial ewe lambs were purchased directly from three organic farmers (mainly Texel X, with some Charollais X and New Zealand Suffolk x Belclare), and four rams (one Border Leicester for replacements and three Charollais).

By 2021 almost all ewes were Border Leicester crosses so there was a need to buy a new (unrelated) Border Leicester, or introduce another breed. With a good maternal type of ewe established, the focus progressed to improving the overall conformation of the flock, and trying to improve the kill out % and days to slaughter of lambs; a decision was made to add Rouge and Beltex into the mix.

The rams that are now currently on the farm:

- Rouge (5* terminal and 5* maternal), for replacements (or factory lambs)
- Beltex (5* terminal and 5* maternal), for factory lambs (or replacements)
- Beltex (5* terminal and 4* maternal), for factory lambs
- Charollais (5* terminal), for factory lambs
- Galway, for own group of purebred Galways

In 2022 approximately 119 mature ewes (mainly Border Leicester X) and 42 ewe lambs (mainly Rouge X) were put to four rams (in groups), and a separate group of 17 Galways to the Galway ram.

*Flock Management on the Farm*

The rams go out early October for a March to April lambing season; prior to that (in August) they're checked over for status of body condition, teeth, and udders – any culls are marked (for sale as culls) and the remainder are given a six-month mineral bolus.

At around 80 days gestation, the ewes are pregnancy scanned. Balancing out the age profile and reducing the average age of the flock are key improvements that are being worked on to improve the productivity of the flock, with a high number of ewe lambs being retained in the past two seasons. Early February, the ewes are given a six-month mineral bolus, their vaccination booster, and are foot bathed then housed in groups according to litter size. In accordance with the Flock Health Plan, prepared together with the vet, ewes carrying twins and triplets have access to high energy licks, and ewes that have lambed have access to magnesium licks.

Ewes are lambed indoors, moved into individual pens for about two days, and then into a "crèche" in the shed until they're good and strong. Lambs are tailed and castrated (under derogation) before they move out of the individual pens, and are tagged when they are turned out to grass. There is no requirement to tag this early, but because the factory requires all treatments for the past 12 months to be declared, Amy and Ross find this the only way to be certain that all records and declarations are correct.

On veterinary advice and in accordance with the farm's flock health plan a combined vaccine for protection against lamb dysentery, pulpy kidney, struck, tetanus, braxy, blackleg, black disease, and pneumonic and systemic pasteurellosis is administered. Lambs receive their first vaccination as early as possible but after three weeks of age, and then a booster four to six weeks later (for this reason there may be a couple of groups until the vaccines are completed). Around this time too, some lameness may be encountered in the lambs due to scald, and this is treated by holding them in the footbath whilst they receive their vaccinations and (later) boluses. Ewes are shorn in May.

Sheep are grazed on grass and on multi species swards that have been sown on the farm, through stock rotation, and by using temporary electric fencing to create more paddocks. In doing this it aids maximising grass utilisation and makes it easier to maintain a clean supply of grass ahead of the lambs thus reducing worm burdens. The temporary fencing worked out at €2/m at the time, versus €6.50-€7/m for permanent fencing – with the added benefit of needing less (because it can be moved around), and being able to remove it altogether when fields go back into tillage.

Faecal egg counts are completed using a microscope at home, typically confirming whether or not there's a significant problem, and what the problem is. Individuals are treated accordingly, or if there is a widespread problem all may have to be treated (but the aim is to avoid this); this is one of the scenarios where having lambs tagged is especially useful, as all treatments are recorded per tag number.

*Pre lambing winter feeding*

All grass fields to be grazed in spring are closed off in mid-November. The sheep are then moved onto winter forage crops in mid-November supplemented with silage in a ring feeder. The in-lamb ewes this year have been moved onto a grassland field that is to be sown in spring with a tillage crop (again, with silage in a ring feeder). The use of silage in the fields allows the ewes to adjust their diet gradually and be kept outdoors for longer; the silage is produced on the farm.

**Table 1.** Pre-lambing feeding regime

| Stock Category | Start Concentrate Feeding |
|---|---|
| Triplet bearing ewes and twin bearing ewe lambs | Nine weeks before lambing |
| Twin bearing ewes and single bearing ewe lambs | Six weeks before lambing |
| Single bearing ewes and any empty ewe lambs | Two weeks before lambing |

All ewes start on 0.3 kg/head/day, and work up to 0.9 kg/head/day at lambing for those carrying triplets, 0.6 kg/head/day for those carrying twins, and ewes carrying singles remain at 0.3 kg/head/day with all having access to ad-lib silage. In 2022 an organic ration and organic soya for the ewes was purchased and fed along with home grown oats. The aim for lamb birth weights are 6 kg for singles, 5 kg for twins, and 4 kg for triplets along with the mothers having good quality colostrum.

*Lamb Sales*

The majority of lambs are sold from mid-June to mid-December. Lambs are sold through the Offaly Quality Lamb Producer Group to Irish Country Meats, where organic lamb gets a premium of 15% above base price. In 2020 Amy and Ross decided to make their lamb available to the general public through the sale of 'freshly frozen' whole or half lambs, with the launch of 'Lacka Organic Lamb'. Most of the lamb is sold throughout Ireland (collection or delivery) with customers also in the UK and France. Lacka Organic Lamb works by pre-order; lambs are selected for these orders and are kept until they're a bit heavier than a factory lamb.

In terms of finishing weights, early in the season lambs being selected weigh 40-42 kg and by the end of the season lambs weigh 47 kg to achieve a 21-22 kg carcass at the factory; for Lacka Organic Lamb a 50+ kg lamb is selected. Kill out starts at about 50% early on in the season, reducing to about 46% at the end of the season, for the breeds currently stocked.

*Future plans*

Some of the future plans that Amy and Ross have for the sheep enterprise are:

- Work on improving the scanning rate achieved with the mature ewes, and the plan to do this is by reducing the average age of the flock and ensuring an even spread of ages within the flock

- Improve the conformation of the flock by using shapier rams to breed replacements
- Once all replacements are Rouge X and Beltex X, the decision will have to be made as whether to stay with these breeds (using Beltex on the Rouge X, and Rouge on the Beltex X) or whether to introduce another breed, which could well be Suffolk (a Suffolk ram, to breed Suffolk X females).

## References:

Organic Food and Farming Standards in Ireland Edition 2 https://www.gov.ie/en/publication/fc7c8-organic-farming/#organic-food-and-farming-standards-in-ireland

Organic Lamb Survey 2021, Bord Bia

# Greenhouse gas intensity of average sheep systems in Ireland

*Jonathan Herron*

*Teagasc, Animal & Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork*

### Take home messages

- The Irish sheep sector directly emitted 1,065 kilotonnes $CO_2$ equivalent in 2020, however, it also indirectly contributes to other greenhouse gas (GHG) emission sources e.g. fertiliser, fuel
- A GHG intensity of 10.8 kg $CO_2$ equivalent per kg live weight has been calculated for a typical lowland sheep system in Ireland
- Improving the efficiency of typical sheep systems and the adoption of low emission technologies can reduce the GHG intensity to 9.6 kg $CO_2$ equivalent per kg live weight
- Further development and implementation of low emission technologies is necessary to reduce the GHG intensity and total GHG emissions of sheep systems.

## Introduction

The Food and Agriculture Organisation has projected that the global demand for agricultural products will increase by 12% over the next decade (2021-2030) as a result of population growth. While large ruminants (e.g. cows) get more focus, small ruminants (i.e. sheep and goats) are key players in the global agricultural economy due to their ability to adapt to a wide range of climates and environments. Although sheep meat is a small contributor to total global meat consumption, global production is expected to increase by 2 million tonnes (12.7%) between 2021 and 2030 to meet growing demand.

In Ireland, the sheep sector is important as it generates approximately €300 million per annum. Within the European Union, Ireland is the largest net exporter of sheep meat, with the domestic market accounting for less than 7%. However, as with all food production systems, sheep systems can have negative environmental effects, the most pressing in the current climate being greenhouse gas (GHG) emissions, for which the EU and Ireland have set ambitious reduction targets. Consumers are also becoming increasingly concerned and conscious of how the food they consume is produced, particularly livestock products where purchasing decisions are increasingly influenced by environmental concerns, animal welfare, and human health. To reduce the negative environmental impact of livestock production systems, while meeting global demand and consumer expectations, the sheep sector is required to identify and adopt practices that are environmentally sustainable, economically viable, and socially acceptable.

## National greenhouse gas emissions from the sheep sector

Every year the Environmental Protection Agency publishes the national GHG inventory report which outlines the quantity and sources of GHG emissions across all sectors within Ireland for a given and previous years. In the most recently reported year, 2020, Ireland emitted 58,766 kilotonnes (kt) $CO_2$ equivalent of which 38% came from the agricultural sector. The digestion of feed and the release of methane (i.e. enteric fermentation) dominates agricultural emissions, contributing 61.4%. The remaining GHG emissions are predominantly associated with manure and synthetic fertiliser application (Figure 1). Sheep directly emitted 1,065 kt $CO_2$ equivalent through the digestion of feed and manure management. However, the sheep sector is also indirectly responsible for GHG emissions from the use of synthetic fertilisers, fuel and electricity, which are recorded separately. The current method of calculating national sheep GHG emissions is based on a fixed emission value per head for each breed type (i.e. lowland vs. hill) and animal type (e.g. breeding ewe vs. lamb). This is evident in Figure 2 where total GHG emissions from the sheep sector follows a near identical trend to breeding ewe numbers.

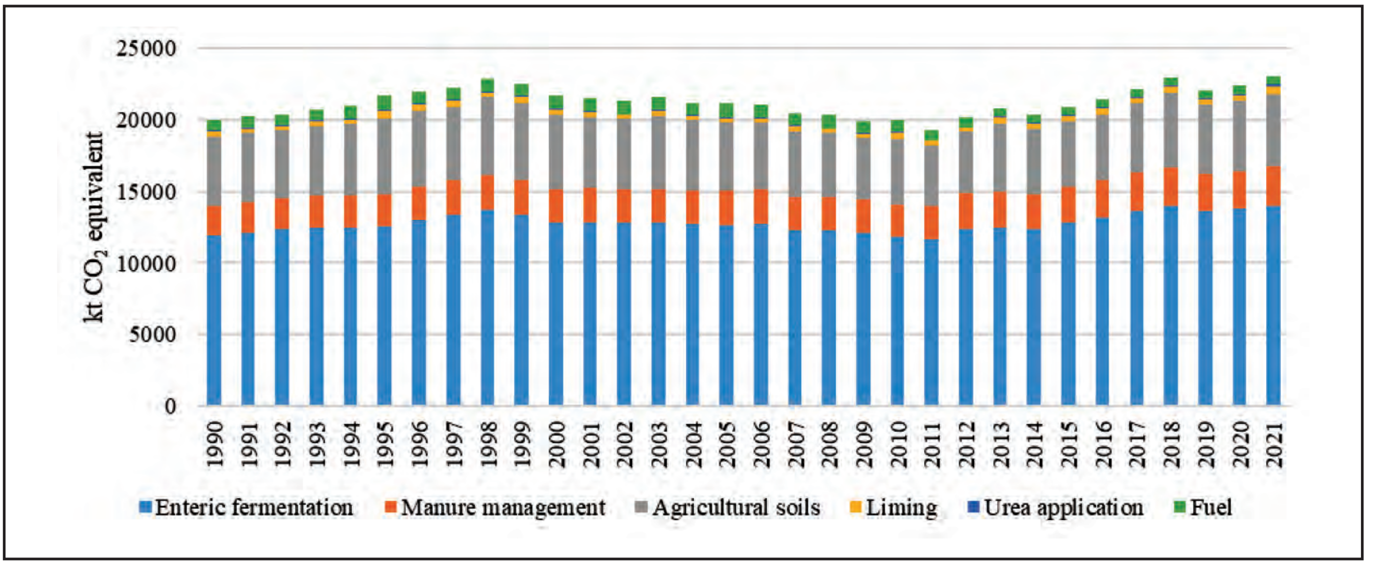



**Figure 1.** National agricultural greenhouse gas emissions 1990-2020

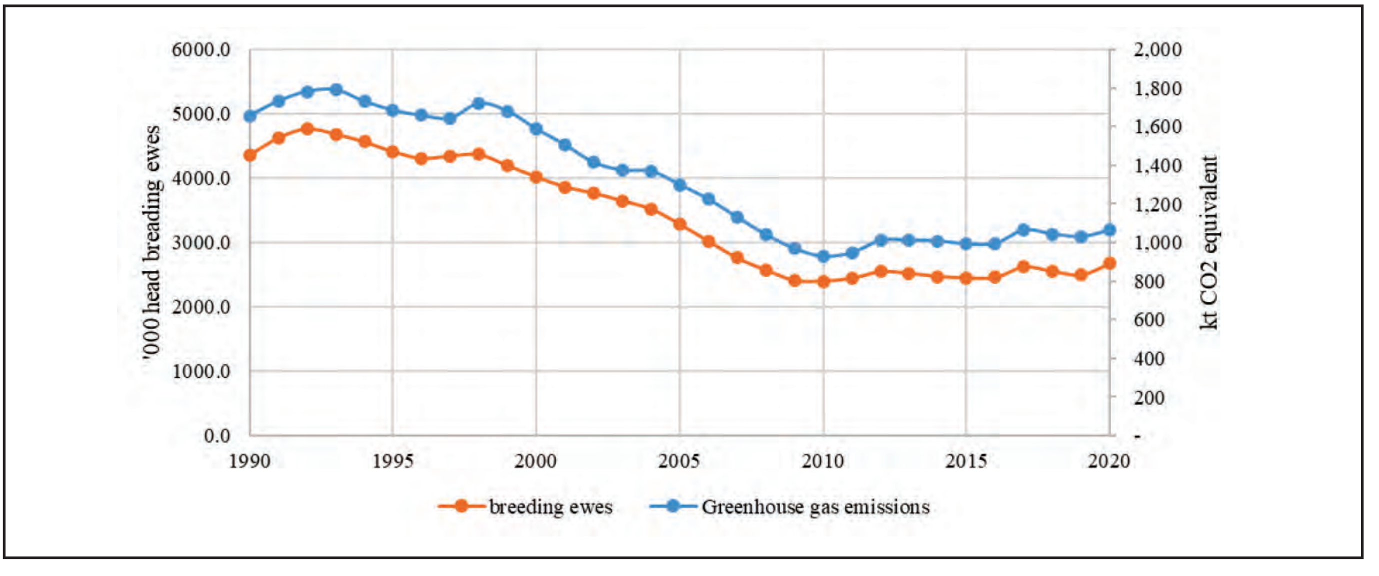



**Figure 2.** Total greenhouse gas emissions (kt $CO_2$ equivalent) from sheep and total breeding ewe population 1990-2020.

In an attempt to avoid the negative impacts of climate change, the European Union has committed to reduce GHG emissions to at least 55% below 1990 levels by 2030. To achieve this target the Irish agricultural sector has been given a 2030 GHG reduction target of 25% compared to 2018 levels. Work is currently underway to develop a new method for calculating GHG emissions from the sheep sector. This method will ensure any improvements in the efficiency of a production system and adoption of technologies will translate in the national GHG inventory and thus contribute to the national GHG reduction targets. For the agricultural sector to achieve the 2030 GHG reduction target, adoption of recommended practices and the identification of new technologies will be required at farm level.

## Life cycle assessment modelling

Life cycle assessment (LCA) is an internationally recognized methodology used to calculate the environmental impact of all life stages of a product, process, system or service. Teagasc has developed LCA models to calculate the environmental impact of agricultural systems in Ireland. The Teagasc Sheep LCA model adopts a cradle to farm gate boundary, meaning all GHG emissions up to the point at which the product (live weight and wool) leaves the farm are accounted for. Not only are on-farm emissions accounted, but also emissions released during the production of farm inputs (i.e. fertilisers, electricity, concentrate feed). By applying this boundary, LCA can identify the key emission sources and identify management practices that have potential to reduce GHG emissions.

To determine the GHG reduction potential of proposed management practices and emerging technologies, and how they may contribute to meeting the agricultural sector's 25% GHG reduction target, it is vital to first determine the performance of an average production system. This sets a baseline or starting point to which practices and technologies can be compared. An LCA of a lowland production system was therefore conducted. Data for flock performance and management practices were obtained from the Teagasc National Farm Survey (Table 1). All lambs were drafted for slaughter to produce a target carcass weight of 20 kg.

**Table 1.** Description and performance of an average lowland sheep system

| | Lowland system |
|---|---|
| Ewes | 140 |
| Stocking rate (ewes/ha) | 7.8 |
| N fertiliser (kg N/ha) | 73 |
| Lambing period | March |
| Replacement rate (%) | 25 |
| Weaning rate (lambs/ewe) | 1.39 |
| Drafted 1st October | 60% |
| Concentrate (kg/ewe) | 103 |
| Carcass output (kg/ha) | 237 |

GHG reduction practices/technologies are typically broken into two categories; 1) improve efficiency and 2) adopt low emission technologies. The first mitigation strategy includes improvements in soil fertility, genetic merit of flocks, animal management, flock health, and more efficient grass growth and utilisation. The second mitigation strategy involves the adoption of low emission technologies such as protected urea and the use of low emissions slurry spreading equipment. The following GHG reduction practices were investigated:

- Substituting nitrate fertiliser with protected urea (from 90% nitrate based to 100% protected urea)
- Incorporation of white clover into swards (reducing synthetic fertiliser requirement by 20%)
- Reducing concentrate feeding (103 kg per ewe to 50 kg per ewe)
- Weaning rate (1.39 to 1.5)
- Mortality rate (7.9% to 5%)

The GHG intensity of a typical lowland system was calculated as 10.8 kg $CO_2$ equivalent /kg live weight, which is lower than the global average of 11.3. Methane contributed 66% of total GHG emissions, predominantly sourced from the digestion of feed (enteric fermentation). Nitrous oxide from fertiliser application, managed manure and manure excreted during grazing contributed a further 19% of total GHG emissions. The remaining 16% of total GHG emissions was sourced from the production of concentrate feed, fertiliser and the consumption of fossil fuels (i.e. diesel). Improving efficiency of a system typically

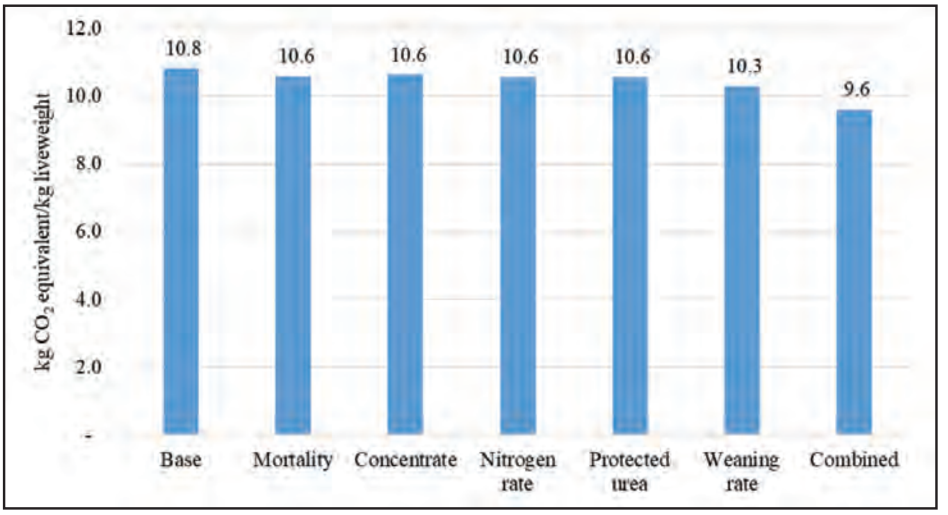



**Figure 3.** The greenhouse gas intensity (kg $CO_2$ equivalent /kg live weight) of a typical lowland sheep system (base) and the mitigation potential of reducing mortality, reducing concentrate feeding, reducing synthetic fertiliser by incorporation of clover into swards, use of protected urea, improving weaning rate and all combined.

reduces GHG emissions per unit output; however, mixed effects occur when assessing total emissions. This is the case for improving mortality and weaning rate. These measures reduced the GHG intensity by 2.2% and 4.9% respectively (Figure 3); however, total emissions remained unchanged. This is due to the greater number of animals in the system due to more live lambs weaned per ewe. As a result, reducing mortality and increasing weaning rate increased live weight sold by 3.0% and 7.4%, respectively.

Conversely, when you look at the fertiliser related strategies, incorporation of clover into swards reduced the quantity of N fertiliser needed to grow the same quantity of forage. As a result, both total GHG emissions and GHG emission intensity reduced by 2.0% and 2.4% while maintaining output (Figure 3). Similarly, the adoption of low emission technologies such as protected urea reduced total GHG emissions and GHG intensity by 5.0% and 2.4%, respectively. Protected urea has significantly lower GHG emissions per kg N applied in comparison to nitrate based fertilisers and also has significantly lower ammonia emissions than straight urea.

The production and distribution of concentrate feed typically results in greater GHG emissions per kg than the same quantity of well managed fresh grass. However, to meet energy requirements, livestock forage intake increases when concentrate feeding rate is reduced. Consequently, when land area and yield is fixed, stocking rate and output is reduced. This resulted in the reduction of concentrate fed per ewe from 103 kg to 50 kg to reduce total GHG emissions and GHG intensity by 4.3% and 1.7%, respectively (Figure 3).

The combination of reducing reliance on concentrate feed, the adoption of protected urea, the reduction in N fertiliser through the incorporation of white clover into swards, and the improvement in mortality and weaning rate reduced total farm GHG emissions by 9.7%. This reduced the GHG intensity of a lowland sheep system from an average of 10.8 kg $CO_2$ equivalent /kg live weight to 9.6 kg $CO_2$ equivalent /kg live weight (Figure 3) while increasing carcass output from 237 kg/ha to 255 kg/ha. Further development and implementation of low emission technologies is needed to reduce the GHG intensity and total GHG emissions of sheep systems and contribute to the GHG reduction target.

## Conclusion

The Irish sheep sector is starting from a good position where a typical lowland system has lower GHG intensity per kg live weight than the global average. The impact of available GHG mitigation practices independently and collectively on a typical sheep system has been calculated to reduce total GHG emissions and GHG intensity while improving the efficiency of the system. For the Irish agricultural sector to achieve the 25% GHG reduction target set by the national climate action plan the sheep sector must be proactive in adopting available GHG mitigation strategies.

# The addition of clovers or herbs to a sheep grazed perennial ryegrass sward: effects on animal and sward performance

*Lisa McGrane[a,b], Nóirín. McHugh[c,] Tommy M. Boland[b,] Philip Creighton[a]*

[a] *Teagasc Animal and Grassland Research and Innovation Centre, Mellows Campus, Athenry, Co. Galway*

[b] *School of Agriculture and Food Science, University College Dublin, Belfield, Dublin 4*

[c] *Teagasc Animal and Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork*

## Take home messages

- The addition of a companion forage to a perennial ryegrass sward significantly improved lamb performance
- Annual herbage production was similar across all sward types at 11 t DM/ha
- Establishment method had no significant impact on companion forage content with the exception that the direct drill method had higher levels of plantain than other methods
- Seeding rate and post-grazing sward height both affected companion forage content.

## Introduction

In recent years there has been growing interest in the use of diverse sward mixtures for grass based ruminant production systems. Numerous studies have shown the benefits of a multispecies sward relative to a perennial ryegrass only sward. These include increased animal and sward performance, reduced requirement for artificial nitrogen application and reduced need for anthelmintic drenches.

A farmlet study was set up in Teagasc, Athenry in 2018, with measurements collected across four production years (2018-2021). The aim of this study was to compare a perennial ryegrass sward to binary sward mixtures of perennial ryegrass and one companion forage, in terms of sward and animal performance under an intensive sheep production system. The sward types under investigation were: i) perennial ryegrass (PRG), ii) perennial ryegrass and white clover (PRG+WC), iii) perennial ryegrass and red clover (PRG+RC), iv) perennial ryegrass and plantain (PRG+Plan), and v) perennial ryegrass and chicory (PRG+Chic). The farmlets were stocked at 11.5 ewes/ha and received 130 kg N/ha/yr.

## Animal performance

Lamb performance was measured for four production years (2018-2021) and is shown in Table 1. The addition of any companion forage significantly improved lamb lifetime average daily gain (ADG). Lamb performance was also separated into two production periods: pre-weaning (from birth until weaning) and post-weaning (from weaning until slaughter). Pre-weaning, lamb ADG was similar across the PRG, PRG+WC, PRG+Plan and PRG+Chic sward types. The addition of red clover, led to an increase of 14 g/ day in pre-weaning ADG relative to the PRG sward type. Post-weaning lambs grazing PRG+Chic had the highest ADG of 176 g/day. This was significantly higher than PRG+WC, PRG+RC and PRG+Plan, which were all significantly higher than PRG at 133 g/day. As a result of improved animal performance, average days to slaughter (DTS) was reduced by 19, 28, 15 and 28 days respectively for lambs grazing PRG+WC, PRG+RC, PRG+Plan and PRG+Chic relative to lambs grazing PRG which took 228 days to reach slaughter weight. Furthermore, reductions in DTS led to reduced rates of concentrate supplementation where average concentrates consumed per lamb drafted was reduced by 6.1, 11.3, 8.2 and 10.7 kg concentrates/lamb drafted for lambs grazing PRG+WC, PRG+RC, PRG+Plan and PRG+Chic respectively relative to PRG which consumed 14.2 kg concentrates/lamb drafted. Carcass weight, carcass conformation, fat score and kill out percentage were similar across all sward types.

**Table 1.** The effect of sward type on lamb performance 2018-2021

| | PRG | PRG+ WC | PRG+ RC | PRG+ Plan | PRG+ Chic | *P*-value |
|---|---|---|---|---|---|---|
| **Pre-weaning ADG (g/day)** | $237^{a}$ | $238^{a}$ | $251^{b}$ | $236^{a}$ | $242^{ab}$ | <0.05 |
| **Post-weaning ADG (g/day)** | $133^{a}$ | $155^{b}$ | $162^{b}$ | $158^{b}$ | $176^{c}$ | <0.001 |
| **Lifetime ADG (g/day)** | $182^{a}$ | $204^{bc}$ | $213^{c}$ | $199^{b}$ | $213^{c}$ | <0.001 |
| **Days to Slaughter** | $228^{a}$ | $209^{bd}$ | $200^{c}$ | $213^{b}$ | $200^{cd}$ | <0.001 |
| **kg Concentrates fed/lamb drafted** | $14.2^{a}$ | $8.1^{b}$ | $2.9^{e}$ | $6.0^{c}$ | $3.5^{d}$ | <0.001 |

Values which share a superscript are not significantly different.

Scanned litter size was similar across all sward types. Ewe milk yield was measured at 5 weeks post-lambing in 2018 and 2019 and was not affected by sward type. This result corresponds with the lack of differences recorded in pre-weaning lamb performance, as lambs are dependent on ewes' milk during this period.

Ewe live weight and body condition score (BCS) were measured at five critical time points across the production year. Ewe live weight was similar at mating and scanning, however, differed at 6 weeks post-lambing, at weaning and at the following mating. Ewe BCS was similar at all time points except at the following mating. Although some significant differences were observed in ewe performance across the production season, the maximum difference between groups was 6.1 kg, and 0.16 BCS, which would be unlikely to be important commercially.

## Herbage production & persistency

All swards were grazed in a rotational grazing system from turnout post-lambing until December in each year. Target pre-grazing sward heights were 7-9 cm (1,200-1,500 kg DM/ha) across all sward types. Target post-grazing sward height was 4.0 cm for the first rotation and 4.5 cm for all subsequent pre-weaning rotations. Post-weaning, a leader-follower rotational grazing system was in place where lambs were removed from the paddocks at a post-grazing sward height of 6 cm, with ewes immediately introduced thereafter to graze to a post-grazing sward height of 4.5 cm.

Herbage production and yield were measured for three production years (2019-2021). Average annual herbage production was 11 t DM/ha, and was similar across all sward types. Annual grazed herbage yield was 9.1 t DM/ha and silage herbage yield was 1.9 t DM/ha, which were also similar across all sward types. For this study all sward types received the same amount of inorganic nitrogen; however, studies have shown that similar levels of herbage production can be achieved from grass and clover swards at lower nitrogen application levels, relative to a perennial ryegrass only sward receiving higher nitrogen application levels. This effect would not be illustrated in the current study but would provide an additional benefit in a commercial setting.

Companion forage content was measured in years 2018-2022. The initial sowings (phase 1) were carried out in 2017 and 2018. Forage contents achieved in this phase were lower than expected and as a result by year 2 average companion forage content was less than 2% for all sward types (Figure 1). This may be down to a number of factors, including the negative impact of the 2018 drought when swards were newly established. Based on the experience of the phase one sowings, sowing management was altered for subsequent reseeding events carried out from 2019 onwards (phase 2) and a series of detailed plot trials (as described below) were established in 2019 and 2020 to investigate some of the possible causes of the poor companion forage establishment and persistence observed in phase 1. The aim of these plot studies was to identify the most suitable management strategies, with an aim towards improving companion forage persistency within a sheep grazing system.

There was a higher proportion of the companion forage established in the phase 2 sowings and as a result in year 2 there was 17-30% companion forage content on average in these swards, which is a large increase on those achieved by the phase 1 sowings at the same stage. Although year 3 data is not yet available for phase 2 sowings, results suggest that good levels of the forages will persist into year 3.

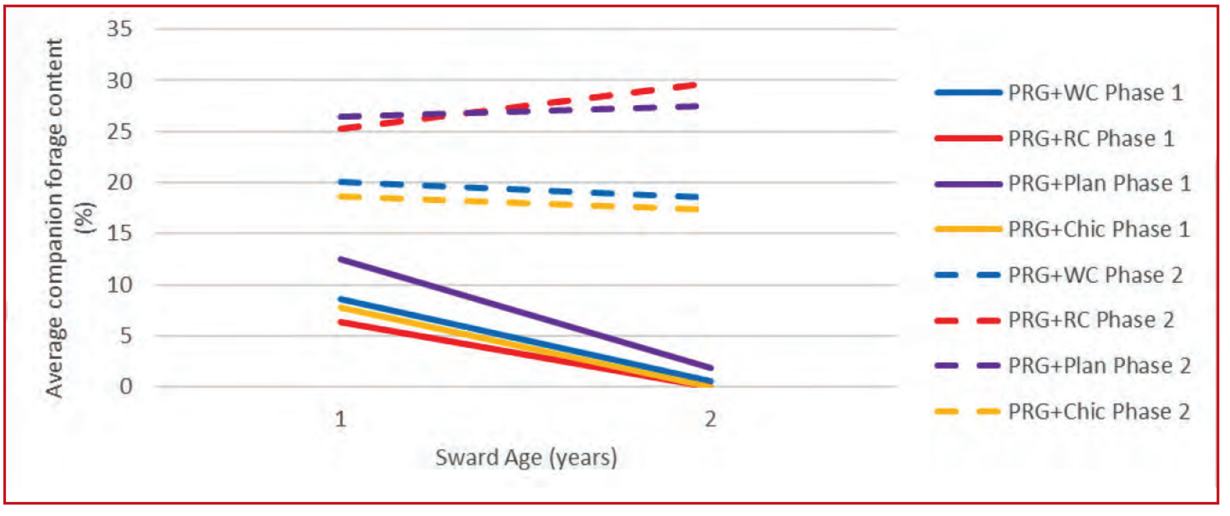



**Figure 1.** Companion forage content from phase 1 and 2 of the farmlet study

## Establishment method

A plot study investigating the effect of establishment method on binary sward types was established in July 2019 and measured for the following 2 years. The establishment methods investigated were; i) Conventional (plough, till and sow), ii) Disc (disc harrow followed by power harrow and sow), iii) Power harrow (power harrow cultivation and sow (one pass)), and iv) Direct drill (direct drill with no cultivation of the soil).

Results of the study indicate that establishment method had no effect on companion forage content in PRG+WC, PRG+RC and PRG+Chic swards. This is a positive finding as it shows that all establishment methods studied are suitable for use in these sward types and resulted in adequate levels of companion forage content. Establishment method had a significant impact on plantain content in a PRG+Plan sward. The direct drill method resulted in significantly higher levels of plantain compared to the conventional method. The disc and power harrow establishment methods yielded an intermediate level of plantain content.

Unsown species content was also measured in this plot study. Establishment method had a significant effect on unsown species content in the establishment year, however in years two and three of the study unsown species content was similar across all establishment methods.

## Post-grazing sward height

Post-grazing sward height (PGSH) has been reported to have a significant impact on the persistency of clovers and herbs in grazing systems. A plot trial was established in July 2019 and measured for the following three years. The PGSHs implemented were; i) 4.0 cm, ii) 4.75 cm, and iii) 5.5 cm.

Companion forage contents in the final year of the study are illustrated in Figure 2. Post-grazing sward height had no effect on clover content in a PRG+WC sward. In a year 3 PRG+RC sward there was significantly higher red clover content for the 4.75 cm PGSH relative to both the 4.0 cm and 5.5 cm PGSH. In PRG+Plan and PRG+Chic swards there was significantly lower companion forage content for the 5.5 cm PGSH relative to both the 4.0 cm and 4.75 cm PGSH.

These results show that the 4.0 cm PGSH treatment had a negative impact on red clover content as almost none of the red clover persisted into year 3 under this treatment. For the herb sward types (PRG+Plan and PRG+Chic) the 5.5 cm PGSH treatment had a negative impact on herb content.

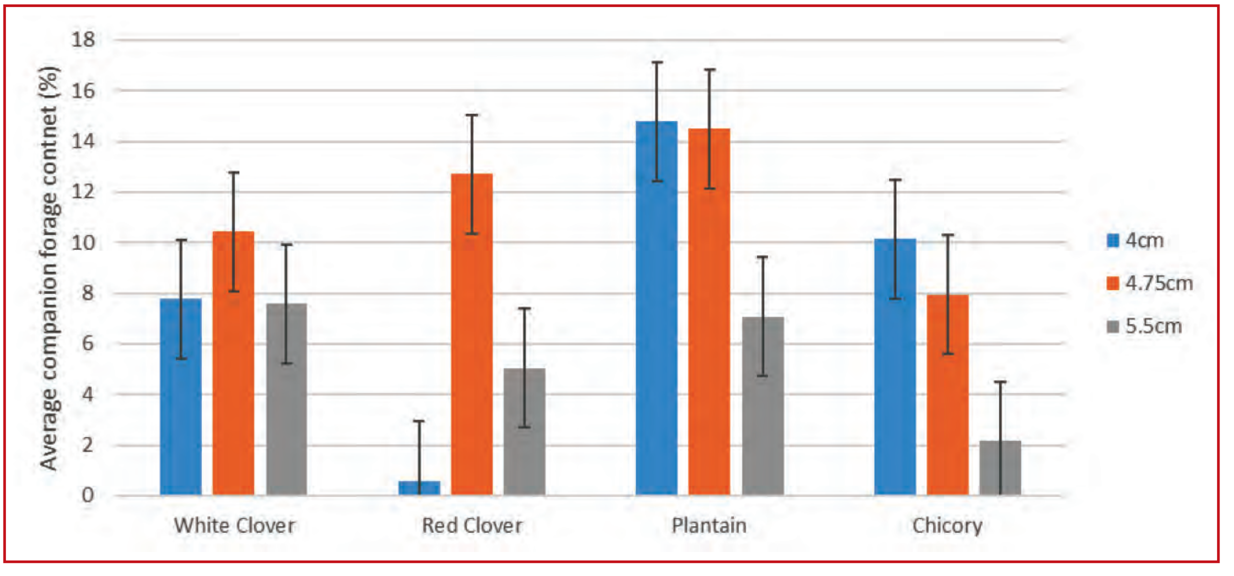



**Figure 2.** Companion forage content in a year 3 sward (2022) by post-grazing sward height

## Seeding rate

A plot study investigating the effect of seeding rate on binary sward types was established in June 2020 and measured for the following 2 years. A total seeding rate of 25 kg/ha was applied across all plots; within this the companion forage seeding rate was varied to provide a low, medium and high seeding rate as shown in Table 2 below.

**Table 2.** Seeding rates applied in seeding rate plot trial

| | Low Seeding Rate | Medium Seeding Rate | High Seeding Rate |
|---|---|---|---|
| **PRG+WC / PRG+RC** | 2.5 kg clover/ ha & 22.5 kg PRG/ha | 5.0 kg clover/ ha & 20 kg PRG/ha | 7.5 kg clover/ha & 17.5 kg PRG/ha |
| **PRG+Plan / PRG+Chic** | 2.0 kg herb/ha & 23 kg PRG/ha | 3.5 kg herb/ha & 21.5 kg PRG/ha | 5.0 kg herb/ha & 20 kg PRG/ha |

The companion forage contents achieved across the study are shown in Figure 3. Interestingly, in PRG+WC swards white clover content was similar across all three seeding rates. In PRG+RC and PRG+Plan swards companion forage contents significantly increased as the seeding rate increased. In PRG+Chic swards companion forage content significantly increased from a low to a medium seeding rate; however, no additional benefit was achieved by increasing the companion forage seeding rate to the high level for this sward type. For the herb sward types (PRG+Plan and PRG+Chic) the unsown species content was lower for the high seeding rate treatment than for the low seeding rate treatment. This illustrates that the higher herb seeding rate had an ability to out-compete and supress weeds.

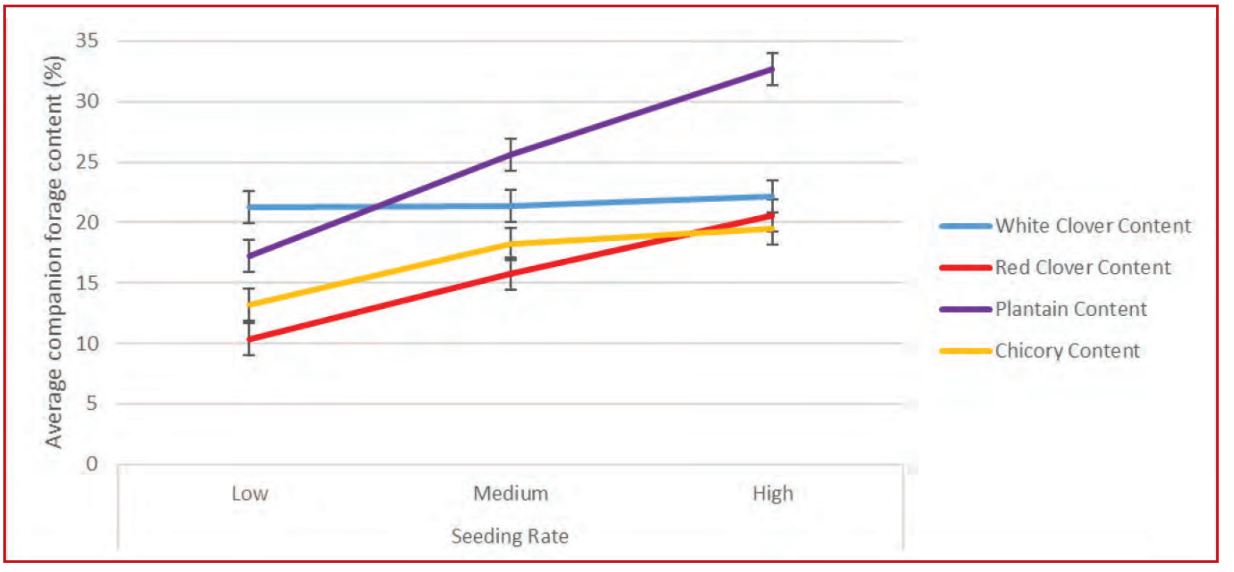



**Figure 3.** Companion forage content by seeding rate

## Summary

Binary sward mixtures containing perennial ryegrass and one companion forage are suitable for use in intensive pasture based production systems. Results from this study show that the addition of a companion forage significantly improved lamb performance, particularly in the post-weaning period and reduced days to slaughter by between 16 and 28 days. Overall ewe performance was similar across all sward types, however the leader follower system implemented post-weaning prioritises lamb performance during this period. Annual herbage production was similar for a perennial ryegrass sward and the binary sward mixtures receiving the same nitrogen application rate. Although not an element of this study, previous research suggests that clover swards may produce the same annual herbage as perennial ryegrass under lower nitrogen application rates. Challenges surrounding companion forage persistency existed; however, improvements in the establishment and persistency of the companion forages were found in the second sowing phase.

Overall establishment method had no effect on companion forage content or weed ingress, with the exception of plantain content, which was higher in a sward sown using the direct drill method than using the conventional method. Post-grazing sward height significantly affected all sward types with the exception of PRG+WC. The 4.0 cm PGSH had a negative impact on red clover content, whilst the 5.5 cm PGSH had a negative impact on plantain and chicory contents. In the seeding rate trial, the low seeding rate was sufficient for a PRG+WC sward, the medium seeding rate was sufficient for a PRG+Chic sward and the high seeding rate was needed to achieve sufficient levels of companion forage content in PRG+RC and PRG+Plan swards. Results from these plot trials illustrate that the sward mixtures respond differently to the various management practices. In conclusion, with appropriate management these binary sward types can be successfully incorporated into sheep grazed swards.

# Meet the speakers

## Dave Leathwick

Dave Leathwick is a principal scientist in parasitology at the pastoral agricultural research centre (AgResearch) in New Zealand. For approaching 35 years he has been researching nematode parasites of grazing livestock, with a focus on their biology and control, and the development and management of anthelmintic resistance. He has worked extensively on parasites of sheep, cattle, and farmed deer and to a lesser extent with goats and horses. For many years Dave has worked on commercial farms, with farmers and veterinarians, dealing with real-world drench resistance management issues.

## Elaine Leavy

Elaine Leavy has been an organic specialist advisor with Teagasc since 2007. Her role is to provide information on organic farming practices; she provides support to local Teagasc advisors, delivers courses, farm walks, gives talks and prepares printed material for the organic industry. She works with other stakeholders within the sector and participates in projects with advisors from other countries.

## Amy Jackson

Amy Jackson farms in partnership with her husband Ross on their mixed organic farm in North Tipperary. They are now in their 8th year of organic farming, growing oats and barley, and producing quality assured lamb (which is sold both privately to individual customers and to Irish Country Meats through the Offaly Quality Lamb Producers Group); the sheep are grazed mainly on multi-species swards, occasionally on red clover, and on winter forage crops.

## Jonathan Herron

Jonathan Herron graduated with a degree in Agricultural Science from UCD in 2016. He subsequently completed a PhD in 2020 in Teagasc Moorepark investigating the effect of management practices on the environmental impact of beef and dairy systems using life cycle assessment. He currently works as a researcher in Teagasc Moorepark working on beef, dairy, and sheep systems and is part of the team developing the Digital Sustainability Platform.

## Lisa McGrane

Lisa McGrane is a final year PhD student based in Teagasc, Athenry working under the supervision of Dr Philip Creighton, Teagasc and Professor Tommy Boland, UCD. Lisa began her research in 2019 after graduating with an Animal Science degree from UCD. Her research focuses on the addition of clovers (white clover or red clover) or herbs (plantain or chicory) to perennial ryegrass swards on animal and sward performance under an intensive sheep production system. Lisa's research also includes plot trials investigating the effect of sward management factors such as establishment method, seeding rate and post-grazing sward height on the various mixed sward types. These plot trials will provide future management advice for the use of mixed sward types under sheep grazing.

# Notes

## Contact:

**Head Office: Teagasc, Oak Park, Carlow, Ireland**
**Tel: +353 (0)59 917 0200**
**Email: info@teagasc.ie**
**www.teagasc.ie**

Teagasc
Agriculture and Food Development Authority