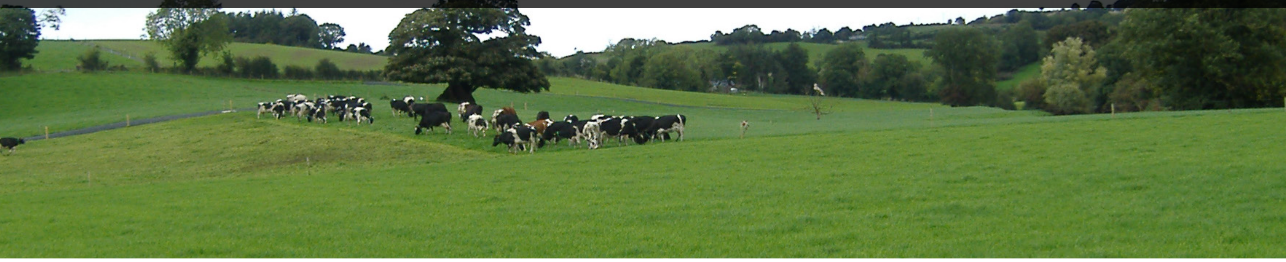
Animal & Grassland
Research and Innovation
Programme
Moorepark

Ballyhaise Open Day 2024

Futureproofing Irish Dairy Systems

Wednesday 24th July, 2024



Teagasc
Agriculture and Food Development Authority

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Principal's welcome

John Kelly

College Principal, Teagasc, Ballyhaise Agricultural College, Co. Cavan

Welcome to Teagasc Ballyhaise Agricultural College, a vibrant campus spread across 220 hectares. Here, we harmonise our rich biodiversity and watercourses with advanced grassland and forestry production systems. Our college is dedicated to providing top-tier training in agriculture and forestry, and we proudly collaborate with Dundalk Institute of Technology (DkIT). Since our last dairy open day in 2022, an additional 736 people have completed QQI courses at Levels 5 and 6, gaining comprehensive experience through Teagasc's education, advisory services, and dairy research programs.

Our commitment to dairy education remains steadfast. Many graduates from our Level 6 Advanced Certificate in Dairy Herd Management have advanced to the Level 7 Farm Manager Apprenticeship, becoming successful dairy farm managers—a crucial progression for the industry's future. Our second-year programs focus on essential skills and management practices for advanced farming systems, with weekly training in grass production and management forming a cornerstone of our curriculum. As a Teagasc Signpost farm, we emphasise sustainable farming practices, integrating our farm's natural resources into all our programs, particularly in the Sustainable Farming in the Environment module.

Addressing the challenge of sustainability is paramount, and we are dedicated to incorporating all outputs into a circular economy. Our facilities are constantly being upgraded and improved. During the open day, you will witness our latest advancements, including pasture renewal and enhanced infrastructure such as slurry storage, farm roadways, and fencing. Our teaching and advisory staff are engaged in continuous training to stay updated on the latest technological developments from our research, ensuring that we provide our students and farmer clients with the most current information.

The Irish economy remains strong, and we anticipate a growing number of learners transitioning away from full-time towards part-time delivery of our programs. Regardless of their chosen mode of delivery, all students will receive the same high-quality knowledge and skills that Teagasc offers. This empowers them and their families to embrace new technologies and production systems, which are crucial for meeting our climate action and water quality goals.

On behalf of Teagasc and Ballyhaise Agricultural College, I welcome you today and wish everyone a successful event.

Best regards,

John Kelly

College Principal

Foreword

Laurence Shalloo

Head of Animal & Grassland Research and Innovation Programme, Teagasc, Moorepark, Fermoy, Co. Cork

The Irish dairy industry has undergone a transformational change since the removal of the EU milk quota in 2015. Indeed, since the Irish dairy industry began to prepare for EU milk quota removal (2007), milk solids output has increased by close to 100% by 2022 with milk output dropping slightly nationally since then. This increase in output has been achieved through increases in cow numbers, increased milk yield per cow, increased fat and protein percentages, increased grass growth and stocking rate and additional land entering the dairy industry. Although there has been significant investment at both farm and industry level, overall debt levels have remained relatively static at farm level, while debt levels per kg of milk solids have reduced significantly. However, there has been a dramatic increase in costs at farm level since 2021. National Farm Survey data suggests that costs have increased from 24 cpl in 2020 to over 37 cpl in 2023 (excl owned labour). These cost increases are across the board but feed and fertiliser accounting for 44% of the increase observed, energy cost increases accounting for 10% of the increase and increased depreciation accounting for 25% of the increase in costs. Clearly, the Geo Political events have had a large bearing on the cost increases and are outside the control of farmers. Systems of milk production that rely less on bought in feed, fertiliser and energy are more resilient in these challenging times. These events should serve as a reminder of the need to reduce the exposure of the businesses operated to these type of scenarios and there is now a need for each dairy farmer to have a look at their business and to focus on cost control setting a target for cost reductions and implementing a plan to achieve that target. It won't happen without a focus. We must be realistic and focus on cost savings that can be achieved at farm level and implement a plan to achieve these costs.

At the same time, there are challenges that the dairy industry will have to address in relation to changing policy environments. From an environmental perspective, these include greenhouse gas emissions reduction targets as well as policy around water quality and biodiversity. Key to this process will be the deployment of the currently available solutions at farm level coupled with further investment in research to develop new solutions to facilitate the industry to meet its overall commitments. This is particularly the case in relation to water quality with the EPA's most recent assessment suggesting that water quality is stable but is not improving. Teagasc has recently launched its Water Quality Campaign "Eight actions for change" which sets out simple solutions and target areas that can be worked on within any farm. Maintaining the nitrates derogation, thus allowing grazing stocking rates to match grass production will be central to maintaining a grass based low carbon footprint and sustainable systems of milk production. Ireland's grazing model is largely unique from an EU perspective and must be protected to ensure it is maintained.

The availability of skilled and motivated people to work and lead within the industry is, and will be a central challenge now and in the future. Thus ensuring that education and training is delivered based on industry needs across different career roles within the sector will be central to delivering a more vibrant industry in the future. Teagasc launched the apprenticeship model of education in 2023 with very strong opportunities now for career progression on dairy farms in Ireland.

DairyBeef and the integration between the beef and dairy industry is making huge progress and can be of benefit to both sectors. There has been huge progress through developments in the EBI and DBI with age of slaughter and carbon emissions now included in a balanced index. Sexed semen use has grown dramatically and there is up to 100,000 less dairy*dairy calves born in 2024 with this category of animal expected to continue to reduce as dairy farmers use more sexed semen and more high DBI beef semen in their dairy cows. The Commercial Beef Value Index will facilitate a robust communication process between dairy and beef farms and requires a strong campaign to roll out across the industry.

Finally, after a rollercoaster couple of years with 2022 (high profit) and 2023 (low profit, poor weather and high costs) and ever ending conversations around policy change, it is apparent that farmer sentiment is currently poor. Days like today here at this Ballyhaise Open Day are extremely important to get an understanding of the potential from existing and new technologies, when used on farm. But also to get off the farm, meet people, socialise and discuss issues and solutions together. While all problems won't be solved here today, however, the conversations and the ideas generated might start the process of finding the solutions needed.

Futureproofing Irish dairy farms – Transitioning to low chemical nitrogen perennial ryegrass white clover swards on wetland grazing dairy systems

Helena Walsh[1], Donal Patton[1], JohnJoe Collins[1], Karina Pierce[2] and Brendan Horan[1]

[1]*Teagasc, Animal & Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork;*
[2]*School of Agriculture and Food Science, University College Dublin, Belfield, Dublin 4*

Summary

- Both significant economic value and improved environmental sustainability have been achieved in the Irish dairy sector by focusing on core grazing principles to maintain low production costs and high levels of pasture utilisation
- Our grazing systems can be improved by reducing reliance on supplementary feed and chemical fertilisers by incorporating white clover within grazing swards. The successful establishment of white clover in the border midland and western (BMW) region of Ireland can significantly reduce requirements for chemical nitrogen (N) fertilisers whilst maintaining similar pasture productivity to perennial ryegrass only swards which require increased chemical N applications level
- For farms that are in the process of establishing new swards and incorporating clovers, the process of new sward establishment significantly reduces winter forage production and additional forage reserves are required as part of the transition
- During the three-year transition period, only modest increases in milk and fat plus protein yield are observed with no differences in milk constituents (fat, protein and lactose content), body weight and body condition score.

Introduction

The financial landscape for dairy production has been substantially altered during the last three years with unprecedented increases in both dairy product prices and costs at farm level. In addition to the ongoing requirement to improve efficiency to meet climate action commitments, dairy farmers must also refocus on prudent financial budgeting to reduce costs and maintain financial margins during 2024. To that end, high productivity pastures are the cornerstone of efficient grazing systems contributing to more than 80% of the feed requirements on Irish dairy farms. Such systems can be further improved by reducing reliance on increasingly uncompetitive supplementary feed imports, incorporating clovers within grazing swards and the further refinement of day-to-day operations to reduce nutrient losses.

It is hugely challenging to maintain farm productivity and profitability while reducing chemical nitrogen (N) use levels and requires the successful incorporation of a substantial legume component within grazed pastures. Although the incorporation of white clover (WC) within perennial ryegrass (PR) grazing pastures has been proven to reduce requirements for chemical N fertiliser in numerous research studies, its impacts have mainly been evaluated within free draining soil types and where the entire farm area has been reseeded to new swards. The border midland and western (BMW) region of Ireland is dominated by wet mineral soils and is associated with shorter grazing seasons, reduced pasture utilisation and reduced farm profitability. However, previous studies indicate that the production and utilisation of increased quantities of higher quality grazed grass can substantially increase productivity on dairy farms in the region. There has been limited research documenting the performance of WC within such conditions and the transition from old permanent pasture to new WC swards has received little attention. On that basis, the objective of the current study was to investigate the transition from old PR swards receiving high rates of chemical N fertiliser application to new PR swards at similar high rates of chemical N fertiliser application and compared to PR-WC swards receiving reduced rates of chemical N on a wetland soil type.

Experimental design

The current experiment is a five-year systems trial proceeding from 2021 to 2025 with the initial three years of the study (2021-2023) focused on the transition from old PR only swards to new PR and PR-WC swards through the combined process of full reseeding and oversowing. The experiment consists of two sward types; PR only swards which receive 250 kg chemical N per hectare per annum and newly established WC (WC-new) or oversown WC (WC-over) swards which receive 125 kg N per hectare per annum. During each year of the transition, a proportion of the land area underwent sward renewal in the form of reseeding with additional area oversown with WC, while the remainder of each farmlet remained as old pasture (PR-old). The details of sward renewal for each sward system are outlined in Table 1.

Table 1. The proportion of each sward system (perennial ryegrass (PR) and perennial ryegrass white clover (WC)) in old pasture (PR-old), newly established reseeded swards (PR-new and WC-new) and WC oversown swards (WC-over) for each of the three year transition period

Sward type	PR		WC		
Sward change	PR-old	PR-new	PR-old	WC-new	WC-over
2021	70	30	50	30	20
2022	50	50	10	50	40
2023	20	80	0	80	20

In May, June and July of each year, paddocks were reseeded with three high Pasture Profit Index (PPI) PR varieties (Astonconqueror, Astonenergy and Glenfield) with or without WC (PR-new or WC-new) using min-till cultivation. During the transition 30%, 20% and 30% of the land area was designated for reseeding in 2021, 2022 and 2023, respectively. Additionally, 20% of the WC system area was oversown (WC-over) each year in May 2021 and July 2022 using an air-seeder after a grazing event. Chieftain and Crusader were the two medium leaf clover varieties used for both sward renewal methods. All reseeded swards (PR-new and WC-new) were grazed at a pre-grazing herbage mass of 1,200 kg DM/ha or below while WC-over swards were grazed at 800 kg DM/ha for the remainder of the first year post-establishment. The chemical fertiliser strategy remained the same for each year of the study. Chemical N fertiliser was applied to PR swards at each rotation post defoliation from February 15th to September 14th each year. In contrast, WC swards received the same chemical N rates as PR swards for the first two rotations until mid-April with reduced rates thereafter depending on the sward clover content for the remainder of the year. Where sward clover contents exceeded 15% in early May, chemical N applications ceased for the remainder of the year. However, where contents ranged from 0-5 % or 5-15%, chemical N applications were reduced by 0 or 50% of PR application rates for the remainder of the year. Excluding the year of sward renewal, grazing management was similar for all treatments in terms of pre-grazing herbage mass, post-grazing sward height and residency time.

Results to-date

The average monthly rainfall and mean daily air temperature (mm and °C, respectively) for the study period were similar to the 10 year average (78mm and 9.9°C for 2021, and 87mm and 9.9°C for 2022). The initial year of the study (2021) had below average monthly rainfall for April (36%), June (24%), July (50%) and November (48%) when compared to the 10 year average values, whereas the air temperature remained consistent with the long-term average. Similarly in 2022, drier than normal conditions were observed at the site for January (45%), March (46%), July (44%) and August (52%), however above average rainfall was recorded for February (127%), September (174%) and October (213%). In contrast, rainfall in 2023 exceeded the 10 year average values for March (182%), April (169%), July to October (150%) and December (113%), while drier than normal conditions were recorded in February (27%) and May (81%). The 10cm soil temperature for the three-year study period was comparable to the long term average values, excluding July to November 2021 (113%), July 2022 (103%), February 2023 (142%) and August to October 2023 (111%), where above average soil temperatures were reported.

Grazing measurements

During the study, 11 grazing rotations were achieved during both 2021 and 2022 with 10 rotations during 2023. The total number of days during which cows grazed varied each year and between sward treatments (259 days for both PR and WC in 2021, 257 and 256 days for PR and WC in 2022, and 243 and 235 days for PR and WC in 2023, respectfully). The effect of sward type on turn out and housing during the study period is outlined in Table 2 below.

Table 2. Dates of turnout of calved cows in spring and housing for the winter and additional days housed during the main grazing season (to avoid excessive damage to the sward)

	2021		2022		2023	
Sward system	PR	PRWC	PR	PRWC	PR	PRWC
Turnout date in spring	8/2	8/2	24/1	24/1	13/2	13/2
Out by day and night	10/2	10/2	7/2	7/2	13/2	13/2
Housing date for winter						
In by night	27/10	27/10	21/10	21/10	18/10	18/10
In by day and night	16/11	16/11	25/11	25/11	06/11	11/11
Additional days housed (No.)	19	19	34	35	15	16
Total days outdoors (No.)	259	259	257	256	242	243

The transition from PR-old to newly established and oversown pasture had no significant impact on grazing characteristics. Total pasture production was significantly reduced during the year of new sward establishment from 14,182 kg DM/ha in PR-old to 8,925, 8,561 and 11,830 kg DM/ha in newly established PR-new, WC-new and WC-over swards (Table 3). The significant reduction in pasture yield in newly established swards is attributed to extended closed periods between spray off of the old swards and first grazing of the new sward, which is mainly due to inclement weather during cultivation and establishment. In the years subsequent to establishment, total pasture production was increased for new PR and WC swards (14,891, 15,642 and 15,218 kg DM/ha in PR-new, WC-new and WC-over, respectively) when compared to old permanent pasture. The establishment of WC-new and to a lesser extent WC-over resulted in a significant reduction ($P<0.001$) in mean chemical N fertiliser application from 229 and 230 kg N/ha for PR-old and PR-new to 119 and 90 kg N/ha for WC-over and WC-new.

Mean sward clover contents were 21, 25 and 19% for 2021 (early September onwards), 2022 and 2023, respectively, within the WC sward systems. Method of establishment significantly impacted mean WC contents with 30% clover content in WC-new in comparison to just 14% in WC-over throughout the transition. This was particularly evident from late May until the end of the grazing season as reseeded swards rapidly increased WC content during this period until July (12 to 29%) whereas WC-over experienced much slower increases during the same period (13 to 16%; Figure 1). Clover contents peaked in September for both establishment methods with 38 and 28% for WC-new and WC-over, respectively. Achieving a high level of WC content (20-25%) is critical to replace chemical N fertiliser with biologically fixed N without implications for pasture production. At the end of 2023 within the PR-WC area, 52% of the land area had sufficient mean WC content to reduce chemical N application by 100 kg N/ha with the majority originating from WC-new pastures. However, the remaining PR-WC area either experienced intermediate (15-19%) or poor (<14%) WC contents and therefore chemical N applications were only reduced accordingly on this area as previously outlined. The impacts of establishment method on WC content reported here over the three years excludes a number of oversown swards where no clover was established and so these paddocks had to be reseeded fully in subsequent years. There were limited impacts of sward renewal and WC incorporation on sward quality. Sward crude protein (CP) content increased for reseeded swards (201.8 g/kg for both PR-new and WC-new) compared to PR-old (195.0 g/kg) while WC-over swards had the lowest CP content during the initial year of establishment (172.0 g/kg), thereafter reaching similar levels to that of reseeded swards in Years 2 and 3 post establishment as WC contents increased (202.3 and 195.4 g/kg, respectively).

Table 3. The effect of sward change (SC) transition from old permanent pasture (PR-old) to newly established swards (Perennial ryegrass (PR-new) and Perennial ryegrass white clover (WC-new)) and clover oversown (WC-over) swards on total pasture production and chemical fertiliser application during the three year transition period

Sward system	PR		PRWC	
Sward change	PR-old	PR-new	WC-new	WC-over
Pasture production (kg DM/ha)				
Establishment year	14,182	8,925	8,561	11,330
Year 2		14,064	14,723	12,848
Year 3		14,891	15,642	15,218
Chemical N application (kg N/ha)				
Establishment year	229	200	84	124
Year 2		245	94	103
Year 3		246	93	131

While the high levels of sward renewal accelerated transition from PR to WC swards, this also had a major impact on the overall feed budget on the farm as annual pasture production within the year of establishment was significantly reduced. Sward type had no effect on the winter feed shortage with PR systems being 55% self-sufficient and WC systems being 56% self-sufficient (Table 4).

Table 4. The effect of transition of each sward system (SS; Perennial ryegrass (PR) and Perennial ryegrass white clover (PRWC)) on stocking rate (SR), feed requirements and milk production performance

Sward system	PR	PRWC
Whole Farm SR (cows/ha)	2.5	2.5
Milking Platform SR (cows / ha)	2.7	2.7
Concentrate fed (kg DM/cow)	840	848
Silage fed (kg DM/cow)	1,677	1,626
Winter feed self-sufficiency (%)	55	56
Milk yield (l/cow)	5,092	5,197
Fat plus protein yield (kg/cow)	461	473
Milk composition (%)		
Fat	5.11	5.12
Protein	3.70	3.71
Lactose	4.75	4.74
Body weight (kg)	522	523
Body condition score (1-5)	2.90	2.91

Animal performance

Transitioning to WC systems resulted in modest increases in both milk yield (5,197 and 5,092 kg) and milk fat plus protein yield (473 and 461 kg/cow) for WC swards when compared to PR only swards while there were no significant differences observed for milk composition (fat, protein and lactose) between the two sward types during the transition (Table 4). Similarly, body weight and body condition score were comparable for both sward types.

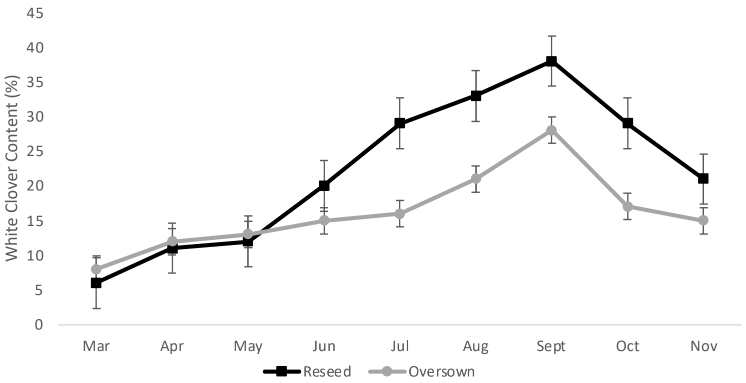


Figure 1. *Mean monthly sward white clover content for reseeded and oversown perennial ryegrass white clover swards during the grazing season throughout the three year transition (2021-2023)*

Implications of this research

Previous studies have stated that a minimum WC sward content of 20% was required to achieve the production benefits of WC in grazing swards. However, the overall sward WC contributions in this study only reached that threshold level in the third year of this study when a significant increase in milk production was achieved. Nonetheless, even at relatively lower sward WC contents during the transition period, WC can make a positive impact primarily in terms of maintaining herbage production while reducing requirements for chemical N fertiliser application. This change can help to insulate farmers from dramatic price fluxes in both milk prices and fertiliser costs which have occurred in recent years. Although the establishment of new swards represents a considerable cost at farm level (€1,150/ha), at current N fertiliser costs (€1.40/kg of N applied) and milk prices (€5.50/ kg MS), the establishment of PR-WC swards increased farm profitability by €300/ha per year compared with the PR system within this study during the transition period and therefore represents a significant short term return on investment. As WC content increases and additional pasture growth and animal performance benefits are realised in each subsequent year, the anticipated annual net profit of the WC farm systems are anticipated to reach +€500/ha based on previous studies. Moreover, and in addition to the substantial economic advantage, the development of such systems will reduce greenhouse gas emissions associated with the pasture-based grazing systems under evaluation therefore further improving the sustainability of Irish grazing systems.

Conclusions

This study demonstrates the successful establishment of WC to maintain pasture productivity and reduce dependence on chemical N fertiliser applications in the BMW region of Ireland. Although the transitional period showed successful establishment of WC swards, long-term evaluation on the persistence and productivity of WC swards is essential to encourage a greater adoption on commercial farms. The study also highlighted the detrimental effect of increased rates of pasture renewal on the provision of sufficient winter feed. Therefore, commercial farms must be cautious when planning the rate and extent of transitioning to white clover swards to ensure adequate winter forage reserves are available.

Acknowledgements

The authors wish to thank the staff of Ballyhaise Agricultural College for their care of the experimental animals and assistance with measurements taken during the study. The financial support of the Irish Dairy Levy Funding administered by Dairy Research Ireland and the Teagasc Walsh Scholarship programme is also gratefully acknowledged.

Recommended practices to establish white clover in grazing swards

Áine Murray[1] and Alastair Pollock[2]

[1]Teagasc, Animal & Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork;
[2]Teagasc, Ballyhaise Agricultural College, Ballyhaise, Co. Cavan

Summary

- Transition phase from a grass-only to a grass-white clover farm is a multi-year process with continued maintenance requirements
- Both reseeding and over-sowing will be required to covert the whole farm to a grass-white clover system.

Reseed vs. over-sowing

Establishing white clover on farm will take a number of years using a combination of both reseeding and over-sowing. Incorporating white clover in a full reseed is the most reliable method of establishing clover and provides the best opportunity for weed control. Over-sowing is a simple and lower cost method of introducing white clover into swards. Success is very much dependent on soil fertility, weather conditions at sowing, soil moisture, post-sowing grazing management and competition from the existing sward.

Paddocks for a full reseed should be identified and prioritised based on criteria such as poor pasture growth, old age of sward, high weed content etc.

Selecting suitable paddocks for over sowing to ensure optimal opportunity of establishment should agree to the following criteria:

- Optimal soil fertility (index 3 or > for P & K, soil pH 6.5)
- High perennial ryegrass content
- Open/low density swards – dense swards prevent light getting to new clover plant, hindering establishment
- Low weed content

Any paddocks that are not suited for over-sowing in the first year (but not ear marked for reseeding) should have any issues such as soil fertility or weed burden corrected and over sown the following year.

White clover establishment blueprint

A targeted multiyear approach should be used in establishing a white clover system-combination of reseeding and over-sowing

- Reseed approx. 10% per year
- Over sow approx. 15 % per year
    - Year 1- reseed 10% & over sow 15% = 25%
    - Year 2- reseed 10% & over sow 15% = 25% (50%)
    - Year 3 – reseed 10% & over sow 15% = 25% (75%)
    - Year 4 - reseed 10% & over sow 15% = 25% (100%)
    - Year 5 + - on-going process

Reseeding

- Spring reseed provides best results - April, May, June
- Soil sample for P, K and pH
- Spray off the old pasture with glyphosate
- Prepare a fine, firm seedbed
- Use the Irish Recommended List for cultivar selection
- Sowing rates (sowing depth approx. 10mm)

	Grass	White clover
Cattle	28-30 kg/ha	4-5 kg/ha
Sheep	25-28 kg/ha	5-6 kg/ha

- Apply 40kg N/ha at reseeding
- Apply lime, P and K fertiliser as required
- Roll well to ensure good seed: soil contact

Over-sowing

- Control weeds the previous year prior to over-sowing white clover
- April is the best month for over-sowing
- Over-sow directly after a tight grazing
- Soil contact post over-sowing is one of the most crucial factors
- Over-sowing methods – common methods (Figure 1) including direct drill, stitching in or broadcast, are equally successful as long as the right conditions, settings and post-establishment management are correct
- Broadcasting – more varied results:
    - » Mix clover seed with a compound fertiliser in the field – max of 1ha at a time, reduced spreading width (6 meters)
- Stitching – can ensure a better soil: seed contact:
    - » In sheep swards stitching must be used
- Sow at rate of 5-6 kg/ha

Post-sowing management – (full reseed or over-sowing)

- Light to the base of the swards is the most crucial factor post management to encourage stolon development
- The first grazing of a new reseed or over-sowing should be at a pre-grazing herbage mass of 600 to 1000 kg DM/ha
- The three subsequent grazings should be at a pre-grazing herbage mass <1,100 kg DM and post-grazing height of ≤4 cm
- No silage in the first 12 months after sowing
- Swards should be grazed later in the autumn to avoid carrying heavy covers over the first winter

Weed control

Weed control in reseeded and over-sown grass-white clover swards is vital to ensure long-term persistence of the swards. All pesticide users should comply with the regulations as outlined in the Sustainable Use Directive (SUD).

- Reseeds
    - » Weeds are best controlled when the grass plant is at the three leaf stage and the clover when the trifoliate leaf has appeared. White clover safe herbicide should be used
- Over-sown
    - » Established weeds should be controlled the previous year before over-sowing
    - » Consider residue time of non-clover safe sprays

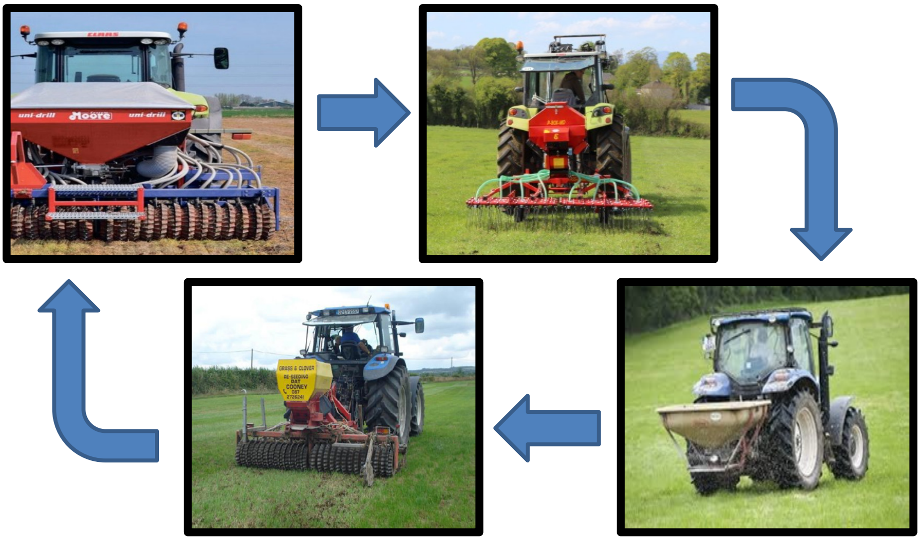


Figure 1. *Methods of over-sowing white clover into existing swards*

Begin with the end in mind: the impacts of white clover incorporation with perennial ryegrass swards on dairy farms

Áine Murray[1] and Deirdre Hennessy[2]

[1]Teagasc, Animal & Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork, P61C996; [2]School of Biological, Earth and Environmental Sciences, University College Cork, Distillery Fields, North Mall, Cork, T23 N73K

Summary

- To reduce both input costs and the environmental impacts of inorganic nitrogen (N) fertiliser use, there has been a renewed interest in the incorporation of white clover (WC) in grazing systems
- White clover can offset some of the N requirements of grazing systems through its ability to biologically fix atmospheric N to facilitate grass production
- In addition, increased milk production has been reported from cows grazing perennial ryegrass (PRG)-WC swards due to an overall increase in herbage dry matter (DM) intake and the higher nutritional value of the PRG-WC sward.

Introduction

Ireland's milk production systems are predominantly spring calving, matching dairy cow feed demand to grass supply. These systems are amongst the most efficient in the world, converting a low-cost, home-grown feed source, grass, into high quality milk products. While PRG based grazing systems are highly efficient and low-cost, growing 13-14 t DM/ha, they have a high dependence on relatively high levels of artificial N fertiliser application (> 225 kg N/ha). In this paper we provide an update on recent experimental studies which describe the effects of WC inclusion in PRG swards on the performance of spring calving grazing dairy systems.

Recent research results and the benefits of White Clover

White clover (*Trifolium repens* L.; hereafter referred to as WC) is the most important legume species in Ireland as its growth profile is complementary to grass, it is tolerant of grazing and has high nutritional quality. To achieve production benefits of WC inclusion in the sward, an average annual white clover content of approximately 20% is required. Sward clover content varies across the year. White clover needs soil temperature of about 8°C for growth compared to about 5°C for grass and therefore clover growth is low during spring, increasing from approximately 0-5% in February to a peak of 35-50% in early September (Figure 1). There are several benefits associated with the use of white clover in grass-based milk production systems.

Nitrogen fixation

As clover is a legume, it has the capacity to fix atmospheric N and make it available for plant growth. This occurs through a symbiotic relationship whereby rhizobia bacteria in the soil infect clover root hairs and form nodules. The clover then supplies the bacteria with energy through photosynthesis to fix N which the bacteria then makes available to the clover plant and the plant uses this N for growth. Many experiments have been undertaken examining the quantity of N fixed in PRG WC swards. In frequently grazed swards (8-10 times per year), receiving around 100 to 150 kg artificial N/ha per year, up to 150 kg N/ha/year can be fixed.

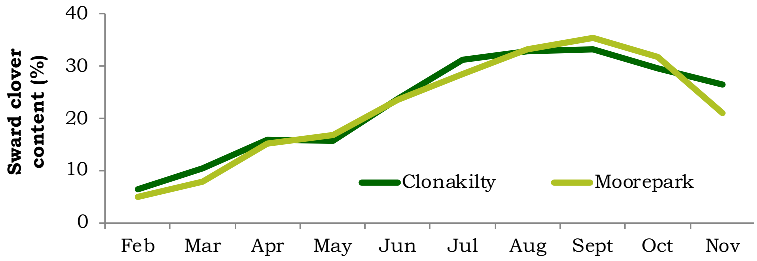


Figure 1. *Annual sward white clover content at Moorepark (8 years) and Clonakilty (4 years)*

The rate of N fixation is influenced by the N fertiliser supply to the sward and the sward clover content. Generally, an average annual sward WC content of at least 20% is required for sufficient N fixation to occur to significantly reduce artificial N fertiliser application. In fertilised swards, as N fertiliser application rate increases, N fixation declines (Figure 2).

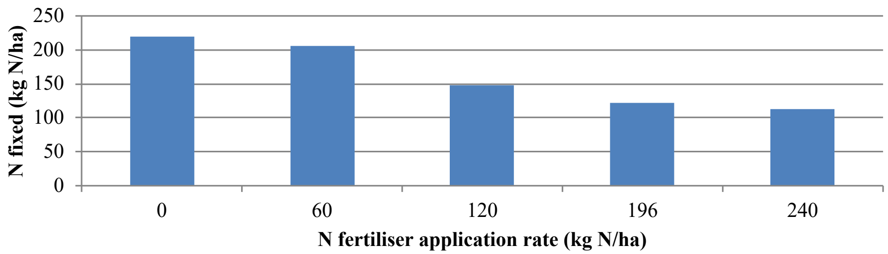


Figure 2. *Nitrogen fixation (kg N/ha) on grass white clover swards receiving 0, 60, 120, 196 and 240 kg N fertiliser/ha over three years. Source: Enriquez-Hidalgo et al. (2018)*

Herbage production

Incorporating WC into grazed grassland can increase herbage production, particularly at lower N application rates. Research from Clonakilty Agricultural College found that incorporating WC into intensively managed swards increased annual herbage production by 1.5 t DM/ha, on average, relative to grass only swards (where both sward types received 250 kg N/ha) over a four-year period where sward WC content was 23% (Guy *et al.*, 2018). Research at Moorepark shows that grass-WC swards receiving 150 kg N/ha grew the same quantity of herbage as grass-only swards receiving 250 kg N/ha (13.4 t DM/ha) over an eight-year period.

Milk production

Grass-WC swards tend to be higher quality in mid-season compared to grass-only swards as sward WC content increases from May onwards. Clonakilty and Moorepark research both show increases in milk production and milk solids production ($P<0.05$) from grass-WC swards compared to grass-only swards (Table 1).

Table 1. Effect of white clover inclusion on milk and milk solids yield in the Moorepark and Clonakilty grazing experiments

Moorepark experiment	Grass-only 250 kg N/ha	Grass-white clover 250 kg N/ha	Grass-white clover 150 kg N/ha
Milk yield (kg/cow)	6,108	6,498	6,466
Milk solid yield (kg/cow)	460	496	493
Clonakilty experiment	**Grass-only 250 kg N/ha**	**Grass-white clover 250 kg N/ha**	
Milk yield (kg/cow)	5,222	5,818	
Milk solid yield (kg/cow)	437	485	

Eight years (2013-2020) of research at Moorepark comparing the standard PRG-only grazing system receiving 250 kg fertiliser N/ha with a PRG-WC system receiving 150 kg fertiliser N/ha have been completed and the results of these long-term trials are outlined in Table 2 below. Both systems were stocked at 2.74 cows/ha while total herbage production was similar on the two sward types despite 100 kg/ha reduction in N fertiliser used on the PRG-WC swards. Approximately 75 kg DM/cow more silage were fed during lactation to the PRG-WC cows, mostly in autumn. Milk and milk solids yield were greater on the PRG-WC system compared to PRG-only.

Table 2. Average animal and sward production on grass-only swards receiving 250 kg N/ha and grass-white clover swards receiving 150 kg N/ha from 2013 – 2020

	Grass-only 250 kg N/ha	Grass-white clover 150 kg N/ha	Difference
Stocking rate (cows/ha)	2.74	2.74	-
Annual herbage prod. (t DM/ha)	13.8	13.5	-0.3
Silage conserved (t DM/cow)	1.00	0.98	-0.02
Silage fed (kg DM/cow)	259	333	+74
Concentrate fed (kg/cow)	438	438	-
Average sward clover content (%)	-	22.0	-
Milk yield per cow (kg)	6,068	6,331	+243
Milk solids yield per cow (kg)	490	510	+20

Farm profitability

Recently, Murray *et al.* (2024) reviewed the financial impact of including WC in grazing swards when compared to traditional PRG-only swards. The cost of N fertiliser and silage was included at €1.41/kg of N applied and €240/t of silage fed, respectively, while milk solids price was included at €5.09/kg MS (equivalent to current values). Based on the analysis, the PRG-WC treatment increased net farm profit by €478/ha compared with the PRG-only treatment. The substantial increase in net farm profit was primarily due to the reduction in fertiliser costs and the increased milk revenues from the PRG-WC treatment.

Conclusion

The inclusion of WC in PRG swards had a significant positive affect on the overall efficiency of milk production systems resulting in increased animal performance and reduced fertiliser inputs. Grass-WC swards can substantially increase the profitability of spring calving grazing dairy systems while simultaneously improving the sustainability of such systems.

Grass10: Review of spring 2024 and lessons learned

Joseph Dunphy[1] and Owen McPartland[2]

[1]Grass10, Teagasc, Athenry, Co. Galway; [2]Teagasc – Lakeland Dairies/Teagasc Joint Programme, Ballyhaise, Co. Cavan

Summary

- PastureBase data indicates that average pasture growth nationally to June 1st was 0.6t DM/ha below the five year average
- The availability of high quality silage (>78% DMD) is critical to the performance of the herd throughout the spring and farms should put measures in place to ensure that at least 50% of their silage is of high quality for the milking cows
- While mid-season can be a tricky period to manage pasture quality, the benefits of regular pasture measurement and the quick identification and removal of surpluses at this time of year will ensure that cows are consuming pasture of high quality.

2024 so far, a PastureBase Ireland summary

From a weather, grass growth and grass quality perspective, 2024 has certainly tested Irish dairy farmers. PastureBase data indicates that average pasture growth nationally to June 1st was 4.0 tonnes (t) DM per hectare (ha) and 3.4 t DM/ha for the BMW region (Figure 1). This is approximately 0.6t DM/ha below the five year average in both cases. Weather issues delayed chemical & organic fertiliser application which negatively affected pasture growth rates during spring while peak pasture growth during late May was also reduced on some farms where fertiliser applications were delayed. Pre-grazing herbage masses from April 10th to May 10th averaged 1,720 kg DM/ha nationally, up 10% from the previous year due to delayed turnout which subsequently resulted in increased post grazing residuals during the 2nd and 3rd rotations. This has led to poorer pasture quality during May and June 2024, which required mechanical correction and resulted in reduced pasture growth rates during mid-season.

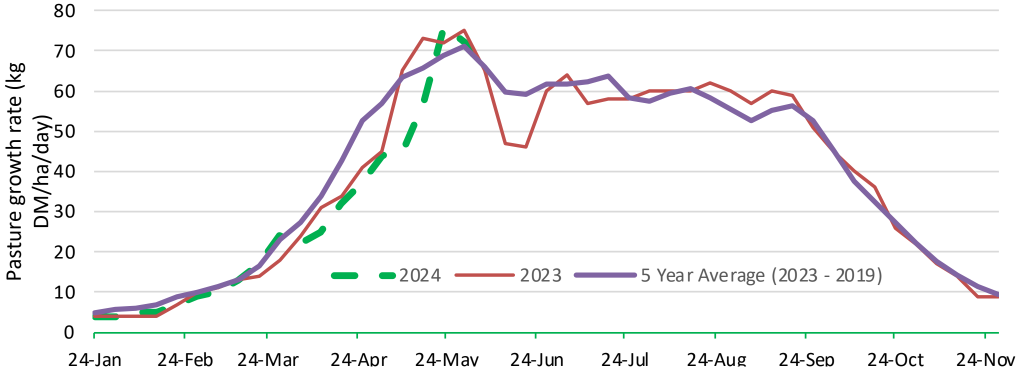


Figure 1. *Pasturebase Ireland pasture growth rates during 2024 compared to 2023 and five year average values*

Unseasonably cold weather during June has put further pressure on pasture growth rates resulting in many farms just growing enough pasture to keep pace with demand. The knock on effect has been reduced opportunities to cut surplus paddocks as a means of improving grass quality, especially on any farms where stocking rates are high through the summer months.

Making enough high quality silage for the spring when cows are housed

If 2024 has taught us anything thus far, it is the importance of having adequate quantities of high quality silage in reserve as part of the overall farm strategy. Table 1 below illustrates the demand for high quality silage in both spring and autumn at various stocking rates, and at various levels of opening average farm cover (AFC) on farms with an 85% six-week calving rate and a 10-week calving period for the herd.

The availability of high quality silage (>78% DMD) is critical to the performance of the herd throughout the spring and into the grazing season. All farms should put measures in place to ensure that at least 50% of their silage is of high quality for the milking cows. After this, the replacement enterprise on the farm must also be supplied with high quality silage, therefore further increasing the quantities of high quality silage required on farm to 75 – 85% of the total winter feed.

The importance of pasture quality on milk composition

Going forward, farmers who want to thrive within a challenging economic environment with increased costs will need to refocus their efforts on how to manage grazing in early spring and mid-season as a way of reducing costs and increasing animal performance. The importance of quality pasture, and high quality silage in the diet of lactating dairy cows has been well proven in trial work and in practice on farms. Figure 2 below illustrates the profile of milk protein content for a large sub set of farms in the Border, Midlands & Western region during each of the last two years. When comparing February 2023 and February 2024, which were drastically different in terms of grazing conditions, similar milk protein contents were observed in both years (3.37% and 3.36%, respectively). This indicates that many farmers did not capitalise on the excellent grazing conditions during February 2023 to get more grass into animal diets and increase milk protein content arising from the good grazing conditions during February 2023. Similarly, while the vast majority of farmers are grazing full-time by June, another decrease in milk protein content is common during mid-season on farms in the region. This is typically a result of high pasture growth rates resulting in high pre-grazing herbage mass (>1,750 kg DM/ha) and a reluctance to remove surplus pasture quickly on many farms. While mid-season can be a tricky period to manage pasture quality, the benefits of regular pasture measurement and the quick identification and removal of surpluses at this time of year can pay dividends for the remainder of the main grazing season. The reduction in milk protein content during June 2024 on the average farm of 93 cows in the region is costing €988 (at current May milk prices) and therefore represents an important opportunity to increase milk value on farms.

Table 1. Effect of stocking rate (SR) and opening average pasture cover (AFC) on herd feed demand and requirement for silage supplementation within compact calving grazing systems

SR	Opening AFC	Grass utilised in rotation 1	Spring silage required	Autumn silage required	Total milking cow silage	Dry period silage	High quality silage
LU/ha	kg DM/ ha	kg DM/cow					% required
2.5	750	703	201	630	831	840	**50**
	1000	783	121	630	751	840	**47**
3.0	750	586	318	795	1,113	840	**57**
	1000	652	252	795	1,047	840	**55**
3.5	750	502	402	870	1,272	840	**60**
	1000	559	345	870	1,215	840	**59**

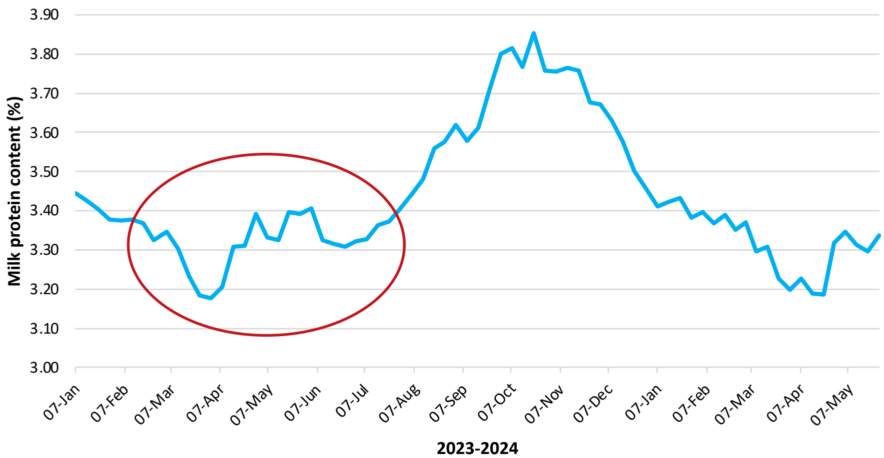


Figure 2. *Seasonal profile in milk protein content on dairy farms in the Border Midlands and Western region during 2023 and 2024*

Importance of good grazing infrastructure on getting grass in the diet

Given current milk prices and rising costs of alternative feeds, the positive economic impact of an additional day grazing during spring has increased from €2.70/cow/day to €4/cow/day in recent years and this remains the single biggest opportunity to maintain profit margins on Irish dairy farms. Despite even good grazing management practices, many farmers reached a point during April 2024 when grazing came to a standstill as land was not trafficable and/or the driest paddocks had already been grazed on the farm. To continue to graze during such difficult conditions, farms with excellent grazing infrastructure were at a major advantage while minimising pasture damage. On that basis, dairy farmers should evaluate opportunities to improve grazing infrastructure to each grazing paddock on farm. In this regard, permanent un-fenced spur roadways (Image 1 below) costing €15 per linear metre can provide valuable additional flexibility when allocating grass during spring and autumn.

Image 1. *Permanent un-fenced spur roadways installed*

Conclusions

Where many improvements at farm level can be slow and expensive and require patience to see results, improving grazing management can be a relatively quick and inexpensive way to increase animal performance on farms in the BMW region. Those who have embraced more flexible grazing management are reaping the rewards through high levels of performance at lower cost. The fundamentals of increasing days at grass, improving the quality of pasture offered to cows every day and continual improvement in grazing infrastructure should be the focus of farmers who want to secure their future in an uncertain economic climate.

A modern breeding strategy for high profit dairy farming

Margaret Kelleher[1], Anthony Mulligan[2], Mark Waters[1] and Kevin Downing[1]

[1]Irish Cattle Breeding Federation (ICBF), Link Road, Ballincollig, Co. Cork; [2]Teagasc, Ballyhaise College, Ballyhaise, Co Cavan

Summary

- Greater use of sexed semen on dairy farms, along with a slowdown in the growth of the national herd, has led to a higher proportion of dairy females being bred with beef AI
- The Economic Breeding Index (EBI) continues to deliver over €10 genetic gain per year and genotyping females enables more selective breeding decisions
- The Dairy Beef Index (DBI) is the breeding tool dairy farmers can utilise to select beef bulls for their dairy cows, aiming for favourable outcomes in calving, beef quality, and carbon characteristics. Improving the beef carcass quality of dairy-beef cattle is essential to ensure a market for the resulting beef x dairy calves
- The Commercial Beef Value (CBV) is a new index that provides information on the predicted profitability of non-breeding beef animals, offering dairy farmers and rearers insights into beef quality of resulting offspring resulting from DBI matings.

Introduction

The number of dairy cows in Ireland has grown from one million in 2010 to over 1.6 million in 2024, although the rate of expansion has slowed in recent years. The fertility of the national herd has improved during this period due to genetic gains achieved through the Economic Breeding Index (EBI). As a result, cows are now more productive and fertile and have longer lifespans, reducing the need for dairy replacements. More recently, the use of sexed semen has significantly increased on dairy farms, with over 20% of total AI services using this method in 2024, an increase of over 50% in only two years. These factors have contributed to a rise in the use of beef bulls on the dairy herd resulting in a greater proportion of beef x dairy offspring entering the market. With the advent of numerous emerging technologies and shifting industry trends, what breeding strategies can you implement to increase the profitability of your herd?

Genomic selection and genetic gain

Genomic selection has significantly contributed to profitability and sustainability on Irish dairy farms. This technology has transformed genetic improvement in the national dairy herd, doubling the rate of genetic gain in EBI from €5 to €10 per year. Up until 2023, genomic selection enabled the pre-screening of over 10,000 genotyped young bull calves born each year on Irish farms, with only a small percentage selected for the national breeding program based on genomic results. Similarly, farmers also pre-selected their dairy females using more reliable and accurate information at an earlier age due to genotyping. However, as shown in Figure 1, only 6.5% of dairy cows had been genotyped up to 2023. Following the introduction of the National Genotyping Programme, over 35% of all dairy cows are now genotyped.

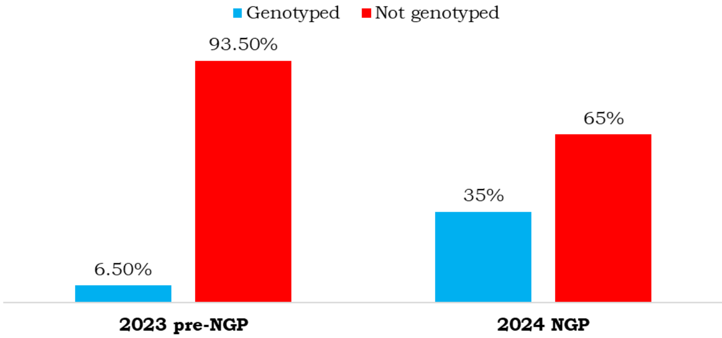


Figure 1. *Proportion of the national dairy cows genotyped in 2023 (pre-NGP) and 2024 (post NGP commencing)*

The National Genotyping Programme

The National Genotyping Programme (NGP) represents an innovative collaborative effort aimed at establishing a fully genotyped national dairy and beef herd in Ireland. This initiative is a partnership between the Irish Cattle Breeding Federation (ICBF), the Department of Agriculture, Food and the Marine (DAFM), and various stakeholders from the beef and dairy industries, and participating farmers.

Over 10,000 herds applied to participate, including (~3,500 dairy and ~6,500 beef herds) accounting for over 650,000 cows in total. In the first phase of the NGP, all breeding stock were required to be genotyped in 2023, in preparation for the 2024 calving season. This was achieved, at no cost to the farmer, using the Brexit Adjustment Reserve fund. The second phase of the NGP began in January 2024, and will run up to 2027, and involved the genotyping of all calves born in the participating herds at birth. The genotype results are integrated into the national calf registration system through the DNA calf registration process. There is a significant benefit to farmers and the industry as inaccuracies in the recorded dam, sire and sex of each calf can be corrected before the bovine passport has been issued. For instance, in Spring 2024, parentage errors were identified in an average of 15% of cases (Figure 2). Errors in the recorded sex were identified and corrected in 1.5% of cases. In the 8% of calves submitted for registration without sire details, a sire was identified by the genotype and added in 83% of cases. The cost of genotyping each calf in the programme is shared equally three ways between the farmer, DAFM and Industry with each contributing approximately €6/calf. Calves were fully registered by an average of 12 days of age, with over 98,000 samples processed in a single week during the spring peak. Additional herds which are currently not participating in NGP will have an opportunity to sign up later this year.

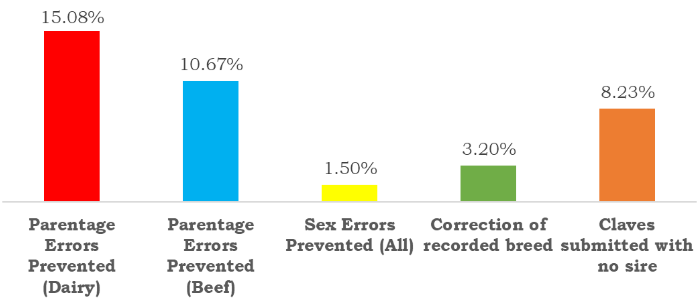


Figure 2. *Percentage of corrections from the Spring 2024 calf registrations in NGP*

Sexed semen

Although using sexed semen traditionally lowers conception rates, analysis over five years of field data from the ICBF shows that the relative performance of sexed semen compared to conventional semen is 92% (Figure 3). This indicates a significant improvement in the technology over the last five years and this improvement has resulted in increased uptake of sexed semen at farm level.

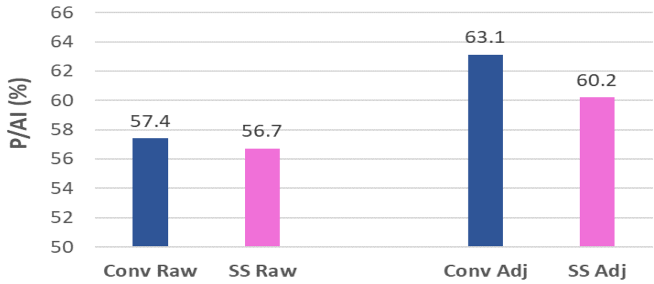


Figure 3. *Pregnancy rate for conventional (Conv) and sexed (SS) semen (using raw and adjusted values)*

Sexed semen is one of the key measures dairy farmers can use to increase their genetic gain by intensively selecting which cows are selected to be the dams of future replacements. At the same time, this reduces the reliance on conventional dairy semen which typically results in about 50% dairy male offspring. Furthermore, by using sexed semen, farmers can increase the use of high beef merit semen on dairy cows, leading to calves with higher Commercial Beef Value (CBV). This not only enhances the profit potential for dairy farmers but also benefits beef farmers with calves that have a reduced age to slaughter and require fewer inputs throughout their lifetime.

Use of beef semen on dairy females

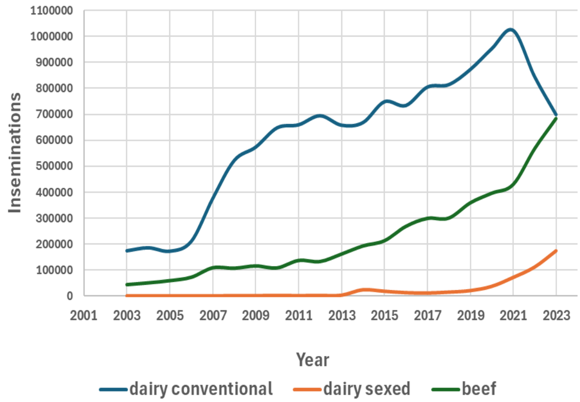


Figure 4. *Number of inseminations in the dairy herd by dairy conventional, sexed and beef sires*

Other emerging trends indicate a shift in breeding strategies. Traditionally, dairy sires were used at the start of the breeding season, with beef semen reserved for repeat or late-calving cows. However, beef semen is increasingly used earlier in the breeding season. As shown in Figure 4, there has been a noticeable increase in the number of beef inseminations within the dairy herd. Indeed, this year marks the first time the number of beef calves born from dairy cows has surpassed the number of dairy calves born from dairy cows during the peak spring calving season, with over 53% of the calves born by 20th April being beef x dairy progeny.

What is the CBV?

The CBV, or Commercial Beef Value, is a tool for gauging the quality and anticipated profitability of non-breeding animals. The CBV offers farmers valuable insights into the genetic worth of their animals, encompassing important traits for non-breeding (drystock) enterprises such as carcass weight, conformation, and feed intake (Figure 5). Similar to the EBI and Euro-Star Indexes, CBV is denoted as a €uro value. A higher euro value signifies superior genetic merit across the included traits.

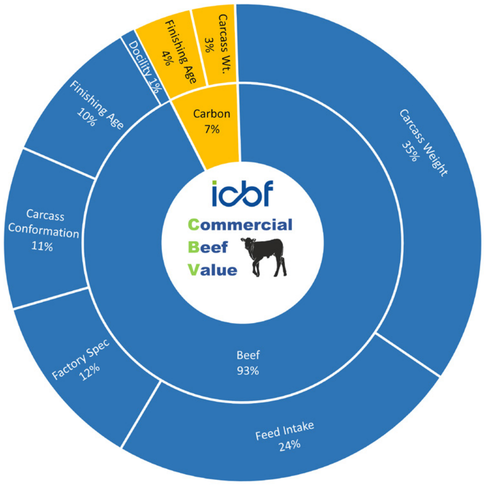


Figure 5. *The Commercial Beef Value*

The beef merit of calves can vary significantly even within the same breed (Table 1). The CBV will allow farmers to make more informed decisions when purchasing animals and genotyped animals being traded through marts will have their CBV displayed on mart boards. Current research conducted by Teagasc shows a €1.85 increase in farm profit for every €1 CBV increase in dairy x Angus steers.

Table 1. Commercial Beef Values (CBV) by breed for 2024 born dairy-beef calves (source www.icbf.com)

2024 Born beef calves from the dairy herd					
Sire Breed	Btm 20%	Btm 40%	Average	Top 40%	Top 20%
Angus	<€50	<€72	€79	>€86	>€104
Aubrac	<€111	<€127	€34	>€142	>€162
Belgian Blue	<€123	<€140	€148	>€156	>€177
Charolais	<€132	<€156	€165	>€174	>€197
Holstein Friesian	<€-18	<€-4	€2	>€8	>€21
Hereford	<€50	<€67	€74	>€82	>€103
Limousin	<€133	<€149	€156	>€164	>€186
Simmental	<€67	<€87	€96	>€107	>€130

From 2024, a distinct advantage to buyers is that more calves are being genotyped at birth and parentage verified due to the NGP. In NGP herds this year, over 93% of all calves born have been verified to a sire. As a result, CBV values become more precise, assuring buyers that animals are correctly registered and enhancing the accuracy of their genetic potential. However, the overall 'quality' of dairy-beef animals, as measured by the CBV, has declined in dairy herds since 2015 (Figure 6). Trying to disentangle why the CBV values have declined is difficult and not all herds have witnessed a decline. Regardless, all dairy herds need to ensure they use beef bulls with good beef quality characteristics as well as the other traits of economic importance such as calving ease and gestation length.

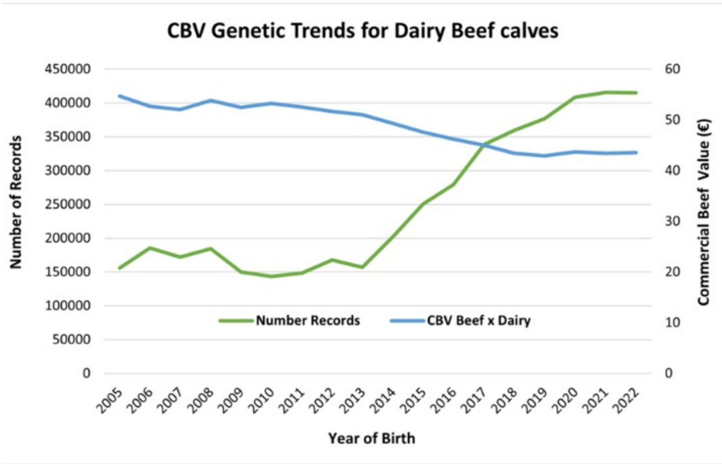


Figure 6. *The Commercial Beef Value genetic trends for beef x dairy*

The Dairy Beef Index (DBI)

The DBI is a genetic index used in dairy farming to select bulls that will produce calves suitable for beef production, while also maintaining desirable calving traits in their progeny. The index consists of three sub-indices: Calving, Beef and Carbon (Figure 7). Traits such as gestation, calving difficulty and mortality contribute to the Calving sub-index. Trends indicate that dairy farmers are increasingly prioritising favourable calving traits and are making consistent advancements in this aspect annually. However, in the Beef sub-index, which encompasses traits like carcass weight, conformation and feed intake, progress appears to be less pronounced. To address this, dairy farmers should select bulls with high beef sub-index values in the DBI in order to improve calf quality. The beef merit traits will be reflected in the CBV of the progeny.

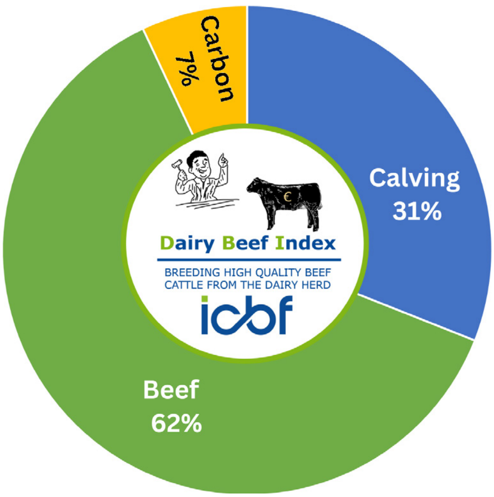


Figure 7. *Dairy Beef Index (DBI) composition*

The Dairy Beef Welfare Scheme (DBWS) is a new scheme to incentivise the use of genetic tools to improve the beef merit of progeny from dairy herds. Participants will be required to use AI straws or stock bulls with a minimum rating of three stars on the DBI and the beef sub-index of the DBI. This criteria supports using the DBI to produce calves with higher CBVs. Farmers who satisfy the scheme requirements will receive a payment of €20 per eligible calf up to a maximum of 50 calves per holding.

Conclusion

The expansion of the dairy herd is slowing down. Increased genetic merit and sexed semen are reducing the need for more dairy replacements and trends have shown that dairy farmers are increasing the use of beef semen on their dairy herds. Historically, farmers lacked important information regarding the 'genetic quality' of dairy-beef bred cattle. However, the introduction of the CBV has addressed this gap. This decision support tool has the potential to instigate tangible transformations within the industry, if dairy farmers select high beef merit bulls from the DBI to improve the beef quality of the beef x dairy calves being produced and reverse the decline in the national herd.

Trends in production costs and drivers of profit on dairy farms

Patrick Gowing[1] and Joe Patton[2]
Teagasc, Moorepark, Fermoy, Co. Cork; Teagasc, Animal & Grassland Research and Innovation Centre, Grange

Summary

- The rate of increase in farm input costs has accelerated in recent years, driven by a combination of unit price increases and input usage levels per farm
- Feed budget costs have increased significantly while pasture utilisation has been declining; given the strong link between pasture utilisation and farm profit, this trend needs to be reversed
- Compared to farms with low net margins, higher margin farms utilise more pasture to produce extra milk sales for no increase in supplement fed. Concentrate level per cow did not relate to financial margin
- Higher margin farms have lower variable and fixed costs indicating better cost control across a range of categories. Differences in labour costs were relatively minor.

Introduction

The financial landscape for dairy producers has been substantially altered during the last 3-4 years, with unprecedented fluctuations in both dairy product prices and costs of inputs. Cost inflation has been a constant pressure arising from geo-political issues and wider economic trends. Supply chain issues caused by the conflict in Ukraine compounded inflation pressure on feed, fertiliser and energy costs in particular during 2021 and 2022. The requirement to meet more challenging environmental regulations and climate action commitments adds further cost and uncertainty for farmers.

High milk prices mitigated the effects on margins in 2022 such that incomes on dairy farms rose significantly (Figure 1). However, an erosion of milk market returns during 2023 saw a 60% drop in dairy farm income within the year and a reduction of 1% in milk output. Market and weather effects have continued to put pressure on margins through the first half of 2024, albeit with some easing of the unit price of key farm inputs.

With such rapid and wide fluctuations in price and output costs and values, it can be difficult to gauge the underlying trends in farm practices and efficiencies, and their effects on financial performance. Key questions to examine include, have dairy farms reacted to high input prices by changing input usage? Did high milk price drive changes in inputs? What were the trends in efficiency, separate to changes in milk price? Are there long-term consequences for farm management decisions?

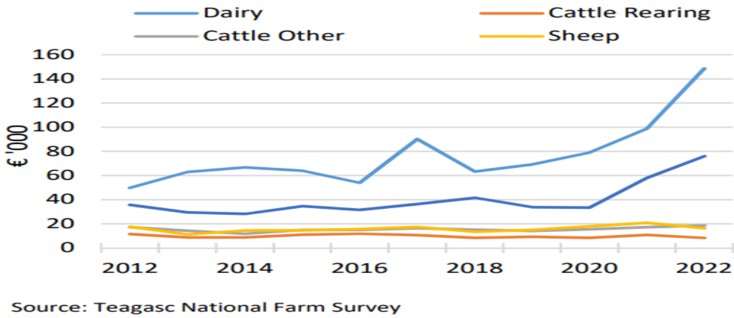


Figure 1. *Tends in farm income by sector 2012-22*

Trends in feed budget and overall costs on dairy farms

To examine these questions, we selected 100 high performing dairy farms from the e-Profit Monitor database to include in the database for trend analysis. Criteria for selection were that the farm had multiple (>5) years' data available, and are specialist dairy farm businesses (>90% LU as dairy stock). The resulting group of farms used were larger than national average herd size and operate at a high whole-farm stocking rate. Physical and financial data from 2019-2022 were compared. Paid labour and land leasing charges were excluded from common costs and margins. No inferences regarding national average costs or margins should be drawn from this data as a result (instead see National Farm Survey report, 2022); however, the trends and outcomes provide a useful picture of management trends.

Results from the 100 farms are outlined in Table 1. As expected, there was a very significant increase in annual input costs (per cow, per kg milk solids and per ha) from 2019 to 2022. On a common cost basis (excluding labour and land lease costs), costs per cow increased by €554, or a 40% increase in costs per cow. Farm stocking rate remained relatively constant over this time-period therefore the trends in per-cow and per-hectare costs are similar. The distribution of this change was analysed across the main cost categories. Fertiliser cost changes accounted for 21% of the total increase in common costs per cow. Unit price (per tonne) differential accounted for over 100% of the differential in fertiliser cost, as farmers in the dataset reduced usage rate per ha. The reduction in fertiliser price during 2023 and 2024 has mitigated the extent of this change in cost, however N usage rates have not increased with falling costs per tonne.

Table 1. Summary of costs and feed trends 2019-22 for ePM herd sample

	2019	2022	Difference
Cows	163	182	19
Farm stocking rate (SR)	2.42	2.46	0.04
Milking platform SR	2.99	3.04	0.05
Milk solids per cow	497	511	14
Costs € per cow			
Fertiliser	177	294	117
Feed	312	527	215
Contractor	160	188	28
Other variable costs	263	381	118
Total variable costs	911	1390	478
Common fixed costs	465	541	76
Common costs total	1377	1931	554
Feed budget metrics			
Concentrate (kg/cow)	1030	1290	260
Fertilizer N (kg/ha)	213	194	-19
Pasture utilised (t DM/ha)	9.40	8.90	-0.50

Purchased feed accounted for 39% of the total change in common costs. Approximately two thirds of the total cost per cow difference was due to unit price. However, unlike fertiliser, which saw a reduction in usage due to price, concentrate fed per cow increased by 29% to 1,229kg per cow. Despite this increase in direct supplement cost per cow, the overall milk solids production per cow difference was relatively minor at 14 kg milk solids, and with farm stocking rates remaining similar, the milk output per ha differences were also minor. Given the variation in annual grass production between years, the data does not allow for the calculation of a direct response to concentrate. The data suggests that much of the additional supplement fed was used to offset reductions in pasture growth due to curtailed fertiliser N input. Nonetheless, the net effect of the cumulative changes to feed inputs and herd performance was a reduction in grass utilised of approximately 0.5 t DM per ha.

The data presented show that rates of inputs, particularly for purchased feed, need to be closely monitored by individual farms. When targeting savings in fertiliser input, the potential effects on direct feed budget costs must be simultaneously considered.

Key factors differentiating high and low net margin dairy farms

While input costs have risen very significantly for all dairy farms in recent years, there remains a high degree of variability in costs and margins across farms within a given year. Previous analysis shows that this is not primarily down to soil type or scale; instead farm management practices have a predominant effect within a given price/cost context. It is therefore instructive to examine the reasons why some farms perform better financially than others. This is not to create competition or unrealistic benchmarks for individuals, but rather to build understanding of the management practices that can deliver better margins at farm level. To this end, we recently examined the differences in the top and lowest 10% of farms in eProfit Monitor, based on 2023 data. Around 700 farms were included in the analysis, which included a high proportion of farmers in the BMW/Ballyhaise catchment area. Table 2 below shows the physical trends for average, top 10% and lowest 10% of farms, ranked on margin per cow.

Table 2. Physical performance of high and low margin dairy farms in 2023

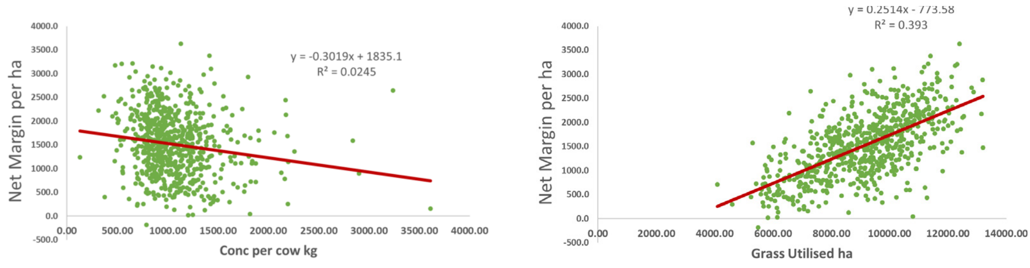
Category[1]	Average	Top 10%	Bottom 10%
Net margin[2] (€/cow)	623	1,186	40
Whole farm SR (LU/ha)	2.22	2.29	2.13
Milking Platform SR (LU/ha)	2.95	2.92	2.96
Cows (No. average)	152	153	166
Milk solids (kg/cow)	472	511	443
Milk solids (kg/ha)	1047	1170	943
Concentrates (kg DM/cow)	1,063	1,105	1,165
Purchased forage (€/cow)	32	35	30
Pasture utilized (t DM/ha)	9.1	9.9	8.2

[1]Ranked on margin per cow using 2023 ePM data. Data are a voluntary sample of farms and should not be taken to represent a national average performance. [2]Margin is operating farm margin (revenue minus direct and overhead costs); does not include own labour, capital repayments, taxation costs, or direct payments

Scale and stocking rate (whole farm and milking platform) were quite similar across the ranking groups. Purchased forage and concentrate levels per cow were also similar, however, compared to the lowest 10%, the top 10% of farms sold 68kg of additional milk solids per cow (+227 kg/ha) and utilised an extra +1.7 t DM of pasture per ha. Of the total differential in net margin between high and low profit farms, 52% of the total differential was due to greater gross output per cow primarily (85%) arising from increased milk solids revenue. At the same time, fixed costs (including paid labour) accounted for 27% of the difference with variable cost differences accounting for 21%. Interestingly, while the majority of temporal change in costs on farms has been driven by feed and fertiliser cost increases, the contribution of these major cost categories to the relative differences in profit within year is minor. Instead, input cost categories such as contractor, machinery, parlour and veterinary costs, account for a greater proportion of the differentials between high and low margin farms within year.

This outcome may seem counter-intuitive given the year-on-year cost trends, but it raises some relevant points. Firstly, the results show that high margin farms tended to have better cost control outcomes across the full range of categories, not just the major items like feed and fertiliser. Differences in consumables and fixed costs like machinery running were more significant than paid labour for example, indicating a need to examine cost control on a category-by-category basis. More fundamentally, the results underline the premise that differences in pasture utilisation explain much of the variation among farm profit outcomes between farms. Remember, supplement feeding levels and stocking rates for high and low margin farms were similar, but high margin farms delivered much more milk solids and hence extra gross output via improved pasture utilisation.

We further examined this relationship across the entire dataset by plotting concentrate feeding levels and pasture utilisation level, versus net margin per ha (Figure 2). The outcomes were clear with no obvious association between concentrate feeding levels and farm profitability (Figure 2a) but a clear and consistent trend of extra pasture utilisation leading to better margins (Figure 2b).



a) b)

Figure 2. *The relationship between a) concentrate feed level per cow and b) pasture utilisation per ha and net farm profitability (€/ha)*

Conclusions

More pasture utilised, converted to improved levels of milk solids production, and aligned with good cost control, will deliver better financial returns for dairy farmers. Consistent with many previous analyses, the data show that concentrate feeding level, and indeed milk output per cow per se, are relatively poor predictors of farm profit. For extra milk solids to contribute to higher margins it must be driven by better pasture intake in the paddock, and not simply more purchased feed. On that basis, the details on how better pasture utilisation and cost control are achieved tactically (day-to-day decisions) and strategically (annual farm system decisions) should be in constant focus to drive cost competitiveness and profitability at farm level.

Acknowledgements

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Taking steps to reduce Greenhouse Gas emissions on dairy Signpost farms

Siobhán Kavanagh[1], Tom O'Dwyer[2] and Liam Quinn[3]

[1]Teagasc, Kells Rd., Kilkenny Teagasc; [2]Teagasc, Animal & Grassland Research and Innovation Centre, Moorepark, Co. Cork; [3]Teagasc, Athenry, Co. Galway

Summary

- Significant progress has been made by Signpost farmers to adopt technologies to reduce emissions on dairy farms
- Chemical N use has declined by 16% since 2021 while pasture growth has been maintained. NBPT-Protected Urea is making up 64% of the chemical N applied on these dairy farms
- It is important that all farmers identify 2-3 key actions they can take on farms to reduce emissions.

Introduction

The Signpost Programme is designed to support and enable dairy farmers to farm more sustainably. This paper aims to benchmark the uptake of recommended climate mitigation practices by the dairy farms participating in the programme and describe changes over the first 36-month period (2021, 2022 & 2023). These dairy Signpost farmers were not selected to be representative of the "typical dairy farmer" and operate at a higher level of productivity and profitability relative to the average dairy farmer.

Results

There was a high level of technical performance on the 36 dairy Signpost farms during 2023 with an average milk solids output of 468 kg per cow using 166 kg of chemical nitrogen per ha and feeding 1,180 kg concentrates per cow. Family farm income declined significantly in 2023, due to increased costs and a significant drop in milk price compared to 2022. Difficult weather conditions during 2023 also resulted in a drop in milk solids production per cow from 497 kg in 2022 to 468 kg in 2023. There was a small increase in livestock numbers and area farmed on these dairy farms over the same period.

Teagasc has identified 12 steps that Irish dairy farmers can take to improve farm profitability while reducing Greenhouse Gas (GHG) emissions and a summary of the steps *implemented on dairy signpost farms include:*

- These farmers were extensively soil sampled in 2022 and again in 2023/2024. The farmers have used the results to target lime applications, with 69 tonnes spread per farm in 2023. This was slightly lower than 2022, largely due to difficult weather conditions in late 2023, highlighting the importance of taking opportunities to apply lime throughout the year rather than waiting for the autumn.
- Four out of ten soil samples taken in 2022 had the correct soil pH, P and K levels. This is higher than typical dairy farm (2 in 10 samples for 2022) indicating that these farms are improving soil fertility levels. Soil samples were taken again in spring 2024 and we await the results.
- Dairy Signpost farmers have put significant emphasis on making best use of manures. Slurry has been analysed on all farms, with almost complete adoption of low emissions slurry spreading (LESS) methods with almost 60% applied during spring to maximise nutrient utilisation.

- The incorporation of clover into grassland swards is an ongoing objective on all dairy Signpost farms; while some farmers have also sown multispecies swards. A clover score conducted on 38 farms in 2023 showed that over 40% of swards have either high (>30%) or medium (10-30%) clover contents.

By implementing the technologies above, these farmers are transitioning to a lower dependence of fertiliser N use, with fertiliser N usage 16% lower in 2023, compared to 2021.

Of the chemical N used for the dairy Signpost farms, NBPT Urea (Protected Urea) provides more than 60% of their fertiliser N, but there is still scope to increase its usage. A further correction of soil P & K indices will allow greater adoption of protected urea.

Dairy Signpost farmers produced 12.2 t DM grass/ha in 2023 with many exceeding the target of 12 t DM grass utilised/ha. This suggests that the reduced fertiliser N use has not impacted on pasture growth, although clover content in swards will need to be monitored continuously to ensure that it contributes N to the sward. Annual concentrate use is high at 1,180 kg/cow similar to 2022.

A summary of the main changes on signpost farms during 2021, 2022 and 2023 are outlined in Table 1 below.

Table 1. Performance of Dairy Signpost farms during three years (2021-23)

Year	2021	2022	2023
Family farm income (€/ha)	2,142	3,283	1,072
Milk solids (kg/cow)	-	497	468
Livestock numbers (No. LU's)	209.4	212.7	214.9
Area farmed (ha)	91.4	93.7	97.8
Stocking rate (LU/ha)	2.29	2.27	2.20
Total lime applied (t per farm)	65.2	78.6	68.8
Optimum soil fertility (% area)	-	40	-
Slurry applied using LESS (% slurry)	87	98	97
Slurry applied Jan-Apr (% slurry)	57	60	59
Chemical N use (kg N/ha)	198	178	166
Chemical N applied as protected urea (%)	43%	49%	64%
Pasture grown (t DM/ha)	12.6	12.2	12.2
Concentrate use (kg/cow)	1,040	1,233	1,180

Environmental metrics

Total GHG emissions on the dairy Signpost Farms was 983 kg CO_2-equivalent in 2023 (Table 2). Greenhouse gas emissions per ha have declined by 0.5 t CO_2-eq./ha since 2021. The breakdown of the changes in GHG emissions reflects the activities on the farm. Methane emissions from livestock increased by 5% from 2021 to 2023, due largely to a small increase in livestock numbers. Over 68% of the GHG emissions in 2023 were from enteric fermentation. There was also an increase in emissions from manure management in 2023 again due to higher livestock numbers and a longer winter housing period because of difficult grazing conditions during autumn 2023.

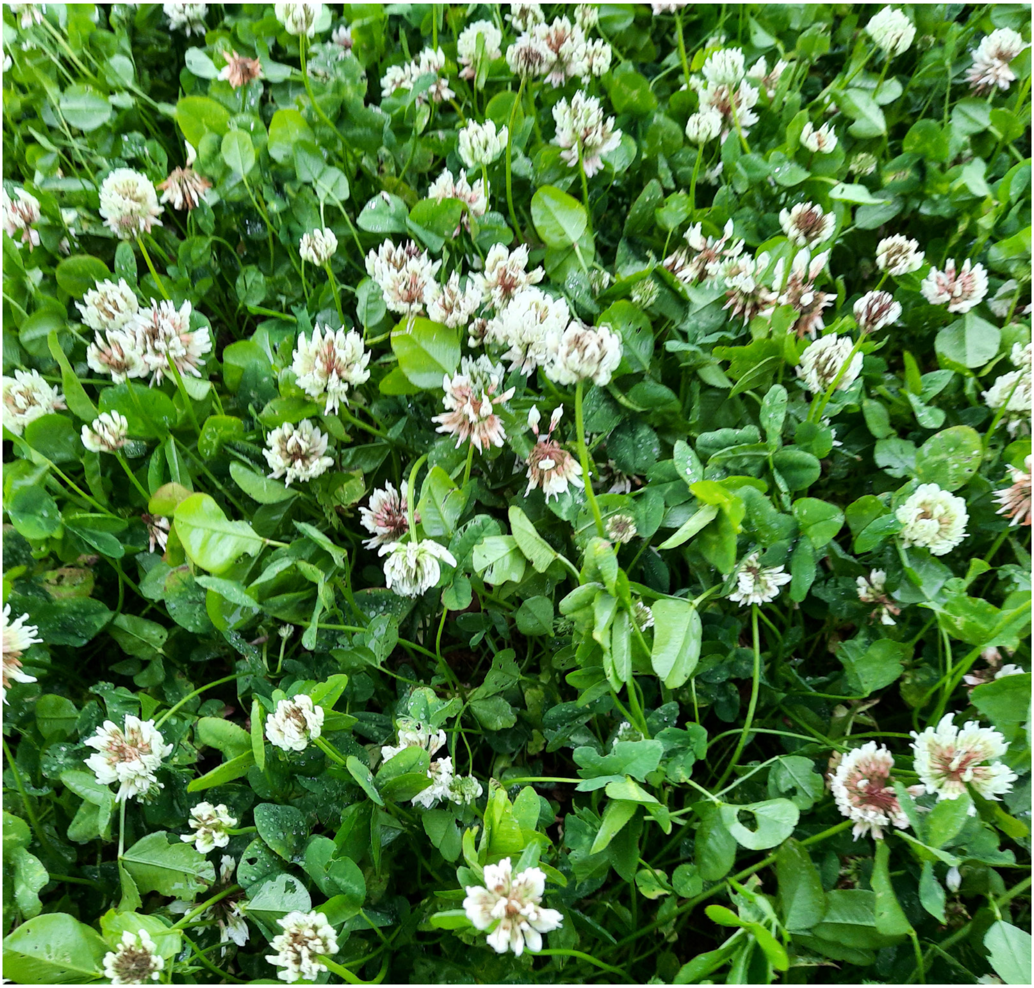
The primary focus of the sustainability plans on dairy Signpost farms has been on reducing reliance on chemical N use and a switch to protected urea fertilisers. The commitment to this objective has resulted in a 7% reduction in GHG emissions from agricultural soils since 2021. Emissions from liming increased in 2022 as more lime was spread on these farms and declined again in 2023. Importantly, from a water quality perspective, Nitrogen Balance has decreased from 183 to 164 kg on the dairy Signpost demonstration farms during the three years while Nitrogen use efficiency has increased overall, albeit with a slight decline in 2023.

Table 2. Environmental metrics for Dairy Signpost Farms (2021-23)

GHG & Ammonia Emissions	2021	2022	2023
Total farm GHG emissions (t CO_2-eq.)	956.5	959.5	982.7
GHG emissions (t CO_2-eq per ha)	10.5	10.2	10.0
Breakdown of Emissions (t CO_2-eq.)			
Enteric fermentation	652.8	667.0	687.3
Manure management	91.6	93.1	98.4
Agricultural soils	171	157.1	159.1
Liming	33.3	34.6	29.5
Urea application	7.8	7.7	8.4
N Balance (kg N/ha)	183	169	164
Nitrogen use efficiency (%)	26.8	30.2	28.4

Conclusions

Significant progress has been made by Signpost farmers to adopt technologies to reduce emissions on dairy farms. In particular, reductions in chemical N use and transition to protected urea fertilisers has resulted in significant reductions in GHG emissions per hectare while maintaining pasture growth and farm system productivity. Based on the experiences of the Signpost programme, it is recommended that all farmers identify 2-3 key actions they can take on farms to reduce emissions.



Better Farming for Water Campaign

Dr. Daire Ó hUallacháin
Teagasc, Johnstown Castle Research Centre, Wexford

Summary

- The 'Better Farming for Water' campaign aims to support and accelerate the adoption of actions on all farms to improve all water bodies (where agriculture is a significant pressure) to Good or High Ecological Status
- The campaign will support all farmers to reduce the loads of nitrogen, phosphate, sediment and pesticides entering our river network through either diffuse or point source pathways from agricultural sources. This will be achieved through the on-farm adoption of 8-Actions for Change, which involve better nutrient, farmyard and land management
- These 8-Actions for Change provide a structured, relatable approach for farmers to effectively engage with improving water quality. They will help to advance the understanding of the need for actions, and instill confidence that the actions undertaken are worthwhile and will result in sustained, positive improvements in water quality.

Delivery of the campaign

- The 'Better Farming for Water' campaign will be delivered by way of six key pillars:
- Stakeholder engagement through a Multi-Actor Approach.
- Building Awareness by acquisition and utilisation of water quality data.
- Upskilling farmers, students, advisors, teachers and industry professionals.
- An impactful Knowledge Transfer programme.
- A supporting Research Programme to identify and develop effective mitigation actions.
- A strong Communications Plan with the target audiences.

Other resources & online information:

Teagasc Website: https://www.teagasc.ie/environment/water-quality/better-farming-for-water/

Bovine TB in dairy herds: taking action to reduce the risk of a breakdown

Wila Bruce, Anthony Stringer and Donal Mooney
Department of Agriculture, Food and the Marine, Backweston, Celbridge, Co. Kildare

Summary

- Levels of bovine TB have been increasing since 2016
- Dairy herds accounted for 38% of all TB breakdowns in 2023
- There are practical actions that all farmers can take to reduce the likelihood of a TB breakdown
- Stakeholders working together through the TB Forum can help to reduce disease levels through new policies.

Introduction

Levels of bovine TB have been rising since 2016. In June 2024, 5.12 % of herds had a breakdown in the preceding 12 months, with 32,118 reactors in that period. This has resulted in 5,242 herds being restricted. Dairy herds accounted for 38% of breakdowns in 2023, an increase of 3% over 2022. In 2023, 65% of reactors were in dairy herds, while 25% of reactors were from suckler herds. These figures highlight the need for urgent action by all stakeholders.

Actions which can reduce the risk of introducing TB into your dairy herd

All dairy farmers can protect their cattle from TB by taking the following steps to address the risk factors for a breakdown.

- Consider culling older animals, particularly those that were alive during a previous breakdown. The risk is that some may have undetected TB infections which can re-start a breakdown.
- If you are purchasing breeding animals, ask for the TB herd category of herds from which you intend to purchase from.
- Breeding herds should maintain a closed herd. Cattle exposed to TB recently may have undetected infections and bring the disease into your herd.
- Animals that previously tested inconclusive and subsequently tested clear are at a higher risk of being infected with TB and spreading disease within your herd. These cattle should be culled no later than the end of their current production cycle.
- Look for badger setts and activity on your farm.
  - » Notify the Department of any setts you find using the badger app available to download at www.bovinetb.ie.
  - » Take steps to reduce badger to cattle contact on your farm by securing sheds/ feed stores, raising troughs and fencing off setts and latrines.
  - » Do not feed concentrates on the ground as badgers can spread saliva in that area while finishing any leftovers, exposing cattle if they then feed off that area again.
- When selecting bulls for breeding use bulls more resistant to TB (breeding value less than 8%). This can reduce the number of exposed cattle which become infected, if your herd does subsequently experience a TB breakdown.

- Ensure good quality testing facilities are available and provide your vet with any assistance required. Each animal must be identified and have its skin thickness measured on both days of the test. If TB is present but is missed, it will spread further within your herd.
- Cleanse and disinfect shared machinery and areas where bTB infected cattle were kept, as the TB bacteria can survive in the environment and cause new infections.
- Maintain good hygiene practices even when your herd is not in a breakdown including regular cleaning and disinfection of feed and water troughs and facilities where cattle are gathered and handled.
- Eliminate contact between cattle and neighbouring farms cattle. Ensure boundary fences are well maintained and avoid mixing groups of cattle which are normally managed separately.
- If you engage in contract rearing, ask the rearer to take steps to reduce TB risk and have a contingency plan for a TB breakdown in either herd.

Challenge

Being free of TB remains critical, from a farm family profitability and sustainability perspective and from a trade perspective. Every TB restriction represents a significant emotional and financial challenge to the farm family concerned.

Working together, we can reduce TB levels, protect cattle from infection, prevent the stress caused by TB on farm families, and mitigate the threat TB poses to our exports.

See www.bovinetb.ie for videos, advice, leaflets, information on how to protect your herd from TB.

Contact details

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

Tel : 353 (0)25 42458

www.teagasc.ie

Agriculture and Food Development Authority

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