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# Grain objectives

Behind the scenes at the National Brewing and Distilling Centre, a new Teagasc initiative to strengthen Ireland's brewing sector



**INTERVIEW:**  
Understanding the science of Irish whiskey p10.



# Welcome

The brewing and distilling sector in Ireland has experienced significant growth in recent decades, and in this issue, we delve into some of the work Teagasc is doing to support this.

Irish barley is the backbone of our brewing and distilling industries. But could Irish-grown wheat, maize and rye reduce reliance on imports? Richie Hackett writes about a Teagasc study exploring the possibilities (p6).

Irish whiskey is an increasingly popular product worldwide, but with popularity comes a greater risk of fraudulent products. On p10, Kieran Kilcawley explains how Teagasc research is helping to protect Irish whiskey's Protected Geographical Indication.

Also an immensely popular product in recent years is non-alcoholic beer. Ana Soriano Lerma and John Kenny have been examining its potential as a health-conscious beverage, and discuss their work on p14.

Teagasc recently set up the National Centre for Brewing and Distilling (NCBD), with support from the Department of Agriculture, Food and the Marine to support this growing sector. We spoke to the team behind it, led by Manager Lisa Ryan, to find out how their work is helping growers and producers better understand Irish grain to maximise utility, efficiency, sustainability, and value (p16).

John Spink, Head of Teagasc's Crop, Environment and Land Use Programme and Director of the NCBD expounds on how Ireland has the potential to remain a global player in brewing and distilling, and how this will require significant focus on the use of Irish grain (p30).

Our Photo Finish on p32 shows sprouting barley, a critical part of the malting cycle, where even and uniform grain development is essential to producing high-quality malt.

We hope you enjoy reading about our scientists' work in this brewing and distilling focus – and we hope that their expertise will be a key ingredient in the industry's continued success.

## Catriona Boyle

Editor, *TResearch* magazine, Teagasc



## Catriona Boyle

Eagarthóir, iris *TResearch*, Teagasc

Tá méadú suntasach tagtha ar an earnáil grúdaireachta agus driogtha in Éirinn le blianta beaga anuas, agus san eagrán seo, déanaimid fiosrú ar chuid den obair atá á déanamh ag Teagasc chun tacú leis sin.

Is í eorna na hÉireann cnámh droma ár dtionscail grúdaireachta agus driogtha. Ach an bhféadfadh cruithneacht, arbhar Indiach agus seagal a fhástar in Éirinn an spleáchas ar allmhairí a laghdú? Scríobhann Richie Hackett faoi staidéar Teagasc ina ndéantar iniúchadh ar na féidearthachtaí (lch. 6). Is táirge a bhfuil an tóir air ag méadú i gcónaí ar fud an domhain é uisce beatha Éireannach, ach le tóir bíonn baol níos mó ann go mbeidh táirgí calaoiseacha ann. Ar leathanach 10, míníonn Kieran Kilcawley an dóigh a gcuidíonn taighde Teagasc le Tasc Geografach faoi Chosaint an uisce beatha Éireannaigh a chosaint.

Táirge a bhfuil an-tóir ar fad air le blianta beaga anuas freisin is ea beoir neamh-mheisciúil. Tá scrúdú á dhéanamh ag Ana Soriano Lerma agus John Kenny ar a acmhainneacht mar dheoch atá aireach faoi shláinte, agus pléann siad a gcuid oibre ar leathanach 14.

Bhunaigh Teagasc an t Ionad Náisiúnta Grúdaireachta agus Driogadóireachta (NCBD) le déanaí, le tacaíocht ón Roinn Talmhaíochta, Bia agus Mara chun tacú leis an earnáil seo atá ag fás. Labhraíomar leis an bhfoireann atá taobh thiar de, faoi stiúir an Bhainisteora Lisa Ryan, lena fháil amach conas atá a gcuid oibre ag cuidiú le saothróirí agus táirgeoirí tuiscint níos fearr a bheith acu ar ghrán Éireannach chun fóntas, éifeachtúlacht, inbhuanaitheacht agus luach a uasmhéadú (lch. 16).

Míníonn John Spink, Ceann an Chláir Barr, Comhshaoil agus Úsáide Talún ag Teagasc agus Stiúirthóir an NCBD, an acmhainneacht atá ag Éirinn bheith ina gníomhaí domhanda i gcónaí sa ghrúdaireacht agus sa driogadh, agus an dóigh a mbeidh gá le fócas suntasach ar úsáid an ghráin Éireannaigh de dhíth ina leith sin (lch. 30).

Inár bhFótaichríoch ar leathanach 32, taispeántar eorna ag péacadh, cuid rithábhachtach den timthriall déanta braiche, i gcás ina bhfuil forbairt grán cothrom aonfhoirmeach riachtanach chun braich ardchaighdeáin a tháirgeadh. Tá súil againn go mbainfidh tú sult as léamh faoi obair ár n-eolaithe sa réimse grúdaireachta agus driogtha seo – agus tá súil againn go mbeidh a gcuid saineolais ina chuid rithábhachtach i rath leanúnach an tionscail.



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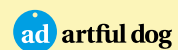
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Main image shows (L-R) Isabella de Oliveira Cenci, Gemma Merrins and Lisa Ryan of the National Centre for Brewing and Distilling at Teagasc Oak Park

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Throughout TRResearch, we include icons alongside articles where there is a clear link to the urgent actions in our Climate Action Strategy. These actions are: Reduce Nitrogen Emissions, Reduce Methane Emissions, Increase Carbon Capture, Enhance Biodiversity, Increase Diversification, Enhance Adaptation, Circular Food System, and Supporting Policy. Teagasc's four research programmes, frequently referred to by their acronyms, are: Animal and Grassland Research & Innovation (AGRIP); Crops, Environment and Land-Use (CELUP); Food (FOOD); and Rural Economy and Development (REDP).

## Video spotlight on hoof health

A new series of short videos on dairy cow lameness were launched at the recent Teagasc Dairy Open Day in Moorepark, Cork, by Noel Grealish, TD, Minister of State at the Department of Agriculture, Food and the Marine (DAFM).

The Sound Cow Innovation Programme was also launched, which is a European Innovation Partnership-funded initiative involving Animal Health Ireland (AHI), Teagasc, University College Dublin, DAFM, International Cattle Breeding Federation, Irish Cattle Foot Trimmers Association, Tirlán, veterinary practitioners and the Farm Relief Service. It aims to pilot a lameness control programme on Irish dairy farms.

Muireann Conneely, Teagasc researcher and chair of the AHI Hoof HealthCheck Technical Working Group, explains: "Lameness is one of the most pressing health and welfare challenges facing Irish dairy farms. Teagasc research found that around one in 10 Irish dairy cow is lame at any one time, with levels rising to over 30% in some herds. The top 20% of Irish herds maintain lameness prevalence below 5%."



Minister Noel Grealish, TD (centre), with stakeholders involved in the initiative at the Teagasc dairy open day

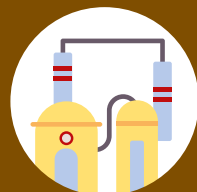
The first in the series of videos on dairy cow lameness (available on the AHI YouTube channel) explores why lameness matters,

not just for animal welfare, but also for farm productivity, sustainability and public trust.

O'Gorman Photography

## Crafting the future of brewing and distilling

The National Centre for Brewing and Distilling is a state-of-the-art hub supporting industry-centred research through stakeholder collaboration. The centre focuses on advancing the science and craft of malting, brewing and distilling, offering support in the following areas:



State-of-the-art laboratories, pilot scale facilities and new product development



Industry partnerships - R&D with leading maltsters, breweries and distilleries



Upskilling opportunities for professionals - short courses and Continuing Professional Development



Research excellence - opportunity to access expertise in product sustainability, flavour science and process innovation



The GRA delegation at Teagasc Grange

## Global climate scientists down on the farm

Teagasc Grange formed part of the itinerary for the meeting of the Council of the Global Research Alliance (GRA) for Agricultural Greenhouse Gases.

The GRA brings together climate scientists from across the world to enhance collaboration and progress climate research in agriculture. Ireland, through the Department of Agriculture, Food and the Marine, officially assumed the chair of the GRA from January 1, 2025, for a period of 18 months. This is the first time that Ireland has chaired the GRA since joining in 2009.

The GRA aims to provide a framework for voluntary action to increase international cooperation and investment in research activities for mitigating agricultural greenhouse gases and improving carbon sequestration, as well as improving the measurement of emissions in different agricultural systems. The GRA also helps scientists to gain expertise in mitigation through developing new partnerships and exchanges.

At Grange, GRA delegates met Head of Enterprise Paul Crosson, who gave an overview of the Teagasc beef research programme. They also met with the research team, visiting the ongoing research experiments on dairy-beef, suckler beef, anaerobic digestion and methane mitigation. The delegates completed their field trip on the farm of Teagasc Signpost Farmer Dermot Heaney to see first-hand the research taking place on agricultural greenhouse gases in Ireland and how the outputs of this research are being implemented on an Irish farm.

## AgNav takes top sustainability honours

AgNav, the online sustainability platform for Irish farmers, has been awarded Sustainability Initiative of the Year at The Grocer Gold Awards in London, UK, beating six other finalists in the category 'sustainable products and services'. The awards were announced at a ceremony in the Royal Albert Hall in July.

This win marks AgNav's second UK award this year, following earlier success in winning the Sustainability Award at the British Culinary Federation Awards.

On receiving the award, Siobhan Jordan, Head of Technology Transfer and Commercialisation at Teagasc, says: "These awards are a fantastic endorsement of the collaborative effort behind AgNav. It demonstrates how science, technology, and farmer-focused solutions can work together to deliver environmental sustainability for the Irish agri-food sector."

Developed through a partnership between Bord Bia, Teagasc, and the Irish Cattle Breeding Federation, and supported through funding from the Department of Agriculture, Food and the Marine, AgNav is a free, easy-to-use online tool designed specifically for Irish farmers. It provides reliable, science-based insights to support farmers' environmental and economic goals. Using AgNav, farmers can create customised farm sustainability action plans helping to reduce emissions, improve water quality, and enhance farmland biodiversity.



Pictured at the ceremony (L-R): Host Naga Munchetty with (front row) Siobhan Jordan, Teagasc; Edel McEvoy, Bord Bia; Natasha Browne, Teagasc; Mick Houlihan, Bord Bia; Chris Tyas, Chair, GS1 UK (award sponsors). Back row: Seán Deane, Bord Bia; Adam Leyland, The Grocer

## News in brief

### Improving vegetable production

Operating between increasingly narrow weather windows, particularly in the spring season, is an increasing feature of field vegetable production in Ireland. A demonstration on field vegetable crop establishment was held at the Oak Park Crops Open Day on 13 July, hosted by the Horticultural Development Department. Eoin Sweetman, Teagasc Vegetable Specialist Advisor, explains: "The demonstration featured a variety of commercial and innovative machinery that can be used to establish quality vegetable crops as labour-efficiently and quickly as possible. A band-spraying demonstration also took place to show how growers can meet the requirements of the new label of root crop fungicide SL567A."

The event was opened and attended by Minister for Horticulture, Forestry and Farm Safety, Michael Healy-Rae, TD, who highlighted both the importance of the sector, and the innovation within the sector.



Pictured: Michael Gaffney, Acting Head of Teagasc Horticulture Development Department (left); Pat Smyth, Paul Brophy Produce (front, centre); and Michael Healy-Rae, TD, Minister for Horticulture, Forestry and Farm Safety (right)

### Food Centre strategy launched

A new strategy was launched for The National Prepared Consumer Food Centre (NPCFC) at Teagasc Ashtown, Dublin on 9 July. The strategy, for the period 2025 to 2030, was prepared in consultation with NPCFC technical group, governance committee and industry.

The centre aims to enhance the competitiveness of Ireland's prepared consumer foods sector through technical support and research, contributing to sustained growth. Ireland's prepared consumer food sector has made significant strides in recent years, and this new strategy has been developed to continue this growth and to enhance the sector.

Since opening in 2018, the NPCFC has completed over 520 projects with over 350 food companies providing technical support, training and services.



Pictured from (L-R): Ciara McDonagh, Head of Food Industry Development, Teagasc; Frank OMara, Teagasc Director; Noel Grealish TD, Minister of State at the Department of Agriculture, Food and the Marine; Liam Herlihy, Teagasc Chairman; and Shay Hannon, Manager of the NPCFC, Teagasc

Dylan Vaughan Photography

Teagasc

DAFM

Bord Bia

# Growing grain for the glass

Irish barley is the backbone of Ireland's brewing and distilling industry. But could Irish-grown wheat, maize and rye reduce reliance on imports? A Teagasc study explores the possibilities.



**S**ignificant amounts of Irish-grown grain are used in the brewing and distilling sector in Ireland and it is an important premium-value market for growers. Barley has been, and continues to be, the grain most associated with the sector; in fact, the majority of Irish-grown grain used by the sector is barley, produced to a range of different quality specifications depending on the requirements of the end-user.

Richie Hackett, Research Officer at Teagasc Oak Park's Crop Research Centre, says: "Over the years, extensive research has focused on optimising barley production to meet these specifications. Except for seasons marked by very poor weather, the Irish industry has largely met its own demand for malting barley."

## Exploring alternatives to barley

While barley remains dominant, other grains such as maize, wheat, and rye are used to varying extents, and some are currently imported. The Department of Agriculture, Food and the Marine-funded project 'Distilling and Brewing – Building Capacity' explored how more of these grains could be sourced from Irish farms.

"One key question was whether Irish-grown winter wheat could substitute for the large quantities of imported maize used in grain whiskey production," Richie explains.

"The project also investigated the potential to grow grain maize domestically, and explored the agronomy – the application of science and technology to the improvement of major food crops – of hybrid rye, a newer crop for Irish farms."

## Investigating winter wheat for distilling

Winter wheat is already used in countries such as Scotland, and by some Irish distilleries, as a substitute for maize in grain whiskey production. However, replacing maize with wheat can cause processing issues such as excessive foaming and sticky, viscous residues that are difficult to remove from distillation equipment.

"These challenges are especially problematic in Irish distilleries due to the unique processes used in domestic grain whiskey production," explains Richie.

Wheat also tends to yield less alcohol per tonne of grain than maize, which affects profitability. International research suggests that both the wheat cultivar (a plant variety bred for traits like yield or disease resistance) and management practices, particularly nitrogen fertiliser application, can influence its suitability for distillation.

Wheats with a soft endosperm texture break down more easily during processing and are preferred by distilleries. However, most winter wheat cultivars currently grown in Ireland have a hard endosperm texture, making them less ideal for this purpose.

To assess alternatives, the study compared several soft wheat cultivars, including those used in Scotland, with commonly grown Irish hard wheat varieties. Trials were conducted at two Irish locations over three growing seasons. Results showed that soft wheat cultivars could achieve comparable yields and similar grain quality to varieties on the Irish recommended list.

Unfortunately, many of these promising cultivars proved vulnerable to *Septoria* leaf blight, a widespread and damaging fungal



Rye exhibits good agronomic traits and can be used in the distilling sector



**Irish-grown wheat may help reduce reliance on imported maize**

disease in Ireland. The pathogen had evolved to overcome a key resistance gene, making these cultivars too risky to grow at scale.

Encouragingly, new soft wheat varieties with improved disease resistance and strong distillation traits are under development and are expected to become available to Irish growers in the near future.

**Maize potential under Irish conditions**

While much of the research focused on using wheat to replace imported maize, the research also examined whether grain maize could be grown in Ireland to serve the same purpose.



**With further breeding, maize varieties better suited to Irish conditions could be developed.**

Maize is widely cultivated for forage (animal feed) in Ireland, where the entire plant is harvested and ensiled (fermented and stored). However, harvesting maize for grain is uncommon, as most forage varieties do not produce grain with low enough moisture content for safe storage without drying.

Researchers trialled early- and very-early-maturing maize varieties, with and without biodegradable mulch (a soil covering that speeds up plant development). The results were promising: when sown early and grown with mulch, the maize produced grain yields comparable to other cereals.

However, the harvested grain consistently had moisture levels too high for safe storage, meaning that costly drying would be required. This challenge was worsened by the fact that most of the 'dry-down' period, when the crop loses moisture naturally, occurred in October, a month often marked by poor drying conditions.

"Encouragingly, the very early varieties dried down earlier, reaching maturity in September, when drying conditions are typically more favourable," adds Richie. "This suggests that, with further breeding, maize varieties better suited to Irish conditions could be developed."



Additionally, projected increases in temperature due to climate change may improve the viability of grain maize production in Ireland in the coming decades.

**Rye's promise for whiskey**

Another new crop, the production of which was examined under Irish conditions as part of the project, was rye. Rye grain can be used to produce rye whiskey with a number of examples currently being produced by Irish distilleries.

A significant amount of research was carried out to develop suitable agronomy guidelines for the production of rye. Although the market for rye in Ireland is currently



limited and it has some drawbacks, notably being very susceptible to slug damage in the establishment phase, it was found to possess a number of traits that made it suitable for production in Ireland.

"Beneficial traits of rye included high yield, good fungal disease resistance, good tolerance of the aphid borne virus BYDV – which can cause considerable yield loss in other cereal crops – and good fertiliser nitrogen use efficiency," Richie notes. "It was also shown to have a low carbon footprint, which is becoming an important trait for many end users."

Overall, the research suggested that, with the right applied agronomy, both hybrid rye and wheat hold potential as additional grain options for the brewing and distilling sector. **T**

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**I**rish farmers are all too aware of the negative impacts of climate change on their farm operations, livelihoods and the environment. Led by researchers in Teagasc's Rural Economy and Development Programme (REDP), the Farm Resilience Project sought to examine how farmers and advisors view these challenges. Combining evidence from a literature review, farmer surveys, interviews with farmers and advisors, and an advisor focus group, the study investigated what adaptation measures are currently being considered and implemented on farms, along with barriers and enablers to their adoption.

While many farmers recognise the need to adapt, the question remains: how?

"Our research showed that uncertainty around climate and policy developments is a key challenge for farmers," said Research Officer Mohammad Mohammadrezaei.

"Building climate resilience and aiding farm-level adaptation will require more practical solutions, knowledge sharing and financial support."

### Disruptive impacts

The research suggested that farmers more frequently experience extreme weather events (droughts, storms, floods) and non-typical seasons (wetter/drier, colder/warmer). Farmers viewed these weather changes as a fundamental shift, going beyond the usual variations that they had managed in the past, often associating them with climate change. "Climate change is real, it is happening, the whole planet is warming up," one dairy farmer said.

These changes challenge prevailing structures for organising and managing farm work, most notably through acute disruptions to the farming calendar. In addition to stress, worry and increased workloads, farmers reported sustainability concerns around animal health and welfare, water quality and biodiversity.

"It's important to note that climate change impacts farm economic performance due to yield losses, increased costs and reduced margins," notes Mohammad. "These negative impacts encourage farmers to act to improve climate change preparedness."

# Building climate resilience on Irish farms

Adapting to climate change is a multifaceted issue for farmers. Research by Teagasc's Rural Economy and Development Programme aims to better understand how farmers perceive adaptation measures for climate resilience.

### Farm-level adaptation

To reduce climate impacts and vulnerability farmers are adapting to climate change with three main goals in mind: protection, prevention and recovery.

The farmers in the study reported implementing a range of adaptation measures, with a focus on short-term management practices that can easily be incorporated into daily farm routines. Examples included regularly checking weather forecasts, walking the fields before letting out animals and checking soil trafficability ahead of field operations.

Mid-term risk management measures were used to improve business planning amid uncertainty around weather and prices, and to build fodder reserves for longer winter periods and potential spring/summer droughts.

Farmers acknowledged the importance, despite financial constraints, of investing in suitable capital infrastructure to ensure sufficient housing space and slurry storage at times when the housing period is unexpectedly lengthened. Enhancing landscape features by letting hedgerows

grow wider and taller and planting trees and hedgerows was seen as an effective means to improve shelter for animals, even if most farmers in this study were not actively pursuing these long-term measures.

### Perceiving barriers

The research showed that adoption levels vary by practice and farmer. For some, a key barrier to adoption is the perceived difficulty in implementing new measures, alongside cost and labour requirements.

"Farmers also found it hard to confidently engage in mid-to long-term changes, owing to uncertainty around future developments in climate and policy," Mohammad added.

Farm economic viability, succession planning, time horizons and age were perceived as both potential enablers of and barriers to adaptation. As one young dairy farmer, operating in partnership with his partner and his father, noted: "We know we have a clear path. Say we're going to be here for the next 30 or 40 years, new slurry storage is going to be a long-term investment." Conversely, a middle-aged beef-sheep farmer said, "I wouldn't have



considered putting that kind of money into new slurry storage, because I don't know if any of my kids are going to do it and it'll be all just sitting there."

Learning by doing and learning from others played a significant role in accelerating farm-level adaptation. Farmers in this study experimented with measures such as multispecies swards, cover crops, and dairy-calf-to-beef systems to ensure their suitability to local farm conditions and learn from their application. They also had opportunity to learn from peers and farm advisors about adaptation measures, their implementation, and associated benefits and challenges.

### Increasing support

In a context where climate change feels uncertain and new skills are needed to adapt, farmer social support is key; one-to-one advisor visits and discussion group meetings provide farmers with opportunities to talk about climate impacts and adaptation. Building stronger social connections through group talks, storytelling, farm

visits, and demonstrations helps farmers gain confidence, share experiences and knowledge, and ultimately adapt to climate change.

However, advisors involved in this research explained that the climate adaptation toolbox is quite limited for them to effectively support farm-level adaptation; in recent years, the focus has predominantly been on climate mitigation. Advisors also highlighted the fast pace and scope of recent policy changes,

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sometimes leading to mixed messages and change fatigue for both farmers and advisors. Overall, they emphasised the importance of consistent messaging and the implementation of a step-by-step approach to support farm-level change.

The study also showed that farming grants and schemes continue to play an important role in supporting farmers and their businesses. Examples of these schemes raised by farmers in the context of climate adaptation include the Agri-Climate Rural Environment Scheme, the Targeted Agriculture Modernisation Schemes, or the 2023 Fodder Support Scheme.

### Future opportunities

Climate change may also offer some opportunities for Irish agriculture, the researchers noted. Some of the opportunities considered by farmers included cross-country learning from areas with a climate akin to Ireland's predicted climate, trialling new crop varieties and species, and looking at future market opportunities as production systems fluctuate.

"Our research demonstrated that climate adaptation is at a crossroads between interconnected sustainability issues," Mohammad concludes. "More work is needed to identify practical adaptation solutions that can simultaneously address multiple environmental challenges, such as climate mitigation, water quality and habitat preservation, while making economic sense for the farmer. Farmers and advisors play a crucial role in co-creating these solutions and ensuring that these are tailored to farmer-specific needs." **T**

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# Cask, and ye shall receive

Irish whiskey is an increasingly popular product worldwide, but with popularity comes a greater risk of fraudulent products. At Teagasc Moorepark, Principal Research Officer Kieran Kilcawley is seeking to understand Irish whiskey's unique properties – to benefit producers and customers alike.

Photography: Fergal O’Gorman




Kieran Kilcawley's background in dairy science ultimately led to a career in flavour profiling. Today, Kieran heads up the flavour chemistry facility at Teagasc Moorepark. *TResearch* caught up with him for a taste (and smell) of all things Irish whiskey.

## What is the relevance of Irish whiskey today?

Irish whiskey has seen tremendous growth, with over 40 distilleries and export volumes exceeding €1 billion – 40% of that to the US. However, this growth brings challenges: tariffs, trade wars, and financial pressure on newer distilleries. Since alcohol must mature for three years, it ties up capital.



There's an emerging ecosystem around whiskey research and education that simply didn't exist 10 or 15 years ago. 

Traditionally, the science of flavour was held by the big players; variables around maturation and congeners – the flavour compounds produced during distillation. We aim to make that knowledge accessible, especially to small producers lacking research and development resources.

Authenticity is also a concern. As the industry expands globally, so does the risk of fraud, particularly now that Irish whiskey has Protected Geographical Indication (PGI) status, which our work helps safeguard.

### How has the field developed over time?

I began in dairy science, researching flavour chemistry when undertaking my PhD with University College Cork. The initial project on *terroir* – how grain location affects flavour – was published in 2021.

The field is now more open. Distilleries increasingly invest in flavour research, and more universities offer related programmes. Previously, Irish students had to study distilling and brewing in Scotland. Now, undergrad programmes exist here, like at TU Dublin, SETU, and Maynooth University. There's an emerging ecosystem around whiskey research and education that simply didn't exist 10 or 15 years ago.

### What are the main challenges?

Consistency is a big challenge. Casks aren't uniform, meaning you might struggle to replicate a successful whiskey year on year, making it harder to build a brand.

Complexity is another challenge. You might have a hundred different volatile congeners in a single sample. It's a big job figuring out which ones are influencing sensory perception. We use gas chromatography olfactometry, where one part of the sample goes to a detector, and another to a human nose, so we can separate and identify both the compound and its aroma.

There's also the issue of raw material; a lot of Irish whiskey is made from imported maize or grain. Maize is economically appealing for its high sugar content and alcohol yield, but importing isn't sustainable, and weakens the case for calling whiskey

"Irish". There's a push towards using more Irish grain, but that carries agricultural and economic risks.

### What impact is this having?

We're creating a database of congeners or compounds to track flavour profiles and maturation markers, helping producers define quality and how to achieve it. The database can also identify fraudulent products, supporting authentication, which is increasingly important as Irish whiskey grows globally. We're also working with the state laboratory on improving validation methods, so our techniques will help enforce the PGI protection in future.

We're also helping build capacity in the industry, such as providing technical services for distilleries who can't afford to run their own analyses. With new funding, we're researching volatile and non-volatile compounds from casks – the next stage of understanding flavour.

From a sustainability angle, if we can encourage more use of Irish grain and reduce import reliance, that could benefit both the economy and the environment. So, the impact stretches from chemistry to branding to agriculture.

### What research have you been doing?

We've analysed over a hundred whiskey samples over the past 18 months, examining grain sources, distillation methods and cask types. Using gas chromatography and mass spectrometry, we're identifying aroma compounds. With TU Dublin, through the project 'Irish Whiskey Evaluation of Biomarkers on Maturation', we're studying maturation of the same spirit in different cask types over a three-year period.

We also studied how pot still types and mash bills influence diversity – Irish whiskey is different to Scottish whisky, and we need to take economic advantage of such differences. Even the still shape and size has an impact, letting distilleries develop unique chemical fingerprints.

Collaborating with colleagues at Teagasc Oak Park, we're studying barley varieties for yield, resilience, and flavour, and developing small-scale testing to enable affordable experimentation for producers.

### Who benefits from this research?

For small distilleries, the benefits are immediate: access to research and tools they otherwise couldn't afford. We help them get grants, do technical analysis, and build consistency. For the industry as a whole, it supports product quality and integrity, especially important now that Irish whiskey has PGI status.

For farmers, our work encourages the use of Irish grain, which could mean higher prices and new markets. For students, it creates new

## Up close and personal

**What's your favourite animal?**

Dogs!

**If you hadn't ended up in research, what job would you have wanted to try?**

As a kid, I wanted to be a soccer player. But I'm glad to be working in science; it's always changing and is never boring. My passion outside of that is sea-fishing.

**What's your proudest professional achievement?**

Setting up the flavour chemistry facility. It probably wouldn't be here if I wasn't here.

pathways into a growing industry. We also support education through supervision and placement opportunities.

Even regulators benefit, by giving them better tools for authenticating product and protecting the Irish whiskey label from fraud or misrepresentation.

### How has industry responded?

Some producers are very open and collaborative, seeing the value in sharing data and improving industry standards. Others are more guarded – understandable, given the competitive nature of the business. We've visited lots of distilleries; while transparency isn't always the norm, there's growing recognition that science and data will help the industry grow responsibly.

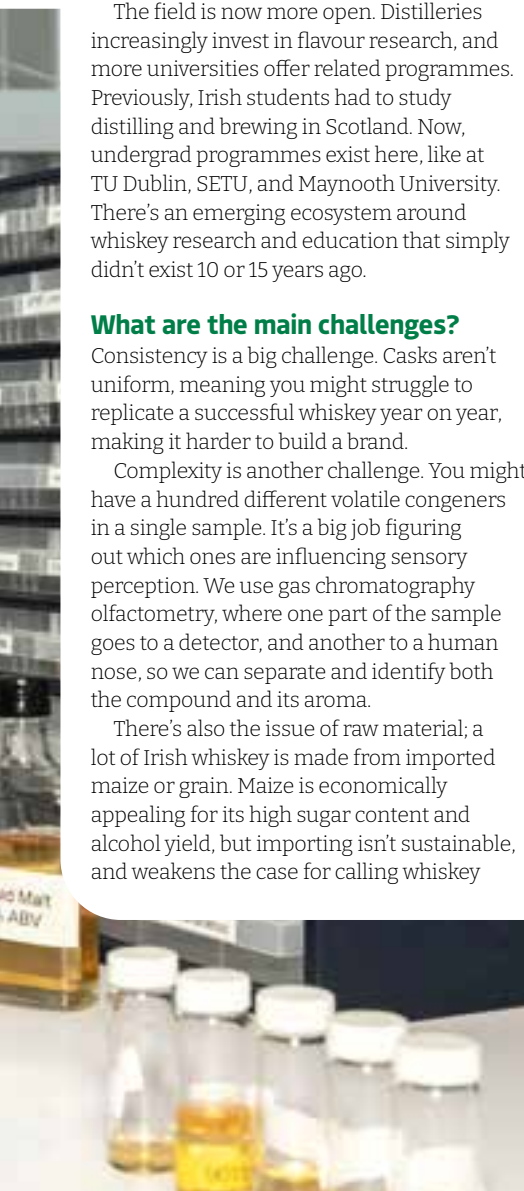
We're already offering technical services, for which there's growing demand. The equipment is often there, but it's people that are needed; trained analysts who can quantify key markers like esters, sugars, and ethanol concentrations. Capacity building is crucial.

### What's next for this research?

We'll continue developing the compound database, while improving our research into sensory assessment techniques for volatile compounds. The new National Centre for Brewing and Distilling is being developed at Oak Park, with capacity to go from 50L to 200L scale, which will support both research and education (see article p16).

We're also focused on supporting use of Irish grain, for both environmental and economic reasons. Reducing reliance on imported maize helps sustainability, and farmers deserve better prices for Irish barley. The PGI gives us leverage, but it's up to research and policy to make the most of it.

Ultimately, we want to bring more science to a traditionally craft-driven space, giving Irish whiskey a distinctive, authentic identity rooted in its landscape, its grains, and its people. **T**



**At Teagasc Moorepark's flavour chemistry facility, Kieran Kilcawley is helping build an Irish whiskey database to help safeguard this unique product**



# Herd it all before

Properly implemented grazing infrastructure increases productivity and sustainability in livestock enterprises, but research from Teagasc Moorepark shows that there are crucial hurdles to overcome first.



grazing infrastructure is a fundamental component of pasture-based dairy farming systems. It ensures that the grass grown on farms is used effectively by grazing animals, which is a key driver of both productivity and sustainability in livestock enterprises.

Two critical aspects of this infrastructure are paddock layouts and roadway network development. Establishing effective infrastructure requires significant initial investment, but such investment is essential, especially as herd sizes increase and farming practices evolve. Ensuring the maintenance and adaptation of paddock layouts and roadway conditions helps maintain optimal

conditions for animal movement.

Since the abolition of milk quotas in 2015, many Irish dairy farms have expanded their herd sizes, either by increasing stocking rates, acquiring additional land, or both. This expansion has placed considerable pressure on existing grazing infrastructure. While many farms have focused on improving farmyard facilities, there is now a need to evaluate grazing infrastructure, especially as herd sizes have begun to stabilise.

## Need for evaluation

Paul Maher, a Research Technologist at Teagasc Moorepark, explains that suboptimal infrastructure can negatively affect herd performance. For example, inadequate grass allocation can restrict animal intake,

especially for first-lactation cows, leading to reduced milk production.

“Recent research has shown that increasing grass allocation frequency from every 36 hours to every 12 hours resulted in a 0.12kg/day reduction in milk solids for first-lactation animals,” Paul notes.

“This was attributed to increased competition for high-quality grass during 12-hour allocations. Dominant cows tend to access the best grazing areas first, leaving lower-quality grass for younger or less dominant animals.”

In contrast, 36-hour allocations reduce competition during the initial grazing bouts, allowing more uniform access to high-quality grass and improving overall milk solids production. Despite this, many farms have not adjusted their paddock sizes to accommodate 36-hour allocations.

A survey of 135 commercial Irish dairy farms revealed that farms with over 250 cows had an average of 33 paddocks, but 46% of these paddocks were only suitable for

12-hour allocations. On smaller farms (fewer than 100 cows), only 10% of paddocks were limited to 12-hour allocations.

“The solution is often straightforward: remove permanent fence lines to consolidate smaller paddocks into larger ones,” Paul adds.

“For a 100-cow herd, the ideal paddock size for a 36-hour allocation is approximately 2 hectares, assuming a dry matter intake of 18kg per cow per day and a pre-grazing yield of 1350kg DM/ha. This adjustment can significantly improve grazing efficiency and animal performance.”

### Walking the walk

Given that dairy cows can spend up to 300 days per year at grass, roadway networks are essential for providing consistent access to grass throughout the year. The distance cows walk on farm roadways can be a factor influencing both milk yield and the incidence of lameness.

Researchers from Teagasc Moorepark undertook a study to assess the walking distances on 135 commercial dairy farms. On average, cows walked 548km per year, but this varied widely: from 196km on a farm with 86 cows, to 1,141km on a farm with 630 cows. There was a moderate correlation between herd size and walking distance ( $R^2 = 0.45$ ). The mean maximum distance walked to a paddock was 1,092m (ranging from 361 to 2,640m).

“However,” Paul notes, “the most influential factor impacting walking distance per year was the mean distance to a paddock, which accounted for 82% of the variability.”

This was largely influenced by the location of the milking parlour within the grazing platform (Figure 1).

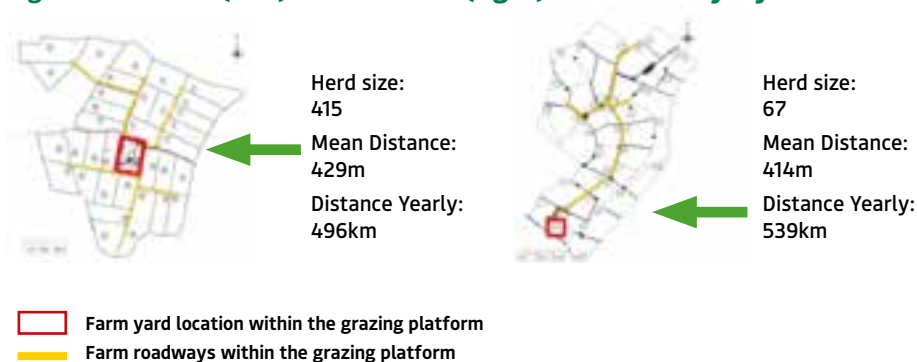
“While it may not be feasible to reduce walking distances on many farms, other strategies can help mitigate the associated challenges,” Paul says. “These include breeding for improved health traits to reduce lameness and enhancing the surface condition of roadways to facilitate easier movement.”

### Suboptimal surfaces

Within the same study, it was demonstrated that wider roadways with better surface conditions increased cow throughput and reduced the labour required to move herds.

However, assessments of commercial farms revealed that larger herds often had roadways narrower than recommended for their herd size. In addition, the surface condition of many roadways was suboptimal: only 14% were classified as optimal, while 24% were classified as poor, with many of the poorest roads located on the periphery of the grazing platform.

**Figure 1. Efficient (left) vs inefficient (right) farm roadway layouts**



On six case study farms, the economic viability of upgrading roadways was evaluated. Of 80 roadways examined, only one showed a positive return on investment over a 10-year period based solely on labour savings.

“Nevertheless, improving roadway conditions offers other benefits, such as better access to grass and potentially reduced risk of lameness,” Paul points out.

“A cost-effective first step is the installation of timed gates, such as the Batt-Latch system. This would allow cows to move at their own pace from paddocks to the milking parlour, reducing both labour and stress on the animals.”

“Improving roadway conditions offers other benefits, such as better access to grass and potentially reduced risk of lameness.”

### Targeted improvements

Maintaining existing roadways is crucial for ensuring their longevity and effectiveness. The study identified several factors associated with optimal and suboptimal surface conditions. Wider roadways and limited verge widths (less than 0.5m) were linked to better surface quality.

#### FUNDING

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#### ACKNOWLEDGEMENTS

The authors would like to thank all the farmers that participated in the studies.

The most influential factor, however, was surface drainage. Roadways that are capable of freely draining onto adjacent paddocks maintained better surface conditions. In cases where the roadway is lower than the surrounding land, it is advisable to raise the road height before resurfacing to facilitate proper drainage. Without adequate drainage, even well-constructed roadways can deteriorate rapidly.

While grazing infrastructure on Irish dairy farms has improved over time, many farms still face challenges that limit efficiency and animal performance. Key issues include outdated paddock layouts, inadequate roadway networks, and poor surface conditions. By reassessing paddock design, consolidating smaller paddocks, improving roadway surfaces, and adopting simple technologies like timed gates, farmers can significantly enhance both productivity and sustainability.

“Now is the time to invest in infrastructure that supports the long-term success of pasture-based dairy farming,” Paul concludes. “With thoughtful planning and targeted improvements, farms can better meet the demands of modern dairy production while promoting animal welfare and operational efficiency.” <sup>1</sup>

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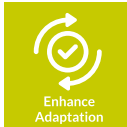


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# To your good health

As fermented foods continue to grow in popularity, research at Teagasc's Food Research Centre is examining the possibilities of an old drink seen in a new light: beer.

**B**eer is one of the most widely consumed fermented beverages, with up to 128 litres being consumed per capita across European Union countries in 2023. While it may come as a surprise to some, food scientists are increasingly examining non-alcoholic beer for its potential as a health-conscious beverage; as a fermented food, non-alcoholic beer is a promising candidate for the 'health drink' category.

Fermented foods have attracted increased attention in recent years for a variety of reasons; affordability and sustainability traits, easy preservation and cheap production, and sensory and health-promoting properties.

Ana Soriano Lerma, a Postdoctoral Fellow at Teagasc Moorepark's Food Research Centre, explains further: "Microorganisms used in fermentation can enrich the final product by activating bioactive molecules and nutrients that wouldn't be available otherwise, as well as increasing flavour and aroma compounds that makes fermented products more attractive to consumers. Moreover, many of the fermentative strains also have probiotic or postbiotic properties, the consumption of which are associated with health benefits."

Fermented foods have been shown to reduce disease risk and improve health and the quality of life, partly via enhancing gut microbial diversity and decreasing inflammation.

## Innovating microbes

The gut microbiome is considered a key contributor to intestinal and systemic health; modulating the gut microbiome through dietary interventions has been established as an effective tool to address health issues. As a complex symbiotic ecosystem, the gut microbiome provides the host with essential functions such as digestion, metabolite synthesis or regulation of immunity. The role of intestinal microbes is not limited to the gastrointestinal tract, since microbial metabolites can be absorbed and impact other organs such as the liver, muscle or the central nervous system.

"So," asks Ana, "what if we could innovate the ways in which microbes are used to brew widely consumed fermented beverages to impact health?"

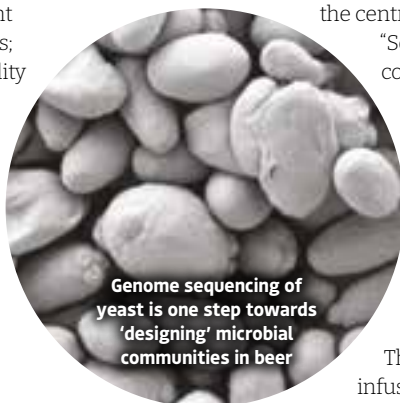
Traditional beer brewing techniques are focused on the use of *Saccharomyces* yeasts.

The wort – the sweet infusion of ground malt or other grain that serves as a base

for beer – contains free sugars. The main aim of traditional brewing is to transform these sugars into ethanol.

"However, fermentation extends way beyond alcohol production," she adds. "Fermentation could be used as a means to impact the healthiness, flavour, aroma and texture of the final product."

What might the implications be if researchers could mimic the microbial community in other beverages and could combine microbes in such a way that they can produce a healthier and tastier beer?



Genome sequencing of yeast is one step towards 'designing' microbial communities in beer



These microbial communities are composed of lactic acid bacteria (LAB), acetic acid bacteria (AAB) and yeasts. Many LAB and AAB are characterised by prebiotic and postbiotic effects, opening up a way to increase the health impact of beer, Ana explains.

"By adding not just yeasts, but also bacteria, to the fermentative community, one can broaden the range of metabolites that can be produced and that will enrich the final product, thus enhancing its health impact and sensory traits. The wort itself has



**State-of-the-art bioprocessing units at Teagasc's Food Research Centre are an important tool for microbial processing**

## “ “ **Fermentation extends way beyond alcohol production... [and] could be used as a means to impact the healthiness, flavour, aroma and texture of the final product.** ” ”

by current advances in bioinformatics and omics techniques, which allow researchers to analyse biological molecules at large scale to understand the structure, function and dynamics of organisms.

### **'Designing' ideal fermentation**

By using Teagasc's cutting-edge sequencing facilities, researchers can study the genetically encoded metabolic capacity of LAB, AAB and yeasts through whole genome sequencing.

In addition, the use of the Teagasc High Performance Computer Cluster allows one to reconstruct the metabolic network of each strain based on whole genome sequencing data, Ana notes.

“Theoretically, we can know which microbes produce what, individually and in combination. This way we can target molecules to be present in the final product, allowing us to ‘rationally design’ which microbes to combine into communities to perform the ideal fermentation. The analysis of the final product will then tell us if our predictions were correct.”

prebiotic properties too, since it contains polyphenols – a group of micronutrients noted for their strong antioxidant properties.”

But how can researchers come up with the right combination of microbes? Can they gain prior knowledge of what microbes to choose, or do they have to rely on trial and error? These questions can partly be answered

#### **ACKNOWLEDGEMENTS**

**The authors acknowledge Wicklow Wolf Brewery and Lisa Ryan of the National Centre of Brewing and Distilling, Teagasc Oak Park, for their assistance in this research.**

This approach, based on using small, easily controllable communities and studying their interaction with a food matrix, is referred to as ‘synthetic microbial ecology’.

“To the best of our knowledge, it has never been explored in beer brewing,” Ana points out.

However, another big question remains when analysing the effect of beer on health: what about the alcohol? There are contradictory results regarding the effect of alcohol in beer; some publications show no negative impact on the gut microbiome, while others highlight alcohol as an obstacle to obtaining the health benefits characteristic of the non-alcoholic fraction of beer.

“It’s possible that the core microbial community could also help control alcohol production by transforming ethanol to organic acids, which would in turn improve the beer’s health impact,” says Ana.

“So, for anyone who’s looking for their next favourite beer, but who’s also conscious of staying healthy, the non-alcoholic beers are definitely worth giving a try.” **T**

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# Distillation nation

Based at Teagasc Oak Park, Teagasc's new National Centre for Brewing and Distilling (NCBD) combines a multidisciplinary, multi-actor approach to promoting and strengthening Ireland's malting, brewing and distilling sectors.

Photography: Finbarr O'Rourke



The National Centre for Brewing and Distilling (NCBD) is led by Manager Lisa Ryan, supported by Brewing and Distilling Technician Gemma

Merrins, Walsh Scholar Isabella de Oliveira Cenci, and working closely with Sinéad Morris, Vice Dean, Carlow International College of Technology, South East Technological University (SETU).

We spoke to them about how their research at the NCBD is helping growers and producers better understand Irish grain to maximise utility, efficiency, sustainability and value.

## Can you explain the history of this team within Teagasc? How did it start, and how has it evolved?

**Lisa:** The team in the NCBD is very new within Teagasc; I have lifelong experience in the brewing and distilling sectors, but have been here just over two years, while Gemma and Isabella have been here less than a year. Through Sinéad, SETU and their Brewing and Distilling Programme have been a strategic partner supporting the centre from the outset.

Currently, the centre houses a pilot-scale malting plant and micro-malting plant, and we also offer lab analysis of testing cereals for malting. The next phase of development will include the installation of a 500-litre pilot brewery and dealcoholisation plant for producing non-alcoholic beverages. In 2026, we plan to install distillation equipment, enabling further development of research, innovations and trials.

So far, we have helped Irish distillery clients with training, processing and malting, and testing new barley varieties for suitability – first to malting, then to brewing and distilling. We're also helping beverage industry start-ups with product development.

## What are your core priorities and objectives?

**Gemma:** Our core priority is for the NCBD to be a hub of research and innovation, supporting stakeholders in piloting industry-led collaboration in the drinks sector. This includes researching the use of native grains to maximise opportunities for value creation, and enabling technology adaption to enhance sustainability, competitiveness and consumer demands.



## We provide growers and processors with critical insights to optimise crop selection and usage. This can enhance profitability and sustainability at farm level.

**Isabella:** We aim to support the drinks sector by providing artisan, micro and SME businesses with the opportunity to use pilot equipment, ultimately helping them adopt novel technologies, enhance their knowledge of malting, brewing and distilling processes and raw materials, scaling up and optimising production, as well as increasing expertise through education programmes.

## How does your research achieve these objectives, and how are your findings used?

**Sinéad:** We combine laboratory experimentation, data-driven analysis, and close collaboration with industry and academic partners. Using a newly developed alcohol yield assessment method, we systematically test Irish-grown grains under controlled laboratory conditions. This

approach enables us to compare performance across various grain types and compositions, and to identify process improvements that enhance efficiency and yield.

**Isabella:** We share findings through several channels, including peer-reviewed publications; conference presentations; direct communication with industry stakeholders such as distillers, growers and policy advisors; and through education, helping train the next generation of scientists in grain processing and alcohol production.

## What are the key techniques and tools you use to achieve this work?

**Lisa:** One of our most innovative achievements has been developing a novel lab-scale method to optimise alcohol yield from Irish-grown grains. Evaluating different grain types under controlled, reproducible conditions generates reliable data on yield and processing characteristics. We're scaling up this method for broader application at pilot and industrial levels, and have published a peer-reviewed paper on this work.

**Sinéad:** We've also published research exploring the roles of pentosans and beta-glucans in both hard and soft wheat, particularly how these components affect alcohol yield and processing efficiency. These studies are helping to identify and overcome key challenges that limit the use of Irish wheat in distilling, such as issues with viscosity and reduced fermentability. By combining analytical chemistry, process trials, and scientific publication, our work delivers practical tools for the industry and new insights that support greater use of local grain in Irish whiskey production.

## What challenges have you encountered in this research?

**Gemma:** Dealing with variability in grain composition, which can affect alcohol yield and processability, is a significant challenge. This is particularly evident with compounds like pentosans and beta-glucans that increase viscosity and complicate fermentation.

To address this, we have adopted a multi-disciplinary approach combining detailed chemical analysis with pilot-scale distillation trials. This enables us to develop tailored enzymatic treatments and optimise processing conditions to reduce viscosity and improve fermentation efficiency.



(L-R) Isabella de Oliveira Cenci, Gemma Merrins, Lisa Ryan and Sinéad Morris are driving innovation at the National Centre for Brewing and Distilling at Teagasc Oak Park

**Isabella:** Another challenge is translating lab-scale findings into industrial-scale processes. Close collaboration between SETU, the NCBD and industry partners helps ensure that our methods are scalable and relevant to commercial distilling practices. Continuous collaboration and iterative testing helps provide actionable recommendations to the industry.

### What specific projects are you currently working on?

**Isabella:** We are currently researching the optimisation of the Pot Still Irish Whiskey category – investigating the impact of alternative inputs, ratios and production

techniques to enhance the overall sensory profile of the whiskey.

Additionally, we're focusing on minimising the environmental impact of the production process, promoting eco-friendly farming practices, reducing resource usage and enhancing efficiency.

**Gemma:** We are currently working on malting trials on new and existing barley varieties; our work involves process optimisation during malting without adversely affecting how the malt performs in brewing and distilling.

We have also partnered in some research on the potential benefits of non-alcoholic beer on the gut microbiome, with pilot scale

trials planned in for the end of this year (see article p14).

### Where does your work fit into the wider context of Irish farming and agriculture?

**Sinéad:** Our work supports the Irish agri-food sector by adding value to native grain production. By investigating alcohol yield from key grains such as wheat, rye, and maize – and understanding how their composition affects yield – we provide growers and processors with critical insights to optimise crop selection and usage. This can enhance profitability and sustainability at farm level. ▶

**Lisa:** Isabella's work on the optimisation of Irish pot still whiskey production is particularly significant given its status as a uniquely Irish product with Protected Geographical Indication. Exploring how technical file adjustments might improve efficiency or broaden grain usage offers flexibility in raw material sourcing while preserving product quality, potentially increasing the use of Irish-grown grain in premium spirits.

**Gemma:** Addressing the technical challenges posed by pentosans and beta-glucans helps unlock the full potential of Irish wheat in distilling. This offers farmers expanded markets for their crops and supports the development of a more resilient, value-added domestic grain supply chain. Overall, our research contributes to sustainable agricultural practices and strengthens the competitiveness of Ireland's agri-food and spirits sectors.

**What results have you seen so far?**

**Sinéad:** The development of our lab-scale method for optimising alcohol yield from Irish grains has provided a reliable tool for assessing grain performance – something previously unavailable. This tool has enabled distillers and growers to make more informed decisions regarding grain selection and processing conditions, leading to improved alcohol yields and greater product consistency.

**Isabella:** Our studies on the roles of pentosans and beta-glucans have identified specific challenges associated with these compounds in Irish wheat varieties. Based on our recommendations, some distillers have begun implementing enzyme treatments and process modifications to mitigate these effects, resulting in more efficient fermentation and increased yields.

**Gemma:** By providing valuable data on how grain composition impacts final alcohol yield, our work has influenced decisions around



**Optimising alcohol yield from grains helps growers and distillers make more informed decisions about grain selection**

By providing valuable data on how grain composition impacts final alcohol yield, our work has influenced decisions around crop rotation and grain breeding priorities, encouraging the cultivation of varieties better suited for distilling purposes.

crop rotation and grain breeding priorities, encouraging the cultivation of varieties better suited for distilling purposes.

While changes at the farm level take time to fully materialise, we have observed growing interest among Irish farmers and industry stakeholders in adapting their practices in line with these findings.

**How does Teagasc benefit from your work?**

**Lisa:** Overall, our work aims to support both the economic and environmental sustainability of the tillage sector – a core strategic goal of Teagasc. We do this through optimising and refining processes to reduce dependency on imported goods, thereby

creating novel, added-value opportunity for the Irish tillage sector.

**How are you anticipating upcoming trends that may affect your work?**

**Sinéad:** Some sectors of the drinks industry are currently in flux; looking ahead, the malting, brewing, and distilling sectors are poised for dynamic growth and transformation over the next three to five years. The convergence of craft and speciality product innovation, sustainability imperatives, technological advancement, and shifting consumer values will drive market expansion and diversification. Companies that prioritise innovation, sustainability, and responsiveness to consumer trends will be best positioned to capture new opportunities and navigate emerging risks.

**Gemma:** The malt market is expected to expand in line with the significant growth of the non-alcoholic drinks sector. The centre will be able to support trials for non-alcoholic beer production, as it is installing a dealcoholisation skid to enable alcohol extraction. Precision fermentation processes are also a big area of innovation and flavour development for both beer and spirit production, and the centre will offer support here also.

**Isabella:** The focus for the next few years will be driven by what the industry needs – more sustainable tillage systems, carbon-neutral processing and eco-friendly packaging. The centre will be equipped to support companies wanting to pilot-test new technologies.

**What are the values and principles that drive the team?**

**Lisa:** Principles for a successful team include trust, honesty, clear communication, collaboration and cooperation and a good sense of humour! We have a very broad area to cover, and our work can be quite diverse, so an open mind and flexibility also go a long way. This centre is the first of its kind in Ireland and it has a far-reaching capability in terms of who it can support; it's great to be involved in such an exciting project. **T**



**Grain selection and distillation techniques are key pillars of the work done at the NCBD**



# Recognising excellence

The Walsh Scholars Programme continues to be a source of excellence in research for Teagasc. In May this year, the organisation granted awards and recognition to some of its best and brightest.



Teagasc awarded the 2025 Walsh Scholars gold medal to Luca van Dijk, a PhD student in the Animal & Grassland Research and

Innovation Programme, at a ceremony held in Teagasc Ashtown on 15 May. The Gold Medal is the highest honour in the Walsh Scholars Programme, Teagasc's postgraduate development and training programme

The annual gold medal is presented to the most exceptional scholar following a rigorous selection process including written application, communication training and interviews with an external panel.

Luca's research focused on the health and welfare of young Irish calves exported to mainland Europe. "Almost 200,000 calves are exported from Ireland



PhD student Luca van Dijk was awarded the Walsh Scholars gold medal at a ceremony at Teagasc Ashtown. Luca is pictured with her parents Ellen Smit and Niek van Dijk.

annually," she explained. "I found that long journeys negatively affect their welfare and that fasting is more harmful than the journey itself. Encouragingly, feeding milk replacer during ferry transport significantly protects their health."

Originally from the Netherlands, Luca is registered with Munster Technological University (MTU) and supervised by Muireann Conneely of Teagasc and Gearóid Sayers of MTU.

## Recognising top scholars

In addition to winning the gold medal, Luca was named Walsh Scholar of the Year for the Animal & Grassland Programme.

Three other top scholars were also recognised, one from each of Teagasc's remaining research programmes, selected from a competitive field of 39 final-year applicants.

Crops, Environment and Land Use Programme winner Rajas Shinde developed a grass-based anaerobic digestion model to support climate action and rural incomes.

"Collaborating with farmers, we co-designed a viable, circular bioeconomy framework," he said. Rajas is supervised by Susanne Barth of Teagasc and David Wall of University College Cork (UCC).

Food Programme winner Mariana Maçãs focused on novel bakery applications of Irish-grown pea flour.

"We created high-protein breads with improved nutrition and shelf-life using advanced milling and analysis techniques,"

(Above) PhD student Luca van Dijk was awarded the Walsh Scholars Gold Medal at a ceremony at Teagasc Ashtown. Pictured L-R: Luca's parents Niek van Dijk and Ellen Smit; Teagasc Chairman Liam Herlihy; award winner Luca van Dijk; Teagasc Director of Research Pat Dillon; Teagasc Director Frank O'Mara; Gearóid Sayers of MTU; Jane Kavanagh, Head of Research Development and Walsh Scholars at Teagasc; Laurence Shalloo, Head of Teagasc's Animal & Grassland Research and Innovation Programme

(Below, L-R) Top Walsh Scholars Rajas Shinde (CELUP), Holly Mullan (REDP), Mariana Maçãs (Food)



she said. Mariana is supervised by Eimear Gallagher of Teagasc and Elke Arendt of UCC.

Rural Economy and Development Programme winner Holly Mullan explored farm succession among older potential successors.

"Off-farm commitments play a major role in decision-making, often in ways missed by traditional surveys," she explained. Holly is supervised by Teagasc's Emma Dillon and Anne Marie Ward of Ulster University.

More information about Luca's research can be found in the feature article on page 20 of this issue of *TResearch*. **T**

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# A long road to better welfare

Each year, large numbers of unweaned dairy calves leave Irish farms for veal and beef rearing units in mainland Europe. These calves, typically under six weeks old, face a long and complex journey by road and sea and several welfare challenges along the way.

**Y**oung, unweaned dairy calves are regularly transported from Irish farms to veal and beef rearing units in mainland Europe. As part of the transportation process, calves undergo a period of fasting; researchers at Teagasc Moorepark have been examining feeding strategies that may improve calf health during this transport.

The researchers compared a group of calves transported from Ireland to the Netherlands with groups of calves transported shorter distances within Ireland and within the Netherlands. Their findings showed that it is the duration of fasting, not the journey duration, that most significantly affects calf welfare. Luca van Dijk, a Walsh Scholar at Teagasc Moorepark, explains more.

“Calves subjected to long-distance export journeys had severely impacted energy balance and hydration parameters, indicating that the current transport system has markedly negative effects on calf wellbeing. However, calves transported within the Netherlands, despite the relatively short journey, also experienced long fasting periods and showed similarly poor physiological outcomes on arrival at their destination. This suggests that when calves are not fed for extended periods, even relatively short journeys can lead to significant welfare compromise.”

Despite differences in journey length, both the internationally transported calves and those moved within the Netherlands arrived with blood values outside normal reference ranges. Glucose, ketones (a by-product of fat breakdown when energy intake is low), non-esterified fatty acids (NEFAs), which increase when calves use their fat reserves for energy, and sodium were abnormal in both groups.



**A calf wearing an activity sensor**

Lactate and potassium were particularly elevated in the internationally transported calves, suggesting muscle fatigue. Calves transported within Ireland showed more stable values by comparison. However, most of these markers returned to normal within one to three weeks, regardless of the group.

“Overall, the findings highlight that the extended periods without milk, rather than the journey duration itself, is the main driver

of poor welfare outcomes in transported calves,” Luca notes.

## Assessing strategies

To tackle these welfare issues, Teagasc researchers and collaborators in Wageningen University and Munster Technological University explored practical feeding strategies before, during and after transport.

One study focused on feeding calves more milk replacer before transport. One group of calves was fed two larger feeds (six litres in total, three litres the night before and three litres the morning of transport) before departure, while the other group received only a single feed of two litres the morning of transport, as was standard feeding practice at the assembly centre. The group fed six litres had better energy levels and less fat mobilisation during the journey than calves fed two litres, reflected in higher blood glucose and lower ketones. These calves were also less dehydrated at the French





Extended periods without milk, rather than journey duration itself, is the main driver of poor welfare outcomes in transported calves.

Increasing feeding for calves prior to transport can reduce the impact of fasting, but doesn't fully eliminate it

lairage (a rest stop for transported livestock), suggesting that a higher feed volume before departure helps calves cope better with the early stages of transport.

The same study looked at feeding calves more milk after transport. Calves fed a higher milk volume on arrival at the veal farm had better average daily weight gain over the first three weeks post-arrival, Walsh Scholar Susanne Siegmann explains.

"This suggests that welfare and productivity can be improved not only by addressing

pre-transport feeding, but also by optimising nutrition during the recovery phase."

A separate study tested the use of a prototype on-board feeding system to provide milk replacer to calves during the ferry crossing. Calves that received milk replacer on board had better physiological profiles at the French lairage compared to unfed controls: higher glucose, and lower ketones, NEFAs and lactate. They also had a tendency to lie down more four hours after feeding, suggesting they may have felt more

comfortable. Although the benefits were not sustained beyond the next fasting period (i.e. after the lairage), the results suggest that feeding calves during the journey can help reduce the negative impacts of extended fasting. However, practical challenges remain, such as accessing calves within trailer pens and safely mixing and delivering milk on moving vehicles.

### Policy and practice

These studies highlight the urgent need to reassess feeding practices for unweaned calves during long-distance transport. While current EU legislation requires calves to be fed at least every 19 hours during transport, exemptions for remote member states like Ireland mean these young animals are routinely fasted for longer.

Feeding more milk before departure and after arrival can partially reduce the impact of fasting, but does not fully eliminate it. On-board feeding systems offer promising potential but need further refinement and regulatory support. Future research at Teagasc, through the DAFM-funded WELCalf project, will aim to further refine a specialised automated system for feeding calves on board during long-distance transport.

"As public concern for animal welfare continues to grow, the dairy and transport sectors have an opportunity to lead by example," Luca concludes. "Reducing fasting times and improving nutrition during transport not only benefits calves but also strengthens public trust and supports a more sustainable, welfare-focused dairy industry." **T**

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Circular Food System



Supporting Policy

# Women leading the chain

A Teagasc work placement explored gender challenges and solutions across two projects: COREnet and Dairy Kenya-Ireland. This highlights how women are driving innovation in short food supply chains.

**T**he project 'Connecting Advisors toward a European Network for consumer-producer chains' (COREnet) is an advisory network funded by Horizon Europe. It aims to develop and coordinate support for farmers and producers who want to sell directly to consumers. The Dairy Kenya-Ireland project works to improve dairy farming practices, boost productivity, and build climate resilience, particularly for smallholder farmers and cooperatives in Kenya.

Both projects focus on strengthening short food supply chains (SFSCs), market systems that reduce the number of intermediaries between producers and consumers, often through direct sales such as farmers' markets, co-ops, or local shops. SFSCs promote transparency, improve returns for producers, and support local economies.

Women are central to the success of both projects. Across the EU, women are strongly represented in SFSCs and are often early adopters of sustainable technologies. In Kenya, women play key roles on farms even when they don't formally own land or assets.

## Improving participation

This article shares insights from a Teagasc work placement that examined how both projects are addressing shared gender-related challenges, and the practical solutions being applied. It highlights how gender-responsive advisory approaches



Women farmers in Tanzania attending a workshop on forage baling techniques

can increase women's participation in agriculture and support more inclusive and sustainable food systems.

"Gender-responsive approaches in short food supply chains are essential to improving women's participation," explains Isaura Mauelele, MA student at the University of Galway. According to COREnet, SFSCs involve a limited number of intermediaries between farmers and markets or consumers.

The research involved analysing articles and reports that outlined gender frameworks used to evaluate agricultural programmes. In addition, qualitative interviews were conducted with team members from the Dairy Kenya-Ireland and COREnet projects to explore aspects of their work related to women in agriculture. Common challenges and shared solutions were identified by assessing areas of cross-cutting relevance between the two projects.

## Socio-economic exclusion

Smallholder female farmers face similar challenges in both regions, particularly in accessing and controlling key resources such as finances, equipment, land, and markets. These issues are rooted in gender norms around land and property ownership, contributing to broader forms of socio-economic exclusion.



For example, women often face greater difficulty accessing financial resources, which limits both their productivity and economic empowerment. In Kenya, team members observed that while men typically own land, livestock, and businesses, it is

Teagasc

often the women working on these farms who are more likely to adopt the climate-resilient technologies promoted by the project. These technologies ease farm work, such as reducing the time spent travelling for water, making them especially valuable to women.

“In the European Union, and to a lesser extent in the African Union, some women are both farmers and landowners, though these are mainly single women and widows,” Isaura notes. “Married women in both contexts tend to have less control over farm assets and income.”

### Addressing imbalance

To help address this imbalance, the Dairy Kenya-Ireland project includes a capacity-building programme to increase women’s participation in farm decision-making, particularly in recognition of their propensity

to be ready adopters of climate-resilient technologies.

The Food and Agriculture Organization of the United Nations highlights that access to financial services enables rural women to purchase inputs, hire labour, and invest in equipment for both agricultural and off-farm activities. Women farmers in the Dairy Kenya-Ireland project participate in a Savings and Loan programme, through which they access loans and machinery to support sustainable farming practices, with guidance from an extension team.

Similarly, the COREnet project’s Golden Cases identify examples of advisory good practice in supporting short food chains, many of which feature female producers. Irish examples such as Kylemore Farmhouse Cheese and Béal Organic Cheese offer useful inspiration for how Dairy Kenya-Ireland’s advisory supports might be adapted in the

future to help Kenyan women make use of growing milk supplies through value-added production like cheese making.


### Supporting empowerment

The advisory good practices identified in COREnet’s Golden Cases are transferable to the Dairy Kenya-Ireland project. They offer a model for supporting the development of milk and cheese short food chains. For smallholder female farmers, this presents a valuable opportunity to turn surplus milk into higher value-added products such as cheese.

“This approach could boost farm-level profitability, contribute to household income, and encourage the development of a feminised diversification activity, ultimately supporting women’s empowered participation in agriculture,” highlights Isaura. “Additional gender-responsive actions could include providing targeted training for smallholder women farmers to become agricultural entrepreneurs.”

As advisory services continue to evolve, particularly in line with European Commission and FAO policy goals to strengthen connections between farmers and consumers, it is essential that these services reach and engage smallholder women farmers. COREnet offers examples of how to do this effectively, such as organising on-farm demonstration events led by female entrepreneurs, along with associated training and workshops.

These approaches not only showcase female-led innovation but also incorporate the voices and local knowledge of smallholder farmers. This is vital for the success of extension services that aim to integrate climate-smart technologies and techniques into the development of short food chains. **T**



**Compared to single women, married women in both [farming and landowning] contexts tend to have less control over farm assets and income.**

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Reduce Methane Emissions



Reduce Nitrogen Emissions

# Getting grass greener?

Can more diverse pastures offer a viable way to reduce methane and total farm gate emissions? Research at Teagasc Athenry is examining the benefits of diverse swards in lamb finishing systems.

**I**ncreasing lamb growth rates directly from pasture while reducing enteric methane emissions is an important strategy for improving production efficiency and promoting more sustainable lamb finishing systems.

In Ireland, pasture-based production systems are mainly based on perennial ryegrass, a high-yielding and nutritious grass species. Although perennial ryegrass can maintain productivity year-round, its nutritional quality, digestibility, and growth vary seasonally. During summer and autumn, this decline in quality can limit lamb intake and hinder growth rates.

Pastures with a greater diversity of plants, including legumes like white and red clover and herbs such as chicory and plantain, have shown strong potential to improve pasture quality post-weaning, supporting superior intakes, leading to improvements in performance. Furthermore, biological nitrogen fixation by legumes can support increased sward production from a reduced rate of artificial fertiliser.

Additionally, there is a constant pressure, nationally and internationally, to reduce methane emissions and the environmental

impact of ruminant livestock, explains Sarah Woodmartin, Research Officer in grassland science at Teagasc Athenry.

“Methane reduction strategies relying on daily supplementation of the basal diet are not currently feasible in most drystock pasture-based systems. However, implementing strategies to increase the daily live-weight gain of growing animals at pasture such as improved grassland management and sward diversification can reduce age at slaughter, thereby decreasing the animal’s lifetime emissions.”

## Companion comparison

Research conducted at Teagasc Athenry across five production years evaluated the inclusion of companion forages to the sward alongside perennial ryegrass. The sward types investigated were perennial ryegrass (PRG), perennial ryegrass and white clover (PRG+WC), perennial ryegrass and red clover (PRG+RC), perennial ryegrass and chicory (PRG+Chic) and perennial ryegrass and plantain (PRG+Plan).

Sward and animal performance, as well as the environmental impact of companion forage inclusion, were assessed within an intensive sheep production system. The swards were stocked at 11.5 ewes/ha,

managed in a rotational grazing system, and received 120kg N/ha/yr.

“Our research question was twofold,” Sarah explains. “Can more diverse pastures offer a viable way to reduce methane and total farm gate emissions? And can this be done while improving lamb growth rates and overall production efficiency in pasture-based sheep production systems?”

All swards produced similar annual herbage yields of 10.5–11.5t DM/ha. Sward quality was enhanced in the post-weaning period with companion forage inclusion. The inclusion of any companion forage reduced sward fibre content. Sward digestibility

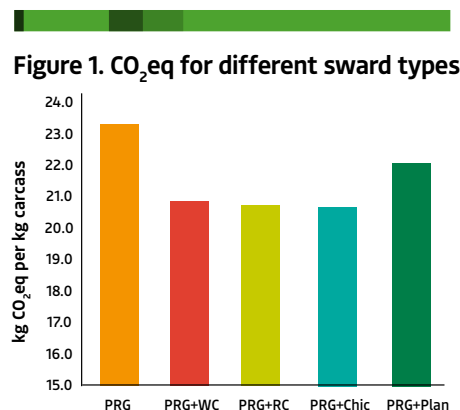


Figure 1. CO<sub>2</sub>e/kg for different sward types

“**Methane production was reduced by 5, 8 and 13% in lambs grazing [mixed swards], compared to those grazing the PRG sward.**”

Lambs grazing diverse swards show potential for enhancing the sustainability of pasture-based sheep systems

and crude protein content were increased with white or red clover inclusion, while the addition of chicory and plantain resulted in an increased ash proportion, signifying a higher sward mineral content.

### Improving performance

Lamb performance was positively influenced by the addition of any companion forage, primarily post-weaning. Post-weaning lamb average daily gain was increased by 33, 41, 40 and 25g/day for lambs grazing PRG+WC, PRG+RC, PRG+Chic and PRG+Plan, respectively.

Driven by the increased performance post-weaning, overall lifetime lamb performance was significantly improved, Sarah notes.

“This resulted in lambs reaching the target slaughter weight 16-32 days earlier when grazing a more diverse sward compared to the PRG sward. Reducing age at slaughter decreased the need for anthelmintic treatments – treatments against parasitic worms – in lambs grazing diverse swards, compared to those grazing PRG only.”

Improved performance on diverse swards also reduced the requirement for concentrate feeding to finish lambs, thereby maximising the contribution of forage in their diet. Concentrate use was reduced by 5-10kg/head

for lambs grazing diverse swards relative to the PRG sward. Top performing lambs were those grazing the PRG+WC, PRG+RC and PRG+Chic, followed by those grazing PRG+Plan, which all outperformed lambs grazing PRG only.

### A promising strategy

Methane output from lambs was recorded throughout the post-weaning period using Portable Accumulation Chambers. Methane production was reduced by 5, 8 and 13% in lambs grazing PRG+WC, PRG+Plan and PRG+RC, respectively, when compared to those grazing the PRG sward.

The inclusion of any companion forage lowered total farm gate emissions, whether expressed per kilogramme of carcass weight (see Figure 1) or per hectare. These reductions in total farm gate emissions were primarily driven by the reduced age at slaughter and the decreased reliance on concentrate feed in more diverse swards.

“Our research suggests that increasing the botanical diversity of the grazed sward is a

promising strategy,” Sarah concludes.

“It shows potential to enhance the sustainability of pasture-based sheep production systems, supporting increased sward quality and enhanced lamb performance from pasture, while also lowering total farm gate emissions. However, to fully reap the benefits of including diverse swards within lamb finishing systems, changes to grazing and sward management will be required.” **T**

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# Tools of engagement

At the VistaMilk research centre, based at Teagasc Moorepark, researchers are examining how engaged research can improve results for end-users.

**P**icture this: you are a dairy farmer with a keen interest in promoting sustainability and animal welfare on your farm. You always track the latest research and are excited to read an article about a cutting-edge cow monitor that will reduce your workload and improve your animals' health and emissions. However, when the new device hits the market, you discover it requires a smartphone model that you don't use, has an upfront cost well outside your current budget, and is viewed negatively by your neighbours and customers.

"Would you decide to use the device on your farm? Probably not," says Rosie Giglia, a Research Officer based at Teagasc Ashtown.

"Meanwhile, the researchers who designed the device are left scratching their heads as to why few people want to adopt their time-saving, environment-protecting, profit-increasing solution."

While this device and scenario are fictional, this problem is common in traditional agricultural research, Rosie continues.

"When we don't work with our end users, we risk wasting valuable time and resources pursuing solutions with little real-world impact."

At Research Ireland's VistaMilk research centre, hosted at Teagasc Moorepark, researchers have been looking into the concept of engaged research and its potential benefits for end-users.

## With, not for

In contrast to traditional approaches, engaged research is research done *with* societal partners instead of *for* them. It is important in research organisations like Teagasc because agricultural research

findings can lead to policy or commercial changes that impact growers, consumers, and businesses, even when they are not involved in the research. "When these groups are not involved in our research, we can produce outputs that are distrusted, unsuitable, unnecessary or even harmful," Rosie notes.

VistaMilk is working to enhance the sustainability of the dairy sector through precision agri-tech solutions. It has established a robust education and public engagement programme and is now working to integrate engaged research into the core activities of the centre. 'The Farmer's Voice' is an engaged research project shaping the VistaMilk research programme using farmer opinions.

**Research Officer Rosie Giglia (left) with VistaMilk colleagues at the Moorepark '25 Open Day**



In 2022 and 2024, VistaMilk ran surveys at the National Ploughing Championships asking participants what dairy research they felt VistaMilk should focus on over the next five years. Responses revealed strong interest in grass management, breeding and genetics, emissions, and profitability across both



**(Left image) Attendees at Moorepark '25 Open Day; open days are good opportunities to speak with farmers and decision-makers about new research**

**(Inset image) Cotton samples used for soil health testing as part of a user-led citizen science project**

When [end-users] are not involved in our research, we can produce outputs that are... unsuitable or even harmful.

years. However, comparison between the two dates suggested decreased interest in some topics (e.g. mastitis and milk composition) and increased interest in others (e.g. young farmers and water quality). These findings emphasise the need for early and ongoing engagement to account for changes in farmers' needs and priorities.

### Enabling responsive results

These results will now be discussed in focus groups with dairy farmers to give context to these responses and explore changes over time. The groups will also be asked for their feedback on current VistaMilk research in the areas that are most important to them.

"The farmers' research interests and needs will be used by VistaMilk's Executive Committee to shape the centre's research plan, and farmer feedback on individual projects will be shared with the relevant researchers," Rosie explains.

"Finally, the participating farmers will be shown how their feedback was used by the researchers to open a two-way path for ongoing communication. This project will

help ensure that VistaMilk's research is responsive to its end-users."

By involving farmers from the beginning of this project, three major benefits emerge. The first is upholding democratic principles: if farmers will be affected by VistaMilk's work, then they have the right to participate in that work.

Secondly, research done collaboratively is more likely to be accepted and adopted.

Specifically, Teagasc researchers found that farmers are more likely to adopt research solutions that they helped to create.

Finally, researchers produce better research when they incorporate real-world insight from their target users. Farmers, for example, might identify unintended consequences or potential solutions that would be missed by the research team alone.

"These benefits improve our ability to tackle complex or controversial problems in areas like climate change, future food systems, data privacy, and animal welfare," notes Rosie.

"An engaged approach will enable the creation of policies, programmes, and products that are responsive to the needs, priorities, and values of the farmers they affect."

### Small steps, big value

Engaged research builds on the work that many Teagasc researchers are already doing, such as involving farmers as data collectors or product evaluators. However, engaged research moves this collaboration earlier in the research process and gives greater decision-making power to participants to ensure that their input is central.

Engaged research is extremely beneficial to Teagasc, but it can also be unfamiliar, time-consuming, and labour-intensive. Because of this, engaged research should not be a one-size-fits-all requirement for all projects. However, adds Rosie, there are small steps that all researchers can take to add value to their research through engagement.

"Speaking to people like farmers, consumers, and policy makers at open days, public events, and online can help you give context to your work and anticipate areas that will need further engagement. Involve as many relevant groups as possible and commit to using their input.

Evidence from other institutions also suggests that access to experience sharing groups helps engaged research flourish, so share your engaged research successes and learnings with your colleagues!"

These practices can create a system by which engaged research is integrated into Teagasc research and seen by all partners as both important and achievable, she concludes.

"By working together with researchers, farmers, consumers, and other community members, we can produce better research that is relevant, accepted, and, ultimately, impactful." **T**

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# Planting the seeds

As the human body ages, our dietary requirements shift. The SO-PLANTS project at Teagasc Moorepark's Food Research Centre is studying the benefits of plant-based foods to help this transition.

**I**n 2022, there were 768,900 people over the age of 65 living in Ireland. This population is predicted to double to 1.6 million by 2051. As humans grow older, our body's nutritional requirements change: the ability to digest food changes, and muscles lose both mass and strength.

According to the European Society for Clinical Nutrition and Metabolism, older people should increase their daily protein intake to 1.0–1.5g of protein per kg bodyweight. Amino acids are the building blocks of protein; there are 20 in total, nine of which cannot be produced by the body and are considered essential in the diet.

Based at the Food Research Centre at Teagasc Moorepark, the SO-PLANTS project is seeking to address this dietary gap. The research is looking at possibilities for producing protein beverages containing all essential amino acids, by using Irish-grown crops such as oats, fava beans, peas and quinoa.

Yueyue Chen, a Teagasc Walsh Scholar working on the project, explains that Ireland has strong potential to increase its production of cereals – such as oats and quinoa – and legumes – such as fava beans and peas.

“By growing and processing these crops domestically, we can lower transport costs, reduce reliance on imports, improve soil health, and cut carbon emissions in our food system,” Yueyue notes.

This approach also supports Ireland's contribution to the European Green Deal target of achieving climate neutrality by 2050.

## Modelling digestion

The SO-PLANTS research combines joint expertise from Munster Technological University (MTU), University College Cork (UCC) and Teagasc. In the first phase, MTU

will examine existing nutrition survey data to assess how much protein older adults in Ireland currently consume: What types of protein do they eat? How much of each essential amino acid is in their diet?

Next, UCC will analyse the protein profiles of oats, quinoa, peas, and fava beans. These ingredients will be blended to ensure the presence of all nine essential amino acids. UCC will then develop five prototype beverages designed to maximise protein content and nutritional value.

At Teagasc, researchers will use laboratory models to study how these beverages are digested in the ageing digestive system, tracking the breakdown of proteins into amino acids as the beverages move through the stomach and small intestine.

Yueyue explains further: “To examine how well the body absorbs these nutrients, the team will build a laboratory model of the older adult gut using human intestinal cells. These cells will be matured in the lab over 21 days to form a realistic gut barrier, and then aged to reflect features of the older gut, such as increased inflammation, oxidative stress, and reduced integrity.”

Teagasc will also develop a model of aged muscle cells to test whether the beverages can help support muscle strength and reduce the risk of frailty. To evaluate real-world appeal, the project will include a consumer study with over 50 women aged 65 and older. Women are the primary food shoppers in Irish households, more concerned about sustainability, more prone to taste new foods, more inclined to have food rejections and live longer than men. Feedback from this group will guide improvements to the formulations, ensuring good taste and texture without compromising nutritional value.

## 9 of 20

The human body cannot produce nine of 20 amino acids, rendering their presence in our diet essential.





Finally, researchers will assess the environmental footprint of the beverages, from seed to supermarket shelf, to evaluate the sustainability of producing these plant-based products in Ireland.

## 65 and older

**Older adults will take part in consumer testing to ensure the new plant-protein drinks are both nutritious and appealing.**

### Laying foundations

The SO-PLANTS project will establish a comprehensive scientific foundation for developing foods tailored to older adults. This includes analysing national nutrition survey data, building models of digestion and nutrient absorption in the ageing gut, studying muscle decline, and conducting acceptability trials with older consumers.

The project will provide up-to-date estimates of protein and essential amino acid intake in older Irish adults, a valuable resource for researchers, dietitians, and health professionals. By creating cell models that simulate the ageing gut and muscle, SO-PLANTS will also advance scientific understanding of this life stage.

"Ultimately, the project will support the development of nutritious, locally produced plant-based beverages," concludes Yueyue. "These could be commercialised by food companies, helping to expand the range of protein-rich plant foods available to support healthy ageing." **T**

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Growing conditions in Ireland result in low-protein, high-starch grains, which are ideal for the production of alcoholic beverages.



# In the spirit of growth

**I**reland produces very high-quality, high-yielding cereal crops with one of the lowest carbon footprints in the world. Currently, the majority of these cereals are used in animal feed, which means that global animal feed commodities determine the price received. For this reason, Teagasc has prioritised developing higher-value human food and drink markets for Irish cereals. Growing conditions in Ireland allow for high yields and relatively low fertiliser inputs. This results in low-protein, high-starch grains, which are ideal for the production of alcoholic drinks.

In the 18th century and up until the late 19th century, Irish whiskey exports significantly exceeded exports of Scottish whisky, but went into serious decline in the early to mid-20th century. From the 1980s onwards, Irish whiskey started to recover; more recently, exports of whiskey from Ireland have grown immensely – from just under €93 million in 2002 to just over €950 million in 2024.

Ireland has the potential to remain a global player in brewing and distilling, but this will require significant focus on the use of Irish grain, explains John Spink, Head of Teagasc's Crop, Environment and Land Use Programme and Director of the National Centre for Brewing and Distilling.



## Market expansion

Over the same period, the importance of the USA as an export market has grown – from 5–21% between 2002 and 2005, to 40–50% in recent years. Because of the importance of the USA as an export market, the recent threats of tariffs have undermined confidence in the continued growth of exports. However, it must be kept in mind that exports to other EU countries and the rest of the world have grown from €58 million to €288 million and €16 million to €229 million, respectively.

During this expansion, the number of operational distilleries in Ireland has grown from two in 1980 to over 40 today. Over the same period, the number of breweries grew

from less than five to a peak of 125 in 2020; there has since been some contraction, down to the current number of around 90.

These craft distilleries and breweries have had little or no technical support domestically and have had to go to Europe or the UK for support. To compound this, getting supplies and services from the UK has become more difficult since Brexit. This prompted Teagasc, with significant financial support for equipment from the Department of Agriculture, Food and the Marine, to set up the National Centre for Brewing and Distilling. The centre aims to support the distilling and brewing industry and demonstrate and encourage the use of Irish grain in the sector. **T**

## Events: my take-home message

Teagasc's researchers attend many events throughout the year, sharing the findings from their research with national and international audiences. Here, we capture the take-home messages – key pieces of information that our researchers want people to remember – from recent events. In this issue we focus on science communications and engaged research.

### Playing for science

**Event: Play for the Planet 2**

**Date: 25 April 2025**

Effective science communication is essential to facilitating understanding among scientists, stakeholders, and the wider community, building trust within society. Researchers should seek innovative ways to engage their audience.

Marta Niedzicka, a Marie Skłodowska-Curie post-doctoral researcher in plant virology in Teagasc's Crop Science Department, participated in the 'Play for the Planet 2' event, organised by the University of York's York Environmental Sustainability Institute.

Marta explains: "The event explores the role of games in environmental education: focusing on how to design and use games

to raise awareness of environmental challenges through all kinds of games."

Through her participation in various activities, Marta presented her research on aphid-transmitted plant viruses, discussed how to use and adapt games, and presented her own game prototype, which focuses on the connection between insects, viruses, and plants.

Participants shared their experiences using different kinds of games (board games, card games, role-play games, or even video games) as teaching tools across different levels of education and as extra



**Marta Niedzicka (left) and fellow delegates discuss using play to drive public engagement with science**

activities to engage diverse audiences.

"Through the presented talks, open discussions, and feedback from other researchers and game developers, I felt inspired to diversify ways of engaging with the public at different events and workshops," Marta concludes.

### Engaging farmers for sustainable solutions



**Engaging minds at EUSEA 2025**

**Event: European Science Engagement Association (EUSEA) annual conference, Gran Canaria, Spain**

**Date: 13-15 May 2025**

EUSEA is a European network of public engagement professionals in the fields of research, innovation and education. This year's conference, attended by Catriona Boyle, Senior Science Communication Officer at Teagasc, focused on challenging stereotypes in STEM, providing real science experiences for audiences, and supporting teachers with resources.

Catriona reports on a presentation by Georgia Mitroussia, Engagement Officer, Rothamsted Research, UK. Georgia works with scientists to help facilitate engagement with farmers by involving them in all stages of the research project, from project design up to reporting on final results. Catriona found it particularly interesting to hear Georgia's explanation that the organisation uses engaged research particularly in those projects of strategic importance, covering topics such as biodiversity, climate change, and food security: "Farmers are crucial in tackling

global challenges like food security and sustainability, offering valuable real-world insights that enhance scientific impact. Farmers can accelerate the adoption of sustainable practices."

Georgia works with researchers to help support the translation of research outputs into forms accessible to the farming community. She also facilitates engagement and dialogue through a variety of channels including industry events, farmer networks and relationships with key stakeholder organisations to help maximise research impact.

**Don't miss Teagasc's upcoming events! Join us at the National Ploughing Championships, Scraggan, Tullamore, Co. Offaly, 16-18 September 2025. Visit our website for more information on this and all our upcoming events: [www.teagasc.ie](http://www.teagasc.ie)**

## Developing a more sustainable malt industry

One of the initiatives at the National Centre for Brewing and Distilling is to provide new insights into the production of malting barley. As well as examining how production can be made more sustainable, researchers are looking at optimising the steeping and germination processes, identifying new malting barley varieties, and exploring opportunities for the use of green malt - barley that has been steeped and germinated, but not yet kilned, requiring less energy for production and thus lowering emissions.

This image highlights the versatility of barley, shown sprouting under varying steeping durations and temperature conditions. Illustrated here is the germination stage, a critical part of the malting cycle, where even and uniform grain development is essential to producing high-quality malt.

Photo:  
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Photography

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