



TEAGASC



RESEARCH IMPACT HIGHLIGHTS IN 2025



Foreword

Teagasc launched its new corporate strategy in late 2025, 'Innovating for Impact: Improving Competitiveness and Resilience in the Irish AgriFood Sector.' The strategy focuses on enhancing productivity, strengthening environmental sustainability, increasing the sector's attractiveness and driving innovation across the agri-food industry. This is in line with the EU Commission's new vision for agriculture and food by making future farming and food production systems more competitive and resilient, sustainable and attractive for future generations.

Productivity can be enhanced through advances in plant and animal genetics, the adoption of innovative technologies and the creation of greater food added value. Environmental sustainability will be strengthened by supporting farmers to reduce emissions, sequester carbon and improve water quality. Sectoral attractiveness will be enhanced by facilitating inter-generational farm transfer, new entrants to farming and collaborative farming. Innovation across the agri-food sector will be increased by strengthening the digital, AI and entrepreneurial capabilities of farmers and food businesses.

This publication presents 20 examples of our research impact from 2025, highlighting a selection of the innovative work delivered across our four research programmes: Animal and Grassland; Crops, Environment and Land Use; Food; and Rural Economy and Development. To evaluate the impact of its research activities, Teagasc has developed a dedicated impact assessment framework. This includes describing how Teagasc's work contributes to the agri-food sector through three interconnected pathways: Technology Development and Adoption, Capacity Building, and Policy Information and Support.

Improving the accuracy of Ireland's livestock emissions has influenced policy by contributing to a reduction in greenhouse gas emissions from the Irish beef (297kt CO₂e) and sheep (394kt CO₂e) sectors, achieving an overall decrease of 8.4%. This represents a significant advancement in Ireland's national inventory. *Citizen Science identified tolerant ash trees* strengthens Ireland's capacity to restore ash populations and a scalable model for national tree health monitoring and conservation. The development of *Smarter milking settings to improve*

dairy efficiency without compromising milk yield or quality directly enhances farm profitability and milking system performance. Additional research impacts with similarly significant pathways can be found throughout this publication.

Our research underpins the technical advice Teagasc provides to farmers and the food industry, and it also plays a key role in informing policy development. Innovation is central to the future of the food sector, and we highlight the extent of the sector's engagement with our innovation support facilities. Our work is made possible through the funding we receive, primarily from the Department of Agriculture, Food and the Marine, as well as from agencies including Research

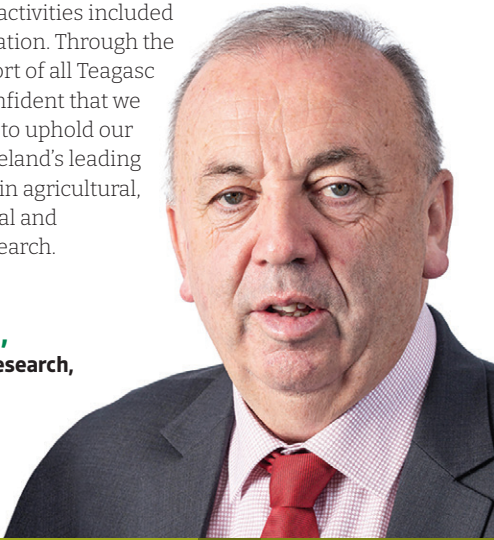
Ireland, Enterprise Ireland, the Environmental Protection Agency and the Horizon Europe programme. We also acknowledge the important contributions made through farmer levies in the dairy and pig sectors.

I would like to express our appreciation to our farmer and industry stakeholders for their continued support, which we greatly value.

Teagasc is fortunate to have an outstanding core of scientists, supported by highly skilled technical, farm and administrative staff, whose combined efforts underpin our research output. I would also like to acknowledge our collaborators in universities and other external organisations who play an active role in many research projects. I wish to recognise our Walsh Scholars and post-doctoral fellows, whose contribution to our research activity is deeply valued.

Finally, I wish to acknowledge the dedication of my colleagues in Teagasc who contributed to, or supported, the research activities included in this publication. Through the collective effort of all Teagasc staff, I am confident that we will continue to uphold our position as Ireland's leading organisation in agricultural, environmental and agri-food research.

Pat Dillon,
Director of Research,
Teagasc



"Our research underpins the technical advice Teagasc provides to farmers and the food industry, and it also plays a key role in informing policy development."

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AGRICULTURE AND FOOD DEVELOPMENT AUTHORITY

NutriStock: Pioneering zero carbon food manufacturing

Shay Hannon, Sasa Novakovic

Teagasc scientists at the National Prepared Consumer Food Centre collaborated with food tech startup NutriStock to address the growing need for sustainable, nutritionally enhanced foods, alongside the challenge of developing a scalable, commercially viable production system in Ireland. The goal was to integrate novel technologies with traditional processes, creating a zero carbon and waste production model to meet demand for healthier, low-impact meal solutions. The collaboration developed and scaled NutriStock's novel food production system while exploring alternative processing and cooking technologies. Teagasc supported product development, process optimisation and technology integration to maintain nutritional integrity and ensure commercial viability. Through pilot-scale trials and technical expertise, the concept transformed into a scalable manufacturing model, enabling product development and accelerating NutriStock's commercialisation.

The project has significantly strengthened NutriStock's capacity to produce high-value food product through the establishment of a scalable

production system, culminating in the opening of a production facility in Co. Wexford. This achievement is significant for the company and the wider sector as it demonstrates integration of sustainable low carbon manufacturing leading to a commercially viable business model. The scale of impact is already substantial, enabling market entry in the UK and Asia, with future potential to expand production capacity and product lines. NutriStock's reach extends from local Irish supply chains to international food service and healthcare markets, positioning Ireland as a leader in sustainable food innovation with strong future growth potential.

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Impact pathway: Technology Development and Adoption

Safeguarding soil health through communities

Fiona Brennan, Elena Hayes, Veronica Nyhan, Saorla Kavanagh, Luis Lopez-Sangil, Karen Daly, Eimear Hutchinson, Karla Burke

Healthy soils underpin agricultural productivity and planetary health, yet practical skills to assess and manage soils are lacking among students, farmers, advisors and the public.

The 'GroundTruth' citizen-science initiative engaged communities nationwide in soil health and biodiversity assessments to raise awareness, build skills and improve soil stewardship.

Participants were recruited through schools, farming networks and community groups, with a strong emphasis on inclusivity and accessibility. Each participant received a user-friendly resource pack with factsheets, step-by-step protocols and supporting media to build confidence and ensure consistent data collection. Citizen scientists submitted observations and photos online, which the project team collated to build a national picture of soil health. A dedicated national soil health week was held in September.

The project also produced a handbook, 'Farming for Soil Health', along with tailored resources for schools and farmer discussion groups.

Growing attention to soil health and emerging EU soil policy underlines the significance of this initiative. Over one year it engaged over 14,000 people across 24 counties through more than 50 events, including webinars, radio interviews, farm walks, discussion groups and school visits. It also reached beyond traditional farming audiences, with 66% of participants identifying as urban or suburban. Participants reported increased awareness of citizen science (71%), improved confidence in conducting DIY soil tests, and in some cases changes in on-farm soil management.

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Funding: Research Ireland and Department of Education; Supported by VistaMilk Research Ireland Centre and Teagasc
Impact pathway: Capacity Building

Modelling Ireland's nitrates derogation impacts

Michele McCormack, Elodie Ruelle, Cathal Buckley, Trevor Donnellan, Kevin Hanrahan, Laurence Shalloo, Joe Patton, Pat Dillon

Ireland's nitrates derogation permits farmers to operate at an organic nitrogen (N) stocking rate above 170kg/ha within the framework of European Union (EU) regulations. Drawing on robust data from the Teagasc National Farm Survey (2021–2023), this study quantifies the proportion of dairy farms exceeding the 170kg/ha threshold and evaluates the economic implications of removing the derogation at farm level. It also examined a range of mitigation strategies to offset the associated economic impact, including land rental, slurry export, contract rearing and herd reduction.

The analysis estimated that approximately 49% of dairy farms in Ireland, representing 65% of national milk production, operated above the organic nitrogen (N) stocking rate limit of 170kg/ha. Requiring these farms to comply with stocking rates below 170kg/ha would result in a national reduction of approximately 203,719 cows (14%) and a decline in milk production of 1.2 billion litres (15%). The findings also indicate that, if herd reductions were required, affected family farms would experience a substantial decline in income of approximately 39%. Although alternative mitigation strategies would also lead to significant income reductions, their impact would be comparatively less severe.

This research has had a direct impact on national policy development and the extension of Ireland's nitrates derogation until the end of 2028. The research was commissioned specifically to inform the government's formulation of the next Nitrates Action Programme (2026–2029) and to support negotiations with the European Commission and other EU member states. The analysis provided an evidence-based assessment of how changes to maximum organic stocking rates would affect Irish dairy farms.

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Impact pathways: Policy Information and Support

On-farm monitoring prompts slurry policy change

Pat Tuohy, Jack O' Neill, Tomas Condon, Laurence Shalloo

The project addressed a critical gap in accurate data on slurry and dairy soiled water volumes produced on Irish dairy farms. Existing estimates were insufficient, limiting effective regulation, infrastructure planning and efforts to protect water quality. The project aimed to generate reliable on-farm data to inform policy, improve nutrient management and support more sustainable agricultural practices.

A total of 100 dairy farms were surveyed to quantify slurry and dairy soiled water volumes. The study also catalogued storage infrastructure, farm management practices and potential additional sources, such as runoff and silage effluent. Monitoring equipment was installed on each farm to record tank volumes at hourly intervals, with data collection running from late 2022 to early 2025. Researchers collaborated closely with policymakers and stakeholders, providing regular updates and data analysis. The resulting dataset delivered robust, real-world evidence on actual volumes produced, directly informing regulatory revisions regarding storage requirements, and best practice guidance for improved nutrient management and water quality protection.

The project provided the first reliable dataset regarding current slurry and dairy soiled water volumes. Findings revealed that actual volumes produced on farms are significantly higher than previously estimated. This evidence directly informed revisions to the Government's 6th Nitrates Action Programme, particularly in relation to storage requirements and farm management practices. By improving nutrient use efficiency and reducing risks of nutrient losses, the work supports sustainable dairy farming and water quality protection. It also strengthened policy confidence, enabling evidence-based decision-making, and highlighted the value of on-farm monitoring. The project's impact extends beyond regulation by directly enhancing the environmental sustainability of the dairy sector.

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Impact pathway: Policy Information and Support



Farmer health programme informs EU best practice

Diana van Doorn, David Meredith

Internationally, farmers face significantly elevated risk of cardiovascular disease (CVD), yet they are a 'hard-to-reach' population through conventional health services. This gap represented both a serious occupational health challenge and an opportunity: delivering health interventions in settings that farmers already frequent, such as livestock marts and agri-branches, where engagement barriers could be overcome.

The 'Farmers Have Hearts Cardiovascular Health Programme' (FHH-CHP), developed through a Teagasc Walsh Scholarship, delivered a gender-sensitive, farmer-centred CVD intervention to 868 livestock farmers. The programme combined CVD health screenings at marts and agri-branches with tailored lifestyle change support. Programme effectiveness was rigorously evaluated after one year. Findings demonstrated measurable improvements in health outcomes and behavioural change and were published and disseminated to national and European policymakers. Teagasc researchers provided expert input to the European Agency for Safety and Health at Work's (EU OSHA) review of work-related CVD prevention across European Union member states, and programme findings informed Ireland's Farm Safety Action Plan.

EU OSHA selected the programme as one of five European best-practice case studies in occupational CVD prevention, with Teagasc expert input shaping the forthcoming EU OSHA report on work-related CVD prevention. This is a policy document that will inform occupational health strategy across all member states. At national level, 41% of participants in the Irish study improved their CVD risk profile, while 81% reported sustained behaviour change. Nationally, the programme's findings informed Ireland's Farm Safety Action Plan, and the Health Service Executive is now piloting a national programme rollout in 2026. This demonstrates a clear pathway from research to health service delivery at scale.

41% of participants improved their risk profile, while 81% reported sustained behaviour change

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Funding: Teagasc Walsh Scholars Programme; National Centre for Men's Health South East Technological University; Tirlán; Health Service Executive; Irish Heart Foundation; University College Dublin

Impact pathways: Capacity Building; Policy Information and Support



Improving accuracy of Ireland's livestock emission estimates

Paul Crosson, David Kelly, Jonathan Herron

Reducing agricultural emissions is a priority for Ireland. Methane from non-breeding cattle accounts for greater than 30% of agricultural emissions and is a major source of uncertainty in the national greenhouse gas emissions inventory. Improving estimate accuracy is essential to enhance national reporting and support evidence-based climate mitigation strategies.

Using high-quality data from the Irish Cattle Breeding Federation, Teagasc National Farm Survey and the Central Statistics Office, Teagasc developed new, country-specific models for Irish cattle and sheep, replacing outdated factors previously used in Ireland's national inventory.

This enabled the development of more detailed, system-specific emission models that better reflect modern animal performance, management practices and feeding systems. The work was developed in close collaboration with national inventory compilers and applied updated Intergovernmental Panel on Climate Change (IPCC) methodologies. The project supported knowledge transfer through engagement with policymakers and inventory stakeholders. The new models improve estimation accuracy, reduce uncertainty, and provide a robust platform to assess mitigation strategies and inform climate policy.

The models were incorporated into Ireland's National Inventory Document 2025, significantly improving the accuracy of enteric methane estimates for Ireland's grass-based livestock systems. Their adoption resulted in a reduction of 393.7ktCO₂e for sheep and 296.5ktCO₂e for beef, delivering a combined 8.4% decrease in reported enteric methane emissions. This represents a major advancement in Ireland's greenhouse gas inventory, strengthening scientific robustness and supporting more evidence-based climate policy and mitigation planning.

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Other contributors: Irish Cattle Breeding Federation; Central Statistics Office

Funding: Teagasc; Department of Agriculture, Food and the Marine

Impact pathway: Policy Information and Support

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Healthier porridge from Irish-grown oats

Nefeli Lampoglou, Ewen Mullins, Atikur Rahman, André Brodkorb, Daniela Freitas

This project focused on creating added value for Irish tillage farming through advanced nutritional profiling of oats. Although oats are widely promoted for heart health, the amount required to achieve clinical benefits can vary considerably across oat varieties. Depending on the variety, reaching the same cardioprotective dose could require anywhere from 4–24 tablespoons of rolled oats per day, a very significant difference for consumers and product developers alike.

NutriOats is a multidisciplinary research project investigating the nutritional composition, digestibility and potential health effects of Irish-grown oats. In the largest nutritional diversity screening to date, published in a high-impact journal by Nature group, this project revealed an exceptionally wide compositional spread among 95 cultivars, among them Irish and European open-source heritage oats. Findings include some high yield varieties with over 20% protein content, which are suitable for the growing global plant protein food market.

This project is already influencing agricultural practice. Seed growers are starting to use results to prioritise cultivars that combine superior nutritional quality with strong yield and resilience traits. Seeds from seven lines have been provided to the Irish Seed Savers Association for on-farm evaluation, while Teagasc advisors are assessing their suitability in organic production systems. In parallel, material is being trialled with the Agrifood and Bioscience Institute as part of the Co-Centre for Sustainable Food Systems. Integrating science with agriculture testing, NutriOats is helping position Irish-grown oats as a leading option for healthy, climate-resilient food systems.

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Other contributors: University College Cork; Irish Seed Savers Association; Agrifood and Bioscience Institute, Northern Ireland; Co-Centre for Sustainable Food Systems

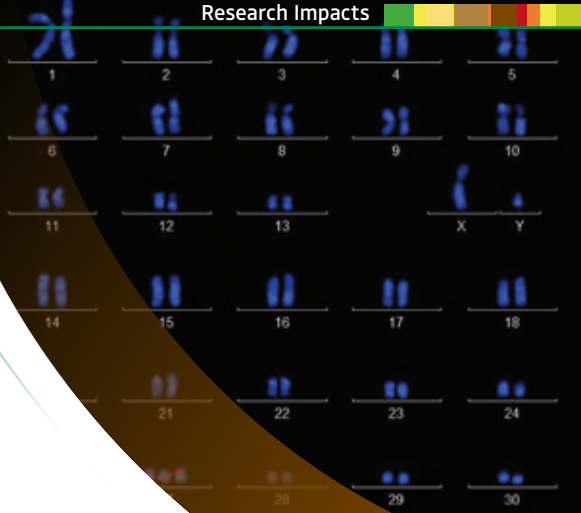
Funding: Research Ireland Pathway programme

Impact Pathway: Technology Development and Adoption

Teagasc



Alfie Shaw



Routine genotyping identifies hidden infertility

Cliona Ryan

Cattle, sheep, and horses can be born with extra or missing chromosomes, a condition similar to Down's syndrome in humans. Affected animals may appear physically normal but the conditions can cause infertility or premature death. As a result, farmers may unknowingly rear infertile animals with no way to identify them until breeding fails and rearing costs are already incurred.

At €60 per animal, conventional chromosome testing (karyotyping) is not economically viable at national scale. Teagasc pioneered an automated detection method using genotype data already collected through national evaluations, enabling chromosomal screening at no additional cost. Detection thresholds and implementation-ready code were developed, and this work is now implemented in the Irish Cattle Breeding Federation's genotyping pipeline to screen artificial insemination bulls entering the national breeding programme.

Across cattle and horses, owners of affected animals were contacted, and farm visits were conducted alongside veterinarians to collect blood samples for karyotyping confirmation and to provide farmers with personalised reports showing their animal's genotype profile.

This research demonstrated that routine genotyping data can reliably identify infertile animals before they enter breeding programmes, and the approach is now implemented in practical use. Spanning nearly 1.3 million cattle, 63,000 sheep, and 21,000 horses, this research estimates that approximately 1,500 calves, 3,000 lambs, and 37 foals are born with chromosomal abnormalities in Ireland each year. Rearing an infertile heifer to breeding age costs approximately €1,500, a loss that now can be prevented through early detection using existing genotyping data.

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Other contributors: Irish Cattle Breeding Federation; Horse Sport Ireland; University College Dublin; Munster Technological University

Funding: Department of Agriculture, Food and the Marine; Research Ireland (VistaMilk)

Impact Pathway: Technology Development and Adoption

Teagasc pioneered an automated detection method using data already collected through national evaluations, enabling chromosomal screening at no additional cost

Teagasc

Biocontrol adoption in the mushroom sector

Joy Clarke, Helen Grogan, Brian McGuinness, Donal Gernon

The farm gate value of the mushroom industry was €158M in 2025. Disease control on mushroom crops is a major challenge within the sector, with an estimated 7–8% of Irish crops lost annually to disease. Due to resistance development and regulatory withdrawals, only one fungicide remains available to mushroom growers in Ireland. This project evaluated whether biocontrol-based treatments could provide effective disease management and assessed the resistance status of this key fungicide.

This project evaluated two bacterial biocontrol strains: a commercially available product used in other crop systems and a novel strain first isolated from a crop grown at the Teagasc Mushroom Research Unit. Laboratory experiments and multiple large-scale crop trials were conducted to evaluate effectiveness against the pathogens responsible for two major diseases (cobweb and dry bubble) affecting the mushroom industry. In parallel, resistance to the only remaining chemical treatment was also identified. BioProject findings were communicated directly to growers through Teagasc stakeholder events and international industry events, including the Dutch Mushroom Days.

This project was the first to confirm resistance of mushroom pathogens to the only remaining fungicide available to growers, increasing grower awareness and shifting attitudes to disease management. The findings highlight the urgent need to integrate alternative disease-control products and to improve biocontrol effectiveness through mixed Integrated Pest Management strategies.

The first biocontrol-based treatment developed for use in the mushroom industry is now being rolled out to growers. Our research has increased grower confidence to adopt these sustainable biocontrol products by providing practical, evidence-based guidance for on-farm use.

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Funding: Teagasc Walsh Scholars Programme

Impact pathway: Technology Development and Adoption

Clover150 – reducing chemical nitrogen on farms

Michael Egan, Caitlin Looney, Michael Healy, Michael O'Donovan

Irish agriculture is facing a major challenge to reduce chemical nitrogen fertiliser in response to environmental regulations, climate change and increased farm costs. Farmers must adopt sustainable practices like incorporating white clover into grass swards and improving fertiliser management, while maintaining overall farm production. However, achieving and maintaining sufficient levels of white clover in grassland remains a significant challenge.

Research by Teagasc has demonstrated that incorporating white clover into grass swards delivers significant productivity and environmental benefits. Despite this, adoption across the industry has remained relatively low. To address this, 30 farmers participated in the Clover150 programme over five years (2021–2025). The programme aimed to reduce chemical fertiliser use while maintaining grass growth and lowering farm-gate nitrogen surplus.

Teagasc researchers provided guidance on clover establishment, pasture management and fertiliser strategies. Participating farmers also hosted farm

walks in collaboration with the Teagasc Grass10 campaign, showcasing practical implementation and supporting peer-to-peer learning to encourage wider uptake of clover-based systems.

Over five years, the Clover150 programme delivered significant on-farm and industry impact. Participating farmers successfully

established clover on 75% of their farm area, achieving an average sward clover content of 19%. The incorporation of clover reduced nitrogen fertiliser use by 60kg N/ha, to an average of 176kg N/ha, while herbage production was maintained at 14t DM/ha. This resulted in a reduction in farm-gate nitrogen surplus to 150kg N/ha, thereby lowering the risk of environmental nitrogen losses and reduced farming input costs.

The Clover150 programme provides a proven blueprint for clover establishment, management and nitrogen reductions strategies, with wider industry influence evident with white clover seed sales having doubled to 353t since 2021.

75%
Participating farmers
established clover on
75% of farm area

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Funding: Teagasc core funding; Dairy Research Ireland

Impact pathway: Technology Development and Adoption

Supporting the European Soil Directive

Réamonn Fealy, Karen Daly, Lilian O'Sullivan, Giulia Bondi, Niall Lehane, Fiona Brennan, Jesko Zimmerman, Owen Fenton, Felipe Bachion de Santa, Luis Lopez Sangil

The EU Soil Monitoring Law (SML) was initially proposed by the European Commission in a renewed effort to provide a framework for the protection of soils across member states. Translating the SML into a full directive required extensive negotiations with member states, which in turn required detailed support from soil experts at national level.

At the request of both the Department of Agriculture, Food and the Marine (DAFM) and the Department of Climate, Energy and the Environment (DCEE), Teagasc provided considerable and wide-ranging expert support to the Irish government teams involved in negotiating the law with the European Commission. This support drew on multidisciplinary research expertise and was delivered collaboratively by Teagasc environmental and economic researchers. Teagasc staff participated in multiple workshops with the DAFM and DCEE negotiating teams. In addition, they conducted frequent and detailed reviews of successive drafts of the proposed legislation issued by the European Commission. The Teagasc team met frequently to ensure feedback to the Commission was aligned and comprehensive.

The proposed monitoring framework required careful scientific consideration of the optimum mapping and statistical approaches. Recommendations on appropriate soil descriptors to underpin baseline conditions were subject to extensive feedback to the Commission through the Government negotiating teams to preserve scientific integrity and data collection efficiency. Ongoing engagement by Teagasc staff during the legislation formation process has led to the successful final development of the adopted directive, which takes account of Irish soil conditions and existing data.

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Funding: Teagasc core funding

Impact pathway: Policy Information and Support

Public engagement highlights importance of agri-food microbiomes

Paul Cotter, Paula Fernandez Gomez, Dara Leong, Fiona Brennan, Olivia McAuliffe, Orla O'Sullivan, John Kenny

This work highlights the interconnected nature of microbiomes (microbial populations) along food systems, and how this knowledge can be harnessed – to enhance crop resilience and productivity, improve animal health and performance, refine management practices in fishing and aquaculture, or prolong shelf life and reduce food spoilage during distribution.

A team of leading scientists, coordinated by Teagasc, reviewed existing data to determine the extent to which microbiome connections across food chains impacted on human, animal and global health. The resulting publication appeared in the high-profile journal *Frontiers in Science*, was accompanied by a webinar (viewed almost 300,000 times on YouTube), and by articles tailored for public and younger audiences. These outputs highlighted the work's relevance with respect to policy, importance for developing countries and other societal impacts.

Agri-food system microbiomes form a complex,

dynamic, and interconnected network that can be traced across soil and marine environments to primary agriculture, farming, and food processing sectors, ultimately influencing human gastrointestinal niches. These microbiomes impact human, animal and planetary health. This engagement highlighted the importance of these microbiomes to hundreds of thousands of individuals, ranging from teenagers upwards, and encompassing the public, farmers, food producers and processors, scientists, regulators and policymakers across the globe.

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Funding: Research Ireland; Horizon Europe

Impact pathways: Technology Development and Adoption; Capacity Building; Policy Information and Support

300,000
views for the
publication's
accompanying webinar





CAP changes supporting farmer mental health

David Meredith, John McNamara, Joseph Firnhaber, Conor Hammersley

Farmers are exposed to multiple occupational stressors including isolation, climate change and financial and administrative burdens. Left unaddressed, these can result in mental health challenges, an issue increasingly recognised amongst EU policymakers. Despite this, mental health support for farmers and farm workers remains underdeveloped or fragmented across many EU Member States.

Through the EU Horizon-funded SafeHabitat project, Teagasc led a comprehensive programme of evidence generation and policy engagement. Activities included: a systematic scoping review of 603 studies on agricultural psychosocial stressors; focus groups with young farmers at a European Council of Young Farmers event; and a stakeholder workshop involving European experts including farmers, farm advisors, industry representatives and policymakers. A policy seminar was hosted at the European Parliament bringing together MEPs and farming organisations to explore policy options. The findings were synthesised into a policy brief, containing 10 evidence-based recommendations.

This body of work contributed to a landmark policy development requiring farm advisory services to raise awareness about mental health issues and availability of the relevant services. This marks the first time that mental health has been embedded within farm advisory services supported by EU agriculture policy. Once enacted, this provision has the potential to shape advisory services across all EU Member States, with direct benefit to Europe's farming population.

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Other contributors: CIHEAM (International Centre for Advanced Mediterranean Agronomic Studies); National Centre for Farmer Health (Australia); ZRC-SAZU (Research Centre of the Slovenian Academy of Sciences and Arts)

Funding: Horizon Europe

Impact pathway: Policy Information and Support

Optimised sulphur fertilisation boosts nutrient use efficiency

Patrick Forrester, Claire Aspel

The agriculture industry faces an ongoing challenge to reduce nitrate leaching losses to water while sustaining agricultural output. This project identified sulphur nutrition as a key factor for improving the nitrogen use efficiency of applied fertiliser nitrogen on Irish grassland soils, while also increasing herbage yields and potentially reducing nitrate losses to water.

Field and lysimeter trials demonstrated a positive grass herbage yield response to sulphur application across a range of Irish soils. It was found that sulphur optimisation could reduce nitrate leaching to water by improving the grass uptake and yield response to applied nitrogen. This knowledge was disseminated to advisors, farmers, commercial

stakeholders, policymakers and agricultural science students through in-service training, the Teagasc QQI Level 6 Crop Nutrition Course, technical conferences, field meetings, student lectures and a sulphur technical bulletin in collaboration with the Fertiliser Association of Ireland. This work is having national impact, improving awareness of sulphur's importance in fertilisation programmes, with the fertiliser industry increasing availability of a range of

sulphur-containing nitrogen and compound fertilisers suitable for silage and grazing. Based on this work, including sulphur in fertiliser programmes to reduce nitrate leaching was one of the March-April 2026 "Top Tips" of the Farming for Water European Innovation Partnership.

Continued optimisation of sulphur use has the potential to increase grassland productivity, improve nitrogen use efficiency, reduce farm N balances and decrease nitrate leaching to water — supporting the sector in addressing current environmental and productivity challenges.

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Funding: Teagasc Walsh Scholars Programme

Impact pathway: Technology Development and Adoption



Teagasc-Cybercolors collaboration driving cheese colourant innovation

Prabin Lamichhane, Prashant Shelke, Karen Dawson

Collaboration between research and industry addressed a key limitation of traditional annatto-based cheese colourants, where 10–20% of the pigment is lost to whey, reducing its commercial value, product quality and sustainability. Teagasc supported Cybercolors Ltd. in advancing the scientific understanding of their patented emulsion-based cheese-colouring system as an alternative to annatto.

Recognising Teagasc's scientific expertise, and with operations based at the National Food Innovation Hub, Moorepark, Cybercolors Ltd. initiated a collaborative research partnership to deepen the understanding of their formulation. Supported by Enterprise Ireland's Innovation Partnerships Programme, this two-year project utilised advanced microscopy techniques at the National Food Imaging Centre, alongside dairy processing facilities at Teagasc Moorepark, to generate new insights into the formulation's behaviour and underlying colouring mechanism. The project also examined the impact of the colour formulation on downstream processing. Ongoing knowledge transfer between Teagasc and Cybercolors Ltd. supported formulation optimisation and product improvement.

The knowledge generated enabled Cybercolors Ltd. to optimise its technology, strengthen technical credibility with clients, and respond more effectively to customer queries. As a result, the company has expanded its client base and seen a significant increase in demand for its colouring formulation. Building on this success, the company is now progressing the licensing of the knowledge and expertise generated through the project.

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Other contributor: Cybercolors Ltd.

Funding: Enterprise Ireland; Innovation Partnerships Programme

Impact pathways: Technology Development and Adoption; Capacity Building

Ongoing knowledge transfer between Teagasc and Cybercolors Ltd. supported formulation optimisation and product improvement

Sustainable sheep breeding

Noirín McHugh, Edel O'Connor, Lucy Chipondoro, Fiona McGovern, Philip Creighton, Jonathan Herron

The Euro-Star sheep breeding indexes have been proven to increase farm profitability while reducing the carbon footprint per kilogramme of carcass produced. As climate targets increasingly focus on emissions intensity per animal, a new component to the breeding indexes is required to quantify total animal emissions while continually improving flock productivity.

Approximately 20,000 individual animal methane emissions records have been measured by Teagasc in collaboration with Sheep Ireland. This data has enabled the development of genetic models that predict the methane emissions from individual animals. Simultaneously, life cycle assessment has been undertaken to calculate the associated carbon costs with traits already included in the sheep breeding indexes. The integration of methane breeding predictions combined with the calculated carbon emission values on key traits underpinned the creation of a new methane sub-index within the Euro-Star sheep breeding indexes.

The methane sub-index is just one component of the overall breeding indexes and is integrated alongside key production traits, which importantly ensures that the Euro-Star indexes identify animals that simultaneously increase farm profitability while reducing emissions. Launched in late 2025, the updated Euro-Star sheep breeding indexes, incorporating the methane sub-index, will be used by Irish sheep farmers to select rams in the 2026 breeding season, supporting more productive and environmentally sustainable sheep farming.

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Funding: Department of Agriculture, Food and the Marine

Impact pathway: Technology Development and Adoption



Citizen Science identifies tolerant ash trees

Dheeraj Rathore,
Ricardo Pimenta

332
public reports
submitted on
identifying
tolerant ash trees

Ash dieback has severely reduced Ireland's ash population, threatening biodiversity, landscape value, and future timber supply. A key challenge is identifying and conserving tolerant trees to support restoration and breeding, as traditional survey methods alone are insufficient to locate surviving healthy ash trees across the landscape. The 'AshforFuture' project combined research on ash dieback tolerance with a national citizen science initiative to identify healthy trees. Given that ash is widespread across hedgerows, farms, woodlands and private lands, public participation was essential to access trees beyond traditional surveys. Citizens acted as distributed observers, submitting over 300 reports with images and providing access to scientists for sampling healthy trees. Reported trees were verified, and selected genotypes were collected and

grafted for inclusion into breeding and conservation programmes. Activities included stakeholder training, collaboration with local authorities and community groups and the development of tools such as disease severity scoring scales.

The initiative has significantly increased the identification of potentially tolerant ash trees, with public reports rising from 73 to 332 within one year. This enabled the collection and grafting of 389 genotypes from 26 counties, which are now integrated into national breeding and conservation programmes. Media engagement drove measurable behaviour change, with a single RTÉ Brainstorm article triggering a rapid increase in public reporting.

Overall, the approach has expanded the geographic and genetic diversity of candidate material beyond traditional surveys and enabled identification and protection of regeneration hotspots on private lands. This impact is strengthening Ireland's capacity to restore ash and provides a scalable model for national tree health monitoring and conservation.

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Funding: Department of Agriculture, Food and the Marine; Department of Agriculture, Environment and Rural Affairs, Northern Ireland

Impact pathways: Capacity Building

Finbarr O'Rourke

Smarter milking settings improve dairy efficiency

John Upton, Martin Browne

Dairy milking systems have traditionally operated with conservative cluster removal settings. This often results in unnecessary low flow periods at the end of milking and associated overmilking, increasing labour demand, exposing cows to avoidable teat stress, and limiting overall system performance at farm level. Research conducted at Teagasc Moorepark, supported by the VistaMilk Research Ireland Centre, evaluated the impact of adjusting automatic cluster removal (ACR) settings on milking performance. The study combined on-farm trials with detailed vacuum and milk flow measurements.

Findings were put into practice through a collaboration with Dairymaster, supporting the development of the Swiftflo Personalised Milking platform, enabling cow-specific ACR settings. Industry partners, advisory colleagues, education specialists and farmers were engaged to support adoption.

The research has led to improved milking efficiency through reduced milking duration (approximately 95 seconds per cow, around 14%) and reduced overmilking. Implementation through

Dairymaster's Swiftflo system has enabled practical uptake at farm level. The approach is applicable across an estimated 250,000 to 300,000 cows in Ireland, with potential for wider international reach.

These improvements enhance parlour throughput, reduce labour demand and support better cow comfort during milking. Importantly, these gains in efficiency are achieved without compromising milk yield or quality, directly benefiting farm profitability and milking system performance.

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Funding: VistaMilk Research Ireland Centre; Dairymaster; Department of Agriculture, Food and the Marine

Impact pathway: Technology Development and Adoption

300,000
Automatic cluster
removal settings are
applicable to 300,000
cows across Ireland

Teagasc

Targeting contaminants in horticultural crop production

Kaye Burgess, Michael Gaffney, Martin Danaher, Elena Anedda

The HortAssure project addressed critical food safety challenges facing the horticulture sector by mitigating risks associated with microbiological and chemical contamination. It generated key evidence on contamination sources, particularly *Listeria monocytogenes*, while also addressing the lack of national data on chlorate levels in Irish horticultural produce. HortAssure conducted on-farm surveillance studies across commercial horticultural systems, producing crops with varying risk profiles.

A total of 750 samples from targeted surfaces, equipment in production and processing environments helped identify potential harbourage sites for *L. monocytogenes*, a pathogenic bacterium responsible for the disease listeriosis. Molecular analysis of isolates enabled the tracing of potential contamination pathways. Complementary lab-based studies assessed selected crops' ability to support the growth of *L. monocytogenes*, providing important regulatory insights. Over 650 horticultural commodities were analysed for chlorate levels, generating the first national dataset of its kind.

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These integrated approaches provided evidence-based insights into contamination risks across the sector. HortAssure has strengthened food safety assurance by enabling more targeted, evidence-based risk mitigation strategies, directly communicating findings to improve on-farm practices and regulatory decision-making.

The project reduced uncertainty around *L. monocytogenes* growth, supporting compliance with evolving regulations. In addition, the national chlorate dataset demonstrated consistently low levels, providing a critical evidence base for future policy development.

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Funding: Department of Agriculture, Food and the Marine

Impact pathways: Policy Information and Support; Capacity Building

Improving farmers' pension provision

Anne Kinsella

The sustainability of agriculture in Europe is deeply intertwined with the financial wellbeing of its farmers. In particular, low pension coverage and late retirement are limiting generational renewal.

This research compared EU pension systems to identify potential solutions to support Irish farmers in transitioning to retirement. Adopting a mixed-method approach combining desk-based research, interviews and surveys, it explored pension coverage among Irish farmers compared to five other European countries. The research also analysed different national approaches to farm retirement schemes, identified gaps in Ireland's current system and suggested practical policy recommendations.

These research findings were presented to the United Nations Food and Agriculture Organization, European Committee of the Regions, European Commission DG Agri, Irish Commission on Generational Renewal, and the CAP unit of the Department of Agriculture, Food and the Marine, and disseminated through *TResearch* and *RTÉ*.

The solutions identified by the research to redress gaps in farmer pension coverage included the payment

of Pay Related Social Insurance by successors/family members from when they begin working on-farm; the introduction of transitional provisions to ensure those currently not adequately covered by the system do not remain disadvantaged; and, as auto-enrolment does not extend to the self-employed farming community, consideration should be given to its extension to farmers in some form. This further exacerbates the requirement for a state pension system that is inclusive of all farmers.

As a direct consequence of this research project, these insights and other findings were listed in key recommendations of the government's *Generational Renewal Report* (2025). The research project itself was heavily cited (over 20 times) in the report.

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Funding: Department of Agriculture, Food and the Marine

Impact pathway: Policy Information and Support

Impact of Teagasc research publications

Emma Boughton, Teagasc Library and Information Services Officer

Teagasc uses two main approaches to identify the impact of its research: science excellence and societal impact. Science excellence focuses on peer-reviewed publications and their indicators of quality, while societal impact focuses on understanding the pathways through which such science is put into use and the changes it helps to bring about in society.

Peer-reviewed publications

Measuring the impact of research is a key activity for Teagasc. One method used is to track and monitor the number of articles in scientific journals authored by Teagasc researchers. Another strategy involves tracking how often these articles are cited by other journal articles. Teagasc uses Elsevier's abstract and citation database, Scopus, and its accompanying research analysis and strategic insights tool, SciVal, to benchmark its research performance.

Teagasc compares the performance of Teagasc articles (at least one Teagasc-affiliated author) annually to that of other relevant Research Performing Organisations for publications in a rolling six-year period. Publication and citation patterns vary considerably across subject areas. Therefore, comparisons within subject categories are the most meaningful when using publication counts or citation-based metrics. To place our performance in a national context, we can compare Teagasc's performance with that of Irish universities, within three relevant subject categories: (a) the broad category of Agricultural & Biological Sciences; (b) Food Science; and (c) Agronomy & Crop Science. Citation counts are merely a snapshot in time, as citations are accumulating constantly. The metrics shown are from SciVal as of 22 April 2026.

How Teagasc compares

Comparing Teagasc with the top eight ranked universities in Ireland, in the SciVal broad category of Agricultural & Biological Sciences, Teagasc published the second highest number of publications (414) in 2025 (Figure 1a). For the narrower category of Food Science (Figure 1b), Teagasc had the highest overall number of publications (231); and, for Agronomy & Crop Science (Figure 1c), Teagasc had the highest overall number of publications (73) in 2025.

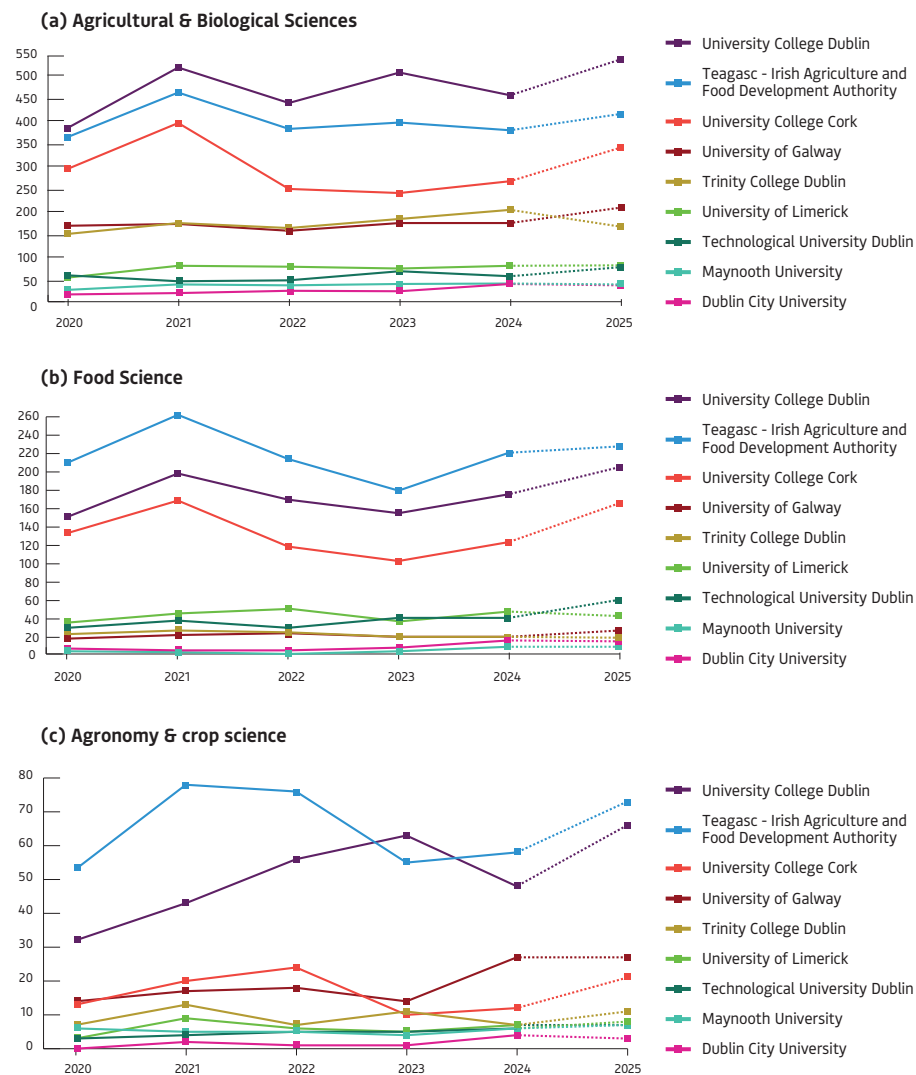


Figure 1: Number of papers by the top ten performing Research Performing Organisations in Ireland indexed in the SciVal in the category of (a) Agricultural & Biological Sciences; (b) Food Science; and (c) Agronomy & Crop Science.

The citation counts for the three 'All Science Journal Classification' subject areas for 2025 were: Agricultural & Biological Sciences (ranked second at 1,325 citations); Food Science (ranked second at 943 citations); and Agronomy & Crop Science (ranked second at 169 citations).

Geographic collaboration is crucial in scientific publishing because it combines diverse perspectives, specialised expertise and pooled resources to tackle complex, global challenges.

The strong international and national reputation of Teagasc research is demonstrated by the fact that for 2020 to 2025, 60.8% of the Teagasc peer-reviewed articles indexed by SciVal listed international collaborators, with 34.8% listing national collaborators. Of course, all bibliometric analysis must be placed in context, and the impact of our research must be evaluated in various other ways to give the full picture.

Impacts from technology transfer and knowledge exchange in 2025

Compiled by Siobhán Jordan, Head of Technology Transfer and Commercialisation, Teagasc



In 2025, Teagasc continued to strengthen its role as a national innovation partner, translating publicly funded research into tangible economic, environmental and societal impact. Through sustained and increasingly strategic engagement with industry, Teagasc supported the development and adoption of technologies, products and services that enhance competitiveness, sustainability and resilience across the agri-food sector.

Engage@Teagasc, the organisation's

Technology Transfer Office, played a vital role in supporting researchers and enabling collaboration and commercialisation. In 2025, 25 invention disclosures were captured, including a strong pipeline of digital technologies, alongside four new patent applications, reflecting the breadth of commercially relevant research emerging across Teagasc programmes.

Licensing remained the primary route to impact, with 40 licences, options and assignments executed, contributing to a

growing portfolio of 97 active agreements. Over €1.17 million in licensing income was generated in 2025, demonstrating both the scale and maturity of Teagasc's commercialisation activity and its contribution to national knowledge transfer performance. Initiatives such as the Teagasc START Fund and the FAST-IP collaboration with UCD continue to strengthen the pipeline of future commercial opportunities and training for entrepreneurs.

Industry engagement continued at scale, with €5.53 million in research expenditure linked to industry collaboration and 19 new collaborative research agreements signed in 2025, primarily through the second phase of the VistaMilk Research Ireland Research Centre. Teagasc's national research infrastructure and pilot-scale facilities further enabled companies to develop, validate, and scale innovations towards market.

Together, these activities highlight how Teagasc is building a robust innovation pipeline, supporting the translation of research into real-world solutions that benefit farmers, food producers, and the wider economy.

2025 activities and impacts provided by Engage@Teagasc facilitating the delivery of end-user ready solutions



119
new industry
engagement
agreements



€1.17M
licensing income



40
new licences,
options and
assignments
executed



25
invention
disclosures

4
patents filed



8
training events

286
researchers
trained



Potato fields in summer

The potato breeding programme at Oak Park has been in existence since 1962. Of the 60 varieties released since then, over 25 are still in commercial production today, and fourteen varieties have been released since 2002. The ability to identify traits of interest, such as disease resistance traits, at an early stage is key to the breeding process. By using markers associated with the genes governing these traits by testing small amounts of plant material, we can identify resistant material at an early stage in the breeding process.

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Project: Potato breeding