teagasc
Agriculture and Food Development Authority

TEAGASC

RESEARCH IMPACT HIGHLIGHTS IN 2022

Foreword

Teagasc's vision is to be a globally recognised leader in developing innovative, science-based solutions for the sustainable transformation of Ireland's land resources into products and services that benefit society. Each year, our research, advisory and educational activities contribute towards the achievement of our vision and make a real and tangible impact on farmers, policy and industry.

This publication contains 20 examples of our research impact from 2022. The examples highlight just a snapshot of the groundbreaking research and impact being delivered from our four research programmes: Animal and Grassland Research and Innovation; Crops, Environment and Land Use; Food; and Rural Economy and Development.

"Many of the highlighted 20 research impacts from the 2022 research programme will contribute significantly to increasing the sustainability of the Irish agri-food sector."

Teagasc launched its Climate Action Strategy in December 2022 with the objective to reduce greenhouse gas emissions from agriculture by 25% by 2030 and become climate neutral by 2050. Many of the research impacts examples from 2022 will be critical in achieving these greenhouse gas reduction targets. They include research impacts such as reducing the age at slaughter from suckler beef, including a carbon sub index in the EBI for dairy cows and increasing the use of white clover on grassland farms to reduce chemical N use. Many of the other research impacts will significantly increase the sustainability of the Irish agri-food sector.

Teagasc is extremely fortunate to have an outstanding core of scientists, supported by top-class technical, farm, advisory, specialist and administration staff whose work contributes to our collective research outputs. Additionally, I would like to acknowledge our collaborators in universities, institutes of technology and other external bodies – including the farming community and agri-food companies – who are directly involved in many of our research projects. I would also like to highlight our Walsh Scholars and post-doctoral fellows, whose contribution to our ongoing research activities is invaluable.

Our research is funded through a variety of sources, including core grant-in-aid allocated via the Department of Agriculture, Food and the Marine and competitive funding awarded nationally. Other important sources include competitive funding awarded from Science Foundation Ireland, Enterprise Ireland, the Environmental Protection Agency, the Irish Research Council, Horizon 2020 and Horizon Europe. Funding is also derived from farmer levy contributions and industry-funded research, as well as earnings from services offered and farming activities. Combined, these significant investments enable Teagasc to continue to support science-based advancements in the agri-food and bio-economy sectors that underpin profitability, competitiveness and sustainability.

Ensuring our research delivers real impact for our stakeholders is a key priority. To assess the impact of our research activities, we have developed a framework to guide the evaluation of our research. This framework provides a structure to describe how Teagasc's activities contribute to impact in the agri-food sector through three interconnected impact pathways: technology development and adoption; capacity development; and policy influencing. You will find the relevant impact pathways listed with each of our research impacts as you read through this publication.

Finally, I want to acknowledge the dedication of my colleagues in Teagasc who were involved with, or supported, the research activities contained within this publication. I also want to commend the role of our extensive research teams across the organisation, whose work has also made a substantial impact but was not included in our 2022 publication. Thanks to the combined effort of all Teagasc staff, I am confident that we can continue to safeguard our role as the leading organisation in the field of agricultural, environmental and agri-food research in Ireland.

Pat Dillon,
Director of Research,
Teagasc

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Teagasc framework for evaluating impact

This framework, included in Teagasc's Statement of Strategy, proposes three interlinked pathways through which Teagasc research impacts the agri-food sector.

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AGRIP

Reducing carbon footprint of beef

Donall Fahy and Padraig French

Reducing the age at which beef cattle are slaughtered in Ireland is a key strategy to reduce methane production from the national herd. Suckler-bred progeny are slaughtered on average at 26.6 and 27.4 months for heifers and steers, respectively, four to five months longer than achieved in research environments.

Established in collaboration with Teagasc and Dawn Meats in 2015, Newford farm operates in a commercial environment. A key focus is achieving a reduction in slaughter age on a pasture-based diet while maintaining carcass weight. 2021 spring-born heifers were slaughtered at 17.9 months and steers at 21 months. Newford's carbon footprint is 14% lower than the national average, reducing labour, winter forage and housing requirements, and reducing bought-in supplement onto the farm. Performance was driven by three key technologies: genetics, winter feeding management, and grassland management.

14%
lower carbon footprint than the national average

Newford farm is used extensively by the Teagasc advisory and education teams to communicate, in a demonstrable environment, key technologies underpinning suckler beef production. This will give confidence to farmers that reducing age at slaughter can also deliver increased profitability, and Newford has demonstrated the technologies to achieve higher profit and lower carbon emissions.

Contact: ***donall.fahy@teagasc.ie***
Funding: Teagasc, Dawn Meats, *Irish Farmers Journal* and McDonald's Ireland.
Impact Pathway: Capacity Building.

Andrew Downes

REDP

Raising awareness of farm data

Áine Regan and Claire Brown

Good data governance is essential to protect farmers and enable them to gain maximum benefits from data sharing. It's important for farmers to be aware of data shared from their farm, and to ensure they understand their rights with regards to data ownership and control.

AgriDISCRETE carried out multi-actor workshops to identify challenges and solutions for good data governance. 'Data awareness' was a recurring theme in the workshops: lack of understanding on use, ownership, and sharing of farm data was a concern in the farming community. In response, the project team worked with agricultural stakeholders to co-design farmer-friendly communications detailing the farm data journey.

An infographic leaflet and poster and animated video were produced, outlining the data journey on and off the farm, with the goal of raising data awareness to empower farmers to learn more about data collecting and sharing on their farm for maximum benefit. Communications resources have been distributed within farm advisory offices and at open days, and adapted for specific use in other data-sharing contexts. The work done has informed training programmes for SkillNet Ireland and was utilised during the launch of the Teagasc Climate Action Strategy.

Contact: ***aine.regan@teagasc.ie***
Other contributors: Walton Institute for Information and Communication Systems Science, SETU; RIKON Research Centre, SETU.
Funding: Department of Agriculture, Food and the Marine.
Impact Pathway: Technology Development & Adoption; Capacity Building; Policy Influencing.

CELUP

Improved monitoring of cereal pests

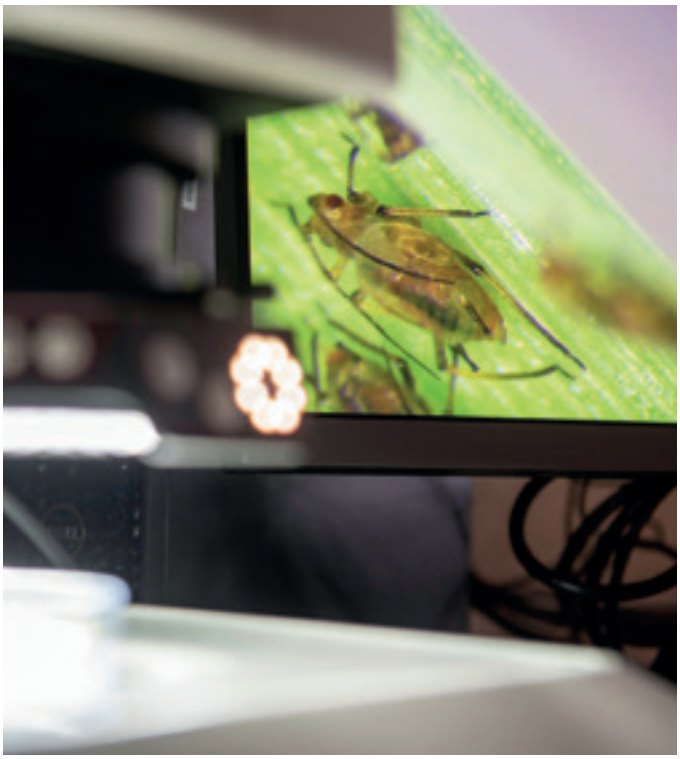
Virgile Ballandras, Louise McNamara and Stephen Byrne

Identifying and testing aphids is time-consuming, impeding rapid, high-throughput insect monitoring programmes. Crop pest monitoring involves painstaking processing of bulk samples and applying multiple molecular and antibody tests to determine aphid virus status. To build a national aphid monitoring programme capacity requires improved molecular tools for aphid surveillance.

Our genome sequencing survey of infected crops across Ireland generated knowledge of viral genomes, and we re-sequenced genomes of multiple grain aphid lineages to understand variability. These data were used to develop AphidMASH, a genotyping platform to determine aphid clonal lineage and the presence of yellow dwarf viruses, and identify mutations for insecticide resistance.

AphidMASH has enhanced the national aphid monitoring network by providing a high-throughput test, able to capture more information on each aphid without increasing testing costs. AphidMASH allows continuous monitoring of grain aphids for emerging mutations conferring resistance to insecticides. Given the potential negative impact of viruses on crop yields, emerging resistance to insecticides, and EU ambitions to halve pesticide usage by 2030, it's important to build national capacity to monitor aphids and the viruses they vector, underpinning Integrated Pest Management programmes for the Irish tillage sector.

Contact: ***stephen.byrne@teagasc.ie***
Other contributors: National University of Ireland Maynooth.
Funding: Teagasc Walsh Scholarship Programme.
Impact Pathway: Capacity Building; Technology Development & Adoption.



Andrew Downes

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AGRIP

Carbon breeding index for dairy cows

Laurence Shalloo, Johnathan Herron and Donagh Berry

The Economic Breeding Index (EBI) for dairy cow selection has been proven to reduce the carbon footprint per unit of milk produced. However, because of increased milk production associated with EBI selection, overall greenhouse gas emissions remains static. A sub-index within the EBI was needed that reflected overall emissions associated with individual animals, while also improving herd profit.

Research at Teagasc Moorepark led the development of a sub-index for the EBI and dairy-beef index (DBI) that's now being used to rank dairy and beef bulls and cows on expected overall carbon emissions, and which reflects emission values on different traits within the two breeding indexes. Because the carbon sub-index is a component of the two breeding indexes, the overall index framework ensures the parents of the next generation improve profit while concurrently reflecting associated emissions.

This sub-index launched in November 2022 and is being used to select bulls and females by dairy farmers in the 2023 breeding season. All dairy animals and beef bulls for use on dairy females have a value for their expected carbon emissions, converted to an economic carbon sub-index within the overall EBI and DBI.

Contact: ***laurence.shalloo@teagasc.ie***
Other contributors: Irish Cattle Breeding Federation, AbacusBio.
Funding: VistaMilk SFI Research Centre.
Impact Pathway: Technology Development & Adoption.

CELUP

Improving water quality

Per-Erik Mellander, Jason Galloway, Daniel Hawtree

Phosphorus is needed for food production, yet it affects water quality through both point-source and diffuse pollution, point-sources being easier to control. Finding ways to reduce diffuse pollution is more challenging, requires knowledge on how phosphorus moves to water, but lacks standardised evaluation.

The Agricultural Catchments Programme, established to monitor the effectiveness of EU Directive 'Good Agricultural Practice for Protection of Waters', has collected over ten years of data on phosphorus concentration and streamflow from six different catchments. This was used to introduce a method describing phosphorus mobilisation and delivery with one index number each. Estimating these numbers over several years provided insights to diffuse phosphorus pollution over time.

Environmental quality standards were often exceeded in three investigated catchments due to different risks of phosphorus loss; the new screening method is able to identify dominant risk types. Characterising risks in this way allows how changes to land management and climate will impact water quality to be assessed ahead of time. Such information is useful for supporting sustainable land management, and to guide policy development to mitigate water quality risk, allowing for investigations into how climate and land use changes affect phosphorus loss risks. This is needed to meet requirements under the Water Framework Directives.

Contact: ***per-erik.mellander@teagasc.ie***
Other contributors: Ulster University.
Funding: Department of Agriculture, Food and the Marine.
Impact Pathway: Technology Development & Adoption; Policy Influencing.

Teagasc

AGRIP

Clover150: reducing N on farm

Michael Egan, Michael O'Donovan and Caitlin Looney

White clover can be used on-farm to reduce reliance on chemical nitrogen (N) fertiliser to grow grass, benefiting farmers through reduced costs and the environment by reducing losses to waterways and reduced emissions. In 2021, a group of 30 farmers started a five-year clover incorporation programme on their farms, aiming to reduce chemical fertiliser levels while maintaining overall grass growth, leading to an overall reduction in N surplus (potential N loss to the environment). Researchers from Teagasc Moorepark provided information on white clover management and tailored management strategies for each farmer. Clover on farm was estimated three times each year (2021 and 2022) and the group met four times a year, with an additional 12 national farm walks carried out to disseminate results.

Between autumn 2021 and 2022, the area in clover increased from 44% to 61% on programme farms, resulting in a 23% reduction in chemical N fertiliser use and a 22% reduction in purchased N surplus, reducing environmental losses and costs to farmers. Clover150 farmers shared results through local discussion groups and farm walks. In the coming years, as the clover area increases on farm, there's greater potential to reduce the purchase and application of chemical N, while maintaining feed self-sufficiency through high grass growth levels.

Contact: ***michael.egan@teagasc.ie***
Funding: Teagasc; Dairy Research Ireland.
Impact Pathway: Technology Development & Adoption.

AGRIP

Reducing antibiotic usage in pigs

Peadar Lawlor and Elisa Arnaud

Litter size in sows has increased dramatically in the past decade. The challenge now is rearing the additional pigs using minimal medication. The first step should be ensuring adequate colostrum intake for each pig.

Providing pain relief to sows post-farrowing proved the best strategy for increased colostrum intake in piglets. Sows were more receptive to suckling, increasing colostrum intake per piglet, resulting in a 350g increase in weaning weight. Clinical cases of disease per litter were reduced by 65%, reducing the need for antibiotic and anti-inflammatory administration to piglets by 50% and 55%, respectively.

Results were communicated to farmers by newsletter articles and Teagasc Pig Enterprise Advisors. Farmers adopting the practice quickly benefitted from this low-cost intervention, prompting further uptake. By 2023, over 35% of Irish pig farms had adopted the practice. This is important as it increases productivity on Irish pig farms while reducing the need to medicate pigs: good news for combating the spread of antimicrobial resistance. Currently, implementation yields a €43 return per €1 spent, thereby, increasing revenue by €63,000 per annum on an average 600 sow unit.

Contact: ***peadar.lawlor@teagasc.ie***
Other contributors: SETU; UCD.
Funding: Department of Agriculture, Food and the Marine.
Impact Pathway: Technology Development & Adoption.

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FOOD

Securing Irish dairy's excellent reputation

Martin Danaher

EU legislation requires monitoring of chlorate residues in milk and dairy powders – arising from chlorine-based disinfectant use. Consequently, dairy ingredient manufacturers need a high-throughput sensitive test to ensure product quality adheres to infant formula specifications.

Following urgent requests, Teagasc developed a rapid, sensitive chlorates test at its ISO17025-accredited laboratories in Ashtown. Initially, the Ashtown laboratories were the sole Irish chlorate-testing service available for industry. However, increased demand presented an opportunity to transfer this technology to dairy testing laboratories. Teagasc supported the establishment of laboratories at three industry partners, resulting in eight new jobs and additional €1 million revenue to commercial laboratories. The reputation of Teagasc's test development and personnel expertise, supported through its Technology Transfer Office, was key to ensuring successful industry engagement, allowing companies to promptly establish dedicated laboratories and begin testing with confidence.

The increased availability of sensitive testing in Ireland can improve the response from local dairy processors and suppliers; prompt identification of chlorate-contaminated milk reduces costly waste and contamination of infant formula. This is key to maintaining Irish dairy's excellent reputation, while ensuring consumer safety – and Teagasc consultancy has been paramount in achieving this. Such significant impact was rewarded with the Industry Engagement Award at the 2022 Knowledge Transfer Ireland Impact Awards.

Contact: ***martin.danaher@teagasc.ie***
Other contributors: Engage@Teagasc; Industry partners: Independent Milk Laboratory, FBA Laboratories and Kerry Agribusiness.
Funding: Teagasc.
Impact Pathway: Technology Development & Adoption; Capacity Building.

CELUP

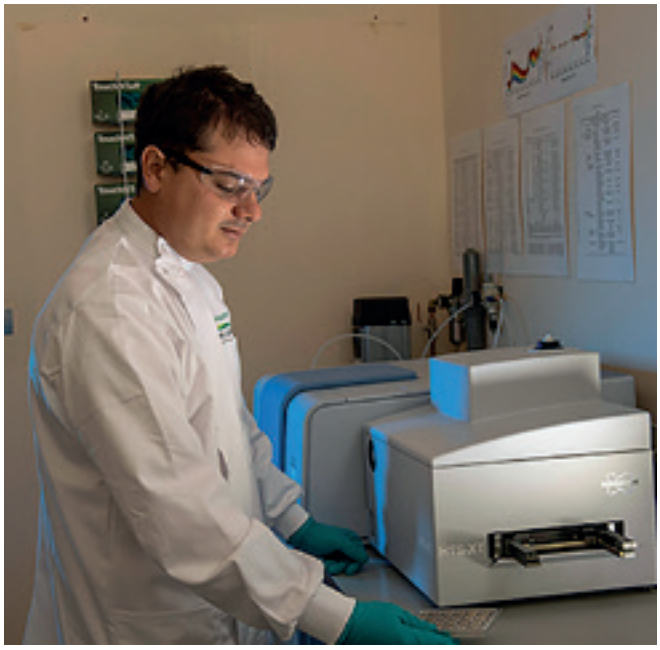
Green chemistry for soil analysis

Karen Daly, Felipe Bachion de Santana and Giulia Bondi

Soil health is a strategic Teagasc goal for sustainable food systems. Classical methods of soil monitoring involve resource-intensive chemical analysis. Transitioning to spectroscopy and machine learning models can save time and costs while reducing chemical waste. Researchers at Teagasc Johnstown Castle developed a systematic method for predicting multiple soil attributes without chemical analysis.

Soil samples were scanned using infrared spectroscopy to build a national spectral library, which was combined with laboratory reference data to develop a machine learning model that predicted a range of soil health attributes. Adopting this method saves greatly on time and cost when generating large datasets. The Signpost Programme at Teagasc collected soil samples from over 100 participating farms, and baseline soil health data were generated using spectral models.

Analysis using classical methods, performed by an external commercial lab and Teagasc soil labs, have an estimated total cost of €110,540. Using spectroscopy, costs were estimated at €3,420, including selecting 2% of samples for commercial analysis for validation. National monitoring for soil health could be expensive and spectral models have commercialisation potential. An Invention Disclosure is currently being drafted by Teagasc for potentially licensing spectral libraries and models.



Andrew Downes

Contact: ***karen.daly@teagasc.ie***
Funding: Geological Survey of Ireland and Teagasc.
Impact Pathway: Technology Development and Adoption; Capacity Building.

REDP

Interactive innovation to develop creative solutions

Áine Macken-Walsh

Interactive innovation is a process where different actors (scientists, farmers, advisors, industry, NGOs) work together to deliver new solutions and opportunities. Examples are EIP-AGRI, Horizon Europe & EU LIFE projects. Because interactive innovation is dynamic and varies substantially from context to context, standard KPIs are ineffective. A versatile evaluation and impact assessment toolbox is required to assess and enhance interactive innovation processes and impacts.

Andrew Downes

Social science knowledge – focusing on human collaborative relationships, equality and power distribution, transdisciplinarity, etc.— was employed to identify effective approaches for assessing the processes and impacts of interactive innovation. Teagasc led an EU consortia of social scientists to engage with end-users on the ground to trial these approaches in diverse projects across the EU. As a result of the trialling process (co-design), the Social Readiness Level (the likelihood of wide adoption) of the approaches was optimised.

A toolbox was produced to effectively evaluate and assess processes impacts of interactive innovation. It has been used to date in over 30 projects across the EU (within and outside of the original work programme), and has been translated from English into French, German, Spanish, Polish and Italian.

Contact: ***aine.mackenwalsh@teagasc.ie***
Other contributors: Forschungsinstitutfür Biologischen Landbau Stiftung; Universidad Politécnica de Madrid – Planning and Evaluation Group; Groupe de Bruges.
Funding: LIAISON, European Union's Horizon 2020 programme, grant agreement No. 773418.
Impact Pathway: Technology Development & Adoption; Capacity Building; Policy Influencing.

REDP

Examining impact of farm support reform

Fiona Thorne, Trevor Donnellan and Kevin Hanrahan

The EU's common agricultural policy (CAP) is about food, the environment and the countryside. CAP is a partnership between society and agriculture that ensures a stable food supply, safeguards farmers' income, protects the environment and keeps rural areas vibrant. Teagasc examined the economic implications at farm level of CAP reform implementation options for Pillar I of the CAP, which covers direct support and market supports, (whereas Pillar 2 covers rural development supports).

Teagasc prepared a report examining the impact on the distribution of Pillar I direct payment income supports, family farm income and agricultural output of a number of defined CAP reform implementation options, agreed with Department of Agriculture, Food and the Marine (DAFM) officials, using data from the Teagasc National Farm Survey.

The research concluded that there would not be a significant change in the number of economically viable farms viable as a result of the Pillar I CAP reform, outlined in the CAP Strategic Plan for Ireland. The results were used to inform policy negotiation by DAFM in the design of the CAP Strategic Plan, which will support the development of Ireland's agriculture sector for 2023-2027.

Substantial stakeholder involvement contributed to the project via data assumptions. DAFM provided administrative data used in defining the policy assumptions necessary for the analysis. Dissemination of the results of this research was supported by Teagasc Knowledge Transfer colleagues, the media and DAFM officials.

Contact: ***fiona.thorne@teagasc.ie***
Other contributors: Department of Agriculture, Food and the Marine.
Funding: Teagasc.
Impact Pathway: Policy Influencing.

Andrii Yalansky/ shutterstock.com

Fergal O'Gorman

AGRIP

A sustainable breeding strategy for dairy farms

Stephen Butler

Artificial insemination is widely used in dairy farms, but traditionally resulted in equal numbers of male and female dairy calves. The fate of male dairy calves is a welfare concern, presenting a reputational risk for the dairy sector. Sexed semen — the ability to bias the sex of dairy offspring to produce 90% female calves — is a revolutionary technology for dairy farming. Teagasc-led research has identified strategies to generate replacement heifer calves using sexed semen, facilitating increased beef semen use for non-replacement calves for a more sustainable calf population.

Sexing Technologies, the global leader in sexed semen production, established a lab at Teagasc Moorepark providing a sex-sorting service to the Irish cattle breeding industry, increasing sexed semen usage in dairy herds. In 2023, up to one-third of replacement dairy heifers could be generated using sexed semen.

This allows dairy farmers to accelerate genetic gain by breeding replacement heifers from their best dams, and generate beef-cross calves from the remaining dams, improving dairy sector sustainability. The beef sires used to generate beef-cross calves are primarily early maturing breeds, resulting in reduced lifetime methane emissions compared with male dairy calves.

Contact: ***stephen.butler@teagasc.ie***
Other contributors: ICBF, UCD, Sexing Technologies, NCBC, Munster Bovine, Progressive Genetics, Dovea Genetics.
Funding: Dairy Research Ireland, FBD Trust, Department of Agriculture, Food and the Marine, Munster Bovine, Glanbia, Meat Industry Ireland, Dairy Industry Ireland, and Ceva Santé Animale.
Impact Pathway: Technology Development & Adoption.

Teagasc

CELUP

ROADRUNNER – Farm roadway runoff assessment

Owen Fenton, Karen Daly and Patrick Tuohy

Waters, soils and sediments on farm internal roadways can become soiled by livestock excrement, leading to increased nutrient concentrations in farm roadway runoff, which can enter waterways, negatively impacting water quality.

The ROADRUNNER project quantified the scale of this problem, highlighting that nitrogen and phosphorus concentrations in soiled runoff waters are up to 10 times higher than expected. Phosphorus concentrations trapped in roadway sediments can remain stored in the ground for long periods, released into waterways during rainfall, causing year-round waterway pollution.

The project found that soiled waters have the highest risk of entering waterways from open ditches connected to farmyards. There are typically three to four such areas on any given farm, which lead directly to rivers. The project co-developed the Farm Roadway Visual Assessment Booklet with farmers and Teagasc's Agricultural Sustainability Support and Advisory Programme, used by farmers and advisors to pinpoint water connectivity areas on farms.

The project identified key intervention points including: 100-metre radius around the farmyard, underpasses and associated waiting areas, water troughs along roadways, junctions or anywhere that impedes cow flow. Low-cost diversion bars placed 25 metres apart were trialled to protect waters from runoff.

Contact: ***owen.fenton@teagasc.ie***
Other contributors: University of Limerick.
Funding: Department of Agriculture, Food and the Marine and Environmental Protection Agency co-funded.
Impact pathway: Technology Development and Adoption; Capacity Building; Policy Influencing.

AGRIP

Reducing antibiotic usage in dairy cows

Clare Clabby, Pablo Silva Boloña, Ainhoa Valldecabres and Pat Dillon

To reduce antimicrobial resistance risk, linked to antibiotic overuse, regulations require that intramammary antibiotics only be used on cows with noticeable intramammary infections. Cows not noticeably infected should be treated with internal teat sealant. Typically, cows with SCC (somatic cell count – an infection indicator) under 200,000 cells/mL are considered not infected, a guideline often used for assignment of dry cow therapy.

In exploring optimal SCC for infection detection, 2,074 cows were studied. Bacteriological results from late lactation milk samples were used to define cows as infected or uninfected. Sensitivity and specificity analysis were performed using test-day SCC to predict intramammary infection. The infection threshold was determined as 65,000 cells/mL for all cows using the last test-day SCC record 37-64 days before dry-off.

Results showed that cows below this SCC level can be treated with internal teat sealant alone at dry-off, reducing antibiotic use without losing opportunities to treat existing infections and maintaining udder health. Emphasis on hygiene is recommended at dry-off and during the dry period to ensure successful outcomes. Results have been presented to Animal Health Ireland and farmers at national conferences, and incorporated into Teagasc advisory services recommendations.

Contact: ***clare.clabby@teagasc.ie***
Other contributors: Kerry Agribusiness and University of Limerick.
Funding: Dairy Research Ireland.
Impact Pathway: Technology Development & Adoption.

Teagasc

AGRIP

Maximising native cereal and protein feeds

Mark McGee, Edward O'Riordan and Aidan Moloney

To reduce dependency on imports and international supply chains, as well as providing environmentally-sustainable growth opportunities for the Irish tillage sector, there is increasing interest in exploiting locally produced cereal and legume crops as feedstuffs for cattle.

Cattle finishing experiments at Grange compared the intake, growth and carcass traits of steers offered grass silage supplemented with contrasting cereal grain-based rations containing supplements of flaked beans, flaked peas or maize by-products. The concentrate rations were formulated to contain similar crude protein concentrations.

Results showed that the nutritive value of rolled barley was similar to rolled oats and maize meal, and flaked beans and peas were similar to maize dried distiller's grains, and dried corn gluten feed when included in the supplementary concentrate to beef cattle offered grass silage.

This implies that, under comparable feeding conditions, native cereal and protein crops can be readily used as alternative feed ingredients. Market end-users are now provided with critical information on which to formulate beef rations based on inclusion of native-produced protein and energy sources.

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Contact: ***mark.mcgee@teagasc.ie***
Other contributors: University College Dublin.
Funding: Teagasc.
Impact Pathway: Technology Development & Adoption.

CELUP

Tree improvement programme for native birch

Oliver Sheridan

Teagasc developed a breeding programme to improve growth quality of native birch species – downy and silver – helping to meet demand for good quality planting material and promoting diversity in Irish forestry. The programme selected and propagated visually healthy trees, and established indoor seed orchards in Teagasc with the propagated plants, with field trials assessing growth quality and evaluating seed orchard trees as parents.

Research has shown a 30% increase in adoption of genetically improved downy birch as a species for plantation under the afforestation scheme in Ireland. Downy birch is now recognised for commercial forestry production. The programme has brought improved planting material to farmers and landowners in Ireland through a partnership between Teagasc and None-So-Hardy (NSH) Nurseries, ensuring a sustainable supply of improved birch.

As a result of Teagasc research, birch was added to the recommended species list by the Forest Service and is now grant-aided. The development of birch as a commercial species supports government policy to increase diversity and biodiversity in Irish forestry. More recently, a silver birch indoor seed orchard was established at Teagasc Oak Park to follow a similar commercialisation route as downy birch.

Contact: ***oliver.sheridan@teagasc.ie***
Other contributors: Department of Agriculture, Food and the Marine, University College Dublin, University College Cork, None-So-Hardy (Forestry) Ltd.
Funding: Initial funding from Council for Forest Research and Development. Current funding from Teagasc.
Impact Pathway: Technology Development & Adoption, Capacity Building.

Teagasc

FOOD

Recovering proteins from plant processing

Carlos Álvarez, Dilip Rai, Brijesh Tiwari and Shay Hannon

Plant-derived food processing generates enormous amounts of co-products. Most of these are rich sources of essential nutrients, such as proteins. Recovering such high-value proteins in a format usable by the food industry is desirable from an economic, environmental and sustainability perspective.

Teagasc's patent to recover proteins from animal co-products caught the attention of Immcell Ltd., an Irish company seeking protein extraction technology. Funding from Enterprise Ireland enabled adaptation of the process for canola oil processing using leftovers from local suppliers, which was successfully scaled up and fully characterised. The technology was licensed to Immcell Ltd. in December 2022, after filing a new patent (WO2023017033).

This protein extraction technology optimised for canola material is adaptable to many other plant materials. It has short-term relevance at the national level by better utilising unused plant materials to create high-value food ingredients and supplements. Long-term, it could enable international market expansion and adoption in the food industry. Our technology makes crop processing more environmentally friendly and economically beneficial, positively impacting the food industry overall.

The inventors have highlighted the benefits of this novel process in several events to food companies, producers and processors.

rezkrr/istock.com

Contact: ***carlos.alvarez@teagasc.ie***
Other contributors: Enterprise Ireland, Immcell Ltd., Engage@Teagasc.
Funding: Enterprise Ireland.
Impact Pathway: Technology Development and Adoption; Capacity Building.

FOOD

Scalable process development of plant drinks

Shivani Pathania

The plant drink market has grown exponentially in recent years; products include cereal-based, pseudocereal-based, legume-based, seed-based and nut-based drinks.

Creating a successful plant-based drink brand can be challenging. A key challenge is finding the right combination of raw materials, additives, and manufacturing processes to create a beverage that tastes good and meets the functional requirements of consumers. Teagasc was approached by an Irish company to develop a scalable formulation and process to develop a drink from an Irish-grown crop.

Andrew Downes

The first phase of the project developed the product at lab-scale in the National Prepared Consumer Food Centre. The second phase included scalability and reproducibility studies of the formulation at pilot scale at Moorepark Technology Ltd. The formulation and process was transferred to a contract manufacturer and adapted accordingly.

The launch of this company saw the creation of four jobs in the local economy, providing employment opportunities and driving economic growth. Launching the plant drink formats in Ireland in Q2 2023 has the potential to meet consumer demand. Teagasc's expertise in developing a scalable formulation and process and adapting it to existing manufacturing infrastructure ensures efficient production of high-quality consumer products.

Contact: ***shivani.pathania@teagasc.ie***
Funding: Industry Contract research project, Enterprise Ireland co-fund Innovation Voucher.
Impact Pathway: Technology Development & Adoption.

REDP

Identifying solutions to sustainability in the European beef sector

Maeve Henchion, Richard Lynch

With a significant proportion of Irish and European farmers dependent on direct supports for viability, and concerns around greenhouse gases and animal welfare, the beef sector faces sustainability challenges, responses to which could improve through collective knowledge exchange.

The BovINE project drew on farmers and researchers across Europe, identifying near- or practice-ready solutions for increased farming system sustainability, collating this onto a shared learning platform, with content freely available to industry.

The BovINE platform helps actors within Europe's beef sector support demand-driven innovation. Its implementation has captured solutions covering 340 topics across four themes – Socioeconomic Resilience, Animal Health & Welfare, Production Efficiency & Meat Quality, and Environmental Sustainability. Results were communicated to the 1,724 external contacts registered to the BovINE network - and through events and media - and are being used by farmers, farm advisors and educators across Europe and further afield to inspire and support innovation implementation.

The potential contribution of these solutions to the EU's Green Deal and Farm to Fork objectives has been shared with policy-makers. A key message is that farmers are innovators in their own right, already addressing sustainability challenges.

Contact: ***maeve.henchion@teagasc.ie***
Other contributors: Irish Farmers' Association and all BovINE project partners.
Funding: Horizon Europe.
Impact Pathway: Technology Development & Adoption; Capacity Building; Policy Influencing.

Teagasc

REDP

New insights to climate change decision-making

Stuart Green, Reamonn Fealy, Gary Lanigan, Cathal Buckley, Jesko Zimmermann, Mohana Logakrishnan, Jennifer Floody and Kevin Carolan, and Hugh Fitzpatrick

George Burba/shutterstock.com

Led by National University of Ireland Maynooth, the Terrain-AI project is a direct response to the challenge of understanding the impact of human activity on land use and climate change. The project answers questions about what happens when land management changes – does the land emit greenhouse gases or absorb them?

The project has research sites across the country covering different soil types, land uses and habitats. Over 40 scientists are working on the project, including geographers, ecologists and computer scientists, collaborating using a new cloud-based portal that holds all data generated by the sensors, drones, aircraft and satellites that continually monitor the research sites. The scientists can then use models and machine learning methods to understand change and activity regarding emissions and land use.

The project has real-time and continual data collected from each site, creating an ongoing record. It has developed new solutions in land use understanding, such as detecting urban driveways and automatically mapping field boundaries correctly. The biggest impact is creating an evidence base for improving greenhouse gas emissions budgets from Irish land use , ensuring that targets and baselines reflect more closely the reality on the ground.

Contact: ***stuart.green@teagasc.ie*** and ***reamonn.fealy@teagasc.ie***
Other contributors: National University of Ireland Maynooth.
Funding: Science Foundation Ireland and Microsoft.
Impact Pathway: Capacity Building.

Impact of Teagasc research publications

Compiled by Máire Caffrey

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. Throughout this publication, we have identified the impact pathways for each of the featured research impacts.

Peer-reviewed publications

Measuring the impact of our research is a key activity for Teagasc. One method we use is to track and monitor the number of articles in scientific journals authored by Teagasc researchers. Another strategy involves tracking how many times these articles are cited by other journal articles.

There are a number of resources available providing these citation counts and other metrics. Teagasc uses Scopus, and its accompanying research evaluation tool SciVal[1]. Teagasc annually compares the performance of Teagasc articles (at least one author affiliated to Teagasc) 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, when using publication counts or citation-based metrics, comparisons within subject categories are the most meaningful. 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, and two narrower categories (b) Food Science, and (c) Agronomy & Crop Science. Citation counts are merely a snapshot in time, as citations are constantly accumulating. The metrics shown are from SciVal as per April 2023.

Comparing Teagasc with the Irish universities for 2017 to 2022, in the SciVal broad category of Agricultural & Biological Sciences, Teagasc published the second highest number of articles, and had the second highest overall citation count (Figure 1). For the narrower category Food Science (Figure 2), Teagasc had the highest overall number of articles and second highest number of citations; for Agronomy & Crop Science (Figure 3), Teagasc had the highest overall number of articles and citations.

The strong international and national reputation of Teagasc research is demonstrated by the fact that for 2017 to 2022, 55% of the Teagasc peer-reviewed articles indexed by SciVal listed international collaborators, with a further 39% listing national collaborators.

Of course, all bibliometric analysis must be placed in context and the impact of our research must be evaluated in a variety of other ways in order to give the full picture.

[1] Scopus is an online subscription-based indexing service, which enables exploration of the scientific literature, as well as counting citations to each indexed article. SciVal is a research evaluation tool that allows an organisation to analyse institutional productivity and benchmark outputs.

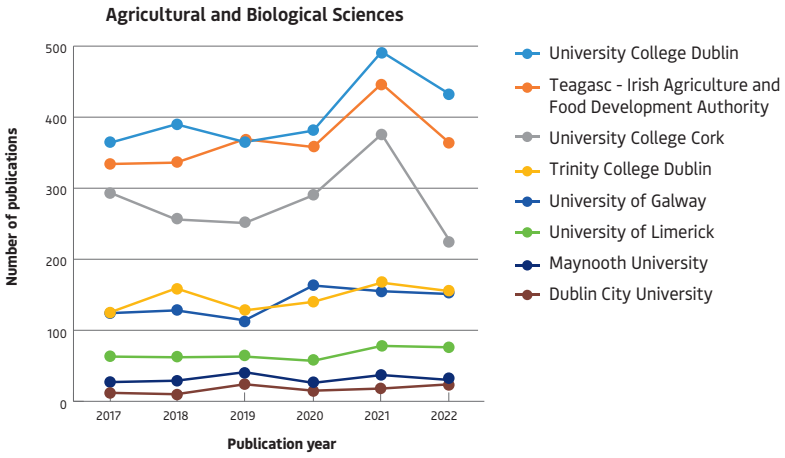

Figure 1: Number of papers by Teagasc and Irish universities that are indexed in Scopus category Agricultural & Biological Sciences (2017-2022).

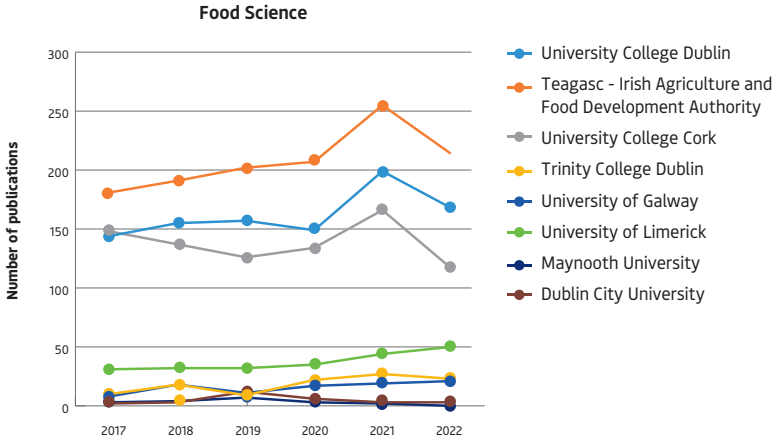

Figure 2: Number of papers by Teagasc and Irish universities that are indexed in Scopus category Food Science (2017-2022).

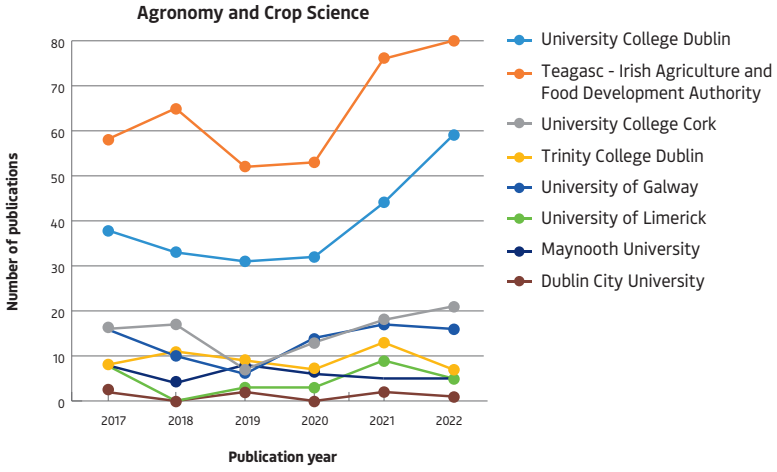

Figure 3: Number of papers by Teagasc and Irish universities that are indexed in Scopus category Agronomy & Crop Science (2017-2022).

Impacts from technology development and adoption by industry of Teagasc research outputs

Compiled by Karen Dawson, Siobhán Jordan and Miriam Walsh

Teagasc research contributes to impact in the agri-food sector in a range of ways from influencing policy to delivering societal and economic impacts. With the need to show return from investing public money in scientific research, there is significant emphasis when applying for funding on considering the potential impact from research outputs as well as the need to promote successful impact stories to a range of audiences.

Innovation and transformation of the agri-food sector

Technology development and adoption builds the capacity of the agri-food sector to innovate and transform. Technology Transfer Offices, such as Engage@Teagasc, are key functions in the research management/professional services of universities and research performing organisations, which support researchers in driving economic impact, through facilitating transfer of research, technologies and knowledge to industry. Engage@Teagasc contributes directly to the long-term impact of Teagasc research by providing a focal point through which industry partners can engage with Teagasc research and technologies. These engagements are in line with the *Teagasc Together* strategy delivering on our commitments in digitalisation and sustainability for the Irish Agri-Food sector.

By enabling its researchers to collaborate with industry and enabling industry to gain competitive advantage through licensing intellectual property (IP) resulting from Teagasc research, we facilitate the delivery of end-user ready solutions needed to provide societal and economic impacts both now and into the future.

Many of the case studies in this publication demonstrate innovation and transformation of the agri-food sector in action. By careful management of IP, collaborative research and/or licensing of IP to industry for commercial exploitation demonstrable impacts for society can be achieved, including job creation, new products/processes launched to market and cost efficiencies for the end users.

2022 activities and impacts delivered by Engage@Teagasc

- **108** Agreements negotiated
- **23** Invention disclosures

- **€833k** Licensing income
- **14** Licenses, options & assignments

- **6** Patents filed
- **2** Patents granted

- **6** Entrepreneurship events delivered
- **36** Researchers trained

Under the shoulders of giants

The majority of forests in Ireland are even-aged plantations managed under the clearfell silvicultural system. Continuous Cover Forestry systems continuously maintain forest cover by nurturing the development of a new canopy under the older canopy prior to being harvested.

The four-year ContinuFor project is a development of research that has been ongoing since 2010. The continuous maintenance, nurturing and researching of the experiment sites is imperative for the success of such long-term silviculture research.

Photo and description by: Ian Short
Project: ContinuFor: Transformation to Continuous Cover Forestry – Synergies and Tradeoffs
Funded by: Department of Agriculture, Food and the Marine (2021R489)