

# TEAGASC

## RESEARCH IMPACT HIGHLIGHTS 2016



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Catriona Boyle and Ann Tiernan

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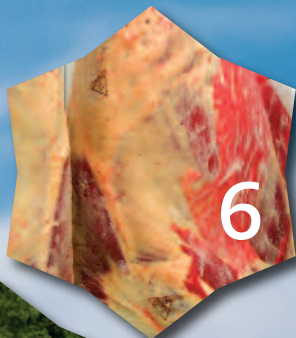
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Teagasc researchers are very productive by any accepted measure of research activity. The number of publications per researcher, the amount of competitive research funding won, and the success rate in these funding cycles are some of the important metrics on which to benchmark research activity. The citation rate of publications and the impact factor of the journals where publications appear are measures of the quality of the science published. On all these metrics Teagasc performs very strongly, as evidenced by information on bibliometric performance summarised on page 14 of this publication. However, it is vital for Teagasc to go further and to achieve impact from its research because our mission is to support science-based innovation. This publication highlights the impacts achieved in 2016 from research conducted in Teagasc. Highlighting the impact of our research is necessary to demonstrate to the taxpayer and stakeholders, who fund our research, that it is a good investment. The examples outlined here are not an exhaustive account of the impact of Teagasc's work, which is achieved through a combination of our research, advisory and education activities, and I would like to acknowledge the huge contribution of Teagasc specialists and advisors. I would also like to acknowledge the many collaborators we have in universities, institutes of technology and other external bodies, as well as the farming community and agri-food companies, which were involved in many of the research projects leading to these impacts. We greatly value those contributions, which are highlighted in the individual reports.

Excellent science requires excellent scientists. Teagasc is fortunate to

have an outstanding core of scientists, supported by top-class technical, farm and administration staff. This needs to be maintained into the future, and the research system needs to continually attract highly talented people if the pipeline of research breakthroughs is to be maintained. Research requires investment, and Teagasc is fortunate that it has been successful in recent years in supplementing its grant-in-aid with funding from other sources to allow more research to be carried out. The Department of Agriculture, Food and the Marine is the major funder of Teagasc research through provision of grant-in-aid and through its competitive funding programmes: Food Institutionalised Research Measure (FIRM), the Research Stimulus Fund and the Council for Forest Research and Development (CoFoRD). Other funding comes from EU research and innovation programmes, Science Foundation Ireland, Enterprise Ireland, the Environmental Protection Agency, farmers and agri-food companies. This funding enabled the impacts reported here and it is gratefully acknowledged.



**Frank O'Mara**  
Director of Research, Teagasc



## Water footprint of Irish dairy, beef and sheep farms

John Upton, Eleanor Murphy, Donal O'Brien, Anne Geoghegan, Kevin McNamara, Laurence Shalloo

**Industry impact:** This project demonstrated that intensification of Irish animal production systems through high utilisation of rainwater resources for the production of milk, beef and sheep meat are sustainable from a water-use perspective. The production of milk consumed on average 690 litres of water per kg of fat-and-protein corrected milk.

The average volumetric water footprint for beef was 8,391 litres of water per kg of carcass weight, while the production of sheep meat consumed on average 7,672 litres of water per kg of carcass weight.

Rainwater for the production of grass made up 85% of the total water footprint in dairy systems, 88% in beef systems, and 87% in sheep production systems. This is a key competitive advantage for Irish agriculture in terms of sustainable food production, since the majority of these products are exported to less water-rich regions.

**Contribution of non-research stakeholders:** Over 70 commercial farms participated in this work. Their commitment to supply data for two years on a regular basis was fundamental to the success of the project.

**Funding:** Department of Agriculture, Food and the Marine Research Stimulus Fund (grant number RSF11s103) with support from the Carbery Group.

## Artisan cheeses

Eddie O'Neill



**Industry impact:** Two artisan cheeses developed at Teagasc Food Research Centre, Moorepark under Enterprise Ireland's Innovation Voucher scheme by expert cheese maker Eddie O'Neill have won awards at the British Artisan Cheese Awards in 2017. Bo Rua, winner of a gold medal, is a Teagasc cheese variant that was developed at Moorepark Technology Limited (MTL) pilot plant for the Dineen family in Conna, Co. Cork. A blue goats' cheese developed for the Finnegan family of Boyne Valley Cheese in Slane also won gold and, in addition, won the best overall blue cheese at the same awards. Both cheeses are currently on sale on the Irish market.

**Funding:** The work was undertaken with the assistance of Enterprise Ireland Innovation Vouchers.

## Profiling milk from grass

Tom F. O'Callaghan, Deirdre Hennessy, Stephen McAuliffe, Kieran N. Kilcawley, Michael O'Donovan, Pat Dillon, R. Paul Ross, Catherine Stanton

**Industry impact:** There is a consumer perception that milk from cows on pasture is better than milk derived from cows housed indoors full time consuming a total mixed-ration diet. Ireland's somewhat unique pasture-based cow feeding system has become a major marketing tool for Irish dairy manufacturers on international markets. However, to date there is limited scientific data available to affirm the benefits of the Irish pasture feeding system. Data from the profiling milk from grass project provides evidence for the beneficial effects pasture feeding has on the nutritional, sensory and rheological quality of milk and dairy products such as butter and Cheddar cheese.

## The competitiveness of Irish agriculture

Fiona Thorne, Trevor Donnellan, Kevin Hanrahan, Anne Kinsella, Patrick Gillespie

**Industry impact:** Irish agriculture, and the dairy sector in particular, has entered a phase of considerable change. Traditional EU policy supports are less prevalent and the most significant policy in the dairy sector, the milk quota, was removed in 2015. The analysis of the competitiveness of Irish agriculture undertaken has reaffirmed the competitive advantage associated with the Irish dairy farm system. Irish dairy farms continue to exhibit relatively low cash costs of production, when compared to key EU and international competitors. The research shows that due to increases in scale post quota, total economic costs on dairy farms have reduced in an international context.

### Contribution from non-research stakeholders:

Data from the International Farm Comparison Network (IFCN) dairy, and agribenchmark Beef and Sheep Networks were used for international cost comparisons in this research. The data collection exercise for these networks for Ireland is based on a typical farm approach, which requires collaboration with dairy, beef and sheep Knowledge Transfer specialists, in addition to various industry collaborators to validate farm data.

**Other contributors and collaborators:** Doris Laepple, University College Dublin, and colleagues from: Lincoln University, NZ; Massey University, NZ; DairyNZ; and, the Agriculture and Horticulture Development Board (AHDB), UK.

**Funding:** Department of Agriculture, Food and the Marine Research Stimulus Fund.

**Other contributors and collaborators:** APC Microbiome Institute, University College Cork.

**Funding:** Teagasc, Science Foundation Ireland, Dairy Research Trust.



## Providing the data to support a major change in European food legislation

Declan J. Bolton, Rachel Reid



## DNA-enhanced national beef genetic evaluations

Donagh Berry

**Industry impact:** The largest livestock genomics programme globally was initiated with the goal of exploiting state-of-the-art DNA technologies to increase the accuracy of differentiating between genetically-elite and genetically-inferior beef cattle. The approach used individual animal information on >50,000 pieces of DNA to better quantify the true relationships between individuals, as well as to trace signatures of DNA sequence that confer competitive advantage in >15 traits. The DNA-based predictions are now routinely undertaken on >1 million animals. Additional benefits of the technology include parentage validation and discovery, as well as screening for DNA variant, conferring major effects including four lethal mutations. The overall outcome is a more efficient and effective national breeding programme for profitable beef cattle in Ireland, achieved while concurrently reducing the environmental footprint per unit of output.

**Other contributors and collaborators:** Irish Cattle Breeding Federation.

**Funding:** Department of Agriculture, Food and the Marine Research Stimulus Fund 11/S/112 (MultiGS).

**Industry impact:** Teagasc was the main provider of data on the microbiology of beef carcasses and primals during chilled storage, which was used by the European Food Safety Authority (EFSA) when providing advice to the European Commission on revising EC 853/2004. It is currently proposed, in draft legislation, to offer the European beef industry flexibility in the time-temperature carcass chilling regimes that may be applied, which, in addition to significant cost reduction, should facilitate shelf-life extension, allowing for the possibility of export to geographically distant markets such as the USA or China.

**Other contributors and collaborators:** Séamus Fanning, University College Dublin.

**Funding:** Food Institutional Research Measure (FIRM), project 11F033, administered by the Department of Agriculture, Food and the Marine (Ireland) and by Teagasc core funding.

## Developing better grass cultivars faster using DNA-based selection

Stephen Byrne, Dan Milbourne, Patrick Conaghan

**Industry impact:** Teagasc has been breeding perennial ryegrass for over 50 years at Teagasc Crops, Environment and Land Use Research Centre, Oak Park, Carlow. Breeding new cultivars takes many years but new technologies are offering opportunities to speed up the process. As of 2016, DNA-based strategies are being employed by Teagasc to select plants for advancement in its grass-breeding programme at Oak Park. The outcome is that many more cycles of selection can be completed in a much shorter time frame, meaning accelerated gains for important traits such as forage yield. Using this technology, Teagasc is now fast-tracking delivery of the next generation of grass cultivars to support Irish farmers.

## Modelling the impact of Brexit on Irish agriculture

Trevor Donnellan, Kevin Hanrahan, Fiona Thorne

**Industry impact:** Brexit could profoundly change the trade relationship between Ireland and the UK, and affect the level of support provided by the Common Agricultural Policy (CAP). The UK continues to be the main market for Irish agricultural and food exports. Teagasc research has quantified the possible impact of Brexit on Irish agriculture, Irish agri-food exports and on Irish family farm incomes. Analysis highlighted the vulnerability of the sector both from higher trade barriers and the negative impact of Brexit on the EU (and CAP) budget. The beef sector in Ireland is the most vulnerable agri-food sector due to current dependence on the UK market and reductions in direct payments that could arise as a result of Brexit. This research has informed Government and industry understanding of the Brexit process and the threat it poses to the Irish agri-food sector and wider economy.

### Contribution from non-research stakeholders:

Knowledge Transfer colleagues have facilitated the dissemination of the results of this research via the Teagasc ConnectED programme. With the support of the Department of Agriculture, Food and the Marine (DAFM), a large public event for industry stakeholders was held in DAFM Backweston in April 2016 involving contributions from DAFM, Ibec and researchers from the Economic and Social Research Institute.

### Other contributors and collaborators:

Economic and Social Research Institute and FAPRI-Missouri.

**Funding:** Teagasc grant-in-aid.

**Contribution from non-research stakeholders:** All new varieties emerging from Teagasc's breeding programme are commercialised and marketed under licence by our commercial partners (Goldcrop Ltd) in return for financial support.

**Funding:** Teagasc grant-in-aid and Department of Agriculture, Food and the Marine Research Stimulus Fund project 11/S/109. Stephen Byrne is supported by the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement number 658031.



## PastureBase Ireland

Mícheál O’Leary, Michael O’Donovan

**Industry impact:** PastureBase Ireland (PBI) has been available to Teagasc clients since early 2013. At that time, there were 160 farmers using the system. Today, over 3,500 farmers are using the programme nationally. In 2016, over 300 farmers completed in excess of 30 farm walks, an increase from 160 farmers the previous year. Dairy farms recording farm cover regularly on PBI have grown between 12 and 14t DM/ha/year over the past four years, while drystock farms have grown between 10.5 and 12.3t DM/ha/year. Each farmer is linked to their Teagasc advisor and discussion group within the application, where they can benchmark their results. This structure incentivises farmers to record farm cover, and gives the Teagasc advisor a good understanding of current grass supply and demand on farms. Data from PBI highlighted that spring grass production varied hugely between farms. One factor identified was autumn management. As a consequence, on-farm spring and autumn events were held throughout the country. The number of rotations is a key driver of grass production and, as a consequence, the Grass10 campaign has been developed.

**Contribution from non-research stakeholders:**

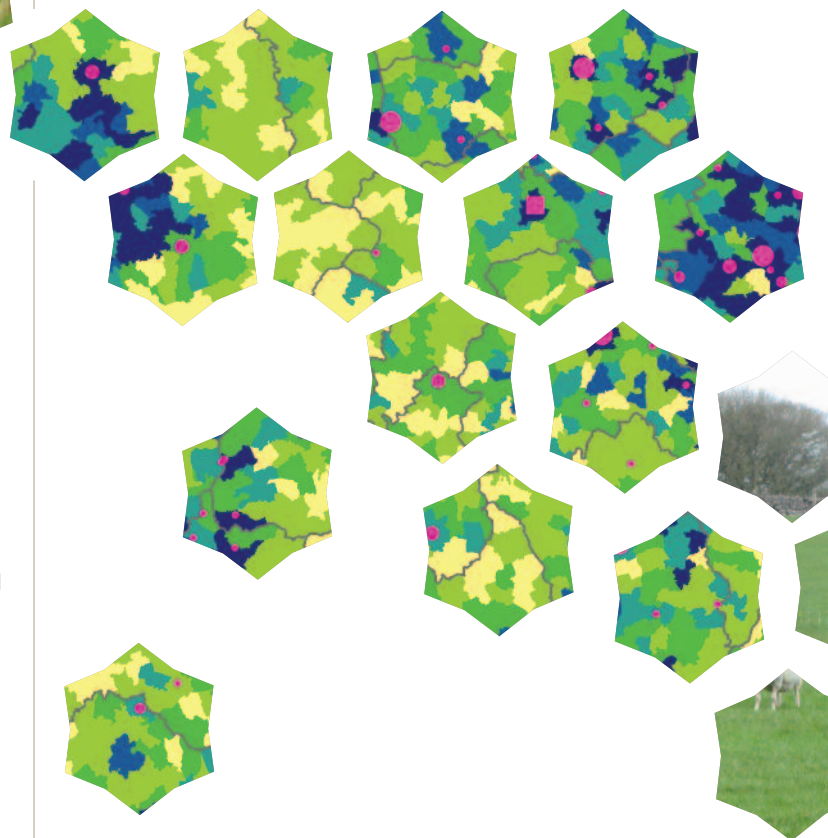
In conjunction with the grassland researchers in Moorepark and Teagasc Knowledge Transfer (KT) advisors, spring and autumn on-farm events were organised across dairy, beef and sheep farms nationally to raise awareness and implement best grassland management during these periods.

**Funding:** FBD Trust.

## Informing the Action Plan for Rural Development

David Meredith

**Industry impact:** Preliminary results from the 2016 Census of Population were published in July 2016 enabling research into changes in the size and distribution of the rural population to be undertaken. Analysis of these data facilitated the identification of different types of rural area. A profile of socio-economic changes affecting these areas highlighted the long-run nature of the processes shaping their development.



The results of this research informed the development of the Action Plan for Rural Development (APRD), which was prepared in 2016 and launched in January 2017. The Action Plan follows on from the Report of the Commission for the Economic Development of Rural Areas (CEDRA). It seeks to co-ordinate State activities that impact on rural communities with a view to facilitating socio-economic development in rural areas. The research undertaken provided a nuanced assessment of changes to the population in different types of rural area ranging from very low-density rural areas to peri-urban rural areas. A summary of the research formed the basis of the contextual analysis presented in the APRD.

**Contribution from non-research stakeholders:**

Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.

**Funding:** Teagasc grant-in-aid.



## Breeding a healthier national sheep flock

Nóirín McHugh, Áine O'Brien, Alan Bohan, Donagh Berry

**Industry impact:** Compromised health in sheep not only reduces productivity while increasing costs and labour requirements, but is also a growing welfare concern for sheep production internationally. To date, however, most sheep breeding goals internationally do not include health traits. Teagasc, in conjunction with Sheep Ireland, collated health data on over 20,000 animals across a plethora of health traits including lameness, mastitis and dag score. Genetic analysis of the data showed that ample genetic variation existed across all the health traits investigated. This, coupled with the calculation of the economic value of each health trait using the Teagasc Lamb Production bio-economic model, allows for the incorporation of health traits into the national sheep breeding goals, thereby providing Irish sheep producers with a selection tool to select healthier and more robust animals.

**Other contributors and collaborators:** Sheep Ireland.

**Funding:** Department of Agriculture, Food and the Marine Research Stimulus Funding.

## Monitoring pyrethroid resistance in tillage aphids

Michael Gaffney, Lael Walsh, Louise McNamara, Gordon Purvis

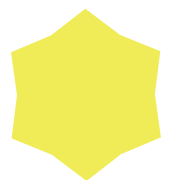
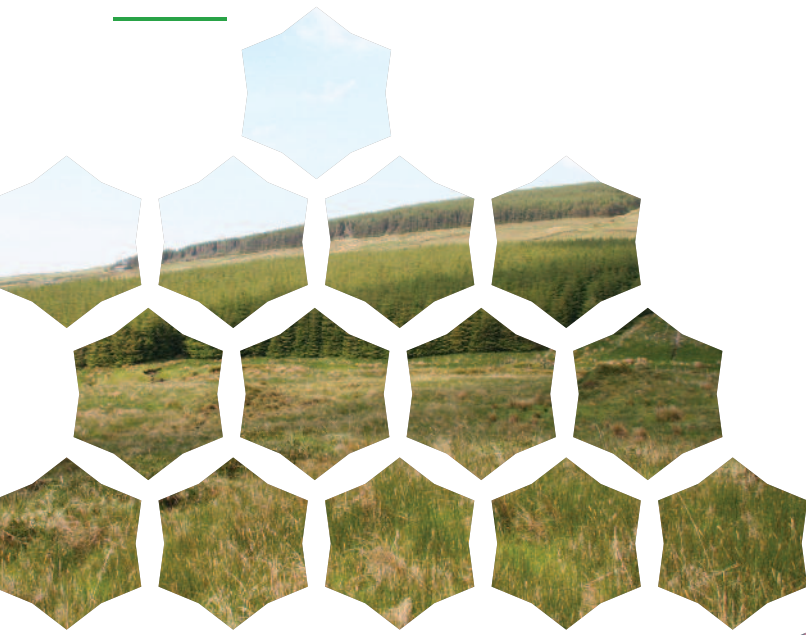
**Industry impact:** The grain aphid (*Sitobion avenae*) is the primary vector of barley yellow dwarf virus (BYDV) in Irish cereal crops. BYDV is a non-persistent virus, and infection early in crop development (before GS31) can result in plant stunting and yield loss (1-30%). BYDV is spread throughout the crop by aphids feeding. Pyrethroid class insecticides have been the primary method of controlling aphids in tillage crops, which in turn limits the spread of BYDV within a crop. In 2013, Teagasc research first detected the occurrence of partially resistant aphids, or aphids containing the 'knock down resistance' gene, and in 2015 and 2016, research identified the widespread presence of partially-resistant aphids in all major cereal-growing counties. A reduction in efficacy of pyrethroid insecticides will severely impact Irish cereal growers' ability to control BYDV in crops and this research has led to a significant increase in the use of seed dressing and a refocusing on important cultural controls such as sowing date.

**Contribution from non-research stakeholders:**

The assistance of Teagasc specialists and advisors, as well as independent advisors and farmers, has been critical to accomplishing this research and is appreciated.

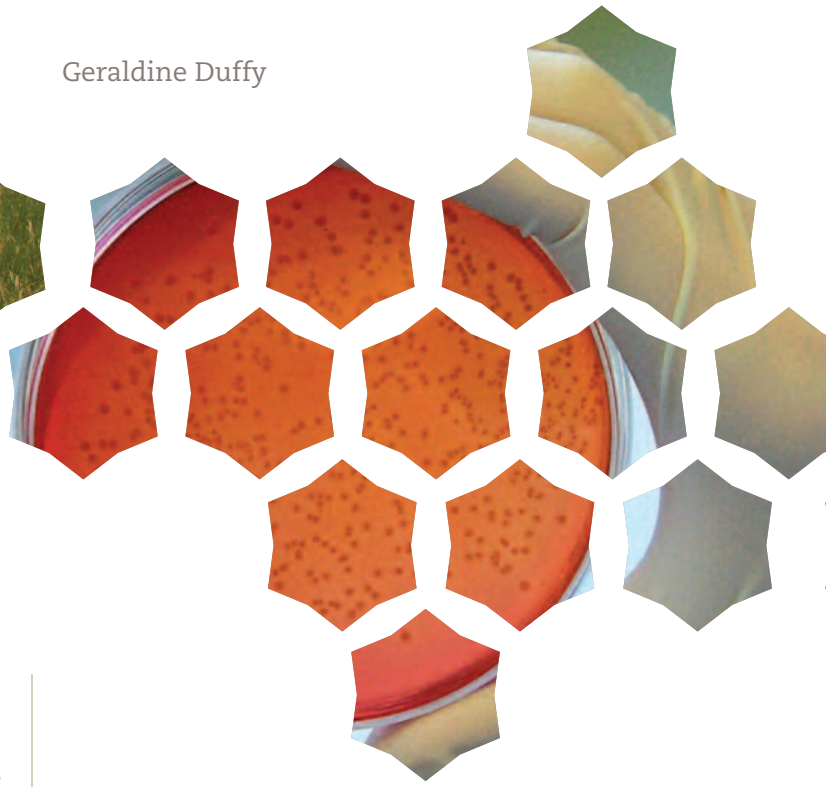
**Other contributors and collaborators:** The authors would like to acknowledge the training received and the input of Steve Foster and Martin Williamson from Rothamsted Research.

**Funding:** Department of Agriculture, Food and the Marine Research Stimulus Fund (14/s/879) and Teagasc core funding.



## Food safety research on Shigatoxigenic *E. coli* supporting new market access

Geraldine Duffy



## Assessing the eligibility of land for support under the Afforestation Scheme

Niall Farrelly

**Industry impact:** A new land classification system has been developed to assist in the identification of land for support under the State Afforestation Scheme. The system has been adopted by the Department of Agriculture, Food and the Marine (DAFM) Forest Service as part of the grant application process and is based on the capability of that land to produce a sustainable commercial crop of timber. The system provides a quantitative assessment of soil fertility based on the composition of the ground vegetation, and standardises the approach to assessing the potential of land for afforestation. The system is already used by registered foresters as part of the afforestation application process, and by Department forestry inspectors to assess eligibility of sites for grant aid. The classification is also utilised by Teagasc advisors to assess the quality of land, so they can guide farmers about forestry investment decisions. The system has resulted in land becoming eligible for planting in counties Wicklow, Roscommon, Limerick, Cork and Kerry.

**Contribution from non-research stakeholders:** The Forest Service and the DAFM inspectorate, who incorporated the research into practice via industry field training. Teagasc forestry development staff, forest industry consultants and companies who provided feedback and road tested the classification.

**Other contributors and collaborators:** Gerhardt Gallagher (forestry consultant), John Conaghan (ecologist), Jenny Roche (ecologist) and Scott Wilson (forest ecologist, Scotland).

**Funding:** Teagasc grant-in-aid and Forest Sector Development, Department of Agriculture, Food and the Marine.

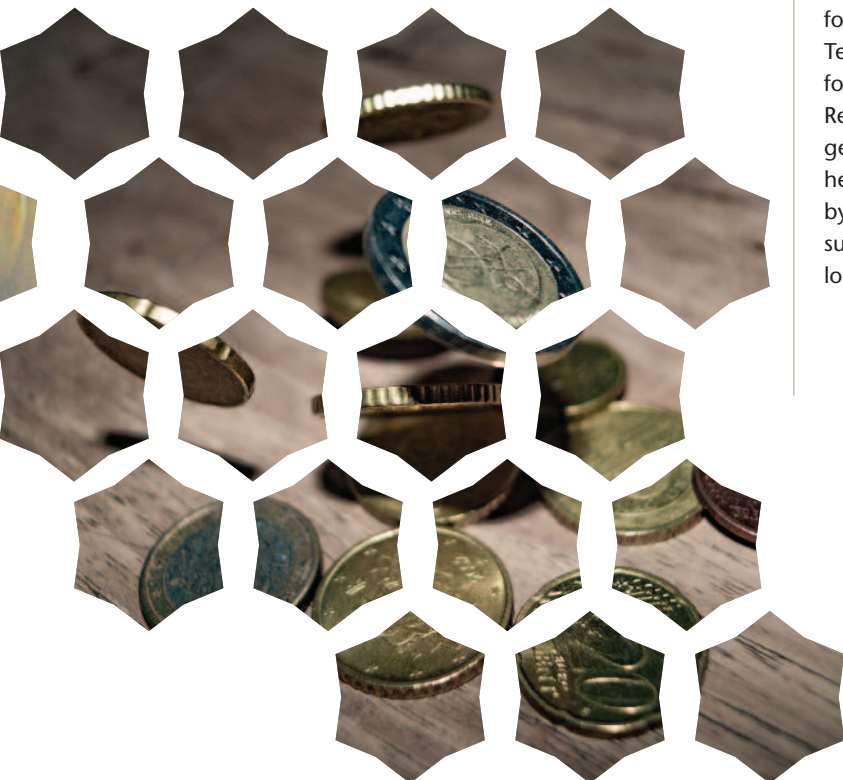
**Industry impact:** Foodwise 2025 highlights that a foodborne outbreak is a key threat across all commodities, which could impact on growth opportunities for Irish food. Access to new global markets will require scientific evidence of the highest standards of safety in Irish foods, and may also require the Irish food industry to meet different sets of food regulations in the new markets. A key pathogen of concern in this regard is Shigatoxigenic *E. coli* (STEC), which can cause serious illness in humans and is also important in terms of market access regulations for beef being exported to the USA. Ruminant animals can carry this pathogen in their gut and it can be shed in animal faeces, potentially contaminating the farm environment, food and the water chain. Teagasc food safety has a significant research focus on STEC based on a One Health approach, which is providing scientific evidence of the prevalence, types and risk posed by STEC in the Irish agri-food chain and how it can be managed. This research on STEC is supporting Irish meat companies to meet regulations on STEC to gain access to new export markets, including the USA.

**Funding:** Department of Agriculture, Food and the Marine, Food Institutional Research Measure.



## Short-run forecasts for Irish agriculture

Trevor Donnellan, Kevin Hanrahan, Anne Kinsella, Brian Moran, Fiona Thorne



**Industry impact:** Information on the short-run outlook for agricultural output value, costs of production and incomes is important to decision makers all along the agri-food supply chain. The short-run evolution of Irish output volume, agricultural input and output prices, and costs of production, are affected both by international market developments and by the likely production decisions of Irish farmers. Using data from the Teagasc National Farm Survey and the most up-to-date information from official and industry sources, the Teagasc Agricultural Economics and Farm Surveys Department produces one-year-ahead forecasts of farm profitability for dairying, cattle, sheep and tillage production systems. Colleagues from the Teagasc Pig Development Department and the Forestry Development Department also provided forecasts for their respective sectors.

### Contribution from non-research stakeholders:

Michael McKeon, Pig Development Department, Teagasc, and John Casey, Forestry Development Department, Teagasc.

**Funding:** Teagasc grant-in-aid.

## The Maternal Herd – validating the Replacement Index

Robert Prendiville, Nóirín McHugh, Simone McCabe

**Industry impact:** In 2012, Teagasc and the Irish Cattle Breeding Federation (ICBF) developed new genetic evaluations for Irish suckler beef cows. Two new indexes were established: 1) Terminal Index, the objective of which is to identify sires suitable for breeding high profit animals for slaughter; and, 2) Replacement Index, which sets out to identify sires suitable to generate replacement suckler cows and for the identification of heifers suitable for breeding. Current industry statistics published by ICBF show that the national suckler cow herd exhibits suboptimal production performance, reproductive efficiency and longevity.



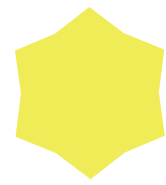
The Maternal Herd was established at Grange to validate that genetic selection, based on the Replacement Index, will deliver as expected for Irish suckler beef farmers and continue to do so into the future. Performance differences from the Maternal Herd show improvements in reproductive efficiency (pregnancy rate), which is in agreement with the expected differences in the Replacement Index. Thus, employing the Replacement Index within breeding strategies will reduce replacement rates and will deliver more sustainable beef suckler cows. The inclusion of genotyped animals in herds nationally as part of the Beef Data and Genomics Programme (BDGP) will accelerate the theoretical rate of increase in the Replacement Index.

### Contribution from non-research stakeholders:

Teagasc advisors and Knowledge Transfer staff.

**Other contributors and collaborators:** Irish Cattle Breeding Federation.

**Funding:** Teagasc grant-in-aid.



## New national fertiliser advice – Green Book 2016

David P. Wall, Mark Plunkett

**Industry impact:** A major responsibility of the research staff at Teagasc Johnstown Castle has been the publication of nutrient and trace element advice for grassland and crops. The fourth edition of the nutrient advice manual *Teagasc Green Book*, published in 2016, provides comprehensive advice for all major farming systems in order to determine optimum levels of major and micro nutrients for the most important agricultural and horticultural crops. This new and updated advice is based on the latest scientific research and complies with the latest European and Irish legislation concerning the management of nutrients in agriculture.

This manual is the primary nutrient management guide for farmers, agricultural advisors and consultants, enabling them to minimise conflicts between the need to ensure an economic return from grassland and tillage farming on the one hand, and growing concerns about losses of nutrients to water, or gaseous emissions to the atmosphere, on the other. The information therein is the basis for good nutrient management practice throughout Ireland, helping to underpin the Government's Food Wise 2025 strategy for agricultural growth, while simultaneously helping farmers to achieve their profitability and environmental sustainability goals.

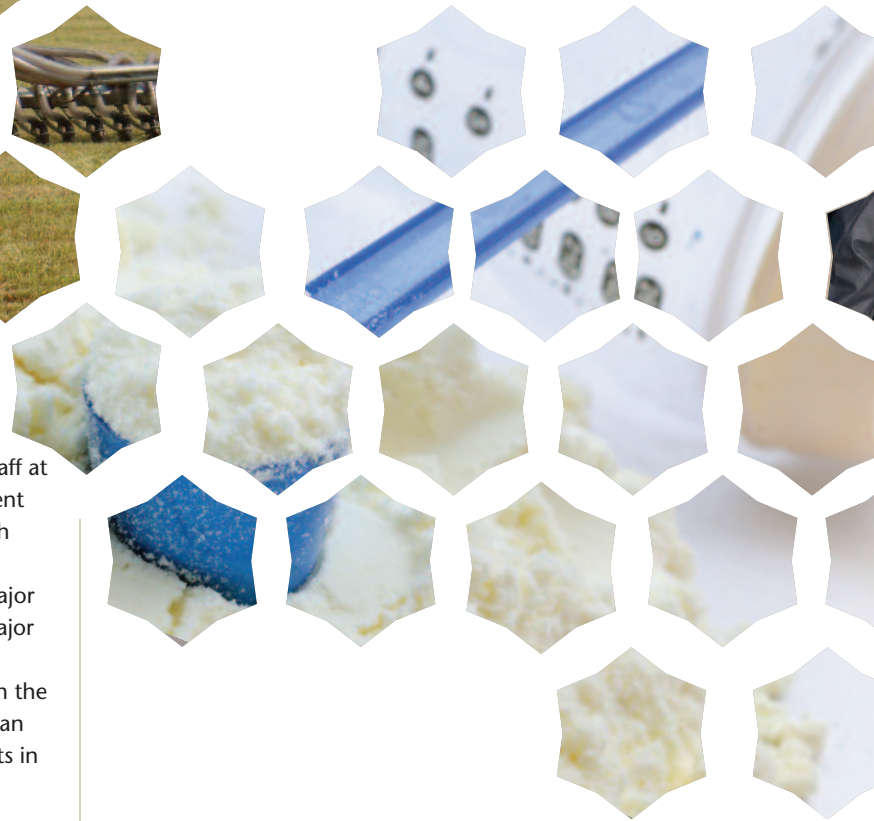
### Contribution from non-research stakeholders:

Teagasc Knowledge Transfer specialists and advisors were involved in shaping how the new fertiliser advice was presented, while the Fertiliser Association of Ireland provided information on various chemical fertiliser ingredients.

**Other contributors and collaborators:** Studies by Teagasc researchers provided the scientific basis for changes, while information on the nature and behaviour of fertiliser constituents applied to soils was provided by Mike McLaughlin, University of Adelaide, Australia.

**Funding:** Teagasc grant-in-aid.

## Teagasc's research infrastructure supporting the infant formula sector



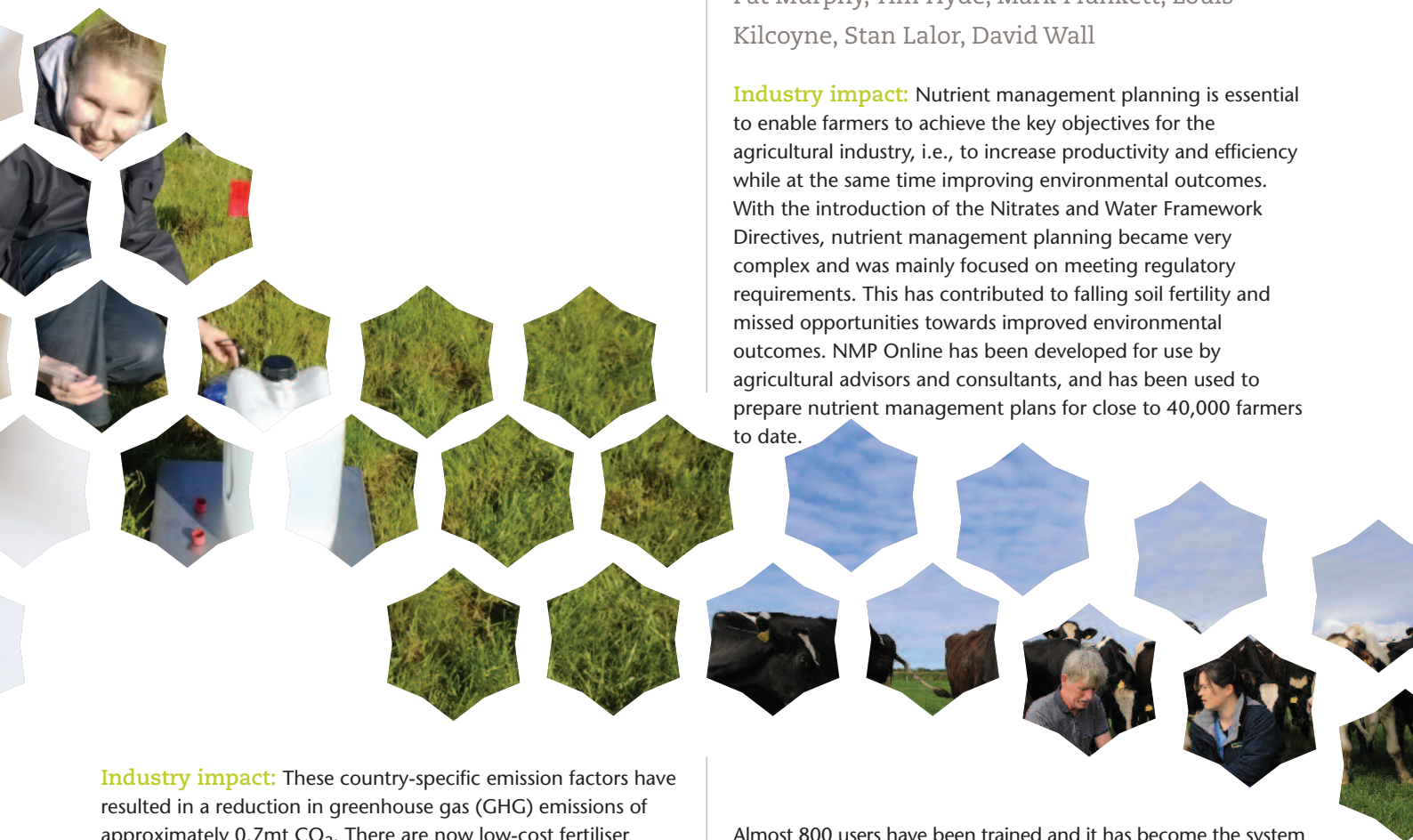
Mark Fenelon, Noel McCarthy, John Tobin

**Industry impact:** Teagasc has played a central role in supporting the infant milk formula (IMF) sector in Ireland through its research at Teagasc Food Research Centre, Moorepark. A platform has been set up to maintain research capability in core processing technologies and ingredient science to develop innovative solutions for both the ingredients and infant formula processors. The research team has transferred new processes, and analytical and quality methodologies, for industrial use. The research has delivered new insights into the consequences of process change that affect hydration of ingredients, stability of concentrates and finished powder functionality. Process mapping techniques have been implemented to monitor the effects of ingredients and optimise conditions during manufacture of ingredients for IMF. These techniques are currently being used for troubleshooting commercial applications.

**Funding:** Department of Agriculture, Food and the Marine and Enterprise Ireland.

## New Irish-specific greenhouse gas emission factors

Gary Lanigan, Karl Richards, Patrick Forrester



**Industry impact:** These country-specific emission factors have resulted in a reduction in greenhouse gas (GHG) emissions of approximately 0.7mt CO<sub>2</sub>. There are now low-cost fertiliser formulation options for farmers to reduce GHG emissions. The research has also resulted in the source of GHG emissions dramatically changing, with fertiliser increasing from 27 to 38% and dung/urine reducing from 41 to 23% of N<sub>2</sub>O emissions. This research has contributed to the development of the Irish National Mitigation Plan Under the Climate Action and Low Carbon Development Act 2015.

### Contribution from non-research stakeholders:

The researchers involved have been engaging with stakeholders, including Knowledge Transfer specialists, advisors, farmers and industry, throughout the project, and continue to do so.

**Other contributors and collaborators:** The Agri-Food and Biosciences Institute (AFBI), Northern Ireland.

**Funding:** Department of Agriculture, Food and the Marine (Grants: RSF 10-/RD/SC/716, 'AGRI-I', and RSF 11S138, 'SUDEN'), and Department of Agriculture, Environment and Rural Affairs (Northern Ireland) (DAERA E&I, Project 13/4/06).

## NMP Online – improving nutrient management and soil fertility on Irish farms

Pat Murphy, Tim Hyde, Mark Plunkett, Louis Kilcoyne, Stan Lalor, David Wall

**Industry impact:** Nutrient management planning is essential to enable farmers to achieve the key objectives for the agricultural industry, i.e., to increase productivity and efficiency while at the same time improving environmental outcomes. With the introduction of the Nitrates and Water Framework Directives, nutrient management planning became very complex and was mainly focused on meeting regulatory requirements. This has contributed to falling soil fertility and missed opportunities towards improved environmental outcomes. NMP Online has been developed for use by agricultural advisors and consultants, and has been used to prepare nutrient management plans for close to 40,000 farmers to date.

Almost 800 users have been trained and it has become the system required by the Department of Agriculture, Food and the Marine for the submission of GLAS and Derogation nutrient management plans. While the initial focus of plans is scheme compliance, the key strength of the system is its capacity to deliver key messages to farmers in relation to soil fertility. Its success will be measured into the future by the capacity of the system to support the adoption by farmers of improved practice at farm level. NMP Online produces detailed maps, which can be easily used by farmers in relation to each component of soil fertility management.

### Contribution from non-research stakeholders:

The system was designed with input from farmers and farm advisors.

### Other contributors and collaborators:

Compass Informatics was brought on board to help build the NMP Online interface and background ICT.

**Funding:** Teagasc grant-in-aid and Department of Agriculture, Food and the Marine funding.



## Impact of Teagasc research publications

Maire Caffrey, Catriona Boyle, Frank O'Mara

Research-performing organisations, such as Teagasc, need to evaluate their research output to justify investment, guide decisions on the direction of future research and understand how their performance compares to similar organisations.

Funding bodies require data to show return on investment and researchers like to know how their peers rate their outputs. Teagasc is monitoring its research impact and compiling that data for stakeholders.

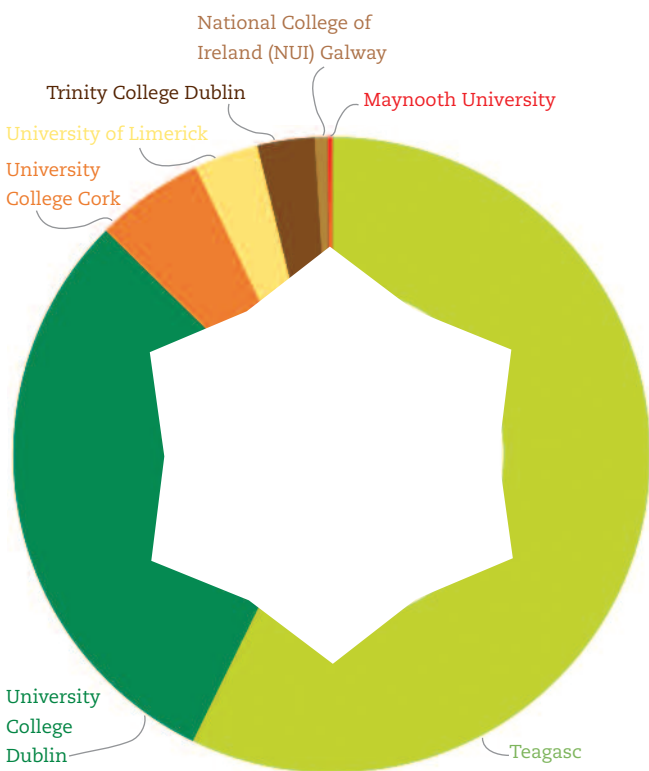


Figure 1. Number of papers by Teagasc and Irish universities that are indexed in the Web of Science category Agriculture, Dairy and Animal Sciences (2012-2016).

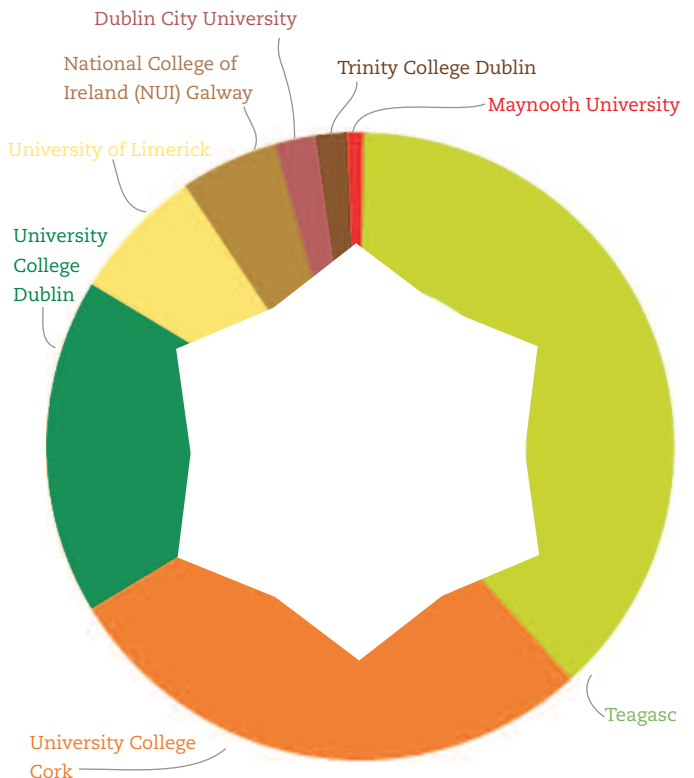


Figure 2. Number of papers by Teagasc and Irish universities that are indexed in the Web of Science category Food Science and Technology (2012-2016).

There are a number of resources available to provide both the basic citation counts and a variety of metrics. One such resource used by Teagasc is the Web of Science and its accompanying research evaluation tool InCites. Web of Science is an online subscription-based scientific citation indexing service, which allows for in-depth exploration of the scientific literature. It also provides a count of citations to each article it indexes. InCites is a customised research evaluation tool that allows an organisation to analyse institutional productivity and benchmark output against peers worldwide. It is important to understand how our performance ranks against other research bodies. Comparisons within (subject) categories are the most meaningful.

Two categories of relevance to Teagasc are: (a) Agriculture, Dairy and Animal Sciences; and, (b) Food Science and Technology. To place our performance in a national context, we can compare Teagasc's performance with that of the Irish universities within these subject categories. In the period 2012-2016, Teagasc ranks first in each of these categories with 314 publications in the category Agriculture, Dairy and Animal Sciences (Figure 1), and 642 papers in the category Food Science and Technology (Figure 2). Of course, all bibliometric analysis must be placed in context and the impact of our research must be evaluated in other ways, to give an overall assessment.

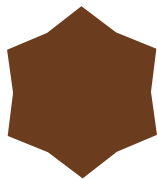


## Research Programmes

Teagasc's mission is to support science-based innovation in the agri-food sector and wider bio-economy that will underpin profitability, competitiveness and sustainability.

This is achieved through the close coupling of research and knowledge transfer in four programme areas:

- Animal & Grassland Research and Innovation;
- Crops, Environment and Land Use;
- Food; and,
- Rural Economy and Development.



Each of these programmes is composed of research, development and knowledge transfer/industry development departments, as outlined below. Research is conducted at six dedicated locations, while knowledge transfer professionals are located throughout the country (see map on back cover). Our annual research portfolio comprises some 350 research projects, carried out by 800 scientific, technical and other support staff and Walsh Fellow graduate students in our research centres throughout Ireland.

In order to maximise the impact of our research, Teagasc actively collaborates with research organisations across the world. This collaboration stretches from individual projects and publications right up to formal alliances and partnerships.

### Animal & Grassland Research and Innovation Programme Departments

- Animal & Bioscience Research
- Grassland Science Research
- Livestock Systems Research
- Pig Development
- Dairy Knowledge Transfer
- Drystock Knowledge Transfer

**Locations:**

- Athenry, Co Galway
- Grange, Dunsany, Co Meath
- Moorepark, Fermoy, Co Cork

### Crops Environment and Land Use Programme Departments

- Crops Research
- Environment, Soils and Land Use Research
- Forestry Development
- Horticulture Development
- Agricultural Catchments
- Crops Knowledge Transfer
- Environment Knowledge Transfer

**Locations:**

- Johnstown Castle, Co Wexford
- Oak Park, Co Carlow
- Ashtown, Dublin 15

### Food Programme Departments

- Food Biosciences Research
- Food Safety Research
- Food Chemistry & Technology Research
- Food Industry Development
- Food Quality & Sensory Science Research

**Locations:**








- Ashtown, Dublin 15
- Moorepark, Fermoy, Co Cork

### Rural Economy and Development Programme Departments

- Agricultural Economics and Farm Surveys Research
- Spatial Analysis, Food Marketing and Agri-Innovation Research
- Farm Management and Rural Development
- Knowledge Transfer

**Locations:**

- Ashtown, Dublin 15
- Athenry, Co Galway

-  Head Office, Research Centre and Advisory
-  Research Centre and Advisory
-  Advisory Centre
-  Research Station
-  Teagasc College and Advisory
-  Private College
-  Planned Closure



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